

Surveillance and Rescue Boat using Satellite Communication

Submitted in partial fulfillment of the requirements for the award of Bachelor of
Engineering Degree in Electronics and Communication Engineering

by

S. AKHILESH(37130392)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

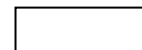
SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE UNIVERSITY)

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JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of S. AKHILESH (37130392) who carried out the project entitled "**Surveillance and Rescue Boat using Satellite Communication**" under our supervision from September 2020 to April 2021.

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DECLARATION

I, **S. AKHILESH (37130392)** hereby declare that the Project Report entitled **“Surveillance and Rescue Boat using Satellite Communication”** done by me under the guidance of **Mr. L. JEGAN ANTONY MARCILIN, M.Tech.**, is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

1)

DATE:

PLACE: CHENNAI

SIGNATURE OF THE CANDIDATE

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ABSTRACT

In today's world, the technology is so advanced that the weather reports can be known in advanced, accidents still can't be prevented and to hear such news of having ships and people go missing into the sea is disheartening. There are regions when a man cannot travel into the sea during a storm or a few places which is not easily accessible by man. In such scenarios, the idea is to build a RC Boat that is used for surveillance and to pass the information about the location and send a rescue team to save them. The RC boat module is a boat which is built with a transmitter end and the base station has the receiver end. The device used is LoRa-WAN. The RC boat is attached to a GPS tracker which transfers the exact location. With the help of camera attached to the RC boat, it captures and sends the images around it.

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CHAPTER 1

INTRODUCTION

In today's world, the technology is so advanced that the weather reports can be known in advanced, accidents still can't be prevented and to hear such news of having ships and people go missing into the sea is disheartening. There are regions when a man cannot travel into the sea during a storm or a few places which is not easily accessible by man. In such scenarios, the idea is to build a RC Boat that is used for surveillance and to pass the information about the location and send a rescue team to save them. The RC boat module is a boat which is built with a transmitter end and the base station has the receiver end. The device used is LoRa-WAN. The RC boat is attached to a GPS tracker which transfers the exact location. With the help of camera attached to the RC boat, it captures and sends the images around it.

1.1. ELECTRONIC DEVICES AND MICROCONTROLLERS

The new improvements in data and correspondence innovation have upheld the researcher, engineers and different clients to have minimal and adaptable electronic gadgets with higher limit and more capacities. Prior electronic gadgets were space burning-through and relatively with exorbitant costs. Because of the turn of events and developments in chip, the measures of the electronic gadgets are impressively diminished and the expenses are likewise altogether extremely low. The elements of the electronic gadgets are expanded to coordinate with the client prerequisites and to oblige the innovative turns of events.

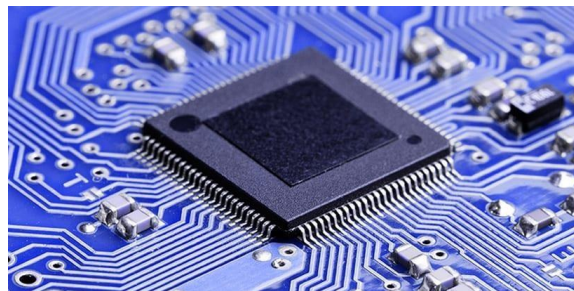


Fig:1.1: Microcontroller

1.2. ARDUINO

Arduino can be characterized as the open source electronic stage which has codes that assist the clients with planning circuits and to help them make the code simpler. As it is an open source, anybody can contribute the code in the stage and can be gotten to by individuals. In computerized gadgets world Arduino delivered different sheets like Uno, Mega, Due and Leonardo. The most normally utilized items are Uno and Mega. This is an ideal board that supports inclining hardware and the parts without any problem. This likewise gives hands on experience to figure out how the actuators and sensors work in computerized reasoning framework.



Fig:1.2.1:Mega

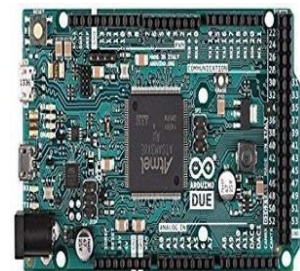


Fig:1.2.2:Deo



Fig:1.2.3:Leonardo

The Uno is microcontroller board which is created utilizing mini chips AT-Mega-328-P. It is considered to be an open source that was created by Arduino company.



Fig:1.2.4.:Arduino Uno

1.3. ARDUINO SOFTWARE

Arduino IDE, a multiple platform user app, i.e., Mac OS, Windows OS, Linux etc. It uses C and C++ language for the code to be uploaded into the hardware. Generally, IDE is used to transfer the code from the PC to the processor. IDE generally gives the library from wiring project. This gives many customary data techniques. IDE uses Arduino program to change the code to be executed to a book report which is a hexadecimal encoder which is stacked to the Arduino microprocessor by loading the program in its framework.



Fig:1.3. Arduino IDE

1.4. ARDUINO HARDWARE

It has a microcontroller attached to it. The IC varies according to the main processor. This board shall be connected to computer directly through USB cable. The code written using IDE software shall be transferred to the controller through the cable. In general, uno boards do not have USB to Serial Driver convertor. This is an open-source microcontroller board and hence the required software is available freely for the developers.

1.5. EMBEDDED SYSTEM

Embedded system is being attached to something or combination of many stuffs. Generally, the combination of multiple hardware components that gets embedded with a software part. It is thought of as a hardware being embedded to a software. It is a free framework or it tends to be a piece of a huge framework. It is a microcontroller or chip based framework which is intended to play out a particular undertaking.

We generally use Embedded C language to code in the microprocessor or controller.

Block diagram of Embedded System:

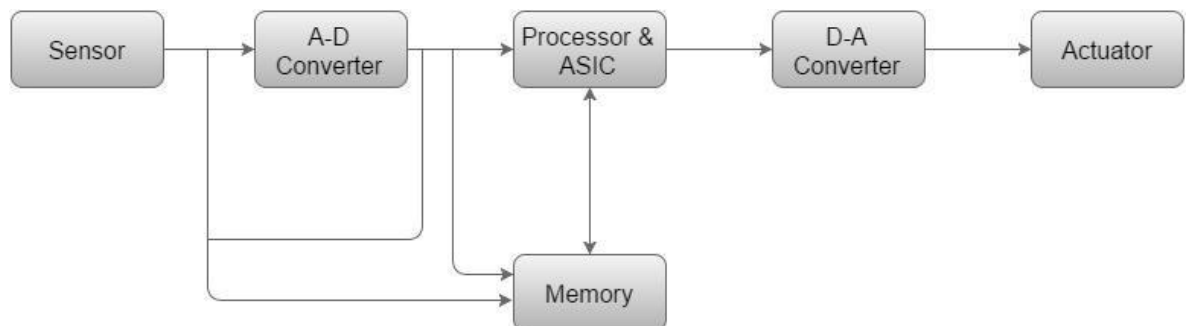


Fig. 1.5. Block Diagram of ES

- **Sensor:** It is used to convert the physical quantity to electrical quantity. This helps the user to use the value at any point of time.
- **A-D Converter:** It converts analog to digital signal.
- **Memory:** It has an inbuilt memory used to store the data.

- Processor: It transfers the data to the actuator.
- D-A Converter: It converts the Digital output signal back to analog.
- Actuator: It compares the D-A convertor output given to the output stored and accepts it.

1.6. ADVANTAGES OF EMBEDDED SYSTEM

1. It can be easily customized.
2. It consumes very less power.
3. It is affordable.
4. It has enhanced performance.

1.7. DISADVANTAGES OF EMBEDDED SYSTEM

1. It consumes a lot to market.
2. It has a very huge development effort.

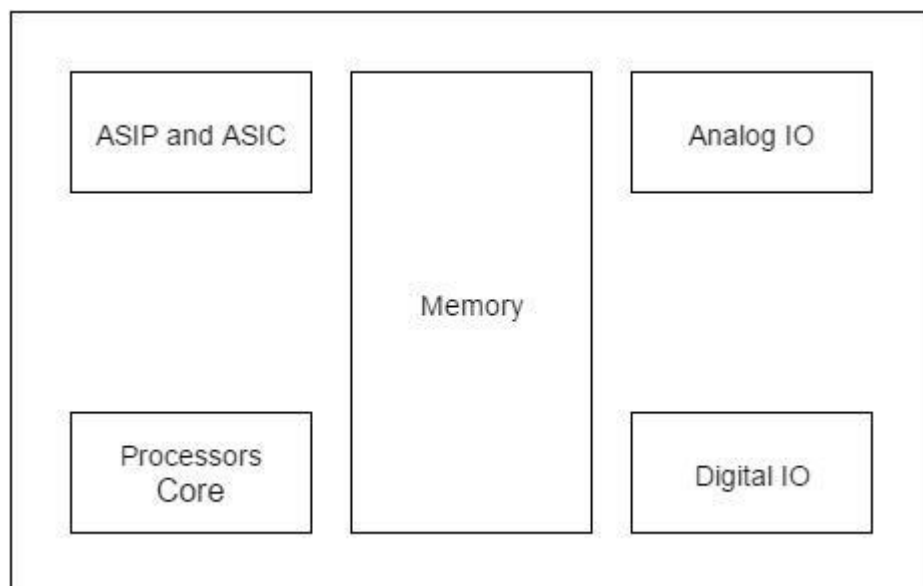


Fig:1.7:Schematic Diagram of Embedded System

Chapter 2

LITERATURE SURVEY

Kadam Akshay M and Mali Vipul(2020) “Design and development of RC speed boat”

From this paper, we can find that the boat uses WIFI directed camera to capture good quality image. The boat can be visible even at night or dark by the user so it can be used for long distance viewing. The surveillance issue has been resolved as the boat is having the surveillance water proof camera. For the RC boat not to sink in deep water bodies, the boat it is made up of special type of materials which has less density than water and also has a 180-degree flip attached to the camera. But can be increased by adding a low motor and Lithium Polymer battery. It will use flood chamber to rotate itself at 180 degree to avoid risk of sinking and uses light indicators to be visible at night. The hull design of the boat makes it easier to reduce the weight of boat it thus reduces the drag force of the body of the boat. The current efficiency of the boat is less due to less powered battery.

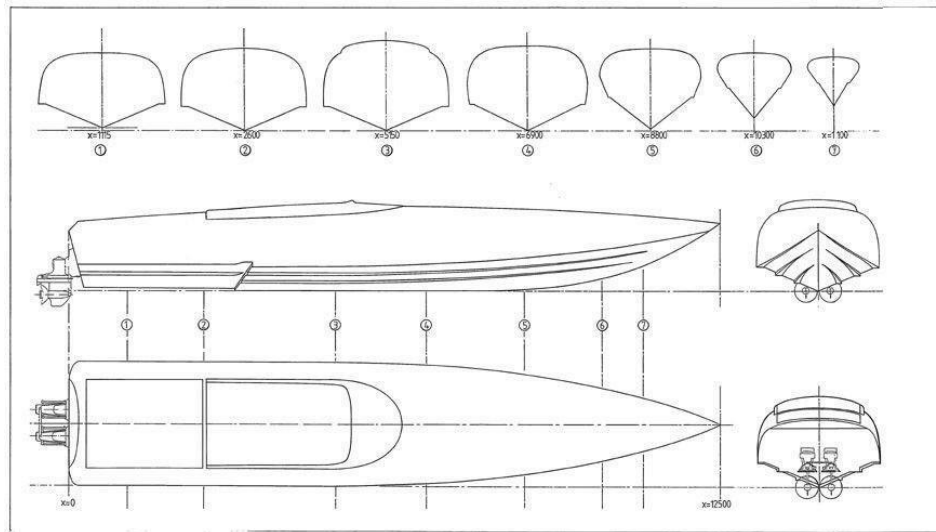


Fig:2.1:Boat external structure

The main methodology that is existing in the current paper goes by a Radio-Controlled boat is a boat controlled remotely with radio-controlled equipment. In many RC boats the radio control motor provides guidance while another source of power provides the locomotion.

Deeksha Srivatsava, Awanish kesarvani, Shivani dubey(2018) “Measurement of Temperature and Humidity using Arduino and DHT11”

This module discusses about how the data is sent in the form of pulse in a given period of time. From this paper, we can understand how temperature and humidity of the particular location is obtained. This Sensor has a total of three sections, namely the Vcc, data and ground. The DHT11 is a single wired communication i.e. serial communication. The proposed system provides a convenient method to monitor temperature and humidity in day-to-day life. Using this sensor, the temperature of the particular location is displayed on the monitor or screen to which the arduino board is connected.



Fig:2.2: DHT11 sensor

The humidity of the particular location is displayed in the LED or on the screen to which the Arduino Uno board is connected to. The system is not expensive and is easy to use due to its relatively small size. It is environmentally friendly.

Ms. Priyanka, Mr. Praveen kantha (2018) “ Realization of an IoT System to Ensure Doorway Security by Integrating ESP32-CAM with Cloud Server”

The goal was to build up a unique remote entryway security framework which enables the client to obtain guest's photograph personality and take a wise choice to give proper comments. The equipment utilized here included an elite minimal

effort Wi-Fi empowered computational stage with incorporated camera for example ESP32-CAM board.

This stir had used the trial set up based technique as of the research was planned to show the equipment association with a cloud worker utilizing Wi-Fi to move the information explicitly for observing and control based applications.



Fig: 2.3: ESP-32 Camera module

The outcomes got from the last model board can be plainly seen over the Blynk app. Before finishing of effective fruition of this work it was presumed that through IoT we can associate different information/yield gadgets, numerous sensors and actuators in an organization so they can converse with one another. The image can be captured by copying the link generated and pasting it on any browser to view it as a JPG image. To view it as a video, the url must end with MJPG (Motion JPG).

