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## Indian Journal of Engineering, Science, and Technology

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# Semi-Automated System of Growing Plants Using Hydroponic Technique

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## Abstract

*Hydroponics is the method of cultivation in which the plants are grown without soil by nutrient rich water solution. Mostly the hydroponic plants are grown by exposing them to the direct sunlight or in the polyhouse for controlling the temperature. In this project, we are going to develop a model which involves the growth of hydroponic plants in a controlled environment by using artificial lights for providing optimum temperature required by the plants. We have chosen long day plants (requires 18 hours of sunlight/day) like leafy vegetables – coriander, amaranthus. Depending upon the plant species, the amount of light required by the plants per day is fully controlled.*

**Keywords:** Artificial light, Hydroponics, Polyhouse

## 1. INTRODUCTION

Facing some major challenges, open field or soil based agriculture is capable of being replaced by soil-less culture of plants. This is possible with hydroponics as one of the ways of soil-less cultivation. Under critical circumstances like polluted soil becoming infertile due to increased urbanization and industrialization, food production under soil-less culture is proving to have shown some promising results worldwide enabling less space occupation conserving much water. Increased production with less energy resources is possible in this as many problems like insect or pest attack and their effect on plants, effects of soil contaminants, natural weather ruins etc., are being avoided here.

The standard method of hydroponic system is practiced for both plant biology research and commercial production of several crops, including vegetable and floriculture crops. In order to deliver essential elements to the plant, hydroponic cultures utilize nutrient solution. It becomes most profitable when the nutrient media is being controlled and regulated properly. Besides the nutrients, the roots require oxygen supply steadily. On anoxic conditions, roots will be unable to take in and convey metabolites to other parts of the plant body. So nutrient solution and oxygen supply are most crucial for hydroponic cultivation followed by the plant's environmental factors like suitable temperature, moisture level, electrical conductivity, pH range, light intensity varying for each plant species.

## 2. REVIEW OF LITERATURE

Crop characteristics

Characteristics	Coriander	Amaranthus
Season	June to July and October to November	March to June
Temperature	20 to 25 <sup>0</sup> C	20 to 22 <sup>0</sup> C
Temperature for Germination	20 to 30 <sup>0</sup> C	23 <sup>0</sup> C
pH	6-8	6.5-7
EC	1.6 to 1.8	1.8 to 2
Germination	8-15 days	8-10 days
Light system	metal halide	metal halide
Lightening hrs/day	12 hrs	12 hrs
Harvesting	2-3 weeks gap after late spring	2 weeks

## 3. MATERIALS USED

List of components used are as follows:

- PVC pipe
- End cap
- Seeds
- Coir pith
- Net cup
- Precision meters
- Submersible pump
- Air stone
- Hydroponic solution
- Shade net
- Reservoir

### 3.1 PVC Pipe

Poly Vinyl Chloride pipe of diameter 63 mm is taken. And white colour paint is painted on the pipe.



### 3.2 End Cap

PVC plain 75mm endcap is taken.



### 3.3 Coir Pith

The husk taken from the coconut is normally used as manure in name of coir pith, which is good for the growth of nursing for hydroponics.



### 3.4 Net Cup

Net cups with numerous holes for propagation of roots were taken.



## 4. PRECISION METER



### 4.1 pH Meter

To measure the optimum pH of the plant during their growth, pH meter is employed.



#### 4.2 Temperature Meter

To get the optimum temperature during the growth of plant, temperature meter is used.



#### 4.3 Seeds

We have taken coriander and amaranthus seeds.



#### 4.4 Submersible Pump

To circulate the required amount of water and hydroponic solution, submersible pump is utilized.



#### 4.5 AIR STONE

Air stone which is used to circulate the oxygen in the hydroponic solution.



#### 4.6 Shade Net

Shade net of 50 percentage transparent is brought.



#### 4.7 Reservoir

The plastic tub is used as a reservoir for the hydroponic solution.



## 5. PROCEDURE

### Step 1: Making holes in PVC pipe



### Step 2: Placing net cups in the hole



### Step 3: Placing the net cup in the hole



### Step 4: Filling coir pith in the net cups



### Step 5: Temperature in water



### Step 6: TDS in water



### Step 7: pH of water



**Step 8:** Preparation for trial method



**Step 9:** Trial with clay balls



**Step 10:** Germination of the plant



**6. RESULTS**



**Experimental setup**



**Transplantation**





## Plant Growth



Parameters	Days	Coriander and Amaranthus
pH	1 to 9	6.5-6.8
EC	1 to 9	1.34-1.5
Temperature	1 to 9	26 <sup>0</sup> C-28 <sup>0</sup> C

## 7. CONCLUSION

The coriander and amaranthus species we have taken for the study has grown well. As they are leafy vegetables both the plants consume equivalent nutrients for their growth. The lettuce plant, a cool weather crop which have taken for the trial using clay balls has not grown after germination stage because it doesn't tolerate higher temperature.

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# A Study on Internet of Things and its applications

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## Abstract

*This paper focuses on Internet of Things. The integration of several technologies and communications solutions is the enabling factor of this paradigm. Wired and wireless sensor, identification and tracking technologies, distributed intelligence for smart objects, enhanced communication protocols (shared with the Next Generation Internet), and actuator networks are just the most relevant. Advancement of internet of things lead to the result of activities held in different fields such as telecommunications, informatics, electronics and social science. In such a complicated scenario, this survey provides solutions to complex discipline and contributes to its development. Enabling technologies are reviewed and different visions of internet of things are reported. What emerges next is that still major issues and that shall be faced by the research community. The most relevant technologies among them are addressed in details.*

**Keywords:** Internet of Things, Pervasive Computing, RFID systems

## 1. INTRODUCTION

The Internet of Things (IoT) is a novel worldview that is quickly making progress in the situation of present day remote media communications. The fundamental thought of this idea is the inescapable nearness around us of an assortment of things or objects, for example, Radio-Frequency Identification (RFID) labels, sensors, actuators, cell phones, and so on which, through one of a kind tending to plans, can communicate with one another and coordinate with their neighbors to arrive at shared objectives. Irrefutably, the fundamental quality of the IoT thought is the high sway it will have on a few parts of regular day to day existence also, conduct of potential clients. From the perspective of a private user, the most clear impacts of the IoT presentation will be obvious in both working and household fields. In this unique situation, domotics, helped living, e-wellbeing, improved learning are just a couple of instances of conceivable application situations in which the new worldview will assume a main job sooner rather than later. By beginning from the contemplations above, it ought not be as tounding that IoT is incorporated by the US National Intelligence Council in the rundown of six "Disruptive Civil Technologies" with potential effects on US national power. NIC predicts that "by 2025 Internet hubs may dwell in regular things – nourishment bundles, furniture, paper documents, and more". The potential dangers getting from a broad reception of such an innovation are additionally focused. This review gives an image of the ebb and flow cutting edge on the IoT.

On the whole it furnishes the per users with a portrayal of the different visions of the Internet of Things worldview coming from different logical communities, surveys the empowering advancements and outlines which are the significant advantages of spread of this worldview in regular life, offers an examination of the real research gives the scientific community still needs to face.

## 2. ENABLING TECHNOLOGIES

Realization of the IoT idea into this present reality is conceivable through the combination of a few empowering advances.

In this segment we talk about the most applicable ones. Note that it isn't our motivation to give a thorough overview of every innovation. Our significant point is to give a image of the job they will probably play in the IoT. Intrigued perusers will discover references to specialized distributions for every particular innovation.

### 2.1 Identifican, Sensing and Communication Technologies

"Anytime, anyplace, anymedia" has been for a long time the vision pushing forward the advances in correspondence advances. In this specific circumstance, remote innovations have assumed a key job and today the proportion between radios what's more, people is nearing the 1 to 1 value. In this specific circumstance,

key parts of the IoT will be RFID frameworks, which are made out of at least one reader(s) what's more, a few RFID labels. Labels are described by an interesting identifier and are applied to objects (even people or creatures).

Perusers trigger the label transmission by creating a suitable sign, which speaks to a question for the conceivable nearness of labels in the encompassing region and for the gathering of their IDs. Appropriately, RFID frameworks can be utilized to screen questions continuously, without the need of being in observable pathway; this takes into account mapping the genuine world into the virtual world. Thusly, they can be utilized in a staggeringly wide scope of utilization situations, crossing from coordinations to e-wellbeing and security. Sensor systems will likewise assume a pivotal job in the IoT. Truth be told, they can participate with RFID frameworks to better track the status of things, i.e., their area, temperature, developments, and so forth. All things considered, they can expand the mindfulness of a specific domain and, subsequently, go about as a further connect among physical and computerized world. Use of sensor net-works has been proposed in a few application situations, for example, natural checking, e-wellbeing, astute transportation frameworks, military, and modern plant observing.

## 2.2. Middleware

The middleware is a product layer or a lot of sub-layers mediated between the innovative and the application levels. Its component of concealing the subtleties of various advancements is key to exclude the software engineer from issues that are not straightforwardly appropriate to her/his core interest, which is the improvement of the particular application empowered by the IoT frameworks. The middleware is increasing increasingly more significance in the most recent years due to its significant job in disentangling the improvement of new administrations and the mix of inheritance innovations into new ones. This excepts the software engineer from the accurate information of the variegated set of advances embraced by the lower layers.

### 2.2.1. Applications

Applications are on the highest point of the design, trading all the framework's functionalities to the last client. Surely, this layer isn't viewed as a component of the middleware be that as it may, abuses every one of

the functionalities of the middleware layer. Using standard web administration conventions and administration creation advancements, applications can understand a ideal mix between appropriated frameworks and applications.

### 2.2.2. Service Composition

This is a typical layer over a SOA-based middleware engineering. It gives the functionalities to the organization of single administrations offered by arranged articles to construct explicit applications. On this layer there is no idea of gadgets and the main obvious resources are administrations. A significant understanding into the administration scene is to have a vault of all as of now associated administration examples, which are executed in run-time to assemble formed administrations. The rationale behind the creation and the administration of complex administrations, can be communicated as far as work processes of business forms, utilizing work process dialects.

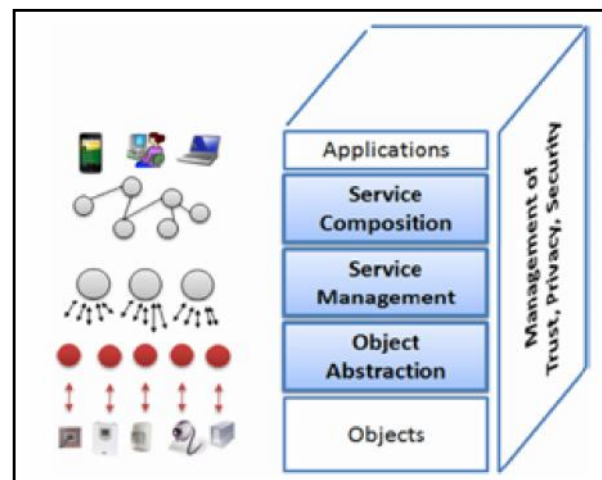


Fig.1 SOA-based architecture for the IoT middleware

### 2.2.3. Service Management

This layer gives the primary capacities that are normal to be accessible for each article and that take into account their administration in the IoT situation. An essential arrangement of administrations envelops: object dynamic revelation, status observing, and administration arrangement. At this layer, some middleware proposition incorporate an extended arrangement of functionalities identified with the QoS the executives and lock the board, just as some semantic capacities (e.g., police and setting the executives) [32]. This layer may empower the remote arrangement of new benefits during run-time, so as to

fulfill application needs. An administration archive is worked at this layer in order to realize which is the inventory of administrations that are related to each protest in the system. The upper layer would then be able to create complex administrations by joining administrations given at this layer.

#### **2.2.4. Object Abstraction**

The IoT depends on a huge and heterogeneous arrangement of articles, every one giving explicit capacities open through its own lingo. There is in this manner the requirement for an reflection layer fit for orchestrating the entrance to the various gadgets with a typical language and methodology. In like manner, except if a gadget offers discoverable web benefits on an IP organize, there is the need to present a wrapping layer, comprising of two principle sub-layers: the interface and the correspondence sub-layers. The first one gives a web interface uncovering the strategies accessible through a standard web administration interface and is in charge of the administration of all the approaching/outcoming informing activities associated with the correspondence with the outside world. The subsequent sub-layer actualizes the rationale behind the web administration techniques furthermore, makes an interpretation of these strategies into a lot of gadget explicit directions to speak with this present reality objects.

#### **2.2.5. Trust, Privacy and Security Management**

The arrangement of programmed correspondence of articles in our lives speaks to a peril for our future. To be sure, inconspicuous by clients, installed RFID labels in our own gadgets, garments, and staple goods can unconsciously be activated to answer with their ID and other data. This conceivably empowers a reconnaissance component that would plague enormous pieces of our lives. The middleware should then incorporate capacities identified with the administration of the trust, security what's more, security of all the traded information. The related capacities might be either based on one explicit layer of the past ones or (it happens all the more frequently) circulated through the whole stack, from the item deliberation to the administration structure, in a way that doesn't influence framework execution or on the other hand present inordinate overheads. While the majority of the proposed middleware arrangements make utilization of the SOA approach, some others have pursued an alternate way, particularly whenever produced for a particular situation (target application,

explicit arrangement of articles or restricted land situation). One striking undertaking is the Fosstrak one, which is explicitly centered around the administration of RFID related applications [34]. It is an open source RFID framework that actualizes the interfaces characterized in the EPC Network details. It gives the accompanying administrations identified with RFID the board: information spread, information collection, information separating, keeping in touch with a tag, trigger RFID peruser from outer sensors, shortcoming and arrangement the executives, information elucidation, sharing of RFID activated business occasions, query and catalog administration, label identifier the executives, and protection [35]. Every one of these capacities are made accessible to the application layer to facilitate the arrangement of RFID-relate administrations.

### **3. APPLICATIONS**

Possibilities offered by the IoT make conceivable the advancement of countless applications, of which just an exceptionally little part is presently accessible to our general public. Many are the spaces and the situations wherein new applications would probably improve the nature of our lives: at home, while voyaging, when debilitated, at work, when running what's more, at the exercise center, just to refer to a couple. These conditions are currently furnished with articles with just crude insight, a large portion of times with no correspondence abilities. Giving these articles the likelihood to convey with one another and to expound the data saw from the environment suggest having various conditions where an extremely wide scope of uses can be sent. These are grouped into following domains:

- Transport and logistics domain.
- Healthcare domain.
- Smart environment domain.
- Personal and social domain.

Among the potential applications, we may recognize between those either legitimately pertinent or closer to our current living habitudes and those cutting edge, which we can just extravagant of right now, since the advancements and additionally our social orders are not prepared for their sending (see Fig. 3). In the accompanying subsections we give a audit of the short-medium term applications for each of these classifications and a scope of cutting edge applications.

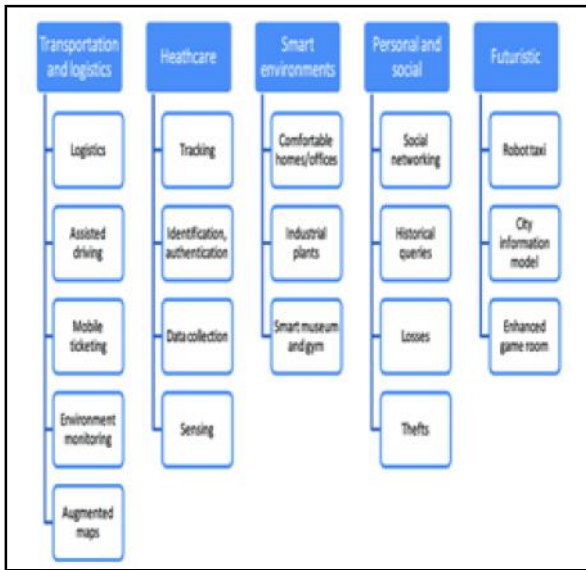


Fig.2 Applications domains and relevant major scenarios

### 3.1. Transportation and Logistics Domain

The main applications in transportation and logistics domain are described below.

#### 3.1.1. Logistics

Constant data handling innovation dependent on RFID and NFC can understand constant checking of nearly each connection of the store network, going from ware plan, crude material acquiring, generation, transportation, stockpiling, circulation and closeout of semi-items, returns' handling and after-deals administration.

#### 3.1.2. Assisted Driving

Sensors, actuators and processing power equipped in Cars, trains, and buses along with the roads and the rails may provide important information to the driver or passenger henceforth allow better navigation and safety. Monitoring of transportation and Collision avoidance systems of hazardous materials are two typical example functions.

#### 3.1.3. Mobile Ticketing

Anything that provides information about transportation services shall be equipped with NFC tag, visual marker and numeric identifier. either hovering his mobile phone over the NFC tag, or pointing the mobile phone to the visual markers The user can then get information about several categories of options from the

web. allows the user to buy the related tickets as The mobile phone automatically gets information from the associated web services.

#### 3.1.4. Monitoring Environmental Parameters

Fruits, fresh-cut produce, meat, and dairy products are important parts of our nutrition. the conservation status (temperature, humidity, shock) need to be monitored to avoid uncertainty in quality levels for distribution decisions during the transportation. Pervasive computing and sensor technologies play a vital role in improving the efficiency of the food supply chain.

#### 3.1.5. Augmented Maps

Touristic maps can be outfitted with labels that permit NFC-prepared telephones to peruse it and consequently call web administrations giving data about inns, eateries, landmarks and occasions identified with the territory of intrigue for the client

### 3.2. Healthcare Domain

IoT technologies provides many benefits to healthcare domain and the applications are mainly grouped into: tracking of objects and people(staff and patients), identification and authentication of people, automatic data collection and sensing

#### 3.2.1. Tracking

Tracking helps in identification of a person or object in motion that includes both real-time position tracking, such as the case of patient-flow monitoring to increase workflow in hospitals, and tracking of motion through choke points, such as access to designated areas.

