UNDER WATER AQUA ROBOT

I. Abstract

We are aware of recently happened disaster in '*RUSSIA*' where a plane of Russian Defense ministry crashed into BLACK SEA and members of Russian armed forces lost their life. Also an accident in '*MAHAD*' at *Raigad* district where a bridge over *Savitri* River collapsed taking with it several vehicles that was playing on it, including ST BUSES and few cars. Where many people washed away with fast moving flow of water. It was difficult for NDRF and Rescue team to find out buses and peoples lost in water. A 300kg magnet was lowered in deep river to trace the buses but still the rescue teams couldn't succeed to trace the buses and peoples lost in water, Also this rescue operation took much time with unsatisfied result. So our aim is to design such a robot which will detect the presence of alive/dead humans and vehicles under water depths.

II. Introduction

Underwater operations present unique challenges and opportunities for robotic applications. In this project we are making an Aqua robot for rescue operation of peoples fed with a ship accident & to overcome underwater crisis. Many different underwater applications can be done with the use of Aqua robots. Detection of alive/dead humans, detection of metals, Environmental monitoring and damage assessment, and oil pipelines leakage detection, monitoring marine life, and monitoring population and growth of extinct and endangered water species are among the most well-known. In general humans are limited to short visits underwater and only to limited depths. The underwater environment holds many opportunities for deployment of robotic agents. At the same time, limited visibility, constraints in communications, as well as the application of external forces to the robot from water currents make underwater operations very challenging. We have developed a robotic vehicle named Aqua Robot, that has the potential to find humans and vehicles lost in water during accident with help of PIR SENSOR and METAL DETECTOR. Our vehicle has passed through several designs and re-designs cycles and it has been tested in a variety of environments. Moreover, the mechanical design, the implementation of basic sensing capabilities, and the development of basic behaviors have undergone significant change. The operation of robot can be characterized according to the input given from a human operator. The most common mode in underwater vehicles is complete operation; where the operator is required to constantly monitor and control the robot, reacting to continuous sensor Feedback. Such operations allow no autonomy to the

robot, are quite challenging, and require a well-trained operator.

III. NECESSITY

The aqua robot explores the science and technology for the interpretation of underwater video footage , the identification of underwater features, detection of alive or dead human ,leakage of oil pipes ,monitoring marine life , recovering and lost object in deep water, key application for aqua are the assessment of marine habitats and biodiversity on coral reefs .By using a robot ,we hope several important classes of measurement can be made much more reliable . Trials of this applications are on going .

IV. OBJECTIVES

- To detect the presence alive/dead humans& metals in water.
- To monitor marine life.
- Leakage detection of oil pipes in deep sea.
- Monitoring population & growth of extinct and endangered underwater species.
- To recover lost objects in water.
- To minimize the time required during rescue operation.
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V. THEME OF PROJECT

The project is basically developed and inspired my recently happened disaster in "mahad". During such accidental cases like floods, plane crashing, ship accidents, and Ganpati Visarjans govt appoints a rescue job of victim peoples to NDRF teams .it becomes difficult for rescue teams to trace out the buses, ships or peoples lost away in water i.e.in such a big ocean ,sea or rivers. In order to make the work of rescue teams easy we had designed such a robot which will detect a presence of alive / dead humans and metals under water depts.. We are additionally interfacing camera along with the circuitry in order to increase the applications like under water features monitoring, detection of leakages in oil pipes monitoring marine life etc.

VI. Major component in our project

1.PIR Motion Sensor

Description

The objective of this project is to use inexpensive PIR sensor to detect if a human has moved. To build this project we use a PIC18F25K20 microcontroller to detect if the sensor had change state and it will emit a sound from the speaker or piezo, the MCU also detect the voltage of the battery in the startup, the algorithm it´ is very simple it use a interrupt on change to detect the change on the PIR sensor.

PIR SENSOR :

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses.

PIRs are basically made of a pyroelectric sensor, which can detect levels of infrared radiation. Every thing emits some low level radiation, and the hotter something is, the

more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion(change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

PIR sensor I had use in this project

Fig 1- PIR SENSOR

OPERATION

- **Power Supply**

I use a 9V battery and it´s connect to a switch and as a voltage regulator I use an L317T and it will have an output of 3,3V to make that possible I use two resistors R1 and R2 to set the output, we use this equations to calculate R1 and I set R2 to 240 ohms:

Equation 1 = 1.25 ∗ (R2/R1+1)

- **POR (Power on reset)**

I had to add a RC delay on VPP pin because when I switch on/off the circuit there was a voltage drop because the PIR Sensor and that would generate an unknown state when the MCU was restarted to solve that I add a RC delay, you can use this equations to calculate the delay.

2.METAL DETECTOR

The simplest form of a metal detector consists of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces an alternating magnetic field of its own. If another coil is used to measure the magnetic field (acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected.