Shadman Sakib Arnob, Adiba Sumaiya Khan, Rashed Shelim, Mahmood

Chowdhury (2019) "Safe sailing: GSM and GPS controlled autonomous boat with overweight detection and obstacle avoidance"

The target of the paper is to utilize a RC boat for snag location and overabundance weight identification. The GSM and GPS controlled boat for reconnaissance. The Methodology continued in the paper discusses the boat and its weight factor. Overweight finder is a basic circuit which has four parts where each part gives two unique levels. Cautioning level alarms the boat for weighing overweight and rings on the disturbing bell. GPS following is done to know the area of the boat whenever. A standardized identification scanner has additionally been utilized to filter the standardized identifications.

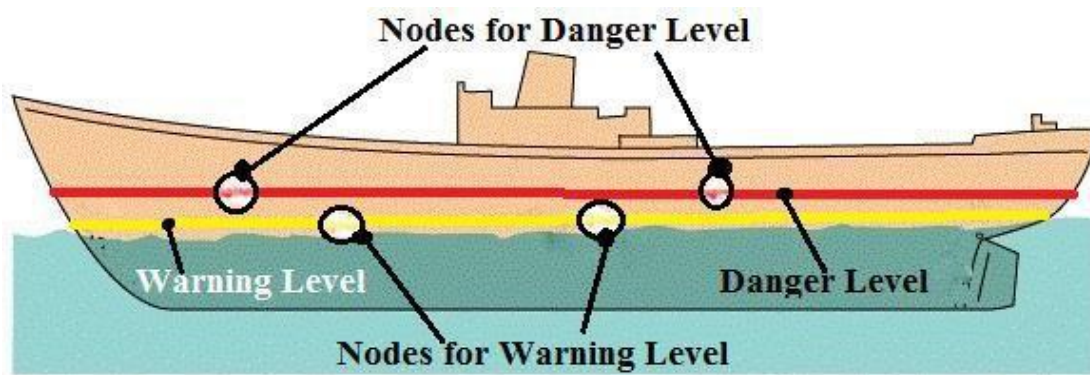


Fig:2.4:Side view of the boat(prototype)

From this paper we can track down that the whole circuit of the venture was executed utilizing two arduino. The Slave Arduino had both the GSM and GPS module associated with the PC. We can reason that RC boat is most appropriate for tracking down the Over weight and deterrent evasion. It tends to be constrained by GSM and GPS for its area.

Tonghao Chen, Derek Eager (2019) “Efficient Image Transmission Using LoRa Technology In Agricultural Monitoring IoT Systems”

The goal of this paper is to check whether LoRa-Wan is a great idea to be utilized in correspondence and to break down the qualities of LoRa WAN and it's properties to be reasonable. The approaches proposed in this paper are Personal remote sensor organization (WSN) advancements, for example, ZigBee have been utilized in IoT applications.



Fig: 2.5:LORA-Wan

In any case, these have a sign distance of all things considered 10 to 20 meters. MPLR is carried out and assessed utilizing a LoRa testbed network. Subsequent to perusing this paper, we found that LoRa-WAN is utilized in correspondence. The pictures of the Agricultural field is being moved and the discoveries are recorded and put away. We can reason that LoRa-WAN is best utilized for picture move. LoRa-WAN has a long reach for the information move and the deficiency of data is less.

Kolapo Sulaimon Alli, Moses Oluwafemi Onibonoje, Akinola S. Oluwole, Michael Adegoke Ogunlade, (2018) “DEVELOPMENT OF AN ARDUINO-BASED OBSTACLE AVOIDANCE ROBOTIC SYSTEM FOR AN UNMANNED VEHICLE”

The target of this paper is to realize how to work an essential vehicle for image recognition and to work a vehicle mechanically. The methodology and the findings proposed in this paper are The ultrasonic communicates a sound at 37 KHz and afterward stands by to get a comparing reverberation from the conveyed message.

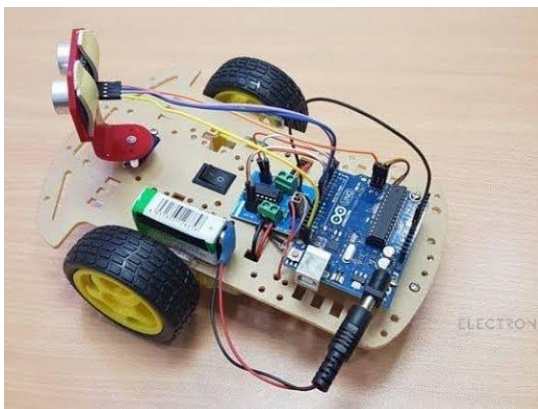


Fig:2.6: (a) RC controller car

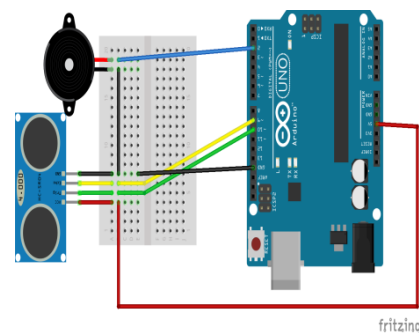


Fig: 2.6: (b) Schematic diagram

The framework comprises of power supplying part, IR drove/recipient sensor pair, ultrasonic sensor, Arduino Microcontroller and DC Motors. In the wake of perusing this paper, it shows a couple of distances are being determined into the type of a table to which the vehicle stops when it discovers a snag. At the point when deterrent is discovered, it stops with a caution. We can infer that two sets of heterogenous sensors were utilized to recognize snags the way of the versatile robot.

Samuel Farayola Kolawole* and Alexander Zakari (2018) “Design of Anti-Vehicle Theft System using GSM and GPS with Image Acquisition”

The paper discuss about how one can find the reason why GPS and GSM is useful and its functioning. The idea is to design a prototype that helps one find the vehicle from being lost and if its stolen, using GPS tracker, we can find the location of the bike. It also sends the information to the registered mobile phone by sending a message or SMS using the GSM. It has a secret button attached to the bike and so when ever the button is pressed, the alarm is sent to the registered sim card. There is a camera attached to the vehicle. This camera takes still images and then saves it to the phone in the memory attached. With the help of camera, we can find the picture of the one who has stolen the bike. The thief can be punished in this way and can be given the appropriate jail time. The camera at that point clicks the hoodlum, the GPS the facilitate while the GSM modem communicate such information to the proprietor's email address that is available from a cell phone

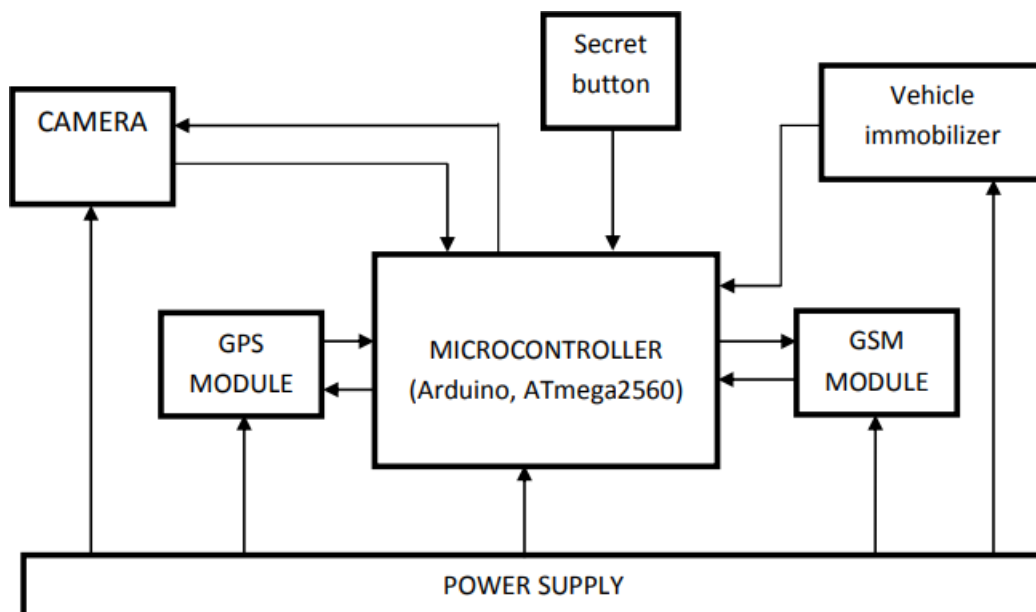


Fig:2.7: Block diagram anti-vehicle theft control system

With this information nearby, the criminal can be proclaimed needed and captured afterwards. The vehicle can't restart until someone presses the secret button. The owner of the vehicle at that point got an e-mail that contains the picture of the

unapproved individual and the location of the vehicle, inferring that his vehicle is stolen.

Leo Louis “WORKING PRINCIPLE OF ARDUINO AND USING IT AS A TOOL FOR STUDY AND RESEARCH”

The paper mainly finds the working of Arduino and its main pins. The functions that an Arduino microcontroller can perform, its efficiency and its working. With increasing number of people using open-source program and gadgets day. Development is forming another estimation by making perplexed things look more straightforward and interesting.

Arduino has many types like:

- Ethernet shield
- Wireless shield
- Motor Driver Shield



Fig: 2.8.1: Arduino Shields – Ethernet, Wireless and Motor Driver

Arduino has hardware and software parts. The Arduino Development Board consists of a huge number that makes it work together. The program code that is designed for arduino is called as sketch. The product used for growing outlines for an Arduino is generally called as the Arduino IDE.

```

class AnimateLeds {
public:
    const color_t kDefaultForegroundColor = Color::kWhite;
    const color_t kDefaultBackgroundColor = Color::kBlack;

    AnimateLeds(Adafruit_NeoPixel *leds) {
        _leds = leds;
        _foreground_color = kDefaultForegroundColor;
    }
};

```

Done uploading.

```

"/Applications/Arduino.app/Contents/Java/hardware/tools/avr/bin/avr-gcc-ar" rcs "/var/folders/7x/bsz1mn9
Linking everything together...
"/Applications/Arduino.app/Contents/Java/hardware/tools/avr/bin/avr-gcc" -w -Os -flto -fuse-linker-plugin
"/Applications/Arduino.app/Contents/Java/hardware/tools/avr/bin/avr-objcopy" -O ihex -j .eeprom --set-sect
"/Applications/Arduino.app/Contents/Java/hardware/tools/avr/bin/avr-objcopy" -O ihex -R .eeprom "/var/fd
Using library Adafruit_NeoPixel at version 1.0.6 in folder: /Users/r/Documents/Arduino/libraries/Adafruit
Using library Regexp in folder: /Users/r/Documents/Arduino/libraries/Regexp (legacy)

Sketch uses 16,200 bytes (56%) of program storage space. Maximum is 28,672 bytes.
Global variables use 829 bytes (32%) of dynamic memory, leaving 1,731 bytes for local variables. Maximum
Forcing reset using 1200bps open/close on port /dev/cu.usbmodem1411
PORTS {/dev/cu.Bluetooth-Incoming-Port, /dev/cu.rdpPhone-WirelessIAP, /dev/cu.usbmodem1411, /dev/tty.Bluet
PORTS {/dev/cu.Bluetooth-Incoming-Port, /dev/cu.rdpPhone-WirelessIAP, /dev/tty.Bluetooth-Incoming-Port, /d
Found upload port: /dev/cu.usbmodem1411
/Applications/Arduino.app/Contents/Java/hardware/tools/avr/bin/avrdude -C/Applications/Arduino.app/Conter

avrdude: Version 6.3, compiled on Sep 12 2016 at 17:22:25
Copyright (c) 2000-2005 Brian Dean, http://www.bdmicro.com/
Copyright (c) 2007-2014 Joerg Wunsch

```

Arduino Leonardo on /dev/cu.usbmodem1411

Fig: 2.8.2:Arduino IDE

From the paper, we have considered the functioning rule of Arduino, its programming highlights and its applications regarding where it is being utilized and where everything it tends to be utilized.

Poonam V. Gaikwad, Yoginath R. Kalshetty (2019) “Bluetooth Based Smart Automation System Using Android”

The paper talks about the Bluetooth module HC-05 and its functioning. This Bluetooth module is used to transfer data. The module is has various functions, in this paper, it is used to control the houses as of Automation System using Android phone. The Bluetooth module is connected to the arduino Uno which has various sensors attached to it. In the world of automation, everything is being automated and is used to reduce the human work. Bluetooth doesn't require any operational cost. It has an effective range of about 100m.