#### 3.2.2. Identification and Authentication

It helps in identification of patients to reduce harmful incidents and also to maintain current electrical medical record and identification of infants in hospital. According to staff, it is most frequently used to grant access and also to improve employee morale by addressing patient safety issues.

#### 3.2.3. Data Collection

Automatic data collection and transfer is mostly aimed at reducing from processing time, process automation

and procedure auditing, and medical inventory management. It also relates to integrating RFID technology with other health information and clinical application technologies across a facility along with potential expansions of such networks across providers and locations.

#### 3.2.4. *Sensing*

Sensor devices focus on patients, and in particular on monitoring patient health conditions and providing real time information on patient health indicators. Sensors can be applied in in-patient and out-patient care and in order to reach patient anywhere, heterogeneous wireless remote patient monitoring systems can be deployed.

### 3.3 Smart Environments Domain

A smart environment is making its “employment” easy and comfortable and thanks to the intelligence of contained objects

#### 3.3.1. *Comfortable Homes and Offices*

Sensors and actuators appropriated in houses and workplaces can make our life progressively agreeable in a few perspectives: rooms warming can be adjusted to our inclinations and to the climate; the room lighting can change as indicated by the time; local occurrences can be stayed away from with fitting checking and alert frameworks; and vitality can be spared via consequently turning off the electrical types of gear when not required

#### 3.3.2. *Industrial Plants*

Shrewd situations additionally help in improving the computerization in mechanical plants with a huge sending of RFID labels related to the generation parts. In a conventional situation, as creation parts arrive at the handling point, the tag is perused by the RFID peruser. An occasion is created by the peruser with all the vital information, for example, the RFID number, and put away on the system. The machine/robot gets advised by this occasion (as it has bought in to the administration) also, gets the creation part. By coordinating information from the undertaking framework and the RFID tag, it knows the most effective method to further process the part. In parallel, a remote sensor mounted on the machine screens the vibration and on the off chance that it surpasses a particular limit an occasion is raised to right away stop the procedure (quality control). When such

an crisis occasion is engendered, gadgets that expend it respond as needs be. The robot gets the crisis shutdown occasion and quickly stops its activity. The plant director likewise quickly observes the status of the purported Venture Resource Planning (ERP) orders, the creation progress, the gadget status, just as a worldwide view on every one of the components and the conceivable reactions of a generation line delay because of shop-floor gadget glitches

#### 3.3.3. *Smart Museum and GYM*

As to provide smart and leisure environments, the museum and the gym are two examples where the IoT technologies help in exploiting their facilities. For instance, in museum, expositions in the building may represent various historical periods (Egyptian period or ice age) with diverging climate conditions. These building adjusts locally to these conditions while also taking into account outdoor conditions.

### 3.4 Personal and Social Domain

The applications under this domain are those that enable users to interact with other people to maintain and build social relationships. Along with, things may automatically trigger the transmission of messages to friends which allows them to know what we are doing or what we have done in the past, such as moving from/to our house/office, travelling, meeting some common mates or playing soccer

### 3.5 Futuristic Applications Domain

The applications described in the previous sections are realistic as they either have been already developed or can be implemented in a short span since the required technologies are already available. Apart from these, we may envision many other applications, which we herein define futuristic since these rely on some (communications, sensing, material and/or industrial processes) technologies that either are still to come or whose implementation is still too complex. These applications are even more below are the few applications that belongs to:

- Robot taxi
- City information model
- Enhanced game room

## 6. CONCLUSIONS

The Internet has changed the way we live, Providing interactions between people at a virtual level in several contexts spanning from the professional life to social relationships. The IoT has the potential to add a new dimension to this process by enabling communications with and among smart objects, thus leading to the vision of “anytime, anywhere, anymedia, anything” communications.

To this purpose, we observe that the IoT should be considered as overall part of Internet of the future, which is likely to be dramatically different from the Internet we use today. In fact, it is clear that the current Internet paradigm, which supports and has been built around host-to host communications, is now a limiting factor for the current use of the Internet. It has become clear that Internet is mostly used for the sending and retrieving of information (regardless of the host where such information is published or retrieved from) and therefore, information should be the focus of communication and networking solutions.

In this paper, we have surveyed the most important aspects of the IoT and what is being done and what are the applications that require further research. Indeed, current technologies make the IoT concept feasible but do not fit well with the scalability and efficiency requirement they will face.

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# IOT Based Border Alert And Secured System For Fisherman

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## Abstract

*The system which protects the fishermen by implementing the option of Embedded Microcontroller PIC IC to reduce the deaths of fishermen by controlling the entire vehicle with the help of GPS Coordinates which is programmed into IC and it receives the signal from GPS satellites about the exact location. If the location is found that the fishermen crossed the border, it alerts the fishermen by the emergency switch and entire control took by concern authority.*

**Keywords:** Global Positioning System (GPS), Global system for mobile communication (GSM), Nautical border

## 1. EXPLANATION OF ISSUE

The Palk Bay, a slim strip of water separating the state of the state in Asian country from the Northern Province of the country, has traditionally provided made fishing grounds for each country.

The region has become an extremely contested website in recent decades, with the conflict taking up a brand new dimension since the tip of the Sri Lankan warfare in 2009. Multiple problems have combined with serious ramifications for internal and bilateral relations. These problems embody current disagreement over the territorial rights to the island of Katchatheevu, frequent cooking by Indian trained worker in Sri Lankan waters, and also the damaging economic and environmental effects of trawling. However, with the governments of each country recently affirming their commitment “to notice a permanent answer to the trained worker issue,”

there’s a chance to form a win-win situation, during which the bay becomes a typical heritage of mutual profit.

In India, the fisheries dispute principally began with an interior dialogue concerning sovereignty associated with relinquishment of the island of Kachchatheevu to country the most drawback with Indian fishermen is that an outsized range of them area unit captivated with fishing in Sri Lankan waters, that is prohibited by the 1976 Maritime Boundary Agreement an outsized range of Indian fishermen area unit captivated with trawling that is prohibited in country.

There are instances of Indian fishermen being prevented from fishing, facing harassment and arrest by the Sri Lankan Navy (SLN) SLN operations involving interdictions and firings on suspicion of the Indian trawlers while fishing in the area



Fig.1 India Srilanka Maritime Boundary



The problem is relatively acute for the Sri Lankan fishermen because their livelihood is more dependent on the catch from the waters concerned, and, conjointly their means that of fishing square measure relatively less expedient and effective vis-à-vis Indian fishermen. The Indians mostly fish at night for shrimp and their use of gill nets and synthetic nets has caused severe damage to the ordinary nets of Sri Lankan fishermen.

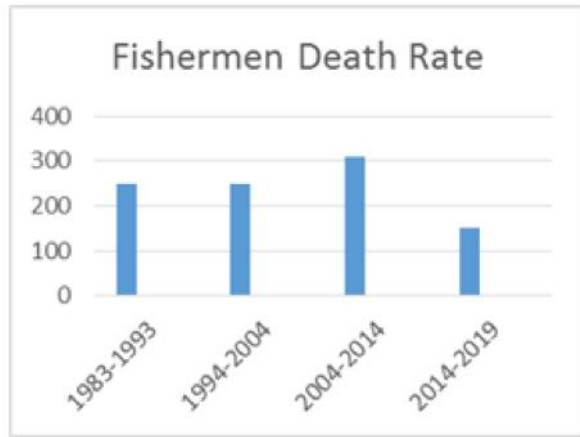


Fig No 2 Fishermen Death Ratio

If the underlying issues with the fisheries dispute are not addressed shortly, relations between fishermen and their governments, between Tamil Nadu and New Delhi, and between Tamil Nadu and Colombo could worsen and reach a crisis point.

There have been tensions between those fishermen using traditional methods and those using mechanized methods, as well as increased the infringement of territorial boundaries. According to the govt of state, the sufferings of Indian Tamil fishermen could be a direct consequence of relinquishment Kachchatheevu to Ceylon and sacrificing the standard fishing rights enjoyed by Indian fishermen trawling by Indian fishermen causes harm to marine ecology and, specifically, fish stocks

## 2. INTRODUCTION

The project induces the new methodology for saving the fishermen's valuable life and their properties from the Srilanka navy. this method makes use of PIC microcontroller that is associate degree open supply embedded kit obtainable for several major functions. Pic microcontroller is associate degree ASCII text file single-board microcontroller, a descendant of the ASCII text file Wiring platform, designed to form the method of victimization physics in multidisciplinary comes additional accessible.

The hardware consists of a straightforward open hardware style for the pic controller board with a 16f877a processor and on-board input/output support. The software package consists of a typical programming language compiler and also the boot that runs on the board. The GPS72h is that the instrumentation used ordinarily by all the fishermen within the navigation within the ocean for the aim of identification. It is a Satellite Navigation primarily based instrumentation conjointly GPS 72H acquires satellite signals quickly and tracks your location in difficult conditions, like significant tree cowl or deep canyons.

The GPS seventy-two H floats in water and its IPX7 waterproof to face up to the accidental dunk or splash within the lake. Whether on water or land, the GPS 72H will save to five hundred of your favorite places in memory and purpose you to your destination (no street or piece of ground maps). The GPS 72H is NMEA 0183 compatible.

To transfer knowledge to your device, GPS 72H simply connects to your laptop via USB. If you are into water travel, looking or fishing, you'll use the 72H's intrinsic celestial knowledge, which has sunrise/sunset times and a looking and fishing calendar. The vital system is IoT(Internet Of Thing).this is wont to send the boat location to the room and act the boat supported the room instruction

## 3. LITERATURE SURVEY

There are several projects undertaken and various methods proposed for border alerting for small boats. Various technologies have been used to implement this keeping safety of fishermen as a motto.

Following are the few papers which propose the idea of border alerting measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent,

### 3.1 IOT Based Nautical Monitoring System

The current latitude and longitude are known to both fishermen and coastal guards. The border is identified by comparing the current values with the original values and the message is sent through Wi-Fi sensor using IOT.

A single antenna is used. This helps in continuous updating of the information instantly. The low earth orbit is used to provide connectivity without a gap. This also helps in retrieving the missed messages. By using the electronic map, the navigation path can be identified. Thus it saves the lives of the fisher and alerts the bottom station to produce facilitate.

### 3.2 Alert Fishers

A LIFE-Saving mobile Application Mobile Application which may save time, effort and cash and life by giving tips and ways that to cut back the arrest of fisher on the far side boundaries that's designed and enforced.

The collected info contains all the small print associated with countries boundary from the boundary process department of Asian country and Ceylon and sorted them into a straightforward and compact application for the good thing about the every and each fisher.

### 3.3 Secure And economical Border Crossing Indicator application In Coastal space

The planned System on Secure and economical Border Crossing Indicator Application in bone space R.Sangeetha et al Maritime police investigation is administered by (and on behalf) of national authorities chiefly to spot and deter (a) infringements to laws and (b) security and safety threats. (These classes overlap and embrace enforcement and compliance observation.) Surveillance administered for the various domains, like fisheries protection, environmental protection, maritime transport safety, border management, etc., in most cases falls underneath (a) as a result of it's done on the idea of laws and laws that govern these domains. a police investigation may be a key component to exercise national sovereignty bewildered.

The police investigation systems embrace reportage / electronic communication systems, that have confidence the ships to produce info, like VMS, AIS and therefore the several manual reportage systems and regimes; and sensing element systems like radars and cameras that collect info concerning ships while not their cooperation. the previous is termed cooperative systems and therefore the latter non-cooperative systems.

### 3.4 Navigation Alert System for Fishermen with Alternative Energy Gathering

The planned system on Navigation Alert System For Fishermen With alternative energy gathering By Nandhitha.B, Mohana Priya Peril long-faced by the fishermen, World Health Organization are caught by the navy for breaching the border has inflated. In spite of the latest development within the technology hardly any action to neutralize the fear has taken place. The border between the countries within the water level isn't terribly simple to spot and this causes issues.

The Tamil Nadu fishermen even these days summon the historical rights and habitually go wide into the International Maritime borderline (IMBL) for fishing. This has a diode to apprehension by the Sri Lankan Navy and in some cases even to shoot or arrest the actual fishermen. This results in loss within each human moreover as their economic incomes. The fishermen chiefly cross the border as they're unaware of their limits within the maritime border.

### 3.5 Embedded System for Ocean Buoy to Find, Sight And Collect Information Regarding Marine Systems

The planned system on Embedded System for ocean Buoy to find, sight and Collect knowledge regarding Marine Systems by Nivetha P et al antecedently, underwater wireless communication technology is employed for police work the underwater device. The essential distinction between underwater acoustic communication and wireless communication is their propagation mediums [1].

Due to the characteristics of high consumption of radio waves within the water, it's terribly surrealistic to use wireless communication technology in underwater communication. Underwater wireless communication has been the obstacle of "sea, land, and air" three-dimensional interconnection for a protracted time. thus a great deal of maturity program of the wireless communication cannot be directly applied within the underwater acoustic communication.

Also, there's a private system used for pursuit the underwater device, monitor the marine atmosphere and for shielding the fishermen from crossing the border.

### 3.6 Design Implementation Of Gps Primarily based Border Alert And Identification System For Fishermen

The planned system on style And Implementation Of Gps based mostly Border alert And Identification System For Fishermen By P.Deepak, R.P.Shrianbarasu

In regular life we have a tendency to hear regarding several Tamil fishermen being caught and anesthetize Srilankan custody and even killed. the ocean border between the countries isn't simply specifiable, that is that the main reason for this cross border cruelty.

Here we've got designed a system victimization AN embedded system that protects the fishermen by notifying the country border to them by victimization the world Positioning System (GPS) and world system for mobile communication (GSM).

### 3.7 Novel Wireless Weather data communication For Fishermen

The planned system on Novel Wireless Weather data communication For Fishermen By Ashutha K, Shetty Arpitha Shekar Fishing is one in every one of the primary occupations of Asian country .

Fishermen need to look out of their safety whereas fishing for long distances. Since the weather is not uniform and it keeps on dynamic, thus it's powerful to predict climate. thus throughout this paper for the welfare of the fishermen we provide the fishermen the information concerning the region conditions.

This method contains two modules. the first module could also be a shore module that consists of a transmitter to send the knowledge from the shore and second module could also be an ocean module that consists of a receiver placed inside the boat that is in a position to receive the signal and show it on the alphanumeric display. information{the data} area unit attending to be sent unceasingly and knowledge of the weather area unit attending to be of the realm of fishing.

The fishermen area unit attending to be able to get the weather reports once they are perplexed and should be able to fathom the weather and build a secure come.

### 3.8 Integrated Source-Wind, Solar, Power to Floating Station For Maritime Boundary Detection

The planned system on Integrated Source-Wind, Solar, Power To Floating Station For Maritime Boundary Detection By Cj. Profun1, R. Sruthi of the worker from going outside the border by swing a floating module inside the many ocean borders. The hybrid Section uses every star and wind sources for power generation. it's given to the PIC Controller.

It senses the amount voltage created by the star and rotary engine. The transmitter is placed in many boats. each Boat has altogether totally different Frequencies.. throughout this method once the boat is nearing the border, the module alerts the boat by a voice message. This activity is monitored by the coast guard in the chopper. once the worker is on the topic of the border, the area unit attending to be alerted by the coast guard.



Fig.3 GPS Signal transmission

The GPS device can often offer the signal that determines the latitude and great circle and indicates the position of the boat and it's displayed within the digital display. The hardware that interfaces with a microcontroller, liquid crystal display, GSM electronic equipment, and GPS Receiver. GPS provides consistent positioning, navigation, and temporal order services to users on a continual basis in a day and night.

GPS store the storage of the maritime position. whereas scrutiny the previous maritime restricted position and current position and result are going to be the latitude and longitudinal degree of the boat's location is set If the boat nearer to the restricted zone, automatically warning message and alert are going to be sent to the liquid crystal digital display and buzzer that is in a boat.

The warning message and alert area unit send by employing an It. Then the fishermen fail to ignore the warning and alert they move to succeed in the restricted zone mechanically engine gets off by suggests that of the relay and send through the message to the coastal guard.

A microcontroller is interfaced serially to a GSM electronic equipment and GPS receiver. a part of seas as towers cannot be placed in the middle of the ocean thus its places in coastal management workplace. therefore the coastal incessantly receive the GPS info from the GPS Address. the most aim of this GSM system is to confirm continuous watching of every boat and knowledge given to the coastal workplace. once boat crosses the border, the keep message adjacent to with compared position and message sent to the specified authority person by victimization GSM module.

This technique will work on the tactic of Coordinate points by having a good circle and latitude by scrutiny with them to their previous coordinate points. If the current coordinates and former coordinates match then it triggers an alarm or an alert messages area unit attending to be sent to the concerned fishermen in a boat and inside the management unit. At present, there are few existing systems that facilitate to identify the current position of the boats/ships using GPS/RADAR Navigation system and examine them in Associate in Nursing electronic map.

This provides the fastest and most correct technique for mariners to navigate, live speed, and determines location. this enables raised levels of safety and potency for mariners worldwide and correct position, speed and heading are required to verify the vessel reached its destination safely. the proper position information becomes even plenty of important as the vessel departs from or arrives in port and a personal need to watch the system for the police investigation the malpractice of the boats. throughout this case, there might even be a manual error to hunt out the boats crossing our boundaries.

Also, the information regarding the boundary crossing boats needs to pass to the higher official, coastal guards by manually. this may collectively provide a time to trace and warn the boats Another system is GPS72H by the GARMIN that's typically utilized by the fishermen is battery based power provide it stands for eighteen hours but the fishermen might even be sadly missing their backup batteries can lead to danger. Also, another

downside is that this GPS72H collectively to be manually watched to identify whether or not or not they crossed the boundary. there isn't any indication for the fishermen whether or not or not they are traced by the foreign navy.