3.GPS (Global positioning system)

GPS or Global Positioning System is a network of orbiting satellites that send precise details of their position in space back to earth. The signals are obtained by GPS receivers ,such as navigation devices and are used to calculate the exact position, speed and time at the vehicles location.GPS is well-known for its military uses and was first developed by the US to aid in its global intelligence efforts at the height of the Cold War. The very first GPS system was developed in the 1960s to allow ships in the US Navy to navigate the oceans more accurately. The first system had five satellites and allowed ships to check their location once every hour. Today, portable Navigation device devices can give drivers their precise location to within a few meters, which is accurate enough to navigate roadways. Military applications have much higher precision so that a location can be pinpointed within a few centimeters .Today, portable Navigation device devices can give drivers their precise location to within a few meters, which is accurate enough to navigate roadways. Military applications have much higher precision so that a location can be

pinpointed within a few centimeters .The US NAVSTAR Global Positioning System (GPS) is the only fully operational Global Navigation Satellite System (GNSS) currently providing positioning data with global coverage. The European Union is currently developing its own GPS known as the Galileo positioning system, which will be operational by 2013. IT has a local system it may expand globally, while Russia is currently restoring its GLONASS system.

4.GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATION)

Mobile communication is an emerging technology these days. GSM is the acronym for Global System for Mobile Communication. GSM module is wireless modem that transmits data using radio waves. GSM architecture is similar to the mobile architecture. GSM modems are generally used in many electronic applications and they are required to interface with the microcontrollers. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone**.** When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network**.** While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities .A GSM modem exposes an interface that allows applications such as Now SMS to send and receive messages over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages. GSM networks operate in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands were used instead (for example in Canada and the United States).GSM module send the data to user through msg After getting these msg the user should get exact location of the bus .Mobile services based on GSM technology were first launched in finland in 1991 .Today's more than 690 mobile networks provide GSM servicesacross 213 countries & GSM represents 82.4%of all global mobile connections.

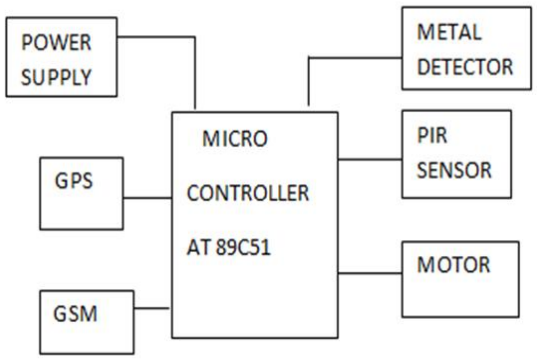
5. ATmega 16

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz. ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD. ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built

peripherals. The following table shows the pin description of ATmega16.

characteristics with both high sink and source capability
stated when a reset condition becomes active, even if the clock is not running.

1. BLOCK DIAGRAM



Discription of block diagram.

An aqua robot model is based on microcontroller AT 89C51.We are using GPS, GSM, PIR sensor and Metal detector. A 12v power supply is given to the microcontroller as an input and then the microcontroller starts working. Whenever any human or hot blooded animal is detected by PIR sensor or any metal is detected by Metal Detector then microcontroller is triggered. This trigger is then given to GPS which will then give the exact location of the object and this location is then messaged at the destination via GSM .Also with help of this aqua robot we can monitor marine life and can take underwater video footage leakages in oil pipes in deep sea can also be found with the help of this aqua robot.

VII. Conclusion of project

Having tested the amphibious robot under various conditions, it can be concluded that various objectives listed for the project have been met.

A aqua robot has been designed, built and tested to be able to detect the presence of alive human and metals under water depths. And also can be possibly used for surveillance while operating underwater. Operations of up to 1m underwater have also been tested to reveal positive results. With the proper sensors and equipment attached, it would also be able to identify live or dead human and metals. It can also monitor marine life and can detect the leakages in oil pipes. As the robot is constantly required to operate in seawater, proper maintenance and care is required to enable it to remain functional. Upon completion of the given

task and returning, the vehicle should be thoroughly washed with clean water and cleaned
to prolong the lifespan of the seals and reduce the possibility of corrosion on the various metallic components. The waterproofing seals should also be inspected regularly to ensure that none of them are damaged, and replaced immediately in
event that they are. Future work will focus on integrating this mobile robotic platform with sensors and autonomous control as well as further development of the propeller design. With the possibilities of their applications being endless, it can be expected that more and more research would be channeled into this area leading to new ideas and designs in the future to come.

VIII. APPLICATIONS FUTURE SCOPE

The project can be made wireless in future and further more advanced components can be used to make the project more efficient and fulfill all drawbacks.

IX. ADVANTAGES

1. The vehicle runs only on electric DC supply, hence doesn't require fuel.
2. Light in weight
3. Compact size
4. Remote controlled
5. Camera is used so operation is easy.
6. Helpful for rescue teams.

X. DISADVANTAGE

1. It has a limited range since it is wired.

XI. REFRENCE.

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1. Detection of alive humans or metals under water depths.

2. Leakage detection of oil pipes.

3. Monitoring marine life

4. Obtaining under water video footages.

5. Monitoring population and growth of extinct and endangered water species.

6. Can recover lost objects.

7. Also can be used for surveillance purpose