Yellow = Pin 12 (TX on Arduino, to VOLTAGE DIVIDER, to RX on BT)
 Green = Pin 11 (RX on Arduino, from BT's TX)
 Orange = Pin 9, carries the 'AT command enable (pin 'HIGH') status

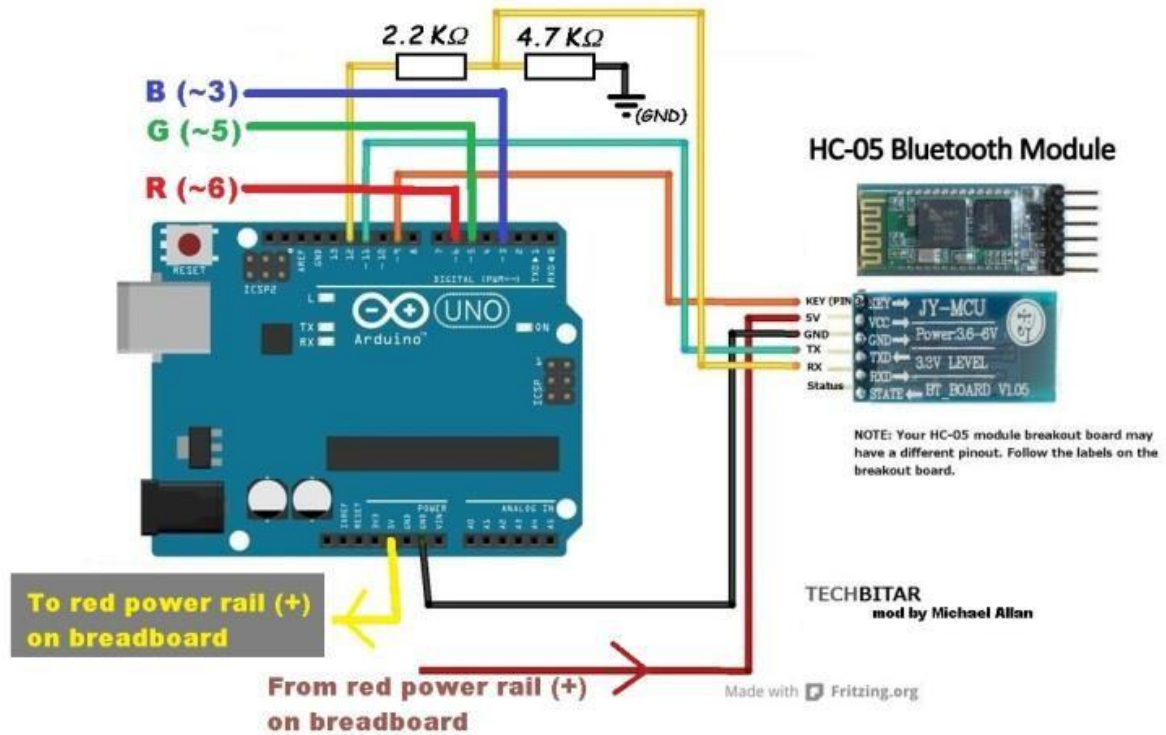


Fig:2.9.1: HC-05 Bluetooth module with Arduino Uno

The paper concludes that Bluetooth HC-05 module that is attached to Arduino which is further connected to the android phone. The android phone has an app installed from Play Store which is used to control the home via automation.

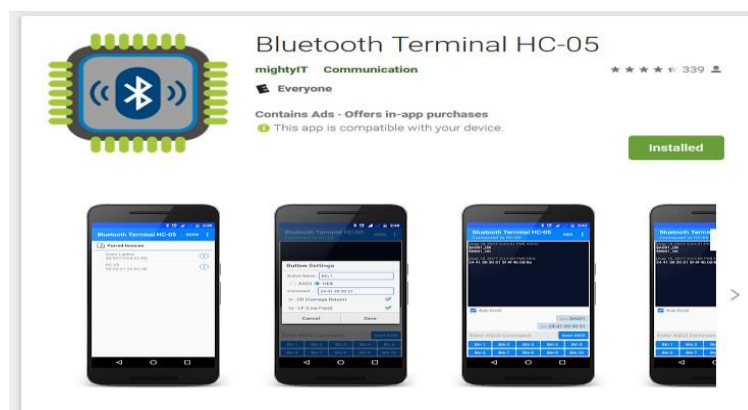


Fig: 2.9.2: HC-05 Bluetooth App in Play Store

CHAPTER 3

AIM AND SCOPE OF THE INVESTIGATION

3.1 AIM AND OBJECTIVE

The main objective of the project is to surveil the sea and to report the condition of the lost boat in its last seen location using a RC Boat. It helps one to know the condition about the places where man cannot reach. When there is a harsh weather condition, it isn't possible for man to reach, so using this RC boat, it sends the video data to the operator's deck and can be monitored.

3.2 PROTOTYPE DIAGRAM

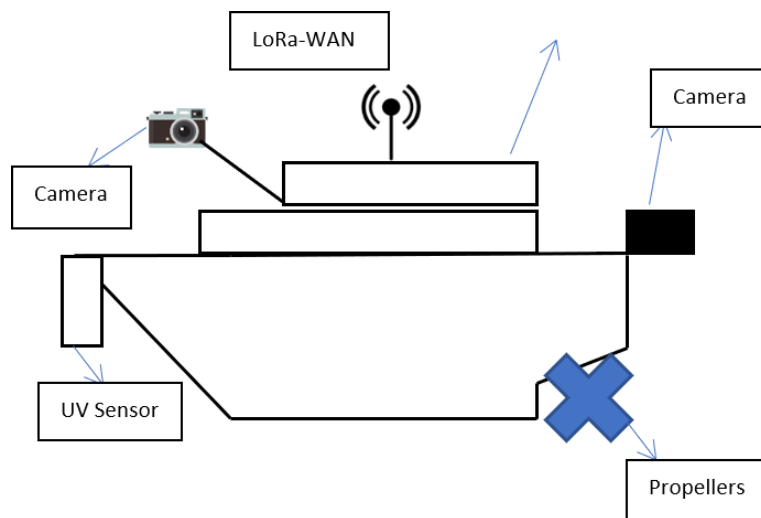


Fig: 3.2: Prototype of RC Boat

The prototype consists of two parts, the boat and the base station. The boat is attached with two DC motors that act as propellers for the motion of boat in water. A microcontroller is fixed on top of the boat. A perigon camera is attached in the front of the boat that captures the video and images. The boat is attached with a GPS module which shows the live location of the boat. The boat can be remotely controlled by the person with the help of a device, phone or laptop, in the base station which is located at the controller's location. There are UV sensors attached in the front of the boat for obstacle detection. In case of any obstacle that is not

captured or noted by the person controlling the boat, it automatically stops and indicates. Other essential sensors like pH sensor, rain sensor, and temperature sensors are also fixed. The power supply for the microcontroller is given by high voltage portable batteries with long lasting life is attached.

Hardware Components:

1. Microcontroller
2. Wireless trans receiver (LoRa-WAN)
3. Perigon cameras
4. DC motors
5. Propellers
6. Temperature sensor
7. pH sensor
8. UV Sensor
9. Battery
10. GPS module
11. H-5 Bluetooth module
12. Alarm and lights

3.3 BLOCK DIAGRAM AND WORKING

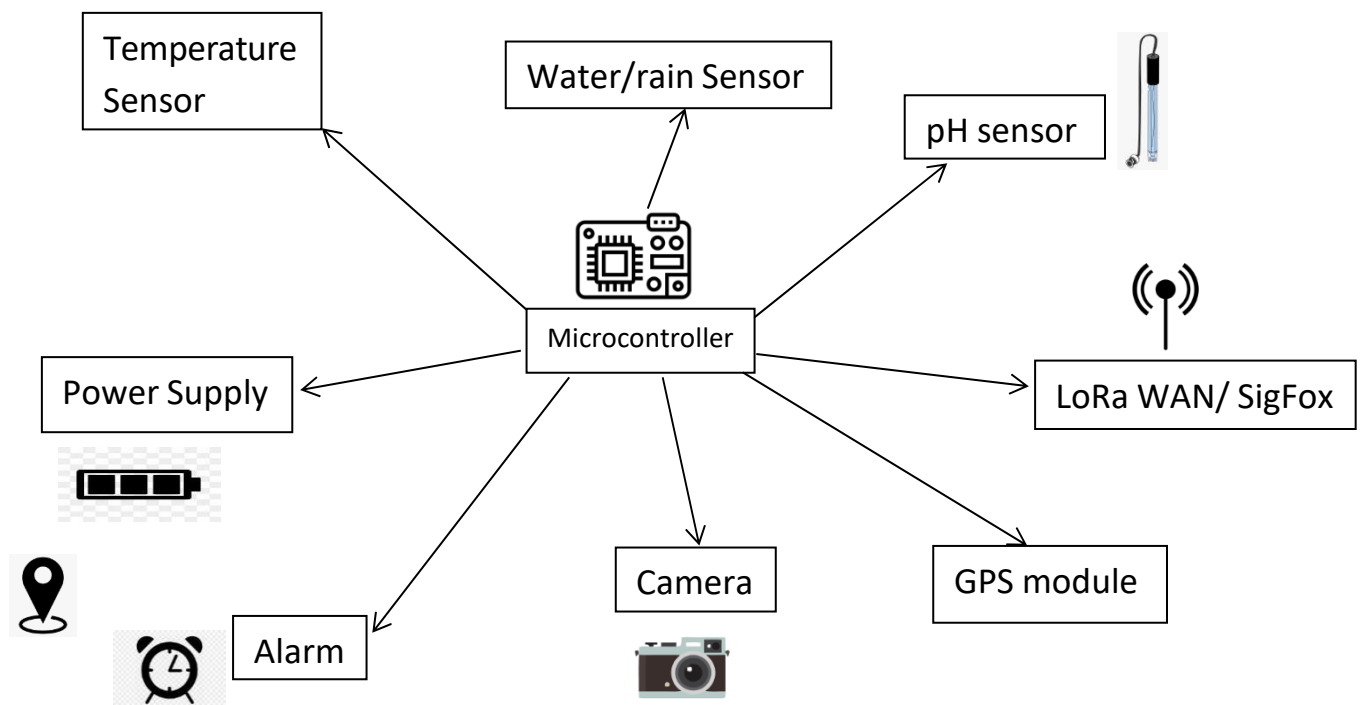


Fig:3.3.1:Block diagram of RC Boat Module

Power supply is given to the microcontroller. The sensors are connected to the microcontrollers. The sensors used are temperature, UV, pH etc. Two perigon cameras are attached at the front and in the rear end of the boat. The perigon camera covers an area of 180° at periodic rotation. The camera module used is variable i.e. the camera can be replaced according to the budget and quality. A wireless Trans receiver component is used for transferring the information i.e. images and videos. The preferred one is LoRa-Wan which has a range up to 100km.

One camera is used for capturing the images on the surface and the other camera is used to capture the images either the rear end or underwater. There is a GPS module attached which gives the location of the boat with its longitude and latitude. UV sensors are fixed in the front of the boat for obstacle detection. In case if there's any obstacle on the way and the person controlling hasn't observed, it intimates as an alert and stops before hitting it. The temperature and pH sensors give the exact temperature and the pH value of the surroundings. LED lights are attached which indicates the presence of the boat for safety purpose.

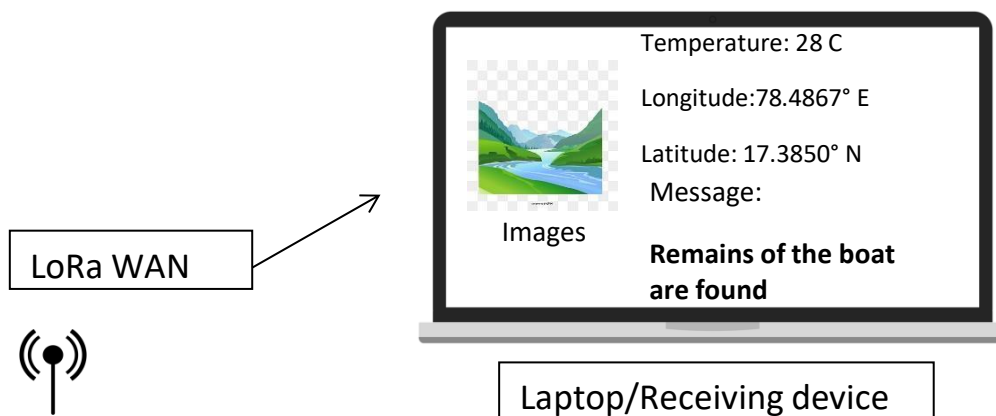


Fig: 3.3.2: Base Station

The other end of the prototype is the base station. The place from where the person operates the boat from acts as the base station. The person has a laptop where the details will be displayed on the screen. The other end of LoRa-WAN is connected to the laptop. The image and the video will be displayed on the screen.

3.4. EXISTING METHODOLOGY

As for the project goes, it is inspired by various method. The prototype consisted of a single attached camera which doesn't rotate at all. It is used to just capture the pictures at regular intervals. A smart eye is used in aeroplane for rescues in times of emergency. Smart eye for lost vehicle transfers data to the nearest station in times crashing or missing.

LORA-Wan is used in the prototype transfers data and the pictures from one station to other. It consumes a lot of power.

The person might not be able to get a clear picture from a low quality camera.

3.5 PROPOSED METHODOLOGY

In the project, the camera is replaced with a perigon camera which rotates and captures pictures. The live video of the surrounding can be obtained. With space being a major concern, the major factor for transferring the image and video is being done using WiFi module. An ESP-32 WiFi module is being attached to it so that the power consumption of the boat is comparatively less. The camera is attached to the WiFi module which makes the connections simple.

Chapter - 4

MATERIALS AND METHODS USED

4.1 MATERIALS USED

- ESP32 CAM WiFi Module – 1
- OV2640 Camera Module - 1
- UBLOX GPS Module - 1
- Arduino UNO – 3
- Ultrasonic Sensor – 1
- L292d Motor Driver - 1
- DC Motors - 2
- LED Lights
- Jumper Wires
- Bluetooth Module
- Connecting wire
- Thermocol sheet (For boat body)

4.2 ESP 32 CAM WIFI MODULE

4.2.1 Description

The ESP32-CAM is a small-length digicam module which can be operated independently at least system.