According to the project of man.Naveen from St.Joseph college of engineering Madras.Instrumentation which can stop the fuel affiliation to the engine of the fishermen vessel once they have an inclination to cross the boundary. they're going to provides a probability to restart the engine with reverse motion if not they fuel provide is permanently disconnected. this method lands up to build the vessels to lure on nearer to boundaries and which might flip too caught by the foreign navy. collectively this method is going to be applicable alone to the inboard engine and not for the outboard engine based vessels.

## 5.PROPOSED METHODOLOGY

The GPS device will frequently give the signal which determines the latitude and longitude and indicates the position of the boat and it is displayed in the LCD. The hardware which interfaces with a microcontroller, LCD display, GSM modem, and GPS Receiver.GPS provides consistent positioning, navigation, and timing services to users on a continuous basis every day and night.GPS store the storage of the maritime position.

While comparison the previous maritime restricted position and current position and result are the latitudes and longitudinal degree of the boat's location is set If the boat nearer to the restricted zone, automatically warning message and alert will be sent to the LCD display and buzzer which is in the boat. The warning message and alert are sent by using a Not.

Then the fishermen fail to ignore the warning and alert they move to succeed in the restricted zone mechanically engine gets off by suggests that of the relay and send through the message to the coastal guard. A microcontroller is interfaced serially to a GSM electronic equipment and GPS receiver. Part of seas as towers can't be placed in the middle of the ocean, therefore, its place in coastal management workplace. Thus the coastal unceasingly receive the GPS data from the GPS Address.

The main aim of this GSM system is to make sure continuous watching of every boat and data given to the coastal workplace. When boat crosses a border, the hold

on message adjacent to with compared position and message sent to the required authority person by victimization GSM module

**6. ADVANTAGES OF PROPOSED SYSTEM**

- Helpful for easy communication between both the country fishermen.
- Helpful for Wreckage recovery.
- Helpful for easy identification of location through GPS.
- Easy to identify the mistakes who had crossed the International Boundary limit and started firing.
- Live Coverage of Videos through Social Media and more.

**7. BENEFITS OF PROPOSED SYSTEM**

- Helpful for straightforward communication between each the country fishermen.
- Helpful for Wreckage recovery.
- Helpful for straightforward identification of location through GPS.
- Easy to spot the mistakes Who had crossed the International Boundary limit and began firing.
- Live Coverage of Videos through Social Media

**8. PLANNED SYSTEM DESIGN**

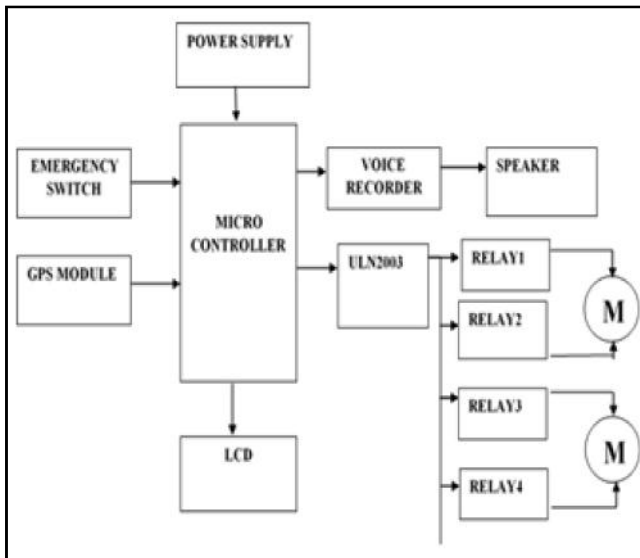


Fig.3 Boat unit

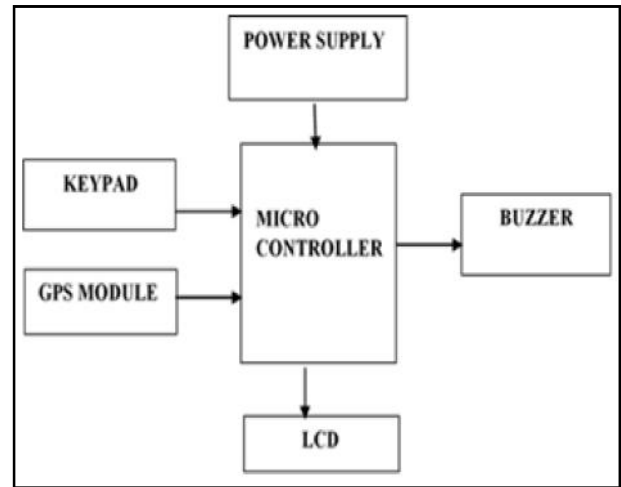


Fig.4 Management Unit

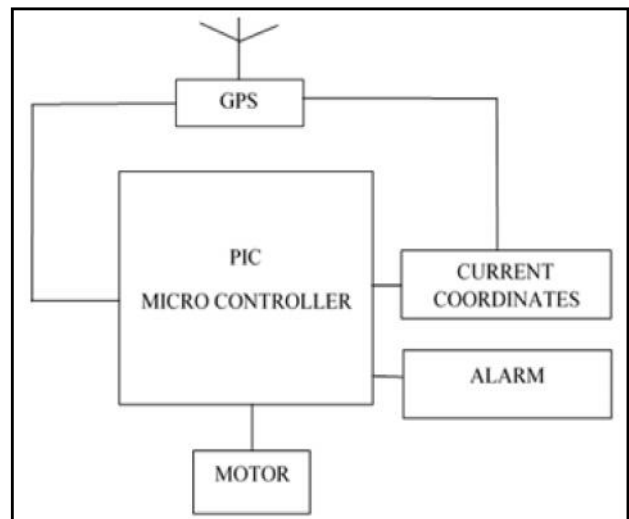


Fig.5 Flow chart

9. EXPERIMENTAL RESULTS

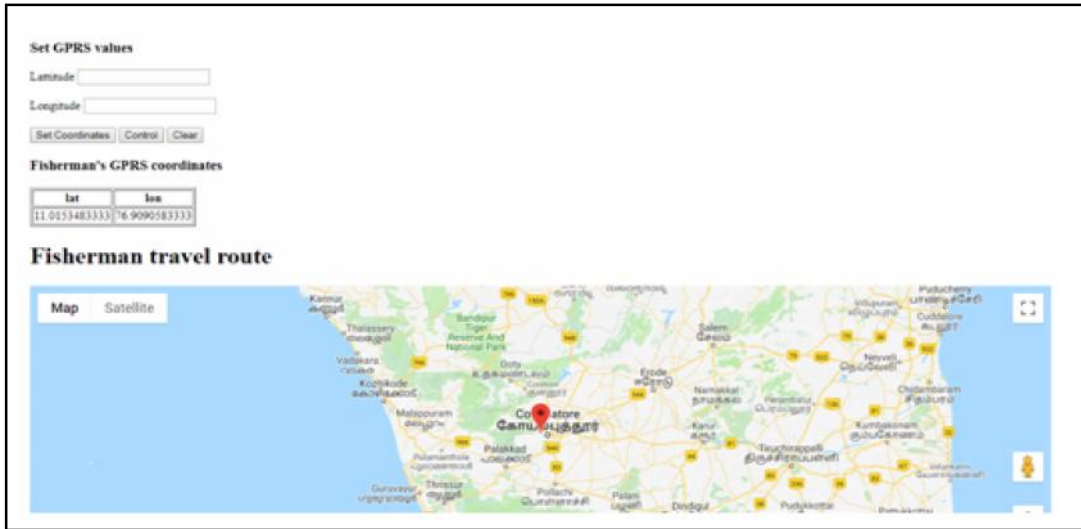


Fig 6 Fishermen Travel Route

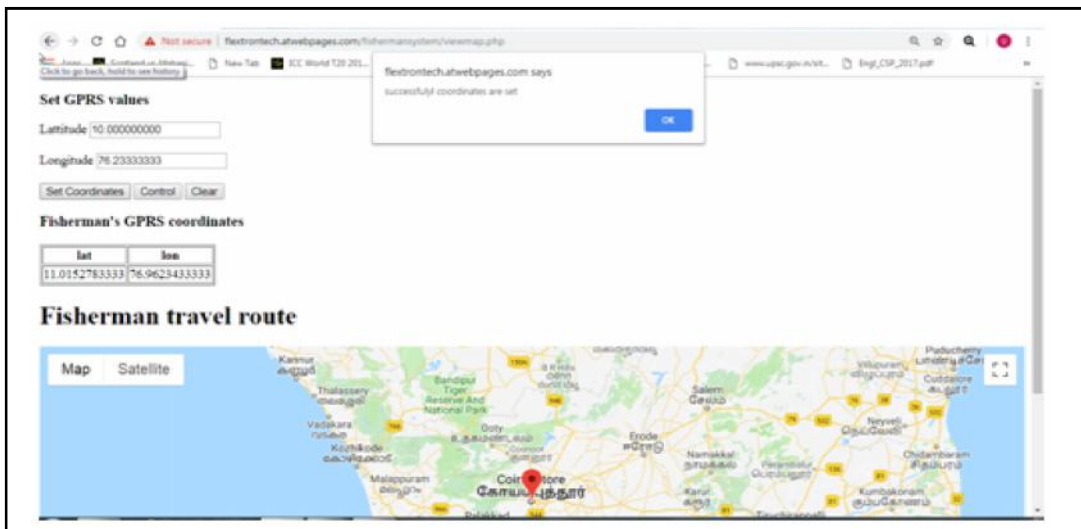


Fig 7 Fishermen Coordinates Setup

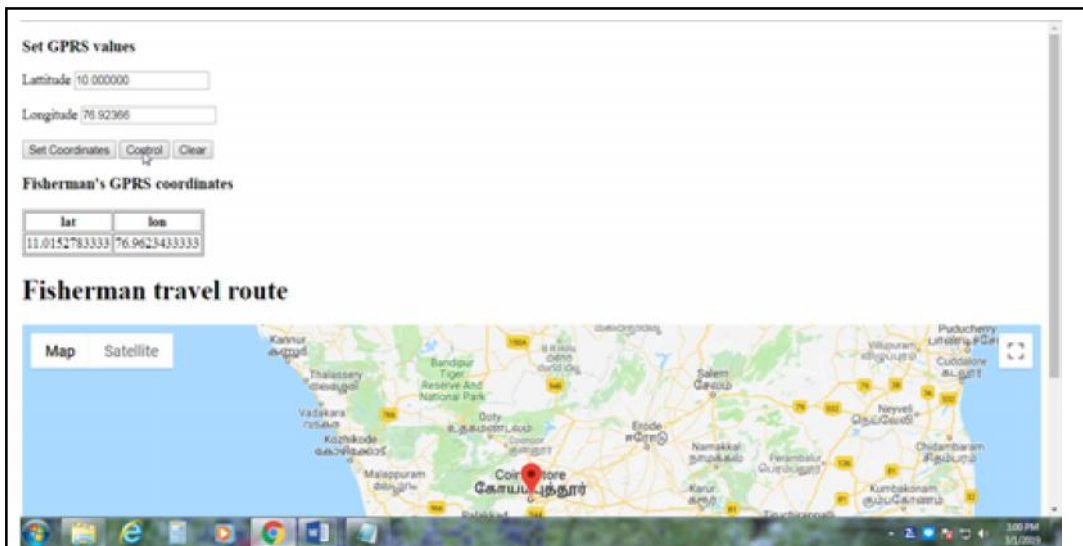


Fig.8 Fishermen hot management

## 10. FUTURE SCOPE

By having a separate Camera mounted to boat unit it helps in identifying the cross border issue and therefore the video is streamed on to social media.

It conjointly ensures the safeness of the fishermen by providing an in-depth report on border coordinates with the assistance of GPS satellites.

It will use the EEPROM to store the previous Navigating Positions up to 256 locations. It will navigate up ton variety of locations by increasing the memory of EEPROM.

It will cut back the scale of the kit by victimization GPS+GSM on a constant module of GPS navigator. It will increase the accuracy up to 3m by increasing the price of the GPS receivers.

## 11.CONCLUSION

The Fishermen risk in borderline because of unwittingly crossed the border may be reduced by this technique, and conjointly saving their life and providing smart relationship with the near countries, and conjointly straightforward to seek out the border vary as inland for anyone on the far side the marine region.

When they crossed the border limit they need to pay a penalty or get in remission by neighbor country navy guards and conjointly this methodology helps the fishermen to guide by navigation and alerting them to succeed in safety the border limit. we tend to have introduced the fishermen border alert system controlled by PIC microcontroller i.e. PIC16F877A. it's a forty pin IC that having the property of burning a program whereas running another program. it's reliable, versatile and of low value.

The alert system that we've developed can give an efficient answer for fishermen's downside and forestall them from crossing the alternative country border. the applying will save the lives of the many fishermen. the applying works as AN automatic incident management application that intimates the user if border crossing happens. If the sailor crosses the border the alarm is employed for identification of fisherman and the alert message is given to countries.

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# Experimental and Analytical Study of RCC Beam Reinforced with Conventional Steel and Basalt Rebars

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## Abstract

*This paper reports the flexural behaviour study on concrete beams reinforced with conventional steel and basalt rebar. Conventional steel bars are vulnerable to various environmental attacks and aggressive attacks such as corrosion. Basalt rebar can effectively overcome this problem due to the enhanced properties like inhibiting corrosion, high tensile strength, low young's modulus, lightweight and resist electrical conductivity. In this paper, the concrete of grade M 30 was used and tested for various mechanical properties such as compressive strength, split tensile strength, flexural strength and modulus of elasticity; durability properties such as salt resistance, sulphate resistance, acid resistance and water absorption. Furthermore, flexural behaviour of conventional steel reinforced beam (SRB) and basalt rebar reinforced beam (BRB) were investigated through experimental and analytical study. The test results were arrived and discussed elaborately. It has been noticed that BRB shows significant greater deflection when compared to SRB due to lower elastic modulus, whereas flexural load carrying capacity of BRB increases due to enriched tensile strength property in basalt rebar. The results proved that basalt rebar can be effectively used in construction as a replacement of conventional steel reinforcement for sustainable development.*

**Keywords:** Basalt rebar, Conventional steel rebar, Durability, Flexural strength.

## 1. INTRODUCTION

Corrosion is the main scourge of metal reinforced constructions and structures, steel machinery and metal products. The steel is mainly used in various applications. Various fibres were developed and used in the construction, industrial and highway engineering. The use of fibre reinforced polymer (FRP) composite materials has been rapidly growing across numerous industries [1]. Natural or synthetic fibres are used to mechanically enhance the strength and stiffness of a polymer matrix. FRPs used to reinforce and strengthen structures are extremely strong upto eight times than typical reinforcing steel. FRP is mainly used due to their properties like high strength, light weight, low thermal conductivity, impact resistant, low lifecycle costs, electromagnetically transparent and mainly corrosion resistant. They do not exhibit any yielding before failure and they behave almost linearly up to tensile rupture. Due to their mechanical properties, deflections and cracking in FRP RC beams are larger than these found in traditional RC members. Consequently, the design of FRP RC beams is often governed by the serviceability limit states [2]. In the construction of structures, strength, stiffness and resistance to environmental factors are considered as main factor. Composite materials based on FRP become outstanding replacement for conventional steel reinforcement [3]. Basalt bars of BFRP group (basalt fibre reinforced polymer) have a number of advantages comparing to steel reinforcement and other FRP composites, such as

glass GFRP (glass fibre reinforced polymer) or carbon CFRP (carbon fibre reinforced polymer). It has high tensile strength than steel and glass FRP rebar of same diameter [4]. This rebar consists of 80% fibers and has a tensile strength three times that of the steel rebar normally used in building construction. It is made by utilizing a resin (epoxy) binder [5]. Comparing to this BFRP bars are designed to use in tension only, as their compressive strength and shear strength is low. Field bents are not allowed [6]. Concrete structures like bridges or underground tanks reinforced with traditional steel bar are subjected to corrosion attack due to environmental conditions [7]. To resist the corrosion, non metallic bars can be used instead of steel bars. Basalt rebar is the best alternative for resistance of corrosion in construction industries, marine environment and in chemical industries. Basalt offers high chemical and thermal stability, which the fiber retains. BFRP is not suitable in earthquake zone [8]. The main aim of this study is to evaluate the effect of basalt bars and steel reinforcement in RC beams supported by various tests such as workability, compressive strength, flexural strength and durability.

## 2. MATERIALS

### 2.1 Cement

The Ordinary Portland Cement (OPC) of 53 grade, conforming to IS 12269 - 2013 was procured from the local market. The physical property tests were carried

out as per IS 4031-1988 (Reaffirmed 2014) and the experimental results are given in Table 1.

**Table 1 Physical properties of Ordinary Portland Cement**

Sl.No	Test Conducted	Experimental Results	Recommended Values as per IS 12269:2013
1	Specific Gravity	3.13	3.15
2	Consistency	31%	30%
3	Initial Setting Time	32 min	Min- 30 min
4	Final Setting Time	286 min	Max- 600 min

**2.1.1 Fine aggregate**

M sand is used as a fine aggregate. Tests for fine aggregate was carried out in the laboratory as per IS 383- 1970 (Reaffirmed 2011). The fine aggregate used in this project belongs to grading zone II and fall under the category of medium sand.

**Table 2 Physical Properties of Fine Aggregate**

Sl.No	Test Conducted	Experimental Results
1	Specific Gravity	2.56
2	Fineness Modulus	2.76

**2.2 Coarse aggregate**

Crushed blue granite metal used in the present work was collected from local supplier. Coarse aggregate of 20 mm size is used. Physical property tests were carried out in accordance with IS 2386-1963 (Reaffirmed 2011) and presented in Table III.