ESP32-CAM is mostly used in IoT applications. It is used in making home clever gadgets, business wi-fi manage, wi-fi tracking, QR wireless identity, wi-fi system indicators and many IoT packages. It is a really perfect thing for IoT packages.

It affords users with a tremendous dependable connection methods and is easy to be used in various IoT hardware terminals.

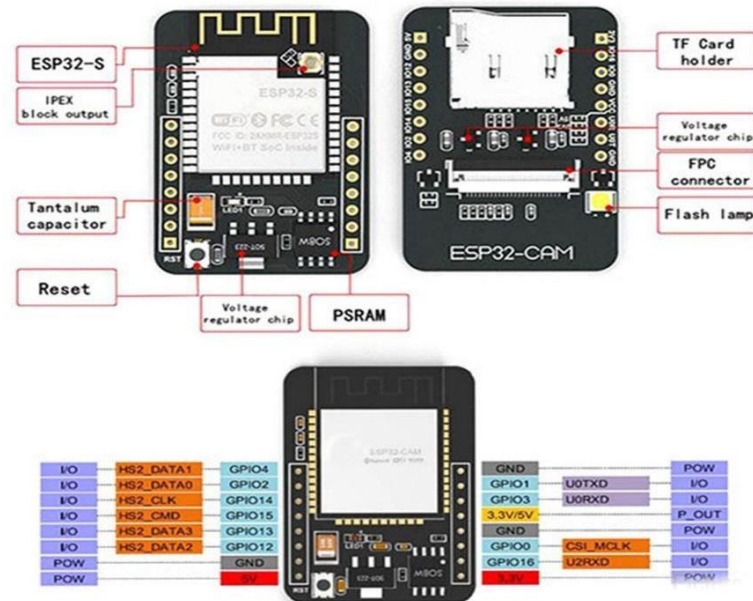


Fig:4.2.1:ESP 32 Camera Module

4.2.2 Specifications

- Very very small 802.11b/g/n WiFi + BT SoC module
- Low-energy twin-middle 32-bit central processing unit
- Supports up to 240MHz-250MHz, up to six hundred DMIPS
- In built 520 KB SRAM, and external 4M PSRAM
- Supports interfaces which includes UART/SPI/I2C/PWM/ADC/DAC
- It supports OV2640 and OV7670 cameras with inbuilt flash
- It supports for photographs WiFi upload
- It supports TF card
- It has multiple sleep modes
- Embedded and RTOS
- It supports STA/AP/STA+AP working mode
- It supports Smart Configuration one time click distribution community

- It support for serial neighborhood to increase and far flung firmware improve (FOTA)

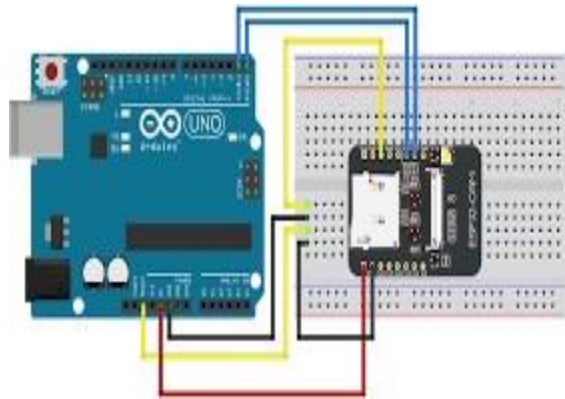


Fig:4.2.2:ESP 32 Cam Connection

4.2.3 Applications of ESP 32 Cam

- Surveillance
- Home Security
- Facial Recognition
- Climate Monitoring



Fig:4.2.3:Monitoring Using ESP 32 Cam

4.2.4 OV2640 Camera Module

It is a 2- mega pixel camera that is attached to the ESP Cam board to stream the video or to take the pictures of the surroundings.

It is used in many IOT and Embedded applications.

It produces Images and Video in JPEG and MJPEG format.

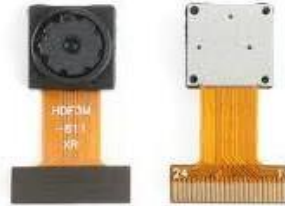


Fig:4.2.4:OV2640 Camera Module

4.3 UBLOX GPS MODULE

4.3.1 Description

Ublox NEO-6M is a global positioning device (GPS) module, is a famous, fee-effective, excessive-overall efficient GPS module with a ceramic antenna, inbuilt memory card/chip, and a battery that is included with a range of microcontrollers. Nowadays, GPS Modules are famous to find the location of a particular object and is mostly used in most of the IoT applications and Projects.



Fig:4.3.1(a):Ublox GPS Module

GPS is generally used to determine the exact longitude and latitude (location) of any object this device will get connected to the satellite when it is turned on and starts sending the location coordinates to the user whoever using this device.

This is an updated GPS module that can also be used with mega v2. This GPS module is very simple to use, boosting the overall module performance along with your Ardu pilot or any other platforms.

The Ublox GPS module generally consists of 4 PINS TX, RX, VCC, and GND. You can download the blynk software for using this GPS and converting the settings and and many more. It is certainly suitable s/w program.

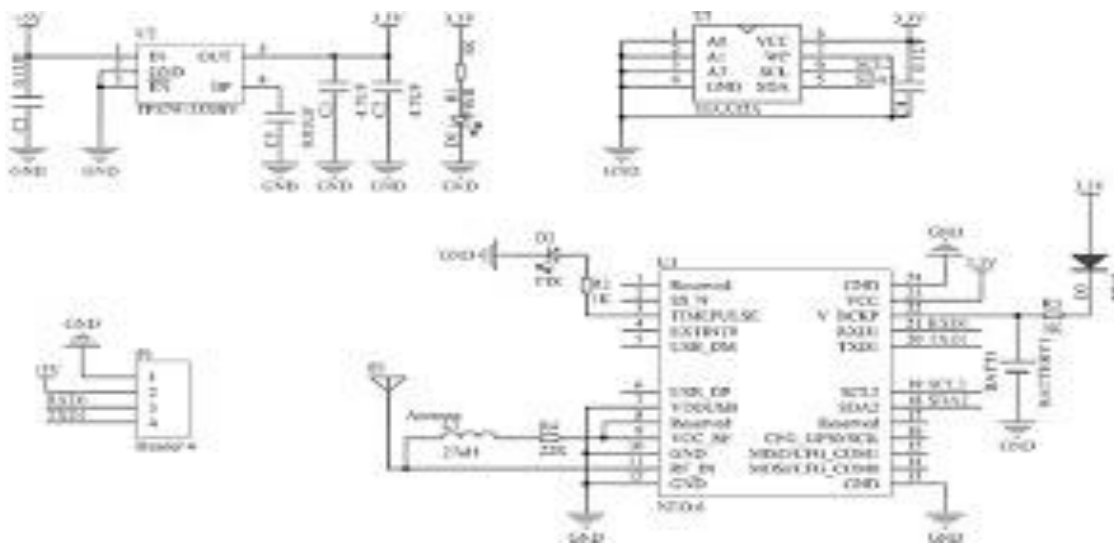


Fig:4.3.1(b):Pin diagram of GPS Module

4.3.2 Features/Specifications of UBLOX GPS Module

- Frequency of 5Hz position replace
- To keep configuration settings EEPROM is used.
- Inbuilt Rechargeable battery for Backup power supply
- Bloodless begin time : 38 seconds, Hot begin time :1 seconds
- Input supply voltage: 3Volts
- Separated 18*18mm GPS Antenna.

4.4 ARDUINO UNO

4.4.1 Overview

Arduino UNO is a prototype/software platform that is based upon a simple to use hardware and software. It has a main circuit board, that is easily programmable

(microcontroller) and organized s/w program referred to as Arduino Integrated Development Environment (IDE), this is useful to write and upload our software code in our PC.

The key features of Arduino UNO are:

- 1) Arduino UNO boards are capable of examine the a/n or dig'l ip signs from particular sensors and flip it to an o/p which includes activating the motor, and turning LED on and off, and to directly connect to the cloud and various other movements.
- 2) You can also control your functions in the board with the useful resource of sending a hard and fast of commands to the microc'ller at the board through Arduino IDE.
- 3) Unlike the maximum previous programmed circuit board, Arduino doesn't require an extra part of hardware component (programmer) for to upload a fresh code to the arduino board. USB cable can be used in for this purpose.
- 4) Moreover, Arduino IDE uses a simplified model of C++ program, it makes less complex to discover ways to software program.
- 5) Finally, Arduino produces a favoured shape thing that breaks all the functions of the microcontroller to the accessible packages.



Fig:4.4.1:Arduino UNO

4.4.2 Features/Specifications of Arduino UNO

The functions/specifications of Arduino Uno consists of the following:

- Working voltage : 5 volts
- The enter voltage will vary from 7volts to 12volts

- The input voltage vary from 6volts to 20volts
- Input/Output pins are fourteen
- Analog pins are six
- The DC Current for all ip/op pin is 40 mA
- The DC Current for three(3V) Pin is 50 mA
- F-Memory is 32 KB
- SRAM : 2 KB
- EEPROM : 1 KB
- CLK Speed : 16 MHz

4.4.3 PIN Diagram of Arduino UNO

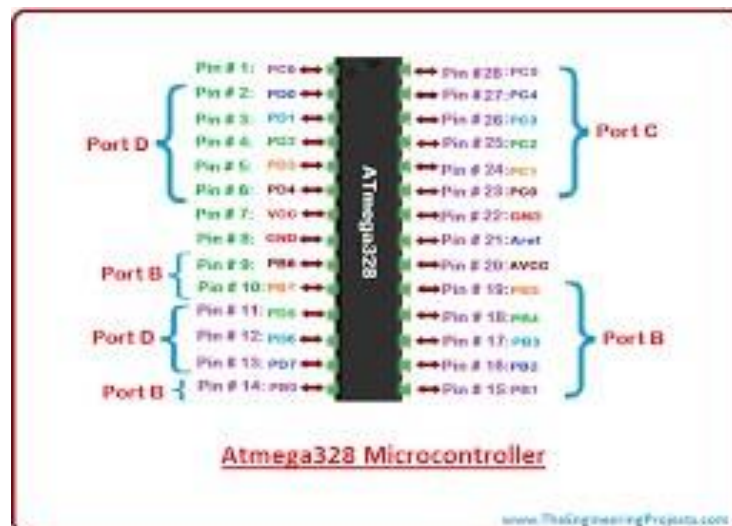


Fig:4.4.3 (a):PIN diagram of ATmega328P Microcontroller

Power Supply

The Arduino Uno power supply can be done using a USB cable or an outdoor electricity supply. External strength factors specifically embody AC to DC adapter in any other case the battery. The adapter can be given as the connection between the device and the board for giving the software code.

Input & Output

The 14 virtual pins that are present on Arduino Uno can be used as i/p & o/p with the assist of the capabilities like :

1) pinMode(), 2) digitalWrite(), & 3) Digital Read().

Pin1 (TX) & Pin0 (RX) (Serial): This pin is used to transmit & attain TTL serial statistics, and these are connected to the ATmega8U2 USB to TTL Serial chip equal pins.

External Interrupts (PIN 2 and PIN 3): External pins can be associate with set off an interrupt over the low value.

PINS (5V, 3V)

The pins that are present in the Arduino are places where you can join wires to make/construct a circuit. Generally, they have black plastic 'headers' that allow you to simply plug the wire into the Arduino UNO board. The Arduino has many exceptional varieties of PINS, everything is categorized on the board and used for different functionalities.

GND (PIN 3): Short form for "Ground". There are numerous Ground pins in the Arduino UNO, any of which can be used to ground the circuit.

5V (PIN 4) & 3V(PIN 5): As you may think, the 5V PIN resources 5 V of current, and the three(3V) PIN supplies three.3V of power. Mostly we use this PINS (5v and 3.3 v) for our projects.

Analog (6): The 6th PIN of the Arduino consists of set of Analog PINS that are categorized as PINS 0 to 6 (A0 – A6). The set of the analog PINS. These PINS can accept the analog data into the Arduino UNO.

Digital (7): Apart from the Analog PINS there are also the digital PINS which are useful for taking the digital input. There are thirteen virtual digital PINS in Arduino.

PWM (8): You may have also noticed a tidle (~) adjacent to the some of the PINS (3,6,9,11 in UNO) These PINS are acted as the regular digital PINS and also they can be used for PWM.

AREF (nine): It is defined as Analog Reference used for some external supply. You can also use this PIN alone according to the situation or the project which you are working in. The voltage is in range (0-5V).

Reset Button

Arduino also has a reset button. By pressing it, it will connect the reset pin to ground and restart the code that is loaded in the Arduino UNO. This can also be very useful in case your code doesn't work. It is very important button in Arduino as Arduino cannot repair itself incase of any damage.

Power LED Indicator

Under the Word "UNO" there is a small LED available in the circuit which will glow whenever an plug is connected to it. It denotes whether the device is turned on or not if its not turned ON there may be something wrong in the Circuit

TX RX LEDs

These PINS are one of the Important PINS of the Arduino, Tx refers to Transmitting and Rx refers to Receiving PIN. The LED's are responsible for knowing the status like uploading the code into the Arduino and indicate us whether the Arduino is receiving and sending the data or not.



Fig:4.4.3 (b): Main IC



Fig:4.4.3 (c):Voltage Regulator

4.4.4 Types of Arduino boards

- UNO
- Micro
- Nano
- Due
- LilyPad
- Decimila
- Bluetooth

4.5 ULTRASONIC SENSOR

4.5.1 Introduction

As the name indicates, ultrasonic or degree sensors senses the distance using the ultrasonic waves.