**Table 3 Physical Properties of Coarse Aggregate**

Sl.No	Test Conducted	Experimental Results
1	Specific Gravity	2.8
2	Water Absorption Value	1.2%
3	Impact Test	28.7%

**2.3 Basalt rebar**

Basalt Fiber Reinforced Polymer (BFRP) - basalt rebar shown in Fig. 1 was used as reinforcement in concrete beam specimens. High yield strength deformed bar of Fe415 was used in beam reinforcement.



Fig.1 Basalt rebar

**Table 4 Properties of Basalt Rebar**

Sl.No.	Particulars	Results
1	Rebar Diameter	8 mm
2	Tensile strength (Mpa)	1200
3	Ultimate force (KN)	96.10
4	Elastic modulus (Gpa)	53.00
5	Ultimate strain (%)	2.34

**3. MIX PROPORTION**

The concrete mix design was performed according to IS 10262: 2009 and M30 grade of concrete mix is used. The quantities of the mix proportion of cement content = 448 kg/m<sup>3</sup>, fine aggregate = 635 kg/m<sup>3</sup>, coarse aggregate = 1041 kg/m<sup>3</sup>. The concrete mix proportion arrived was 1:1.36:2.31.

**4. EXPERIMENTAL PROGRAM**

To determine the mechanical properties of concrete, compressive strength test, split tensile test flexural test and durability tests were carried out. The compressive strength of hardened concrete was found to be 24.26 N/mm<sub>c</sub> at 7 days and 39.87 N/mm<sub>c</sub> at 28 days .The split tensile test of hardened concrete was found to be 2.52 N/mm<sub>c</sub> at 7 days and 4.16 N/mm<sub>c</sub> at 28 days. The flexural

test of hardened concrete was found to be 3.84 N/mm<sub>2</sub> at 7 days and 4.51 N/mm<sub>2</sub> at 28 days.

#### 4.1 Durability Test

Durability is mainly depends on the environmental factors. Tests such as acid attack, sulphate attack, salt attack and water absorption were carried out for 28 days.

- **Acid attack**

Concentrated Hydrochloric acid (HCl) is used in acid attack. The hardened concrete is immersed in HCl replaced by 3% of water for a period of 28 days under the room temperature and the test results were tabulated.

- **Sulphate attack**

Magnesium Sulphate (MgSO<sub>4</sub>) was used for sulphate attack test. The hardened concrete is immersed in MgSO<sub>4</sub> replaced by 5% of water for a period of 28 days.

- **Salt attack**

Sodium Chloride (NaCl) was used for salt attack test. The hardened concrete is immersed in NaCl replaced by 3.5% of water and tested.

- **Water absorption**

The hardened concrete cube mould is immersed in water for 24 hours and it is dried and tested for compressive strength. Initial weight and weight after water absorption is compared and compressive strength was also compared with conventional value. Table VI represents the values of durability properties.



Fig.2



Fig.3



Fig.4

#### 4.2 Beam Specimen

Six rectangular concrete beams were casted and tested for this experimental study to find the flexural strength of beams. The beams were 1000 mm long, with rectangular cross section of 150 x 150 mm. Basalt bars of 8 mm in diameter and steel bars of 8 mm in diameter were used as the longitudinal main bars. Spacing of 150mm are used as shear reinforcement in all the specimen. M30 grade concrete with a water cement ratio of 0.45 is used in this experimental study. Cover in all the beam specimens are 25 mm. The mould is casted, demoulded after 24 hours, kept under curing for a period of 28 days and tested. The reinforcement detailing for beam specimen are given as shown in Fig 5.

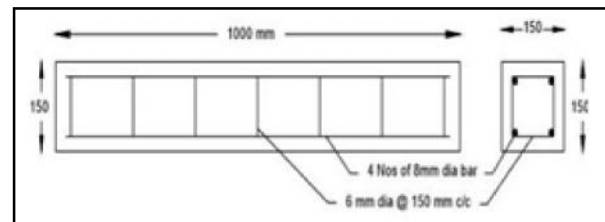


Fig.5 Reinforcement detail of beam specimen



Fig.6 Reinforcement of beam



Fig.7 Casting of beam

Table 6 Durability Property values

Tests	Age	Weight Loss		% of Weight Loss	Strength loss		% of Strength Loss (N/mm <sup>2</sup> )
		Initial (kg)	Final (kg)		Initial (kg)	Final (kg)	
Acid Test	28 days	2.475	2.445	1.21%	39.87	18.78	5.20%
Sulphate Test	28 days	2.505	2.487	0.82 %	39.87	22.75	4.49%
Salt Test	28 days	2.475	2.457	0.71%	39.87	22.82	4.27%

## 5. TEST RESULTS

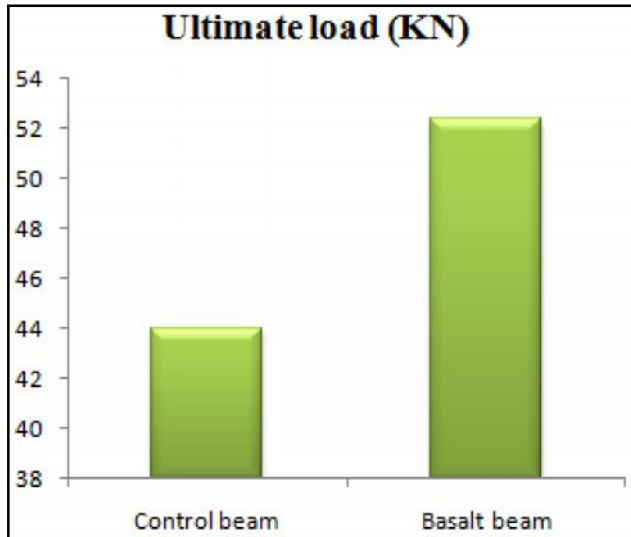
The durability of concrete is tested for 28 days. By the result obtained, for acid test the percentage of weight loss is about 1.21% after the concrete is reacted with hydrochloric acid and the strength loss is about 5.2%. Sulphate test was carried out by using MgSO<sub>4</sub> and the percentage of weight loss is 0.82% and strength loss is about 4.49%. For salt test, weight loss is about 0.71% and strength loss is about 4.27%. Due to reaction with chemicals there was a change in physical appearance of the concrete. By reaction with acid, there was a change of colour to yellow and the sharp edges of cube

were damaged. By reacting with sulphate, there was appearance of white patches on the layer of the concrete.

Flexural tests were carried out with two point loading set up. The beams were 1000 mm long, with rectangular cross section of 150 x 150 mm and tested in loading frame. Four numbers of main bars with 8 mm diameter is provided and stirrups with 6 mm diameter is provided. Deflection and crack pattern of the beam is noted during testing. Test results were tabulated in Table 7.

**Table 7 Test results of beam**

Beam specimen	Ultimate deflection (mm)	Ultimate load (KN)	Initial crack load (KN)
Control beam	21	44	13.20
Basalt beam	11.8	52.34	8



**Graph.1 Ultimate load of beam**

## 6. RESULTS AND DISCUSSION

From the study of results it shows that beam with BFRP bars on tension side has less deflection and increase in ultimate load. When comparing with control beam and BFRP concrete beams BFRP shows 1.2 times increases in ultimate load. BFRP bars reduce tensile stress that prevents sudden break with long term loaded bars. The overall performance of the beam was good. Deflection caused by flexural load is more in basalt reinforced beam than steel reinforced beam due to the lower modulus of elasticity of basalt bars than steel bars.

## 7. CONCLUSION

From the above experimental study and results, it can be concluded that,

- Basalt fiber reinforced polymer bar provide ultimate load and less in deflection.
- From the comparison study of steel bar and basalt rebar, BFRP rod is a better replacement material for beam reinforcement.
- The bond strength between basalt rebars and concrete was good and have ultimate tensile strength.

- Basalt rods can be used in corrosion resistant structures, offshore structures and in chemical industries.

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# A Survey on Object Storage System in Cloud Computing

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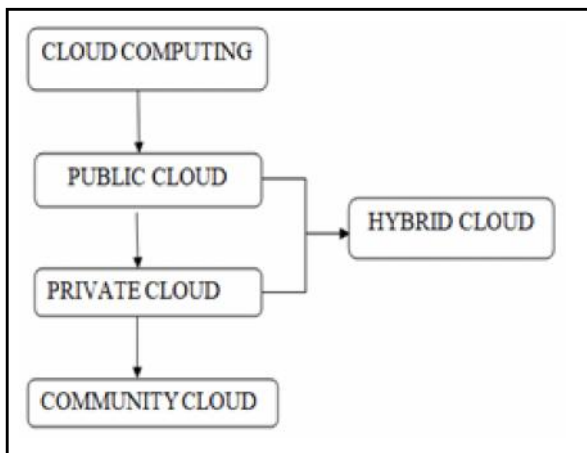
## Abstract

Technology have been developed in the certain period of time which increases the storage of the data and accessing of multiple data by the single user have been increased. To grow well in the data storage and accessing cloud computing have been developed. It is a large storage unit where Meta data can be stored in the server and are accessed by means of internet. In this paper I have given you a brief explanation about the object storage an emerging technique for the data storage which overcomes the drawback of the block storage which have capability to store only the minimal data in the split and merge format.

**Keywords:** Block Storage, Cloud Computing, Object based Storage.

## 1. INTRODUCTION

Cloud Computing is the distributed technique in which multiple resources are then shared as a service to the end user. These services are given through the network not as the physical service to the end user. It decreases the use of the hardware components and demand for the software to the end user. Various use are there in the use of cloud system are the backup and recovery, better performance, no maintenance issue, easy software update. There are four main type of cloud in the cloud system. They are.



### 1.1 Private Cloud

In this technique data are being shared only with that one particular organisation. It is used the inter-business activities where the resources are being organised and managed by only that organisation.

### 1.2 Public Cloud

In this type of cloud the resources are being accessed all over the place where the data are being maintained, organized by any institution are the government and are something as the business to consumer interaction.

### 1.3 Community Cloud

Computing resources are provided for a community and organizations. Community cloud are often used for the joined project, application and research work using the public cloud as their source for data uploading and downloading.

### 1.4 Hybrid Cloud

This type of the cloud is being accessed as the business to business interaction and the business to consumer interaction for the data accessing and this type of the computer resources are being distributed on various cloud servers. Hybrid cloud is the combination of both the public and the private cloud.

There are three type of the connection available for the data storage in the system hard disk and in the public cloud. They are

- Network Attached Storage
- Direct Attached Storage
- Storage Area Network

DAN is the directly attached to the hard disk for the data storage which are accessed only with that particular machine.

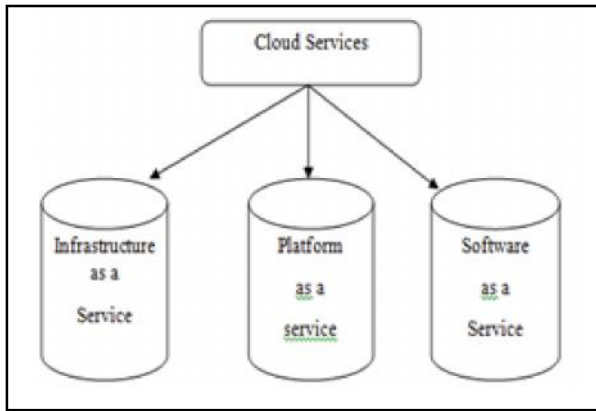


SAN is used for accessing of the data in the cloud storage system using the internet as the way of communication.

NAS is used for the accessing of the data within the particular network using the Ethernet cable for the data accessing.

## 2. CLOUD COMPUTING SERVICES

There may be a three type of services provided by the cloud service providers they are discussed below:



### 2.1 Software as a Service

In this software is then run on the cloud service provider to run the application in their platform. It is a efficient way of using this by pay and use method. This method will not provide any other exception like the storage space, software update, operating system and the networking problem such a services are provided by Google, Veeva system, Workday and Zoho.

### 2.2 Platform as a Service

In this mechanism in which third party provider is responsible for providing hardware and the software tool to the used for the application development. User can focus only on developing and running the application, the construction and maintenance are being fo

### 2.3 Infrastructure as a Service

Iaas is a model that provides computer infrastructure as a service board to support enterprising operation. It provides the hardware, server, storage space, data centre and the network components. It also provides the policy based services such as operating, housing and planning.

## 3. RELATED WORKS

Mike Mesnier et.al[1] In object-based storage, data are stored in a single repository and are not nested as a file in a folder and they are accessed by an interface that is unique for each folder. But in the block storage metadata are not easily dumped in a single folder and are accessed by using a unique address for each folder. Object storage is then developed to overcome the limitation for data accessing and the restrictions for the data usage.

A well-featured storage system provides high performance, scalability. and data sharing amount the different platforms. Nowadays there are three different architecture responsible for the data storage they are Direct attached storage(DAN),

Carsten Vogt *et al.*[2] In some of the object-based storage management system offers the buffer based storage allocation system by the hardware components. It is reasonable for the buffer allocation in the free storage space by a specific length. The storage allocation and de-allocation are then done by using the buffer read and write operation. A More complex term in this buffer based system is the “Buffer Full” and “Buffer Empty Exception”. In this model, an algorithm is used for splitting and merging of the space and the reallocation of the free space in the system. This buffer storage is then modified by some element and at the end of each exception, some descriptor is then used to reduce the probability of a further exception.

Jianwei Yin *et at.*[3] N way replication is the duplication process in which huge data is then split into N duplicated items and then the replicas are stored in the N geographical storage servers which means it can handle N-1 server failure and it has the low latency and high throughput by distributing the workload.

Erasure code is now trending technique and is used in most of the emerging web application in Facebook, Google. In this technique, an encoding object is by the K data segment and m is as similar to that of the data segment it is like a cloned segment for the storage and then distributes these segment in K+M segment geographically for the separate server storage. Suppose if the size of the object of S, then the K+M should be equal to S/K.

Even though both N replication and the erasure code have some restrictions and limitations. For N-way

replication the fault tolerance occupies more than half extra space to graduate but an erasure code, it occupies half of the extra space for the data replication. They have the unbalance trade-off, read, write operation and space efficiency.

Adam Bowers et al.[4] Cloud offers many advantages like availability, large storage space, and flexibility. Last Aware Storage Technique in the open-source Hadoop Distributed File System is then developed to offers the technique for monitoring the file system and the file transfer detection in the illegal form.

The data storage privacy such as accessing, tracking, and transfer is then given to the user with high availability, scalability of the data. It is then monitored by the name node manager for tracking the location of the data where it is stored and the socket monitor for the collection of the transfer information. Load balancing is done by separating the given space into the under-utilized space and the over-utilized space. The data is been replicated as the chunk for control over fault tolerance.

Jun li et al.[5] In the distributed file system a large amount of the data occupies the massive storage space. And by the nature of the physical storage system like power failure, up-gradation failure, maintenance operation, and overload leads to more number of the failure in the data storage. These failures the norm rather than that in a distributed file system the replicated data can occupy more space for the data storage lead to more cost spend for the data storage.

N way replication and the erasure code the multiple copies of the same data are stored in multiple servers. However, N copies of the data are stored in the N storage space by using this it can tolerate up to N-1 server failure without data loss it can cause expensive storage area. Due to this extended storage area new technology Zebre do each space into separate tiers for the storage data storage and is there is any storage requirements then it will allocate based on the size of the file.

#### 4. METHODOLOGY ON OBJECT STORAGE

In the object based storage the given data is then stored fully in one single server and it can be accessed using the object which is unique for each single data. Object storage is then taken place by using two type of the algorithms such as N-way replication which is for

replication of data. Erasure code is used for the managing the fault tolerance and the control over the storage space.

In the N-way replication the data are being replicated N times and the data are being stored in the N no of servers for the storage and the accessing to overcome this erasure code is then used for reducing the data storage usage device.

Erasure Code is the most widely used technique for the data storage in the sever by this technique the data can occupy less number of the space for the storage in the server and it is most widely used for the fault tolerance and error reduction.

Reel Solomon code is used in block storage for the applications in the digital communication and storage. It is a block based because the original message is then split into fixed length of blocks and each block is split into m bit symbols.

Cyclic redundancy checker is a technique used for error correction in the digital data communication. It is a hash function in which it is used to detect the accidental change in the raw data used in the digital telecommunication. CRC is popular because it simple and implemented in binary hardware also used to detect common error correction in the transmission channel.

#### 5 CONCLUSION

Cloud computing is one of the emerging technique for the data storage and it is one of the core technique in the professional world. It have been proved that cloud computing brings us the computer scalability, capability and demand for service which is a challenging one with Security, reliability and privacy.

From the above survey it have been proved that object storage is mainly used for the data storage in the database which can handle most of the fault tolerance and it can able to store the large amount of the data in the single sever it can be accessed using the object.

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# Comparison of Seismic Behavior By Using Different Steel Bracing Pattern in Low Rise RC Residential Building

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## Abstract

Now a days there are many (G+3) residential building with soft storey pattern are constructed without any cognizance of seismic proof at (zone 4) which is highly vulnerable to earthquake. The soft storey is inevitable condition due to the parking lot in the ground floor. In a such case we are anticipated to provide the safe design against all the seismic activity. hence keeping this in our mind, we did a seismic analysis study of different steel bracings by using staad pro software we have compared the (G+3) storey residential building by incorporating different steel bracings into the structure. eg : we have analyzed v bracing, diagonal bracings.

**Keywords:** Base shear, Time period, Mode shape, RCC bracings, Storey displacement.

## 1. INTRODUCTION

Generally the all sorts of building is designed to tackle dead load, live load etc.. but many buildings in India are not designed to resist the earthquake load particularly low raised building which is located at the zone 4, and zone 5, and many soft storey building are built across the country. To resist all kind of seismic forces we should focus on earthquake design which the stiffness and mass play a most vital role in the seismic design. Hence the effective solution to stall the seismic and avoid soft storey collapse is by providing steel bracings are most effective and economic solution to resist the seismic. bracings enhance the stiffness of the building and increase the seismic performance of the structure. there are many types of bracings like x bracings, v bracings, diagonal bracings etc.