This sensor emits the ultrasonic waves and then decides the operation based on the wave resulted. The operation is pretty simple it measures the time take by the transmitted wave and received wave.

4.5.2 Working Principle

The Working of the Ultrasonic sensor is similar to the radar operation. This sensor converts the electrical energy to the waves. It has the frequency of 18kHz. The HC SR04 ultrasonic sensor has a frequency of 40kHz.

This sensor is mostly used in IoT projects and applications, where the thing has to identify the obstacles or any person passing in front of the device it takes the necessary actions based on the code that the user has uploaded into the Arduino.

The Working of this sensor is quite simple it uses the ultrasonic waves for calculating the time interval between the transmitted wave and the received wave. Based on this interval it takes the actions.



Fig:4.5.2:Ultrasonic Sensor

4.5.3 Working

The working of this module is very simple. It converts the electrical energy into the waves which is similar to the operation of the RADAR.

As soon as it gets the power supply the sensor starts generating the ultrasonic waves and starts calculating the time and stops it when the ultrasonic wave is received again.

Based on this time interval this does all the necessary actions based on the conditions that are given by the user and performs all the operations based on the software uploaded.

4.6 L292D MOTOR DRIVER

4.6.1 Introduction

L293D circuit is a very popular 16-Pin Motor Driver IC. Which is used for making so many IoT Hardware projects. As the name suggests that it is used for driving the motors, these motor drivers are used where the DC Motors are used.

The working of this driver is very simple, for the automobiles which has less than 36 volts as the operating voltage can be managed by the virtual circuits like Op-Amp, Timer circuits Arduino, PIC etc.,

4.6.2 Working Principle

Using L293D Motor driver is quite simple. There is an IC that is embedded onto the circuit and it works on Half H-Bridge. A H bridge is a set up used to drive the motors each in both clock wise direction and viz. This IC is used to wake up the vehicles in the automobile industries.



Fig:4.6.2(a):L293D Motor Driver

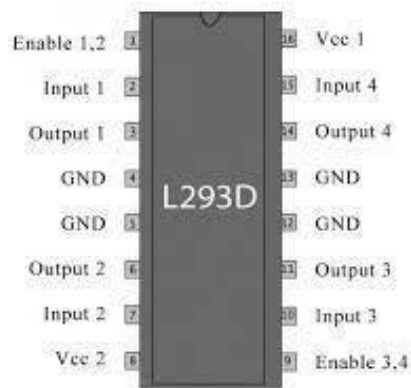


Fig:4.6.2(b):PIN diagram of L293D

The above diagram is the PIN configuration of the L293D Motor Driver, there are 16 pins. 16th pin is the Vcc Pin and the Ground pins are at the positions (4,5,12,13).

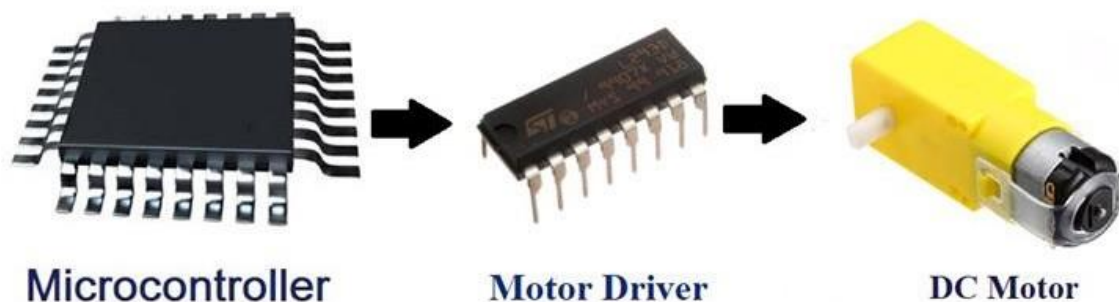


Fig:4.6.3: Motor driver connection

The above diagram is the schematic view of the working of the Motor driver. The three main components that are required to run a vehicle is Microcontroller, Motor driver, DC Motor.

Motor driver generally needs Microcontroller and a DC Motor for the machine to run.

4.7 DC MOTORS

4.7.1 Introduction

A DC Motor is an electric powered machine that runs on direct current. It runs on the principle of electromagnetism. It follows basic electromagnetism principle which states that when the current is supplied the electromagnetic field is created outside the motor which makes the motor to rotate.



Fig:4.7.1:DC Motor

These type of motors mostly used in many IoT projects, which are responsible for the vehicles to drive. These motors are used as wheels.

4.7.2 Advantages

- Cost efficient
- High Reliability
- Speed control is easy
- Full torque at zero speed
- High motor power density
- Less Inertia
- Easy to service and maintain

Chapter – 5

RESULT AND DISCUSSION

5.1 FINAL PROTOTYPE

Given below is the final prototype of the boat after making all the necessary connections. The Source code is uploaded in the arduino for both ESP 32 Cam and UBLOX GPS Module.



Fig:5.1:Final Prototype

5.2 WORKING

The main agenda of this project is to surveil the lakes or ponds and capture the photos and videos of the surroundings and send the data i.e., image, video and location coordinates to the nearest base station.

These things can be achieved by using some components which we have used in the project they are Ublox GPS Module and ESP 32 Camera.

ESP 32 Camera is used to send the photos and videos to the nearest base station. This Camera has inbuilt Wi-Fi module which is used to connect our personal device through Wi-Fi.

Using this device is pretty simple.

The IP address of the ESP 32 Camera is noted and the same is given in the chrome. After clicking 'Enter' the browser will be redirected to the ESP 32 camera, and we can see the video in our device's screen. Below is the image showing video streaming that is done by ESP 32 Camera.

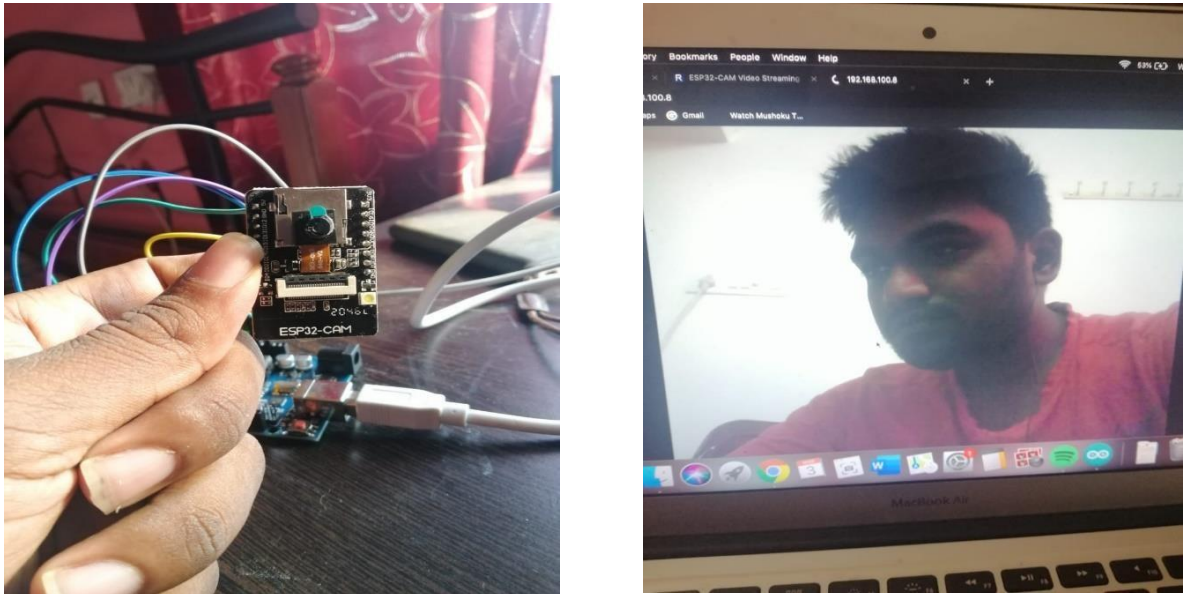


Fig:5.2 (a):Working of ESP 32 Cam

Taking pictures and videos using this device is very simple for taking the pictures we have to use the extension 'JPEG' at the end of the copied address.

For taking Video similarly we have to use 'MJPEG' at the end of the address, which denotes "Motion JPEG".

The Location of the boat is obtained by using Ublox GPS Module. Similarly the operation of this device is also simple. The Source code required for its operation is uploaded in it. After switching on the device the transmitter gets connected with satellite so that it can send the location coordinates to the device. As soon as the GPS Module gets connected with the satellite we can see the location coordinates in the Arduino interface as we can see in the given below image.

If you want the same in map view we can just copy those coordinates and paste in any map apps. By doing this we can even see in which direction our boat is heading towards.

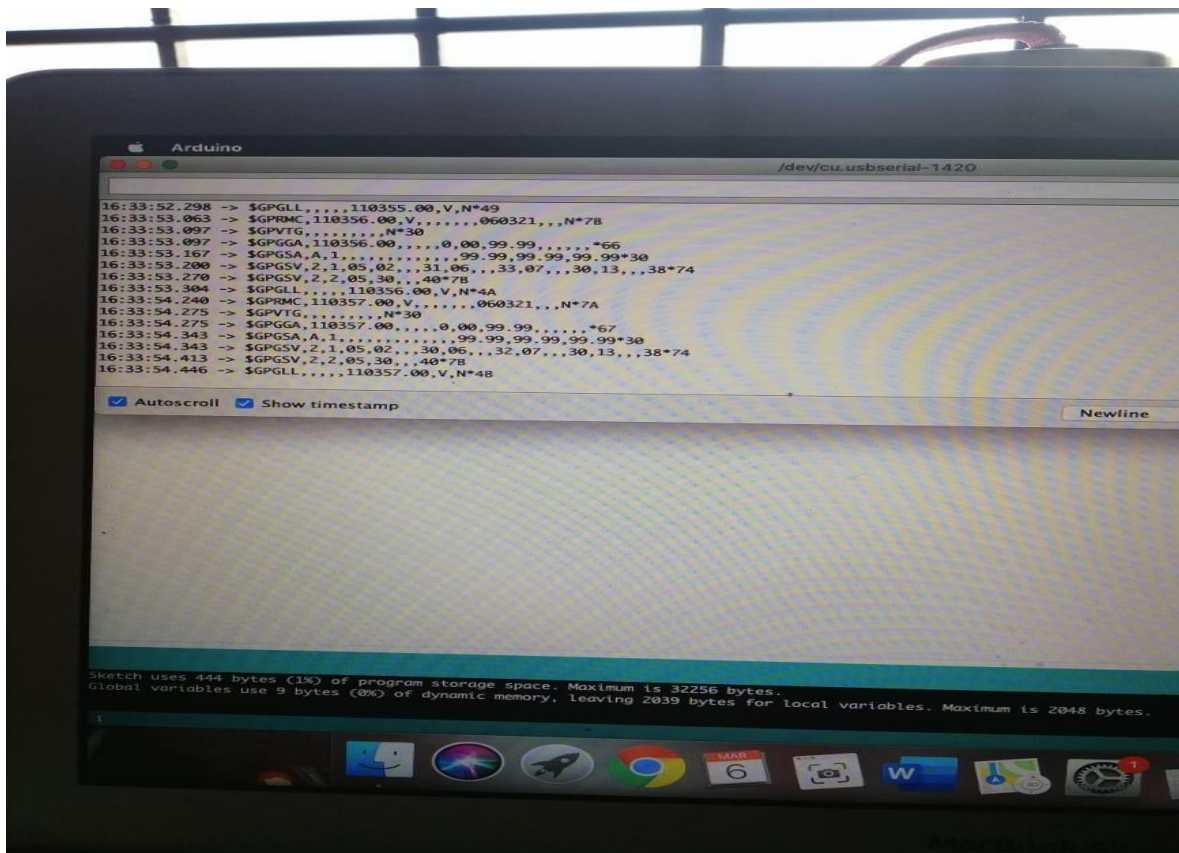
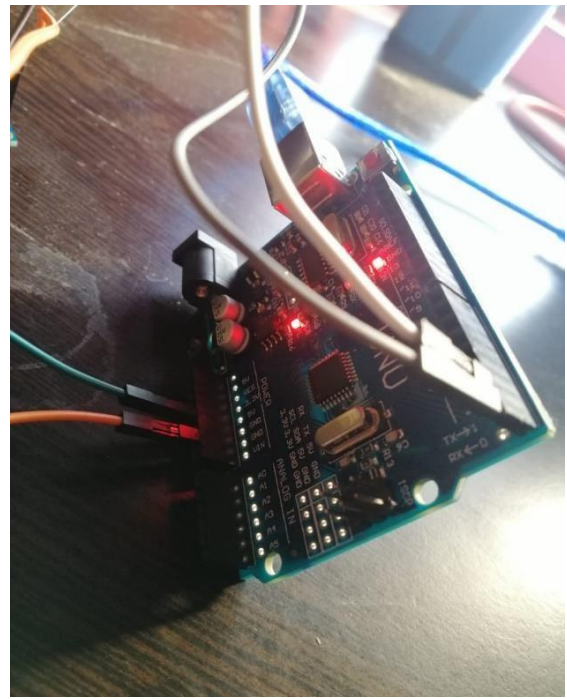
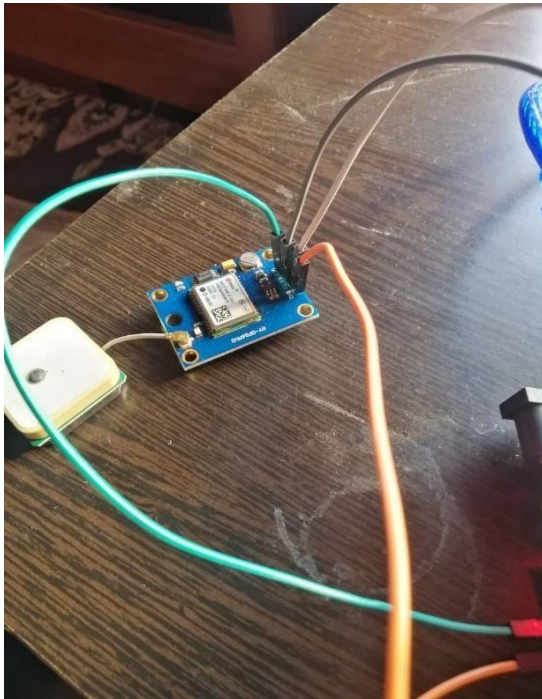


Fig:5.2(b):Working of Ublox GPS Module

For driving the boat we have used two dc motors and a motor driver to drive these motors. The Source code is given to the Arduino for the Bluetooth module and the L293d Motor driver. This boat can be controlled by our mobile or any device which has Bluetooth. Given below are the images of the Bluetooth module and the Motor driver in working.

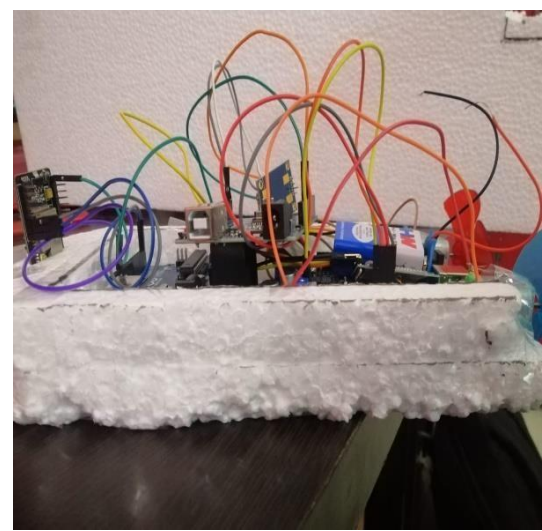
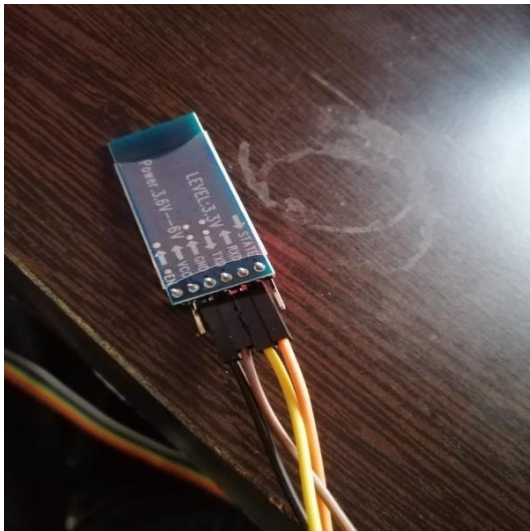
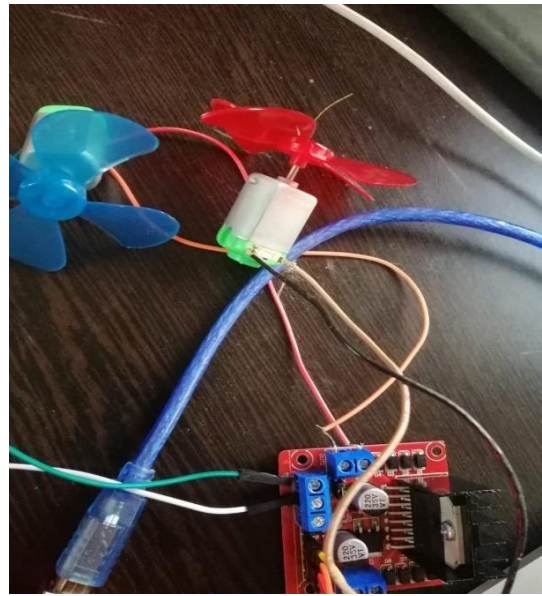
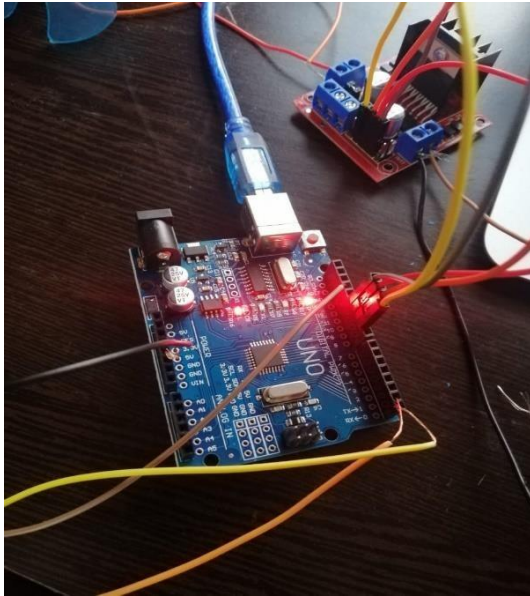


Fig:5.2c:Circuit connections of L293D and Bluetooth Module

Chapter – 6

CONCLUSION

This project is used to surveil the sea or ponds and capture the photos and videos of the boats and their location and sends all the data to the user. The main idea of our project is to make a RC boat which is used to capture all the photos of the boats that are in the ponds or seas and send their images along with the last location to the nearest base station. Because many boats are missing now a days due to heavy rainfalls and cyclones and the people are finding it difficult to track the lost boat. This is where our boat comes into play it surveils the sea whenever any boat passes it captures the image and sends that data along with its location to the base station. When the people come to know that so on so boat got lost the officials in the base station will check the data sent by our boat, if they find the lost boat they will rescue that lost by going there using the location that was sent by the boat.

This whole operation depends on the two major components in the device they are ESP-32 Cam and Ublox GPS Module. The ESP-32 cam has an inbuilt Wi-Fi in it which is used to control it and to receive the data i.e., Images or videos using the IP address of the ESP Camera. The IP address is copied and is given to the user so that he can see the video stream of the boat. This special type of camera also has a inbuilt LED light which will be useful to control the boat even in night times.

The next important component is the Ublox GPS Module which sends the location coordinates of the boat so that the people can know where the boat is present currently. This module has an transmitting/receiving antenna which will get connected to the satellite as soon as we turn it on and starts sending the location(coordinates) to the user

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Surveillance and Rescue Boat using Satellite Communication

Submitted in partial fulfillment of the requirements for the award of Bachelor of
Engineering Degree in Electronics and Communication Engineering

by

S. HARIHARAN (37130394)

S. AKHILESH(37130392)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of
S. HARIHARAN (37130394) and S. AKHILESH (37130392) who carried out the project
entitled "Surveillance and Rescue Boat using Satellite Communication" under our
supervision from September 2020 to March 2021.

Internal Guide

Mr. L. JEGAN ANTONY MARCILIN, M.Tech.;

Assistant Professor, Department of ECE

Head of the Department

Dr. T. RAVI, M.E., Ph.D.

Submitted for Viva voce examination held on _____

Internal Examiner

External Examiner

DECLARATION

We, **S.HARIHARAN (37130394)** and **S. AKHILESH (37130392)** hereby declare that the Project Report entitled “**Surveillance and Rescue Boat using Satellite Communication**” done by us under the guidance of **Mr. L. JEGAN ANTONY MARCILIN, M.Tech.**; is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

1)

2)

DATE:

PLACE: CHENNAI

SIGNATURE OF THE CANDIDATES

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ABSTRACT

In today's world, the technology is so advanced that the weather reports can be known in advanced, accidents still can't be prevented and to hear such news of having ships and people go missing into the sea is disheartening. There are regions when a man cannot travel into the sea during a storm or a few places which is not easily accessible by man. In such scenarios, the idea is to build a RC Boat that is used for surveillance and to pass the information about the location and send a rescue team to save them. The RC boat module is a boat which is built with a transmitter end and the base station has the receiver end. The device used is LoRa-WAN. The RC boat is attached to a GPS tracker which transfers the exact location. With the help of camera attached to the RC boat, it captures and sends the images around it.

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CHAPTER 1

INTRODUCTION

In today's world, the technology is so advanced that the weather reports can be known in advanced, accidents still can't be prevented and to hear such news of having ships and people go missing into the sea is disheartening. There are regions when a man cannot travel into the sea during a storm or a few places which is not easily accessible by man. In such scenarios, the idea is to build a RC Boat that is used for surveillance and to pass the information about the location and send a rescue team to save them. The RC boat module is a boat which is built with a transmitter end and the base station has the receiver end. The device used is LoRa-WAN. The RC boat is attached to a GPS tracker which transfers the exact location. With the help of camera attached to the RC boat, it captures and sends the images around it.

1.1. ELECTRONIC DEVICES AND MICROCONTROLLERS

The new improvements in data and correspondence innovation have upheld the researcher, engineers and different clients to have minimal and adaptable electronic gadgets with higher limit and more capacities. Prior electronic gadgets were space burning-through and relatively with exorbitant costs. Because of the turn of events and developments in chip, the measures of the electronic gadgets are impressively diminished and the expenses are likewise altogether extremely low. The elements of the electronic gadgets are expanded to coordinate with the client prerequisites and to oblige the innovative turns of events.

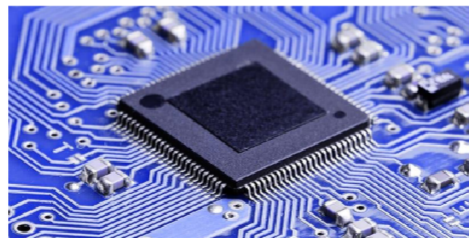


Fig:1.1: Microcontroller

1.2. ARDUINO

Arduino can be characterized as the open source electronic stage which has codes that assist the clients with planning circuits and to help them make the code simpler. As it is an open source, anybody can contribute the code in the stage and can be gotten to by individuals. In computerized gadgets world Arduino delivered different sheets like Uno, Mega, Due and Leonardo. The most normally utilized items are Uno and Mega. This is an ideal board that supports inclining hardware and the parts without any problem. This likewise gives hands on experience to figure out how the actuators and sensors work in computerized reasoning framework.



Fig:1.2.1:Mega



Fig:1.2.2:Deo



Fig:1.2.3:Leonardo

The Uno is microcontroller board which is created utilizing mini chips AT-Mega-328-P. It is considered to be an open source that was created by Arduino company.

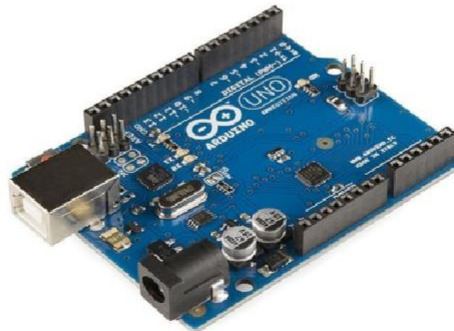


Fig:1.2.4.:Arduino Uno

1.3. ARDUINO SOFTWARE

Arduino IDE, a multiple platform user app, i.e., Mac OS, Windows OS, Linux etc. It uses C and C++ language for the code to be uploaded into the hardware. Generally, IDE is used to transfer the code from the PC to the processor. IDE generally gives the library from wiring project. This gives many customary data techniques. IDE uses Arduino program to change the code to be executed to a book report which is a hexadecimal encoder which is stacked to the Arduino microprocessor by loading the program in its framework.



Fig:1.3. Arduino IDE

1.4. ARDUINO HARDWARE

It has a microcontroller attached to it. The IC varies according to the main processor. This board shall be connected to computer directly through USB cable. The code written using IDE software shall be transferred to the controller through the cable. In general, uno boards do not have USB to Serial Driver convertor. This is an open-source microcontroller board and hence the required software is available freely for the developers.

1.5. EMBEDDED SYSTEM

Embedded system is being attached to something or combination of many stuffs. Generally, the combination of multiple hardware components that gets embedded with a software part. It is thought of as a hardware being embedded to a software. It is a free framework or it tends to be a piece of a huge framework. It is a microcontroller or chip based framework which is intended to play out a particular undertaking.

We generally use Embedded C language to code in the microprocessor or controller.

Block diagram of Embedded System:

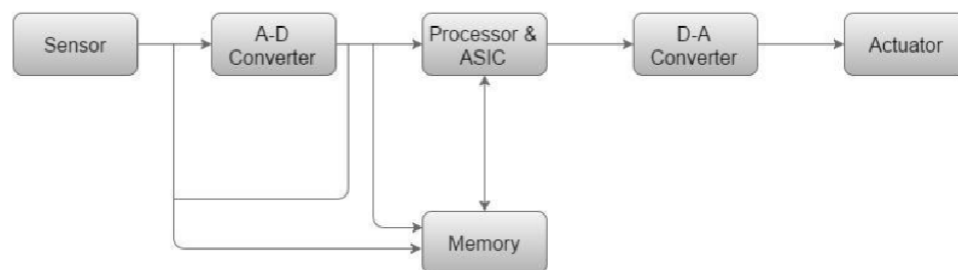


Fig. 1.5. Block Diagram of ES

- **Sensor:** It is used to convert the physical quantity to electrical quantity. This helps the user to use the value at any point of time.
- **A-D Converter:** It converts analog to digital signal.
- **Memory:** It has an inbuilt memory used to store the data.
- **Processor:** It transfers the data to the actuator.
- **D-A Converter:** It converts the Digital output signal back to analog.
- **Actuator:** It compares the D-A convertor output given to the output stored and accepts it.