## 2. LITERATURE REVIEW

- Bharat Patel, Rohan Mali, Prataprao Jadhav, et.al. studied about the seismic behavior and its performance under different types of bracings, base shear results and how the base shear vary due to the stiffness of the building.
- Naveen Kumar B.S, Naveen B.S, Parikshith Shetty et.al. studied about the time period (T) of the building under different types of steel bracings and how stiffness reduce the time period of the building.
- EQTips (24) C.V.R Murty et al. referred how to reduce the earthquake effects on building by base isolation its principle and its pros and cons and its

structural dynamics behavior of the building its response etc.

- EQTips (10) C.V.R.Murty et.al. studied about the time period T its principles and its application in the earthquake engineering.

## 3. OBJECTIVE OF STUDY

The main endeavor of this paper is to compare the displacement, period, Base shear off the RCC (G+3) storey building under different steel bracings like diagonal bracings, V bracing used in the structure.

### 3.1 Description of the building.

Structure = RCC

Number of storey=(G+3)

No of bay =2 in X dir and 2 in Z dir (each 4m long)

Storey Height = 10.5m

Beam size= 0.4 x 0.4m

Column size= 0.4 x 0.4m

Steel Bracing size= 0.2m dia (steel)

Floor load -12kn/m<sup>2</sup>

Seismic load direction = both X and Z direction as per IS 1893-2000

Seismic zone (Z)= IV(0.24)

Importance factor (I)= general building (1.0)

Soil type= Medium type

### 4. STRUCTURAL MODEL

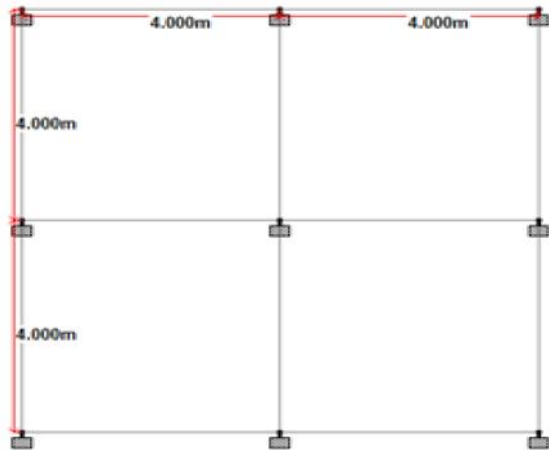


Fig.1 Plan of the building (8mx8m)

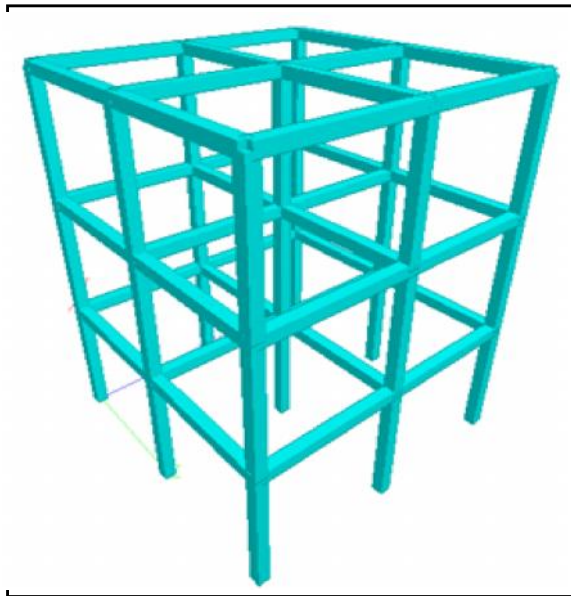


Fig. 2 Bare frame

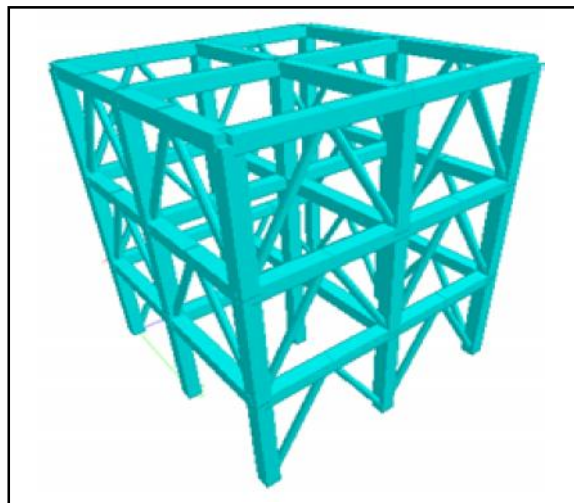


Fig.3 Inverted V frame

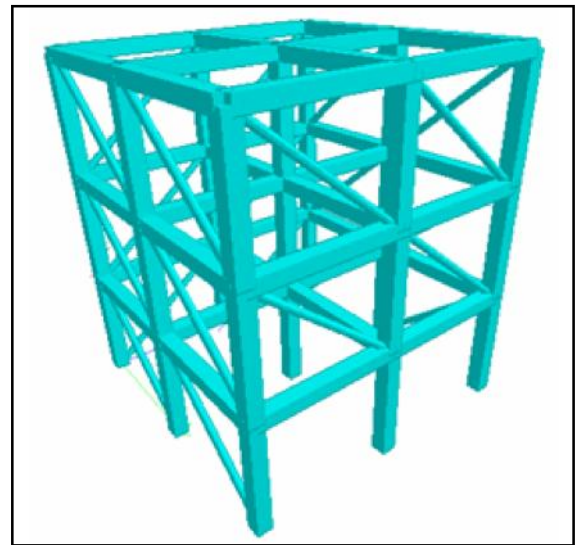


Fig.4 Diagonal bracings

### 5. RESULTS

In this work, we have generated results of storey displacement, period of the structure and base shear of the buildings. We have manifested the results in terms of graphs.

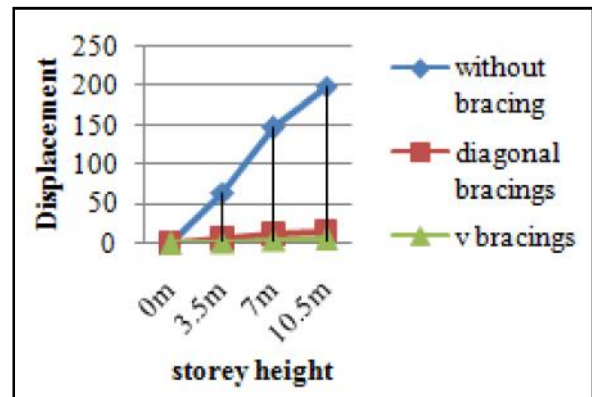


Fig.5 Displacement & Storey height

Storey Height	Without Bracing (mm)	Diagonal Bracings (mm)	V Bracings (mm)
0 M	0	0	0
3.5 M	64.31	5.711	1.849
7.0 M	146.684	11.109	4.048
10.5 M	194.236	15.691	5.949

Fig.6 Displacement & Storey height

From this above graph it is very explicit that displacement is decreasing in the steel bracings building due to increase of stiffness. In without bracings system the stiffness is very less when compare to the steel bracings systems. Here noticeable thing is that v bracing have a phenomenal decrease in the displacement. Hence it is very effective type of bracings.

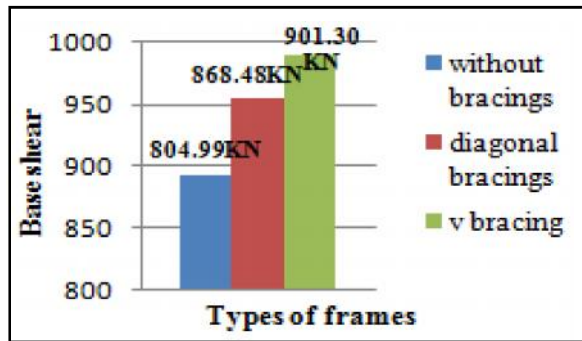


Fig.7 Base shear of the respective frames

From the above graphs is it very clear that base shear will change according to the stiffness of the building. Because hence more stiffness more base shear.

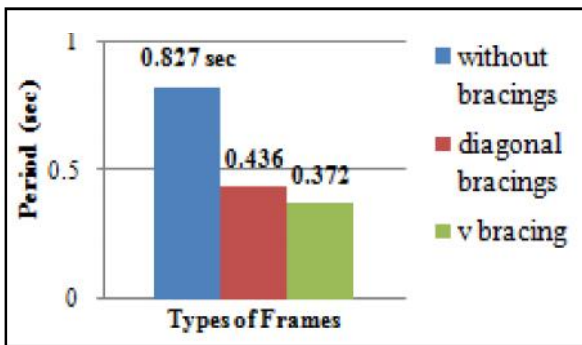


Fig.8 Time period of the respective building

From this above graph we can observe that time period is falling down due to the high stiffness of the building. Because in the less stiffness building the seismic wave passes for long time till it collapse, but in high stiffness building the seismic wave not pass hence the time period of the building is less. Hence high stiffness , less time period.

## 6.CONCLUSION

- Steel bracings results show it is very effective and better earthquake resistance .
- V bracing gives better results when compare to diagonal bracings .
- Displacement is less in bracings system .when compare to other structure.
- Time Period is decreasing when the stiffness of the buildings increase .
- Base shear is increasing, when the stiffness of the buildings increase.

Finally steel bracings system gives better result against the earthquake activity. Among the bracings system v bracings is very effective system.

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# Rotated Object Recognition Using Moment Features by Artificial Neural Network

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## Abstract

*In computer vision, recognizing of rotated object in image is a challenging task. This paper presents a method to recognize rotated objects in images by application of Artificial Neural Network. The grey scale rotated object images where obtained from the standard dataset using google. The grey scale image consisting of boundary filled object was divided into two equal parts horizontal and vertical respectively. Each horizontal and vertical parts consist of two images. The moment features of 0<sup>th</sup> order 1<sup>st</sup> order and 2<sup>nd</sup> order was extracted from the two horizontal and two vertical parts of the images and stored in [1XN]. In the second phase a Neural Network classifier was trained on feature dataset on two classes. The performance of the Neural Network was evaluated on the test dataset. It is found out that 100% classification result was achieved in test phase from the Neural Network on the datasets. The present work shows that the training time can also be reduced drastically by using moment features.*

**Keywords:** Artificial Neural Network, Feature extraction, Moments features, Rotated objects images

## 1. INTRODUCTION

Rotated object recognition by Artificial Neural Network is challenging area of research among the scientists across the world. The authors [1] applied moment- based features such as Hu moments and recognized objects using Artificial Neural Network for 3D object classification, they found out that Artificial Neural Network gives better percentage results than other methods. These moment features from one image is stored in [1XN], where N is the no of columns in the feature vector. Same method is applied to all the rotated object images of two classes. A database of 1,2,...,144 where created with these features. The number 1-72 represents data set of class 1 object similarly the 73-144 represents dataset of class 2 object. The 144 data set are normalized in the range of 0 and 1 by the method of min-max normalization method. A back propagation Neural Network was trained on the dataset. After successful completion of training process, the trained Neural Network was tested with the remaining data sets. There are two types of shaped descriptor applied for the object recognition. The first one is contour-based shape descriptors and region based as in [2]. The most popular and widely used contour- based descriptor is derived by Hu [3]. In [4] the authors applied invariants moments and Principle Component Analysis (PCA) for shape gesture and eye recognition and obtained high

classification rate. In paper [5] the authors used geometrical moments to extract the features from the objects in images. The moments were extracted from Sobel edges of the objects using this method 90% recognition was achieved. In [6] authors use moment-based object recognition system for feature extraction. From the extracted features they train Artificial Neural Network and tested and obtained high accuracy of classification of occluded objects. Neural Network application in image processing can be found in [7]-review paper. The moments of an objects are defined in [8] below used for the feature extraction work. The detail of the Neural Network can be found out in [8]-[10]. Total number of 6 moment features were extracted from each part. The moment features are given below.

$$\begin{array}{l}
 M_{00} = \sum \sum I(x, y) \quad \begin{array}{l} x \\ y \end{array} \\
 M_{10} = \sum \sum xI(x, y) \quad \begin{array}{l} x \\ y \end{array} \\
 M_{01} = \sum \sum yI(x, y) \quad \begin{array}{l} x \\ y \end{array} \\
 M_{20} = \sum \sum x^2I(x, y) \quad \begin{array}{l} x \\ y \end{array} \\
 M_{02} = \sum \sum y^2I(x, y) \quad \begin{array}{l} x \\ y \end{array} \\
 M_{11} = \sum \sum xyI(x, y) \quad \begin{array}{l} x \\ y \end{array}
 \end{array}$$

## 2. METHODOLOGY:

This paper implements the algorithm on the rotated object grey scale images. The complete recognition process consists of two parts, part 1-training of Artificial Neural Network on rotated object images dataset successfully and in part 2-testing the trained network for recognising rotated objects images. The dataflow diagram of the complete process is shown in Fig.1.

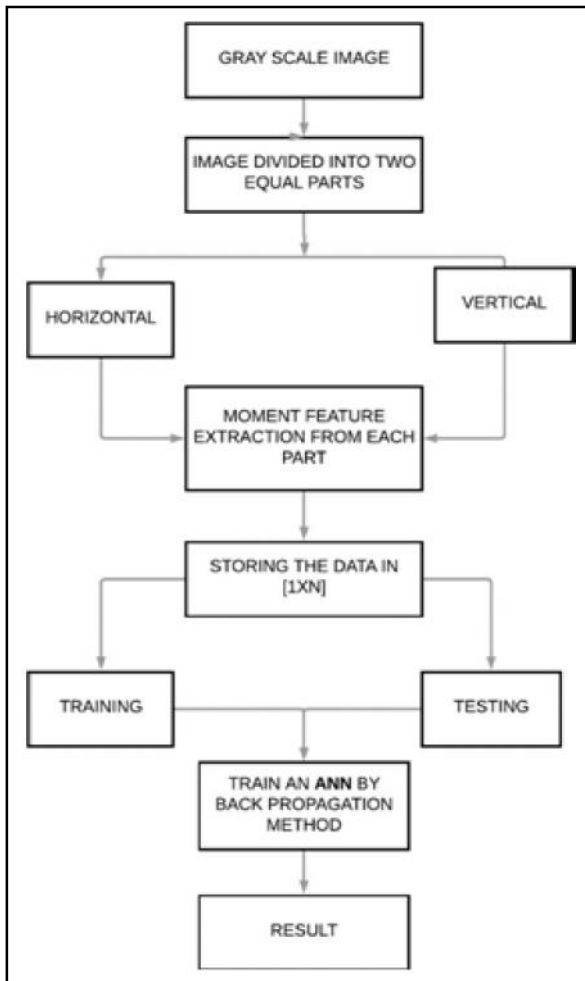


Fig.1 The data flow diagram of the training and testing process

A simple diagram of Artificial Neural Network consisting of two hidden layers is shown in Fig.2. Consider an image of grey scale of size  $pxq$ . The grey scale image is divided into two vertical and two horizontal parts as shown in Fig 2. From each part the features were extracted by applying 0<sup>th</sup> order 1<sup>st</sup> order and 2<sup>nd</sup> order moment features and concatenated horizontally and stored in  $[1XN]$  where  $N$  is the number of columns in the dataset. The features were normalised using min-max method. The range of values become in between 0 and 1. The features were divided into two

parts training and testing. A back propagation Neural Network was trained on the training data set. Once the Neural Network is trained successfully, performance of the Neural Network was evaluated on the test dataset. The nonlinear sigmoid functions were applied to each node in traing phase of the Neural Network. The feature dataset were presented to the trained Neural Network to recognise the rotated objects.

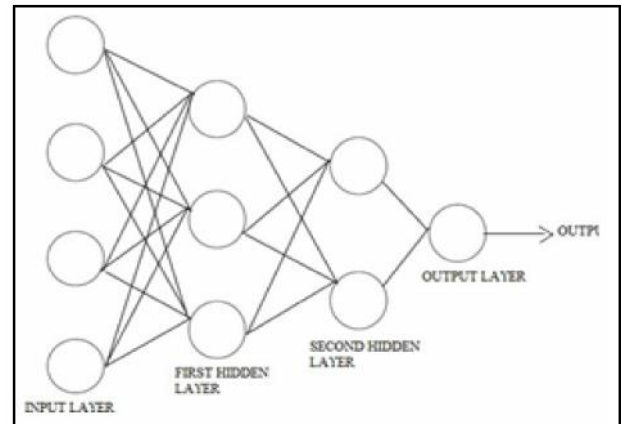


Fig.2 A basic diagram of two hidden layers of

## 3. EXPERIMENTS

For the simulation work a two class problem of two different objects having different shapes were considered. The coding was carried out on the matlab software [11] on Intel(R) Core(TM) i3-5005U CPU @ 2.00GHz 4.00 GB 64-bit Operating System, x64-based processor. The grey scale images for the experiment purpose were downloaded from standard dataset [12] of two classes. The sample rotated images are shown in Fig 4(a-h). The images were resized to 128X128. There were 72 rotated image of the object from 0 to 355 degree of one class therefore for the two classes 144 images were selected. The images were divided into two equal horizontal and two equal vertical parts seperately as shown in Fig 3.