1.6. ADVANTAGES OF EMBEDDED SYSTEM

1. It can be easily customized.
2. It consumes very less power.
3. It is affordable.
4. It has enhanced performance.

1.7. DISADVANTAGES OF EMBEDDED SYSTEM

1. It consumes a lot to market.
2. It has a very huge development effort.

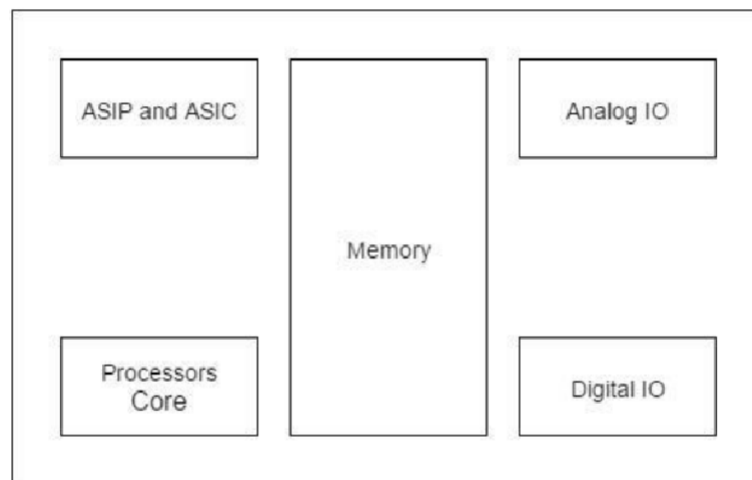


Fig:1.7:Schematic Diagram of Embedded System

Chapter 2

LITERATURE SURVEY

Kadam Akshay M and Mali Vipul(2020)

From this paper, we can find that the boat uses WIFI directed camera to capture good quality image. The boat can be visible even at night or dark by the user so it can be used for long distance viewing. The surveillance issue has been resolved as the boat is having the surveillance water proof camera. For the RC boat not to sink in deep water bodies, the boat it is made up of special type of materials which has less density than water and also has a 180-degree flip attached to the camera. But can be increased by adding a low motor and Lithium Polymer battery. It will use flood chamber to rotate itself at 180 degree to avoid risk of sinking and uses light indicators to be visible at night. The hull design of the boat makes it easier to reduce the weight of boat it thus reduces the drag force of the body of the boat. The current efficiency of the boat is less due to less powered battery.

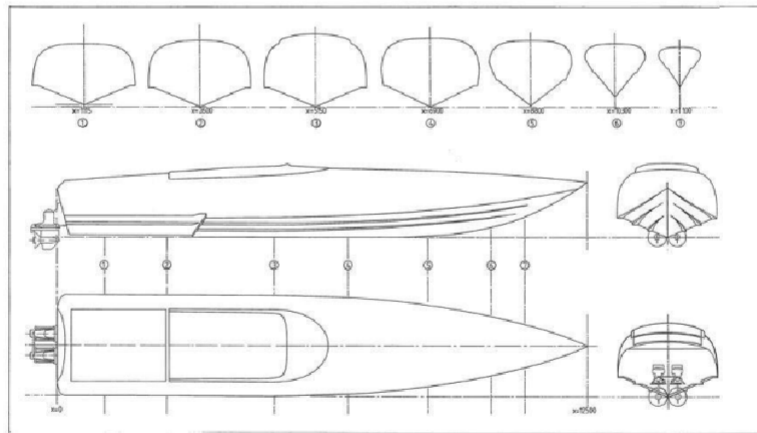


Fig:2.1:Boat external structure

The main methodology that is existing in the current paper goes by a Radio-Controlled boat is a boat controlled remotely with radio-controlled equipment. In many RC boats the radio control motor provides guidance while another source of power provides the locomotion.

Deeksha Srivatsava, Awanish kesarvani, Shivani dubey(2018)

This module discusses about how the data is sent in the form of pulse in a given period of time. From this paper, we can understand how temperature and humidity of the particular location is obtained. This Sensor has a total of three sections, namely the Vcc, data and ground. The DHT11 is a single wired communication i.e. serial communication. The proposed system provides a convenient method to monitor temperature and humidity in day-to-day life. Using this sensor, the temperature of the particular location is displayed on the monitor or screen to which the arduino board is connected.



Fig:2.2: DHT11 sensor

The humidity of the particular location is displayed in the LED or on the screen to which the Arduino Uno board is connected to. The system is not expensive and is easy to use due to its relatively small size. It is environmentally friendly.

Ms. Priyanka, Mr. Praveen kantha (2018)

The goal was to build up a unique remote entryway security framework which enables the client to obtain guest's photograph personality and take a wise choice to give proper comments. The equipment utilized here included an elite minimal effort Wi-Fi empowered computational stage with incorporated camera for example ESP32-CAM board.

This stir had used the trial set up based technique as of the research was planned to show the equipment association with a cloud worker utilizing Wi-Fi to move the information explicitly for observing and control based applications.



Fig: 2.3: ESP-32 Camera module

The outcomes got from the last model board can be plainly seen over the Blynk app. Before finishing of effective fruition of this work it was presumed that through IoT we can associate different information/yield gadgets, numerous sensors and actuators in an organization so they can converse with one another. The image can be captured by copying the link generated and pasting it on any browser to view it as a JPG image. To view it as a video, the url must end with MJPG (Motion JPG).

Shadman Sakib Arnob, Adiba Sumaiya Khan, Rashed Shelim, Mahmood Chowdhury (2019)

The target of the paper is to utilize a RC boat for snag location and overabundance weight identification. The GSM and GPS controlled boat for reconnaissance. The Methodology continued in the paper discusses the boat and its weight factor. Overweight finder is a basic circuit which has four parts where each part gives two unique levels. Cautioning level alarms the boat for weighing overweight and rings on the disturbing bell. GPS following is done to know the area of the boat whenever. A standardized identification scanner has additionally been utilized to filter the standardized identifications.

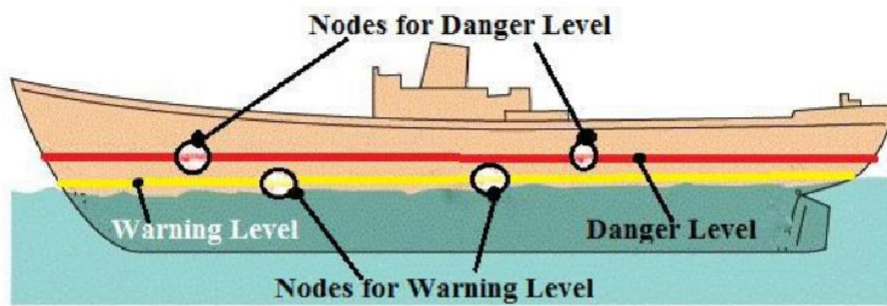


Fig:2.4:Side view of the boat(prototype)

From this paper we can track down that the whole circuit of the venture was executed utilizing two arduino. The Slave Arduino had both the GSM and GPS module associated with the PC. We can reason that RC boat is most appropriate for tracking down the Over weight and deterrent evasion. It tends to be constrained by GSM and GPS for its area.

Tonghao Chen, Derek Eager (2019)

The goal of this paper is to check whether LoRa-Wan is a great idea to be utilized in correspondence and to break down the qualities of LoRa WAN and it's properties to be reasonable. The approaches proposed in this paper are Personal remote sensor organization (WSN) advancements, for example, ZigBee have been utilized in IoT applications.



Fig: 2.5:LORA-Wan

In any case, these have a sign distance of all things considered 10 to 20 meters. MPLR is carried out and assessed utilizing a LoRa testbed network. Subsequent to

perusing this paper, we found that LoRa-WAN is utilized in correspondence. The pictures of the Agricultural field is being moved and the discoveries are recorded and put away. We can reason that LoRa-WAN is best utilized for picture move. LoRa-WAN has a long reach for the information move and the deficiency of data is less.

Kolapo Sulaimon Alli, Moses Oluwafemi Onibonoje, Akinola S. Oluwale, Michael Adegoke Ogunlade, (2018)

The target of this paper is to realize how to work an essential vehicle for image recognition and to work a vehicle mechanically. The methodology and the findings proposed in this paper are The ultrasonic communicates a sound at 37 KHz and afterward stands by to get a comparing reverberation from the conveyed message.

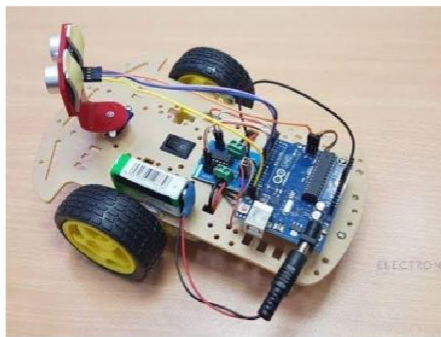


Fig:2.6:a) RC controller car

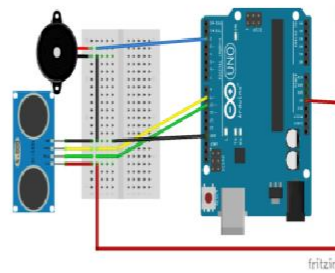


Fig: 2.6: b) Schematic diagram

The framework comprises of power supplying part, IR drove/recipient sensor pair, ultrasonic sensor, Arduino Microcontroller and DC Motors. In the wake of perusing this paper, it shows a couple of distances are being determined into the type of a table to which the vehicle stops when it discovers a snag. At the point when deterrent is discovered, it stops with a caution. We can infer that two sets of heterogenous sensors were utilized to recognize snags the way of the versatile robot.

Samuel Farayola Kolawole* and Alexander Zakari (2018)

The paper discuss about how one can find the reason why GPS and GSM is useful and its functioning. The idea is to design a prototype that helps one find the vehicle from being lost and if its stolen, using GPS tracker, we can find the location of the bike. It also sends the information to the registered mobile phone by sending a message or SMS using the GSM. It has a secret button attached to the bike and so when ever the button is pressed, the alarm is sent to the registered sim card. There is a camera attached to the vehicle. This camera takes still images and then saves it to the phone in the memory attached. With the help of camera, we can find the picture of the one who has stolen the bike. The thief can be punished in this way and can be given the appropriate jail time. The camera at that point clicks the hoodlum, the GPS the facilitate while the GSM modem communicate such information to the proprietor's email address that is available from a cell phone

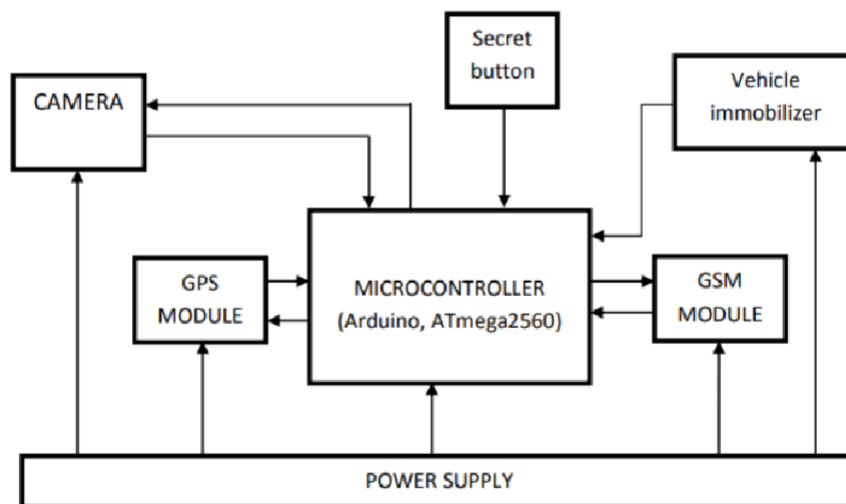


Fig:2.7: Block diagram anti-vehicle theft control system

With this information nearby, the criminal can be proclaimed needed and captured afterwards. The vehicle can't restart until someone presses the secret button. The owner of the vehicle at that point got an e-mail that contains the picture of the

unapproved individual and the location of the vehicle, inferring that his vehicle is stolen.

Literature Survey 8: “WORKING PRINCIPLE OF ARDUINO AND USING IT AS A TOOL FOR STUDY AND RESEARCH”, Leo Louis

The paper mainly finds the working of Arduino and its main pins. The functions that an Arduino microcontroller can perform, its efficiency and its working. With increasing number of people using open-source program and gadgets day. Development is forming another estimation by making perplexed things look more straightforward and interesting.

Arduino has many types like:

- Ethernet shield
- Wireless shield
- Motor Driver Shield

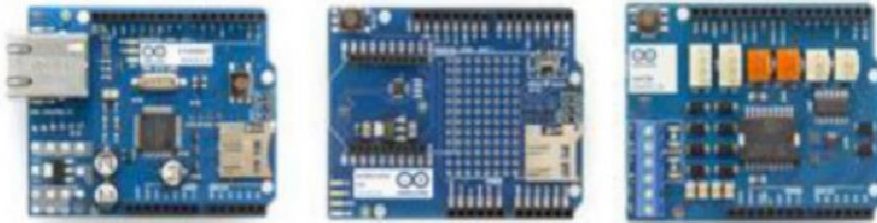


Fig: 2.8.1: Arduino Shields – Ethernet, Wireless and Motor Driver

Arduino has hardware and software parts. The Arduino Development Board consists of a huge number that makes it work together. The program code that is designed for arduino is called as sketch. The product used for growing outlines for an Arduino is generally called as the Arduino IDE.