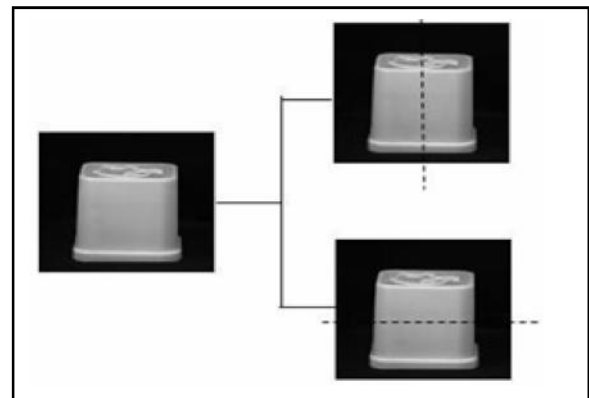


Fig.3 Representation of segmentation of image  
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The six moment features were extracted from each part of the image. Hence a feature vector of length 24 was obtained. The features were normalised in between (0,1) by min-max method. A multilayered Neural Network was considered for the training purpose. The Neural Network was trained with back propagation algorithm on the datasets. The Neural Network having non linear activation functions as outputs. A goal of 0.001 was set for the final convergence criteria of the Neural Network. The learning parameter was kept high 0.9 for the training purpose in all experiment. The performance result of the Neural Network was given below in Table 1. The three experiments were conducted.

**Table 1 Performance of the Artificial Neural Network on Rotated Object Dataset**

Experiment No	Training Feature Data set	Percentage Recognition Rate (%)
1.	1	99
2.	5	100
3.	10	100

### 3.1 Experiment 1

In experiment 1 one feature vector from class one and one from class 2 were considered for the training of the neural classifier. In testing phase 142 dataset were presented for the recognition. It is found that the Neural Network successfully classified 141 dataset into respective classes and misclassified one dataset. Hence 99% performance was obtained.

### 3.2 Experiment 2

In experiment 2 five feature vector from class one and five from class 2 were considered for the training of the neural classifier. In testing phase 134 dataset were presented for the recognition. It is found that the Neural Network successfully classified all the dataset into respective classes. Hence 100% performance was obtained.

### 3.3 Experiment 3

In experiment 3 for training of the neural classifier ten feature vector from class one and ten from class 2 were considered for the training of the neural classifier. In testing phase 124 dataset were presented for the recognition. It is found that the Neural Network successfully classified all the dataset into respective classes. Hence 100% performance was obtained.

## 4. RESULTS AND DISCUSSION

The performance of the Neural Network was evaluated in three experiments on two different rotating object dataset. In experiment 1 only one feature was selected for training from each class and 142 were tested. In experiment 2 and 3, five features and ten features of rotated object of 2 class were selected randomly and presented Neural Network was trained on these features. 134 and 124 rotated objects data was offered for the Neural Network for the testing. In experiment 1 we have one input layers, two hidden layers and one output layer was considered for this simulation work. The layer optimisation of Neural Network was carried on three feature dataset respectively. It is found out that best network architecture found in experiment 1 was 24:15:5:2 and in experiment 2 was 24:20:15:2 and in experiment 3 was 24:23:12:2 and the percentage classification was found to be 99%, 100%, 100% respectively on experiment 1, 2 and 3. The features were robustly extracted in grey scale image by a plain 0<sup>th</sup> order, 1<sup>st</sup> order and 2<sup>nd</sup> order moments. These moment feature are robust against rotation, translation and scaling. The features represented important role in defining the shape of the object.

## 5. CONCLUSION:

A simple feature extraction method was designed to extract the feature from the rotated object from the images. The Neural Network was trained and tested on these features. The performance of the Neural Network was evaluated on grey scale rotated image's dataset. The 100% performance of Neural Network was achieved by training with few samples. The method in this may bring promising solution for the multiclass patterned recognition problems. In future different networks such as Probabilistic Neural Network, Radial Basis Function Network, etc., may be considered for comparing the results with the obtained results. Also different rotated objects of two classes may be considered for the simulation work. The result by the method proposed here is encouraging. The method may also be used for industrial application in future.

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# Experimental Study on Concrete by Partial Replacement of Fine Aggregate by Textile Effluent Treatment Plant Sludge

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## Abstract

*Chemical sludge produced by textile industries poses a high threat to the environment causing pollution in all stages of its treatment and disposal. In this study sludge from textile dyeing unit was collected. It has been partially replaced for fine aggregate in concrete up to 20% replacement to find out the possibility of reuse of this hazardous waste in build materials. Manufactured sand made by grinding angular aggregates was used as fine aggregate. Study shows that the samples failed to meet the desired compressive strength required for structural applications. The reason for failure in strength development is to be further experimented by individual analysis of sludge components.*

**Keywords:** Chemical sludge, Concrete, Fine aggregate, Hazardous waste, Pollution

## 1. INTRODUCTION

Developing industrialization is creating various items and furthermore heaps of waste. The vast majority of this waste makes danger of peril people and the earth. According to USEPA, "Perilous waste will be squander that is unsafe or conceivably hurtful to our wellbeing or nature. The level of peril may shift notwithstanding the amount of the waste produced. By nature, unsafe waste muddles the procedure of gathering, dealing with, treatment and transfer, and, obviously costly and hazard included. Run of the mill case of such squanders incorporate substantial metals, for example, Chromium, Mercury, Nickel, Cyanide, and so forth and oil and oil loaded squanders with poisonous metals. Material industry is one of the most established ventures in India and has a noteworthy nearness in the Indian economy, adding to about 14% of assembling esteem expansion and 1/3rd of the India's gross fare income. According to, yearly risky waste created is assessed to be around 6.23 million tons. Out of this, 49.55 % is recyclable, 6.67 % incinerable and remaining 43.78 % is expendable in verified landfills. Twelve conditions of the nation (Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu, Odisha, Madhya Pradesh, Assam, Uttar Pradesh, West Bengal, Kerala, Karnataka and Rajasthan) represent 97 % of the aggregate squander age. In Tamil Nadu, huge amounts of compound slop is created for example 55.76 tons/day from Balotra CETP, 130.58 tons/day from Pali CETP, 184.60 tons/day from Tirupur CETP and 90.40

tons/day from Karur CETP are created also, are lying in CETP premises anticipating transfer to landfill. Mindfulness has been made for the sheltered administration of unsafe squander. Be that as it may, it isn't yet placed by and by in the greater part of the conditions of India because of different issues. Notwithstanding appropriation of most costly and propelled strategies, the resultant built up could conceivably be dangerous yet it must be dealt with again through a reasonable innovation. One likewise needs to work toward creating different environment- well-disposed and powerful financial innovations for the administration of dangerous waste in India. Hardening/ Stabilization (S/S) is an innovation utilized for treating mechanical strong squanders containing poisonous constituents to keep their disintegration and discharge to nature. It had been utilized for a considerable length of time as a last treatment venture before the transfer of both radioactive and synthetic dangerous waste. A few examiners have endeavoured S/S innovation for the treatment of various kinds of modern squanders, for the most part overwhelming metals containing inorganic/ natural slope. The interest for development materials is dependably heightening because of expanding urbanization. In this way, usage of waste materials in development is the need of hour. It isn't just sets aside extra cash yet additionally diminishes load on the waning common assets. A few specialists have endeavoured to reuse squander materials into different kinds of development materials, for example, obstructs from

sewage muck utilizing fly fiery debris, lime and gypsum what's more, Arsenic and Iron slop in block making, sewage and slime powder in block and tile making, and ooze cinder for light weight totals and.Few writing of portrayal and reuse of compound slime from material CETPs in India are accessible. Still the endeavours are on to discover a reasonable financial and condition agreeable answer for the safe reuse of chemical sludge. We have attempted the experiment with the partial replacement of sand with sludge material.

## 2. MATERIALS

The textile sludge material for study purpose was obtained from Sri Mahalakshmi textile and dyeing unit, Asokapuram locality, Erode district, Tamil Nadu, India. The sludge was collected at sludge storage facility, where sludge is dried to a certain extent prior to storage and is transported for treatment and disposal at periodic intervals. Water samples were also obtained from the effluent treatment plant at three different stages (ETP outlet, RO permeate, sludge mix prior coagulation) for testing.

The sample sludge was dried at 100°C for 24 hours in a hot air oven and the moisture content obtained was 36%. The sludge was further dried in room temperature and was ground to fine particles by manual grinding by trowel. The sludge particles passing 300 micron sieve and retained on 75 micron sieve was taken for study. The sludge that passed 75 micron sieve was not involved in study purpose due to inconvenience in handling at dry state.

Ordinary Portland cement-53 grade confirming to IS 12600-2009 is used. OPC grade-53 shows 53N/mm<sup>2</sup> after 28 days of curing in fresh water. Standard cubes of dimension 150mm x 150mm x 150mm is used for determination of strength with partial replacement of fine

aggregate with certain percentages of sludge material and different curing periods.

Manufactured sand (M sand) is used as a substitute for natural river sand in this study. Particles passing through 4.75 mm sieve is used. Crushed angular aggregates of size 20mm and 10mm showing specific gravity 2.79 and 2.74 respectively was used in the study. Water for curing and mixing confirming to IS 456 was used.

## 3. METHODOLOGY

Specific gravity of the fine aggregate and the sludge which is used in the study was determined by standard pycnometer. The sludge was analysed by Tamil Nadu pollution control board, District Environmental Laboratory, Tiruppur. Standard cubes of 150 mm x 150 mm 150 mm dimension was casted for M20 concrete to determine strength characters with different percentages of sludge for 7 days and 28 days of curing. The standard cubes were made 5% to 20% sludge as partial replacement for fine aggregate. Cubes with different sludge percentages was casted and tested at periodic intervals of curing. The compression test was conducted in a compression testing machine as per IS standards. For various sludge percentages two samples were made and tested for compressive strength at curing periods of 7 days and 28 days respectively and the average strength of the cubes were obtained.

## 4. RESULTS

### 4.1 Characreristics of Sludge

The grade distribution for sludge sample shows that the maximum percentage of sludge particles was retained on 2.36mm sieve. The moisture content of the sludge particles was about 36%, whichwas determined by drying in a hot air oven for 24 hours.

**Table 1 Grade size Distribution of Textile Effluent Sludge**

<i>A. Sl.No.</i>	<i>B. IS Sieve No.</i>	<i>C. Weight Retained</i>	<i>D. Percentage Weight Retained</i>	<i>E. Cumulative % Weight Passing</i>
<i>F. 1</i>	<i>G. 4.75</i>	<i>H. 0.036</i>	<i>I. 3.6</i>	<i>J. 96.4</i>
<i>K. 2</i>	<i>L. 2.36</i>	<i>M. 0.196</i>	<i>N. 19.6</i>	<i>O. 76.8</i>
<i>P. 3</i>	<i>Q. 1.18</i>	<i>R. 0.157</i>	<i>S. 15.7</i>	<i>T. 61.1</i>
<i>U. 4</i>	<i>V. 0.6</i>	<i>W. 0.137</i>	<i>X. 13.7</i>	<i>Y. 47.4</i>
<i>Z. 5</i>	<i>AA. 0.3</i>	<i>BB. 0.152</i>	<i>CC. 15.2</i>	<i>DD. 32.2</i>
<i>EE. 6</i>	<i>FF. 0.15</i>	<i>GG. 0.157</i>	<i>HH. 15.7</i>	<i>II. 16.5</i>
<i>JJ.7</i>	<i>KK. 0.075</i>	<i>LL. 0.149</i>	<i>MM. 14.9</i>	<i>NN. 1.6</i>
<i>OO. 8</i>	<i>PP. Pan</i>	<i>QQ. 0.016</i>	<i>RR. 1.6</i>	<i>SS. 0</i>

The sludge was obtained from different points namely ETP outlet, RO permeate, and untreated sludge sample. The properties shows that the ETP outlet sample shows increased values of dissolved solids, chlorides, oil and grease and phenolic compounds making the sample non portable. The RO permeate shows improved characters under limits of standards making it portable. Untreated sample is highly contaminated with values more than prescribed limits for

portable water making it non portable. The standards of portable waste as indicated my BIS standards are pH (6.5 – 8.5), dissolved solids (500 mg/l), chlorides (250 mg/l. max), and phenolic compounds (0.001 mg/l. max). the RO permeate alone resides within the limits of standards which makes it most probable for portable consumption. ETP outlet and untreated sludge sample are not suitable for portable consumption.

**Table 2 Properties of Textile Sludge**

TT. UU. SLNo.	VV. WW. Parameters	XX. Sample	YY. ETP Outlet	ZZ. RO Permeate	AAA. Untreated Sample
		BBB. LAB Code	CCC. 111	DDD. 112	EEE. 113
FFF.1	GGG. pH	HHH. (Number)	III. 7.56	JJJ. 6.95	KKK. 8.82
LLL. 2	MMM. Total Suspended Solids	NNN. (mg/1)	OOO. 284	PPP. 4	QQQ. 280
RRR. 3	SSS. Total Dissolved Solids	TTT. (mg/1)	UUU. 13008	VVV. 368	WWW. 71010
XXX. 4	YYY. Chloride (asCl)	ZZZ. (mg/1)	AAAA. 4615	BBBB.125	CCCC. 28842
DDDD.5	EEEE. Sulfate (asSO4)	FFFF. (mg/1)	GGGG. 1325	HHHH. 7	IIII. 10142
JJJ. 6	KKKK. BOD 3 days at 27 <sup>o</sup> Celsius	LLLL. (mg/1)	MMMM. 10	NNNN.4	OOOO. 54x
PPPP.7	QQQQ. COD	RRRR. (mg/1)	SSSS. 384	TTTT.16	UUUU. 71010
VVVV. 8	WWWW. Oil and Grease	XXXX. (mg/1)	YYYY. 1	ZZZZ <1	AAAA
BBBB.9	CCCC. TKN	DDDD. (mg/1)	EEEE. 18.48	FFFF <5	GGGG. 6.72
HHHH.10	IIII. Sulphide	JJJJ. (mg/1)	KKKK <1	LLLL <1	MMMM <1
NNNN. 11	OOOO. Phenolic Compound	PPPP. (mg/1)	QQQQ <0. 0005	RRRR <0.0005	SSSS. 0.0005
TTTT. 12	UUUU. Percent Sodium	VVVV. (%)	WWWW. 97	XXXX 65	YYYY. 92

**4.2 Characteristics of M-Sand**

The crushed form of angular aggregates was tested for specific gravity by pycnometer shows a specific gravity of 2.49. The grade size distribution of the

manufactured sand (M-sand) used in the study purpose showed allowable characters to be used in concrete casting and testing process.

**Table 3 Grade size Distribution of M-Sand**

SL No.	IS Sieve No.	Weight Retained	% Weight Retained	Cumulative % Weight Passing
1	4.75	0.006	0.6	99.4
2	2.36	0.129	12.9	86.5
3	1.18	0.259	25.9	60.6
4	0.6	0.122	12.2	48.4
5	0.3	0.262	26.2	22.2
6	0.15	0.156	15.6	6.6
7	0.075	0.049	4.9	1.7
8	Pan	0.017	1.7	0

### 4.3 Compressive Strength and Structural Applications

The compressive strength observed by testing in a compression testing machine at 7 days and 28 days respectively shows that the 5% replacement samples showed values with minor deviations from nonreplaced samples. The samples with 10%, 15% replacement

shows greater deviation and 20% replacement sample shows poor strength development characters. The samples did not achieve desired strength characters at 28days of curing making it unsuitable for structural applications in building components. The compressive strength results shows that average compressive strength decreases with the increase in the percentage replacement of sludge in the concrete.

**Table 4 Compressive Strength Results**

Sl.No.	Percentage of replacement %	Comp strength 7 days (N/mm <sup>2</sup> )	Comp strength 28 days (N/mm <sup>2</sup> )
1	0	19.21	22.46
2	5	17.88	19.56
3	10	9.325	13.44
4	15	8.66	11.66
5	20	3.23	9.66

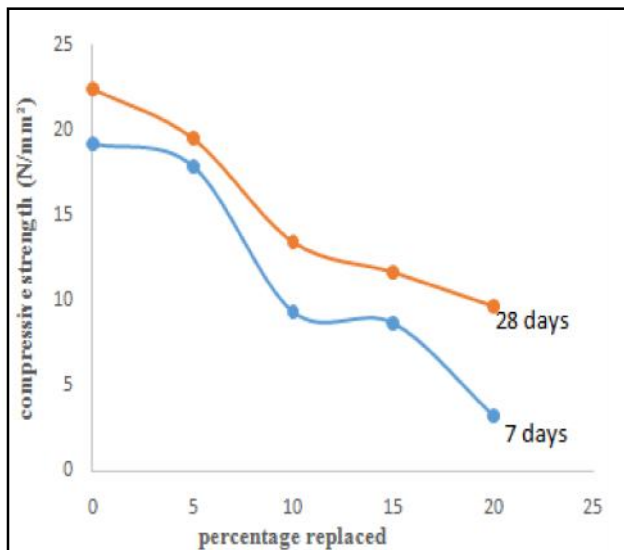


Fig.1 Compressive strength development

### 5. CONCLUSION

From this study it is possible to conclude that partial replacement of textile effluent sludge for fine aggregate in concrete is not possible and restricts the usage of this industrial waste as a component in concrete. The sludge material gets finer than cement particles which increases its volume and water demand during mixing which reduces the strength characteristics of the building. Addition of this sludge also delays the setting of concrete. Detailed study on causes for failure in strength gain in concrete due to individual chemical components of sludge is to be carried out as next step of research.

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# Optimistic Map Router

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## Abstract

*Among the current challenges of the Smart City, traffic management and maintenance are of utmost importance. Road surface monitoring is currently performed by humans, but the road surface condition is one of the main indicators of road quality, and it may drastically affect fuel consumption and the safety of both drivers and pedestrians. Pothole detection system that assists the motive force in avoiding pot-holes on the roads, by giving him previous warnings. Warnings may be like buzzer if the motive force is approaching a hole, or driver could also be warned in advanced concerning what road has what number potholes. The accelerometer sensor is used to detect the potholes using the acceleration algorithm and set some threshold value. If the obtained output is greater than the threshold value, then the potholes which are present in that area are marked with red color in Google map and the good in -condition optimistic road is marked in green color. Thus the optimistic map router can able to collect and process the raw data of the accelerometer sensor.*

## 1. INTRODUCTION

This project researches a utilization of versatile distinguishing furthermore, revealing the surface states of streets. It depicts a framework to screen this significant common foundation utilizing an Android based advanced cell. The pothole following framework, utilizes the natural versatility of the taking part advanced cell by the native, deftly assembling information from picture clicking from an Android based advanced cell which is GPRS empowered, and handling the information to survey street surface conditions. It enables the user to find an optimistic route through a simple solution, by detecting the potholes using the accelerometer sensor which is predominantly available in the mobile device. Pothole stage is measured by the use of the accelerometer. The accelerometer sensor offers for the true avenue condition sensing subsystem which senses the potholes encountered by it, about which it did now not have the prior information. Then conversation subsystem which transfers the data between database access factor and cell node. Access Point proclaims the data about potholes in its area. When automobile receives this statistics car sees if it has sensed any potholes which get entry to point does no longer have records about; if it is the case then the statistics about these potholes is transmitted to get admission to factor as a feedback. Access Point updates its database with the new entries of potholes.

## 2. LITERATURE REVIEW

Pothole detection system is a machine that ambitions at warning the driver about the uneven roads and potholes in its path. We find out about the extraordinary ways in which purpose of the system can be achieved. We justify the strategies we have chosen in this project. And then we supply details about the working of the distinct subsystems. The hassle declaration can be given as follows. This gadget consists of two factors one is mobile node and different is the get admission to point. Access points accountable for storing the data about potholes in its vicinity, taking the feedback from vehicles, updating the data in repository and broadcasting the statistics to other vehicles. Whereas Mobile node which is the small 1 device positioned in vehicle is responsible for sensing these potholes which it did now not have preceding statistics about, finding and warning the driver about the potholes which it has data about, and giving the data about newly sensed pothole to access point. The whole situation works as follows. While deploying the get entry to factor we feed in some initial records about potholes to it. Then it keeps on broadcasting the data. Vehicle geared up with the consumer gadget catches that data. Now the machine has the data about the areas of potholes. The machine is accountable for warning the driver about occurrences of pothole. But new potholes may additionally always be fashioned due to the fact of environment or fatigue. So purchaser gadget also acts as a sensor and finds out the prevalence of newly



fashioned potholes on the road. If it finds out any new potholes it offers statistics of new pothole to Access factor in phrases of the feedback. Access points updates this facts to its records store and then adds it to databroadcast. There are a variety of challenges involved:

- Client machine have to be in a position to feel the pothole. It will be an added gain if it can symbolize the pothole telling how severe it is.
- Placement of get right of entry to factors is an important factor. It should be in such a way that the data be dispensed to most vehicles.
- Communication between get admission to point and client gadget can have many problems which have to be resolved. Some of the troubles that verbal exchange can face are interference, Low throughput due to large no of customer devices, quit to quit reliability.
- Data illustration should be in such a way that the purchaser system be in a position to discover and warn the driver about the potholes which it has data about. Vibration-based technique makes use of accelerometers in order to realize potholes. Considering the advantages of a vibration- based system, these methods require small storage and can be used in real-time processing. However, vibration-based methods ought to grant the wrong results, for example, that the hinges and joints on the avenue can be detected as potholes and that potholes in the center of a lane cannot be detected the usage of accelerometers due to not being hit by any of the vehicle's wheels.

### 3. PROPOSED SYSTEM

The objective of the solution is to find an Optimal route map (Measurement of noise level, dB level and the size and severity of Potholes) with the help of cameras ,sensors and GPS tracking using Satellite and captured images will be stored in Firebase. Comparing the data, we get result as Potholes road then measure the noise level and illumination level by using light sensor for Illumination( photo voltaic ,light-dependent ,Photo diode, proximity) and sound sensor for noise level (Ultrasonic sensors). Finally we know the Noise level and illumination level then we analyze the identification of the Errors (potholes roads).Now Green color dots indicates the good condition of the road and dark red color dots indicates the Poor condition and mild red color indicates that the road is simply damaged and the vehicles can travel. If there is a possible for another road and both the roads are damaged, we can choose the optimal route

map (Based on the lux level and db level and also the size of the potholes with better efficiency by comparing the roads. When the data crosses the threshold size and are not repaired even after certain stipulated time frame we use GPS module to send an alert message via SMS or via to EMAIL and authorities turn up a pop up message with an alert message.

Our methodology is to acquire data from Mobile Phone sensor (accelerometer and GPS) and send and analyze the data to database and to access cloud data from devices.

The Data is sensed using the Android application and it detects the presence of potholes using Accelerometer sensor, where  $(\Delta V = |\text{new value} - \text{old value}|)$ . Now, Retrieve the location and speed using GPS sensor. It uses HTTP request to send the data set to the database. Now, the data is analyzed with centralized web application running on the database. And it collects data from different mobiles and clusters it and also removes the data anomalies-GPS error, false vibration pattern. The data retrieved is used to view data stored in the centralized data storage and the hybrid application for displaying the road conditions. Different color markers are used for the different quality of the road.

The maintained roads contribute a most important portion to the country's economy. Pothole detection strategies that have been developed and proposes a most economical solution to identify the potholes on roads and furnish timely alerts to drivers to avoid accidents or vehicle damages. Accelerometer sensors are used to pick out the potholes and also to measure their depth and height, respectively. The proposed machine captures the geographical place coordinates of the potholes the use of a world positioning device receiver. The sensed-data consists of pothole depth and geographic location, which is saved in the database (cloud). An android application is used to alert drivers so that precautionary measures can be taken to keep away from accidents. Alerts are given in the shape of a flash message with an alert message. In India, roads are the dominant capacity of transportation. Every driver wants to comprehend about the avenue condition. The Bad street situation reason uncomfortable experience greater gasoline consumption and sudden vehicle maintenance cost. The Objective is to notice flaws in the street and to keep and grant the constructive route.

#### 4. BENEFITS OF PROPOSED SYSTEM

The accelerometer sensor on a mobile device collects potholes data, and the gathered information is sent to a pothole detection algorithm. Also, the pothole facts such as the area and severity of a pothole bought from a pothole detection algorithm is despatched to the database. The mobile gadget was set up in a vehicle, and it has countless features such as collecting and storing data of potholes, communicating via Wi- Fi, and gathering vicinity facts via GPS.

##### 4.1 OUTPUT

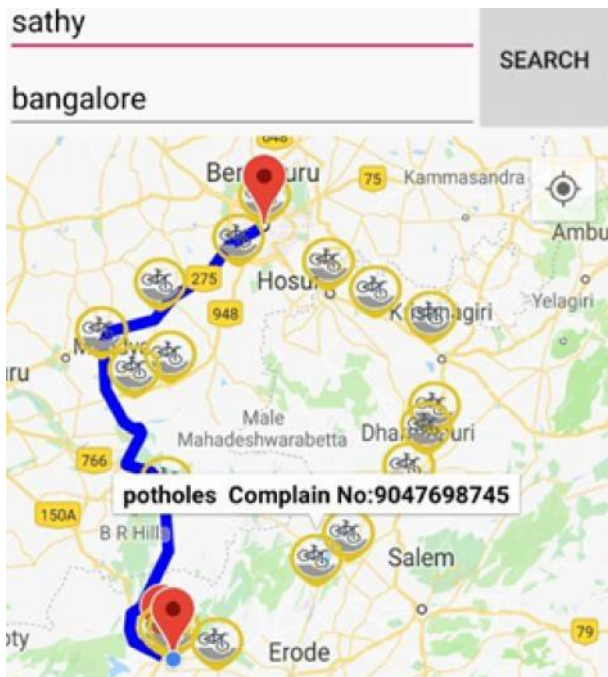


Fig 1. Lifedroid tracker map

<b>Max Acceleration:</b>		
Max Acceleration: X-Axis		
6.938141		
Max Acceleration: Y-Axis		
7.5475006		
Max Acceleration: Z-Axis		
14.127472		
<b>Current Acceleration:</b>		
X-Axis	Y-Axis	Z-Axis
0.0	0.0	10.16507

Fig 2. Survey data

#### 5. CONCLUSION

This project describes and implements a real- time pothole detection and traffic monitoring system, and has been able to harness Smartphone sensors to solve a global challenge, applying an android solution to a real world problem and develop a scalable, reliable system driven by the power of crowd sourcing. However as technology advances, and penetration rises, such challenges are solvable with easily accessible tools as shown with the development of this system.

Thus Pothole Tracking System will be easy to track down the pothole on the road and can easily rectify the optimistic route. By this application, if the user wants to clear the potholes, they can directly contact the municipal to recover the damage and also it is used to measure and map noise and illumination levels in a city along with the tracking of potholes for the comfort and safety of commuters as well as improvement of urban planning.

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# Selection of an Appropriate Contract for Effective Utilization of Resources in Nepal

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## Abstract

*Construction projects require planning, scheduling and resource management for successful completion of a project. Improper planning, poor estimation and unclear contracts regarding the procurement of resources play a vital role in cost and time overrun in activities of a project. So, a resource must be planned with proper estimation, clear contract and smooth utilization of resource constraints. The present study deals with the resource management of two projects namely “Khudi Hydropower Repair Project” and “K.C. Bhawan Semi-Commercial Building Project” in Nepal. The study for this project has been carried out in two stages. At first all the activities were planned and scheduled in Microsoft Project then the resources for each activity were planned and estimated using MS Excel in the second stage. The prices attributed for the Commercial Building was adopted using the Standards prevailing in the market and for the repair of hydropower project, prices are adopted according to the BOQ as agreed between the client and contractor. The study of this paper relates to two prevailing contracts in the market where one contract gives the authority of managing the resources by the contractor itself while the other contract gives the authority of managing resources by the client. The required data has been collected from drawings and prevailing site conditions which has shown that contracts giving authority of managing resources to the contractor is more cost effective than the contracts where resources are procured by the client itself.*

**Keywords:** BOQ, Microsoft Project, MS Excel, Resource Constraints, Standards

## 1. INTRODUCTION

In general, Construction industry in Nepal has mostly failed to achieve its goals which has given rise to dissatisfaction to all the parties involved in the construction. Time and cost overrun are common due to difficulties in management of resource as Nepal is a mountainous country with high terrain which poses difficulties in transportation of resources required for the project. The average delay in implementation of a project is about three years. “Melamchi Water Supply Project” which is one of the most important projects in Nepalese scenario started in 2001 A.D. with the intention to complete in 2006 A.D. Because of slow progress, it was extended to 2007 A.D. then the project had a new target for 2013 A.D. and the project is still running in the present scenario which is 2017 A.D.

This clearly depicts the situation that poor resource management in construction industry exists in Nepal and there exist the necessity for proper management of these resources for the successful completion of these projects within the prescribed budget and time.

One of the major factors for improper resource management in Nepal is due to the contract relating to procurement and management of resources done between client and contractor. There exist two types of contracts in Nepal where resources are procured and managed by either client or contractor. So, this project focuses on the better and efficient type of contract needed for smooth management of resources by comparing the results of both type of contract. “Khudi Hydropower Repair project” is a completed project so as to verify the results whereas “K.C. Bhawan Building Project” is an ongoing project where case study is carried out so as to know which form of contract is better for efficient management of resources for the successful completion of the project.

## 2. RESOURCE MANAGEMENT

Resources are materials, energy, services, staff, knowledge, or other assets that are transformed to produce benefit in the process may be consumed or made unavailable. A resource in construction is usually classified into six categories which are classified as Products and materials, Construction plant, tools and

equipment, Human resources, Space and facilities, Sub contractors, Finance.

### 2.1 Importance of Resource in Construction Project

Resource is one of the major factors that leads to successful, profitable and smooth operation of a project. All activities are associated with some certain resource. So, a project manager must be clear about the resource required and available for completing a certain activity. Unavailability of resource during the execution of a certain activity can lead a project to time overrun. So, the project ultimately leads to cost overrun since, cost and time are interrelated and directly proportional. So, with the proper resource allocation, resource leveling and proper judgement of interdependencies between the resource, a project can be completed within the framed budget and time.

### 2.2 Methodology Adopted

This paper mainly focuses on the effective utilization of resources by scheduling the activities, preparing a grant chart, estimating the resource required for completing each activity and then allocating the resource by leveling all the resource required. At first phase the schedules are prepared in MS project and then resources are allocated and then levelled. In the second phase, the resources are estimated using Ms Excel and quantities required for each activity is known. In the third phase resource attributes between the projects are compared.

## 3. PROJECT ATTRIBUTES

### 3.1 Project Details

Name of the project	: Khudi Hydropower Repair Project
Built up area	: 4415.33 sq. feet
Depth of Foundation	: 0.5 m above ground level
Dimension of base footing	: 0.5m * 1.5m
Dimension of Wall	: 1.5m * 0.5m
Estimated Cost of project	: Rs. 9104260
Actual Cost of Project	: Rs. 8243048
Estimated time of project	: 90 Days
Actual time of project	: 73 Days

Name of the project	: K.C. Bhawan Semi-Commercial Building
Built up area	: 6661.06 sq ft

Number of Storey's	: 5
Floor to Floor Height	: 10 Ft
Height of plinth	: 7 ft
Depth of Foundation	: 6 ft below ground level
External Wall	: 9 inch
Internal Wall	: 4.5 inch
Parapet Wall	: 18 inch
Estimated time of project	: 238 days
Estimated cost of project	: Rs. 26100504

### 3.2 Preparation of Estimates

The estimates were prepared for the individual activity of the project by studying the drawings and materials required for completion of a project. This includes number of bags of cement, quantities of sand, aggregate, formwork, tiles, bricks etc required for completion of the project. Both project's manpower cost is calculated on the basis of contract done between Contractor and Sub contractor. The calculation is done on the basis of length and volume worked by the workers.

For the building case the sub contractor has an agreement of RS.400 per square feet which is calculated by measuring the length and breadth of slab. The electrical works, plumbing works and furniture works are calculated on the basis of contract done between client and contractor.

### 3.3 Project Scheduling

The scheduling of activities is done in two ways. In the first project concerning hydropower, the activities are scheduled according to the practical scenario. Whereas for building case, the activities are scheduled for the first three months on the actual scenario while others are predicted taking the suggestion from experts and the contractor itself who had an experience of 15 years in the field of building construction only. The building project was scheduled in such a way as the project is under construction phase.

The activities can be seen in Grant Chart where at first resource allocation is done to each activity and then scheduled. The total duration for both the project is calculated by resource leveling required for each activity in the grant chart.

### 3.4 Project Cost

The hydropower project cost has been calculated by using the data's of expenses in real field. The

estimated amount of this project is taken from BOQ. The resources are not estimated instead the real field data's are used instead.

In the case of building construction, the project cost has been estimated as this is a running project. The manpower cost, plumbing cost and the electrical cost are attributed to the project by the agreement between the client and different contractors.

#### 4. RESOURCE CONSTRAINT ANALYSIS

The resources quantities are analyzed through drawings and then calculated using the standard formula through excel. The volume of resources required for each activity is accessed and the amount required to purchase the resources are also indicated in the MS Excel. The resources are also leveled in MSP indicating the resource,

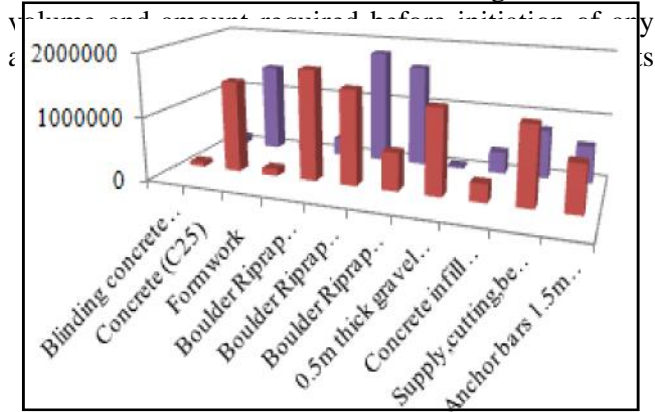


Fig.1 Khudi Hydropower repair project BOQ Vs Actual Expense

The graph above shows the cost required for completing each activity. In the front row the table represents the estimated cost as per BOQ. Whereas in the back row the table represents the actual cost incurred during the site execution.

The overall cost of the project was estimated Rs. 9,104,260.00 while the actual expense of the project was Rs. 8,243,048.87. This clearly shows that resources should be managed by the contractor itself as the project becomes more profitable and cost effective.

The above figure shows the cost for each floor which have been spent on site. The front row indicates the actual amount spent on site where the procurement of resources is done by client itself. The back row indicates the standard rate for construction with the procurement of materials by the contractor itself.

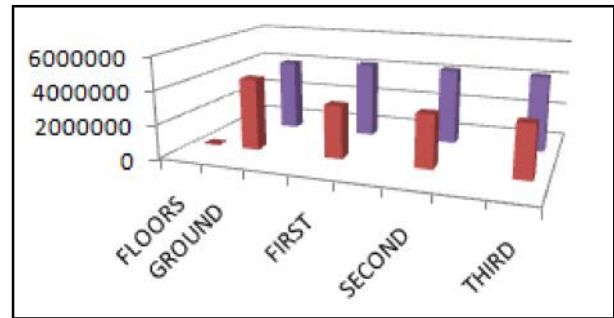


Fig.2 Expenses for each floor indicating the estimated and actual expense

The above graph indicates that in ground floor there is not much of a difference while in the first, second and third floor there's a slight difference. In the fourth floor it is opposite where contract with material has won over contract with manpower only. The overall cost of the project was Rs.26100504 whereas by the standard rates prevailing in the market, cost of the project would have been Rs.24270540. So, calculating the overall cost contract with procurement of materials is more profitable to the client rather than a manpower contract.

#### 5. CONCLUSION

Resource is one of the major factors that are vital for successful completion of a project. So, before managing the resources, it must be clear for a project manager about the procurement authority. By this study it shows that a contract with procurement rights by a contractor is more cost effective and profitable to both client and contractor in case of Nepal.

Resources must be allocated to each activities and it must be clear for a project manager when the resources are required depending upon the activities to be performed. The missing of resources in a particular activity not only affects the activity cost and time but affects the whole project cost and time.

So, the resources must be leveled and estimated precisely so that the project is completed within time and budget.

The overall conclusion of the project is that there is increment of 9.45% when the resources are procured by client itself in the case of hydropower. In case of building construction the increment was 7.011%. So, Taking the average of both these values we can say there will be an increment of 8.2% from the project cost when the resources are procured by client itself.

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# A Study on Flexural Strength of Beam Reinforced with Basalt Fibre Bars

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## Abstract

The advancement in fibre-reinforced polymer (FRP) innovation have a distinct fascination in executing another sort of strands named as basalt fibre reinforced polymer (BFRP), which has the dominating of being erosion safe, strong and cost effective that deliver a predominant outcome when applied in concrete structure. Besides, the accessible codal provision and aides does not give any suggestions to the use of Basalt bars since basic investigations and significant applications are as yet restricted. The objective of our investigation was progressed by two phases. The initial phase was led by examining the properties on BFRP and STEEL bars & these properties were evaluated and compared with the codal provision. The next phase of this test included testing of eight concrete beams (4no's of RC beam and 4no's of BFRP beam) of size 1700 mm long × 150 mm wide × 250 mm profound and to examine the flexural behaviour of both BFRP and RC beam under atwo -point load over a clear span of 1550 mm until failure. The outcomes of these two phases were discussed in terms of its behaviour in crack, load, flexure and the mode of failure. Additionally, the test outcomes prove that the basalt bars have a great mechanical behaviour over concrete structures and it can be set as a substitution of STEEL bars for light, temporary structures.

**Keywords:** Basalt, Beam, Durability, Fibre reinforced polymer, Flexure, Physical and mechanical properties.

## 1. INTRODUCTION

### 1.1 Fibre-Reinforced-Polymer (FRP)

Fibre-reinforced-polymer (FRP) material with being non corrosive in nature is pointed as one of the promising materials related to Structural application. These materials have blown as an alternative to RC bars in RCC structures, mainly to those that are located in corrosive environments, due to their non-corrosive nature, high strength and stiffness-to-weight ratios, resistance to corrosion and chemical attack, controllable thermal expansion, damping characteristics and electromagnetic neutrality. Overall research endeavours on this field through expert association had built up the production of a few codes and standards for the plan of concrete structures utilizing fibre materials.

As of late, consistent exertion being developed and advancement of the FRP innovation is dedicated towards utilizing new kinds of strands, for example, basalt filaments, notwithstanding the normally utilized glass and carbon filaments. Basalt strands strengthened polymers (BFRPs) have turned out to be accessible industrially at a value practically identical to E-glass, which are lesser than the S-glass or carbon filaments and at present drawing in light of a legitimate concern for research networks. Various examinations have been researched

the customary FRP items fabricated with vinyl ester or else with the epoxy pitch to decide their impact on natural conditions like water, salts, due to their both physical and also their mechanical properties. Scarcely any examinations, in any case, explored the attributes and strength execution of BFRP under a genuine and reproduced brutal natural conditions. By this way, Basalt bars are as yet not found its application in US & also in Canada though they are more advanced of specified FRP. Regardless of that and because of the normal spacing between basalt bars as the other basic fibre materials, the accessible codes and particulars were utilized to assess the attributes and auxiliary execution of the recently created basalt bars.

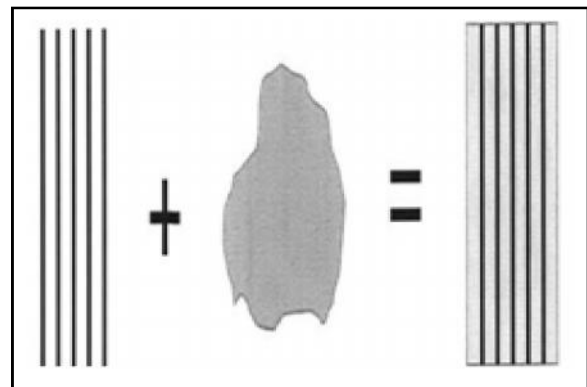


Fig. 1 Formation of fibre reinforced

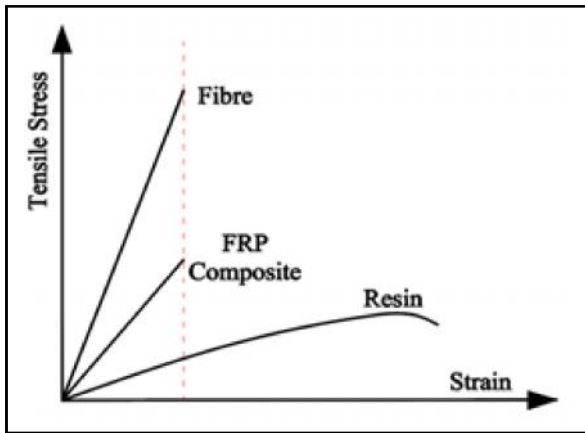
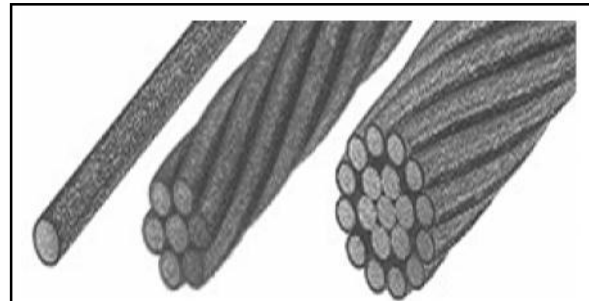
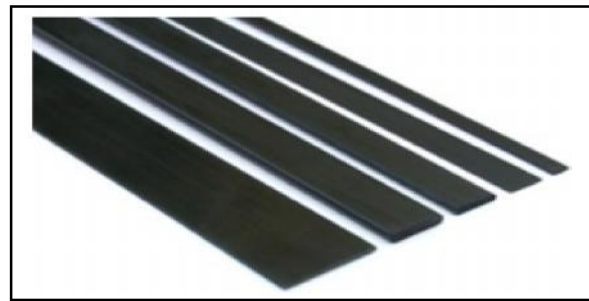


Fig.2 Stress-strain relationships for polymer composite fibres& its composite

FRP strengthening bars are manufactured using the advanced pultrusion method. Fibre-reinforced polymers (FRPs) are a composite material made of a polymer structure strengthened with fibres.

The polymer used is mostly epoxy or vinyl ester. Since FRP composite is a combination of at least two different materials (fibre & sap) with an space between them, the constituent materials still maintain their unique characters with their composite. However, their mix produces properties and qualities that are not the same as those of the constituents and very reliant on the attachment between the strands and pitch. The tar framework made up of a grid for holding the filaments together and also distributing the joined load to the composites between their individual strands. A sap framework additionally shields the strands from the scraped area and effect harm and in addition the serious natural conditions, for example, water, salts, and soluble bases, which influence the solidness of FRP items.



Roving                      Plates                      FRP tendons



Spiral                      Stirrups                      Chopped Sheet

Fig.3 Different FRP products



### 1.2 Basalt Fibre-Reinforced Polymers (BFRPS)

Basalt fibre-reinforced polymers (BFRPs) being the advanced inFRP composites that had been developed on recent decades and guaranteed its preferences in accomplishing the objective of upgrading security and unwavering quality of basic frameworks compared with carbon, glass and aramid fibre composites. Since artefact basalt is utilized as squashed shake in development and Romans perceived its quality and solidness and utilized it in street development as flagstone. Basalt is an inorganic-regular material which are extracted from volcanic rocks started from hardened magma, on a condensing temperature included some place in the scope

of 1500 and 1700 °C. The liquid rocks are expelled through little spouts to deliver consistent fibres of basalt filaments of measurements extending from 13 to 20 µm. The basalt strands additionally have better weariness execution, more than five times of quality and around 33% of thickness than usually utilized low-carbon steel bars. What’s more, it has great protection, against radiation, and sound wave-straightforward properties. BFRP is effectively utilized for discharge and to be utilized in national safeguard industry, aviation, common development, transport framework, vitality foundation, petrochemical, fire security, car, shipbuilding, water preservation and hydropower, sea building and other different fields.

Sl. No.	RFT Type	Diameter of Bars	Area of Reinforcement	E <sub>f</sub> (GPa)	f <sub>y</sub> (MPa)	ε <sub>y</sub> (%)
1		8	50.24	199.54	449.63	0.12
2	Steel bars	10	78.5	200.36	450.31	0.15
3		12	113.04	200.15	450.27	0.21
4		16	256	200.01	450.11	0.24

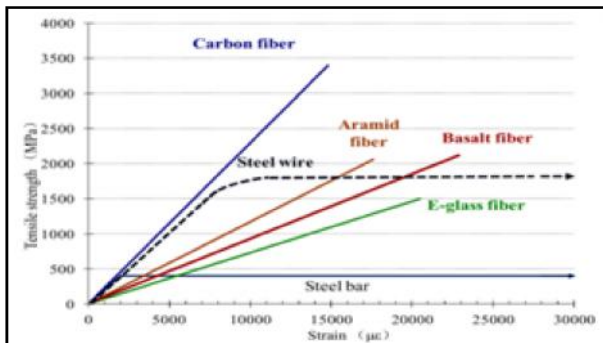


Fig.4 Stress-strain curve of various FRP

### 1.3 Tensile Properties Of Bars

Table 2 shows the tensile properties of the Basalt&Steel bars were determined by testing each representative specimen with its corresponding diameter on a universal testing machine.

Table 1 Comparative Characteristics between Basalt and other Fibres

Capability	Basalt fiber	E-glass fiber	S-glass fiber	Carbon fiber
Tensile strength (MPa)	3000 - 4840	3100 - 3800	4020 - 4650	3500 - 6000
Elastic modulus (GPa)	79.3 - 93.1	72.5 - 75.5	83 - 86	230 - 600
Elongation at break (%)	3.1	4.7	5.3	1.5-2.0
Diameter of filament (µm)	6-21	6-21	6-21	5-15
Temperature of application (°C)	+500	+380	+300	+700
Price (USD/kg)	2.5	1.1	1.5	30

Table 2 Tensile Properties of Basalt bars

Sl. No.	RFT Type	Diameter of Bars	Area of Reinforcement (mm <sup>2</sup> )	E <sub>f</sub> (GPa)	f <sub>tu</sub> (MPa)	ε <sub>fu</sub> (%)
1		8	50.24	64.6±1.4	1655±95	2.56±0.17
2	Basalt bars	10	78.5	65.3±1.1	1678±73	2.57±0.12
3		12	113.04	69.3±0.5	1724±39	2.59±0.10
4		14	153.86	69.8±3.3	1760±64	2.67±0.17

**Table 3 Tensile Properties of Steel bars**

Sl. No.	RFT Type	Diameter of Bars	Area of Reinforcement (mm <sup>2</sup> )	E <sub>f</sub> (GPa)	f <sub>tu</sub> (MPa)	ε <sub>y</sub> (%)
1		8	50.24	199.54	449.63	0.12
2	Steel bars	10	78.5	200.36	450.31	0.15
3		12	113.04	200.15	450.27	0.21
4		16	256	200.01	450.11	0.24

Where,

f<sub>tu</sub> = ultimate strength of BFRB bars (MPa)

ε<sub>tu</sub> = ultimate FRP strain

f<sub>y</sub> = ultimate strength of Steel (MPa)

E<sub>f</sub> = modulus of elasticity of FRP (GPa)

concrete beams. The beams were reinforced with 2 nos of 10mm dia bar as an upper reinforcement, while the bottom reinforcement were made with 3 BFRP & Steel bars in different configurations, 8 mm steel stirrups spaced at 100 mm was considered as a shear reinforcement in both shear spans to avoid shear failure.

**2. DETAILING OF BEAMS (BFRB & RC BEAMS)**

Here the detailing of eight concrete beams (1700 mm length × 150 mm width × 250 mm depth) are made to study the flexural behaviour BFRP & STEEL bars in

**Table 4 Detailing of Reinforcement**

Sl.No	BEAM ID	DETAILS OF REINFORCEMENT (MR- Main Reinforcement, HB- Hanging Bars, SR- Shear Reinforcement)	AREA OF REINFORCEMENT A <sub>st</sub> (mm <sup>2</sup> )
<b>STEEL</b>			
1	FSR 150	3 nos's of 8mmΦ bars (MR), 2nos of 10mmΦ bars (HB) and 8mmΦ bars @ 150mm c/c spacing (SR)	150.8
2	FSR 235	3 no's of 10mmΦ bars (MR), 2nos of 10mmΦ bars (HB) and 8mmΦ bars @ 150mm c/c spacing (SR)	235.6
3	FSR 339	3 no's of 12mmΦ bars (MR), 2nos of 10mmΦ bars (HB) and 8mmΦ bars @ 150mm c/c spacing (SR)	339.3
4	FSR 461	2no's of 16mmΦ bars (MR), 1nos of 10mmΦ bars and 2nos of 10mmΦ bars (HB) and 8mmΦ bars @ 150mm c/c spacing (SR)	480.7

**3. CASTING AND CURING OF BEAMS**

Concrete beams measuring (150 mm width × 250 mm depth × 1700 mm length) reinforced with steel and Basalt bars of different reinforcement ratios, bar diameters are casted with M30 (1:1.3:2.22:0.44) mix proportion for 28 days to attain its strength.

Concrete beams casted with both BFRP & STEEL BARS are allowed to cure in a water tank for about 28 days in order to maintain the concrete temperature by allowing the hydration process & also to prevent the plastic shrinkage of concrete.

**4. TESTING OF BEAMS**

**4.1 Experimental Setup of Loading Frame**

Table 5 shows this examination included eight rectangular solid beams strengthened with BFRP and STEEL bars, with 150 mm width, 250 mm depth, and 1700mm length. These beams were manufactured utilizing ordinary quality cement and were tested under two-point load over an effective length of 1550 mm. These beams are placed with a shear span of 616 mm, while the separation between the two point load distance was 308 mm on the either sides of the midspan. The deflection in the beams are predicted by using 2 LVDT placing at L/3 distance and 1 LVDT at the

midspan. These beams were tested in a loading frame of capacity 750kN capacity. The loads and deflections were monitored using AG-Pro software. The parameters such as initial crack load, ultimate load of the specimens(beams) were noted.



Fig.5 Schematic arrangement for testing of a RC beam

### 5. COMPARISON OF EXPERIMENTAL AND THEORETICAL RESULTS

Comparisons of experimental and theoretical results for flexural strength and ultimate load carrying capacity between Steel reinforced beams and FRP beams are made.

Table 5 Experimental Load Values (Initial And Ultimate)

Sl.No.	BEAM ID	W <sub>cr</sub> (E)(kN)	W <sub>u</sub> (E) (kN)	Compressive Strength (N/mm <sup>2</sup> )
BASALT BAR				
1	FBR 150	15	66	32.13
2	FBR 235	15	81	32.58
3	FBR 339	18	94	32.27
4	FBR 461	20	96	32.77
STEEL BAR				
1	FSR 150	32	68	32.13
2	FSR 235	38	85	32.58
3	FSR 339	42	115	32.27
4	FSR 461	45	169	32.77

Table 6 Comparative Results for beams

Sl.No.	Beam ID	W <sub>cr</sub> (E) (kN)	W <sub>cr</sub> (T) (kN)	W <sub>cr</sub> (T)/W <sub>cr</sub> (E)	W <sub>u</sub> (E) (kN)	W <sub>u</sub> (T) (kN)	W <sub>u</sub> (T)/W <sub>u</sub> (E)
BASALT REINFORCED BARS							
1	FBR 150	15	8.7	0.58	66	49	0.63
2	FBR 235	15	10	0.67	81	53	0.65
3	FBR 339	18	11.8	0.66	94	54	0.57
4	FBR461	20	14	0.70	96	60	0.63
Average				0.65			0.62
Standard Deviation				0.051			0.034
Coefficient of variation				7.85%			5.55%
STEEL REINFORCED BARS							
1	FSR 150	32	21.5	0.67	68	44.6	0.72
2	FSR235	38	22.3	0.59	85	67.83	0.79
3	FSR 339	42	22.64	0.54	115	94.60	0.82
4	FSR 461	45	25.28	0.56	169	157.19	0.93
Average				0.59			0.81
Standard Deviation				0.057			0.087
Coefficient of variation				9.68%			10.7%

## 6. CONCLUSION

This experimental study aimed at a study on the flexural behaviour of newly developed Basalt bars in normal strength RC beams. A sum of eight concrete beams reinforced with (4 no's of BFRP & 4 no's steel) bars were reinforced & tested up to failure. The tested beams measured around 150 mm width, 250 mm depth, and 1700 mm length. Basalt bars sizes of 8, 10, 12, and 14 mm were used. The beam specimens were tested under two-point load along a clear span of 1550 mm until it reach its failure. The test results were analysed against the expectations utilizing Fibre configuration codes and standards. Based on the final outcomes and discourse exhibited thus, the accompanying results are drawn: The tested Basalt & RC beams showed crack load greater than the predicted values using ACI 440.1R (2015) equation. ACI 440.1R (2015) that overestimated the crack load for the tested beam by 25% when the loading pattern increased linearly respectively.

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# Indian Journal of Engineering, Science, and Technology (IJEST)

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- [1] M.Demic, "Optimization of Characteristics of the Elasto-Damping Elements of Cars from the Aspect of Comfort and Handling", International Journal of Vehicle Design, Vol.13, No.1, 1992, pp. 29-46.
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