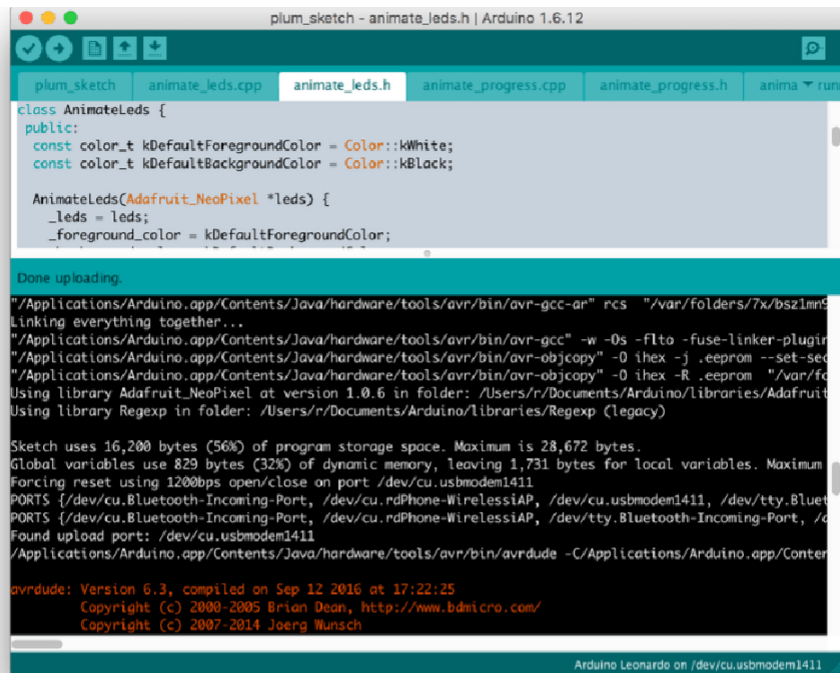


Fig: 2.8.2:Arduino IDE

From the paper, we have considered the functioning rule of Arduino, its programming highlights and its applications regarding where it is being utilized and where everything it tends to be utilized.

Poonam V. Gaikwad, Yoginath R. Kalshetty (2019)

The paper talks about the Bluetooth module HC-05 and its functioning. This Bluetooth module is used to transfer data. The module is has various functions, in this paper, it is used to control the houses as of Automation System using Android phone. The Bluetooth module is connected to the arduino Uno which has various sensors attached to it. In the world of automation, everything is being automated and is used to reduce the human work. Bluetooth doesn't require any operational cost. It has an effective range of about 100m.

Yellow = Pin 12 (TX on Arduino, to VOLTAGE DIVIDER, to RX on BT)
Green = Pin 11 (RX on Arduino, from BT's TX)
Orange = Pin 9, carries the 'AT command enable (pin 'HIGH') status

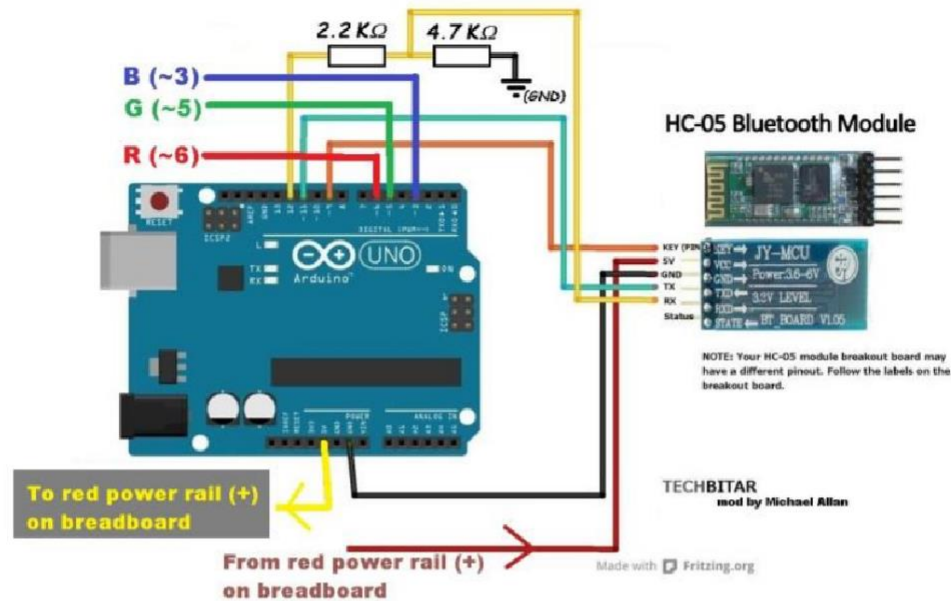


Fig:2.9.1: HC-05 Bluetooth module with Arduino Uno

The paper concludes that Bluetooth HC-05 module that is attached to Arduino which is further connected to the android phone. The android phone has an app installed from Play Store which is used to control the home via automation.



Fig: 2.9.2: HC-05 Bluetooth App in Play Store

CHAPTER 3

AIM AND SCOPE OF THE INVESTIGATION

3.1 AIM AND OBJECTIVE

The main objective of the project is to surveil the sea and to report the condition of the lost boat in its last seen location using a RC Boat. It helps one to know the condition about the places where man cannot reach. When there is a harsh weather condition, it isn't possible for man to reach, so using this RC boat, it sends the video data to the operator's deck and can be monitored.

3.2 PROTOTYPE DIAGRAM

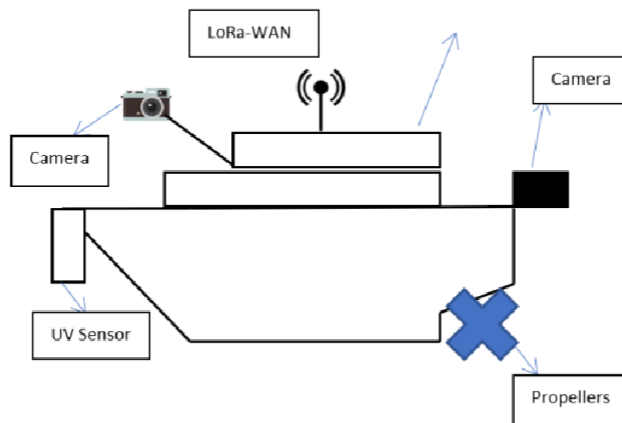


Fig: 3.2: Prototype of RC Boat

The prototype consists of two parts, the boat and the base station. The boat is attached with two DC motors that act as propellers for the motion of boat in water. A microcontroller is fixed on top of the boat. A perigon camera is attached in the front of the boat that captures the video and images. The boat is attached with a GPS module which shows the live location of the boat. The boat can be remotely controlled by the person with the help of a device, phone or laptop, in the base station which is located at the controller's location. There are UV sensors attached in the front of the boat for obstacle detection. In case of any obstacle that is not

captured or noted by the person controlling the boat, it automatically stops and indicates. Other essential sensors like pH sensor, rain sensor, and temperature sensors are also fixed. The power supply for the microcontroller is given by high voltage portable batteries with long lasting life is attached.

Hardware Components:

1. Microcontroller
2. Wireless trans receiver (LoRa-WAN)
3. Perigon cameras
4. DC motors
5. Propellers
6. Temperature sensor
7. pH sensor
8. UV Sensor
9. Battery
10. GPS module
11. H-5 Bluetooth module
12. Alarm and lights

3.3 BLOCK DIAGRAM AND WORKING

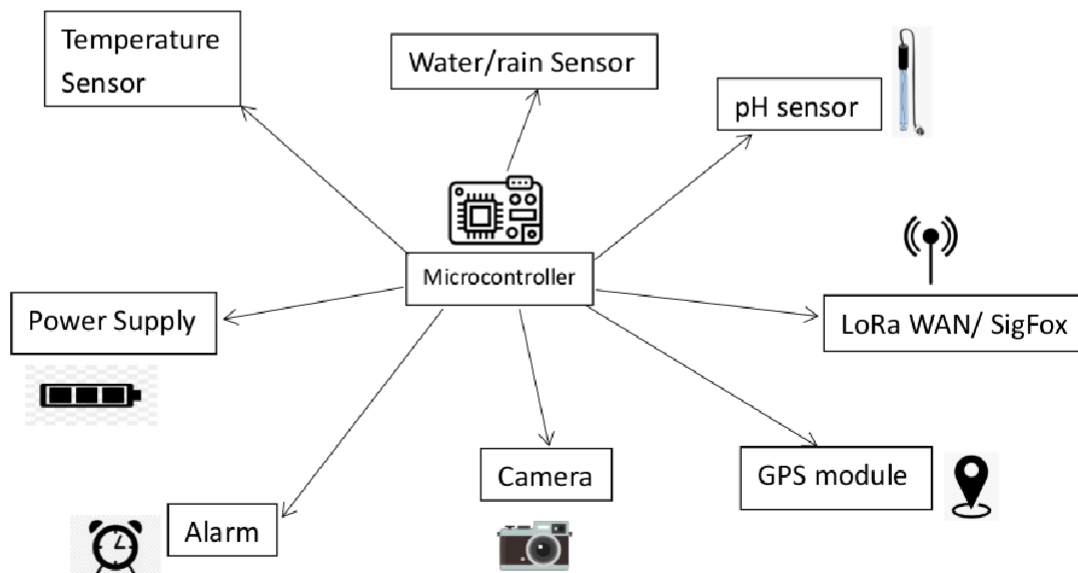


Fig:3.3.1:Block diagram of RC Boat Module

Power supply is given to the microcontroller. The sensors are connected to the microcontrollers. The sensors used are temperature, UV, pH etc. Two perigon cameras are attached at the front and in the rear end of the boat. The perigon camera covers an area of 180° at periodic rotation. The camera module used is variable i.e. the camera can be replaced according to the budget and quality. A wireless Trans receiver component is used for transferring the information i.e. images and videos. The preferred one is LoRa-Wan which has a range up to 100km.

One camera is used for capturing the images on the surface and the other camera is used to capture the images either the rear end or underwater. There is a GPS module attached which gives the location of the boat with its longitude and latitude. UV sensors are fixed in the front of the boat for obstacle detection. In case if there's any obstacle on the way and the person controlling hasn't observed, it intimates as an alert and stops before hitting it. The temperature and pH sensors give the exact temperature and the pH value of the surroundings. LED lights are attached which indicates the presence of the boat for safety purpose.

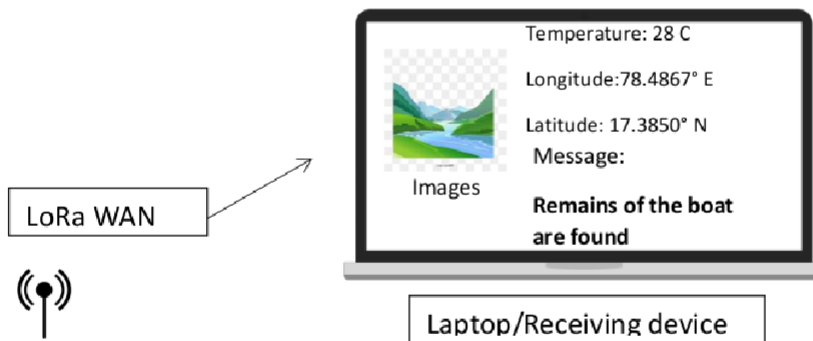


Fig: 3.3.2: Base Station

The other end of the prototype is the base station. The place from where the person operates the boat from acts as the base station. The person has a laptop where the details will be displayed on the screen. The other end of LoRa-WAN is connected to the laptop. The image and the video will be displayed on the screen.

3.4. EXISTING METHODOLOGY

As for the project goes, it is inspired by various method. The prototype consisted of a single attached camera which doesn't rotate at all. It is used to just capture the pictures at regular intervals. A smart eye is used in aeroplane for rescues in times of emergency. Smart eye for lost vehicle transfers data to the nearest station in times crashing or missing.

LORA-Wan is used in the prototype transfers data and the pictures from one station to other. It consumes a lot of power.

The person might not be able to get a clear picture from a low quality camera.

3.5 PROPOSED METHODOLOGY

In the project, the camera is replaced with a perigon camera which rotates and captures pictures. The live video of the surrounding can be obtained. With space being a major concern, the major factor for transferring the image and video is being done using WiFi module. An ESP-32 WiFi module is being attached to it so that the power consumption of the boat is comparatively less. The camera is attached to the WiFi module which makes the connections simple.

Chapter - 4

MATERIALS AND METHODS USED

4.1 MATERIALS USED

- ESP32 CAM WiFi Module – 1
- OV2640 Camera Module - 1
- UBLOX GPS Module - 1
- Arduino UNO – 3
- Ultrasonic Sensor – 1
- L292d Motor Driver - 1
- DC Motors - 2
- LED Lights
- Jumper Wires
- Bluetooth Module
- Connecting wire
- Thermocol sheet (For boat body)

4.2 ESP 32 CAM WIFI MODULE

4.2.1 Description

The ESP32-CAM is a small-length digicam module which can be operated independently at least system.

ESP32-CAM is mostly used in IoT applications. It is used in making home clever gadgets, business wi-fi manage, wi-fi tracking, QR wireless identity, wi-fi system indicators and many IoT packages. It is a really perfect thing for IoT packages.

It affords users with a tremendous dependable connection methods and is easy to be used in various IoT hardware terminals.

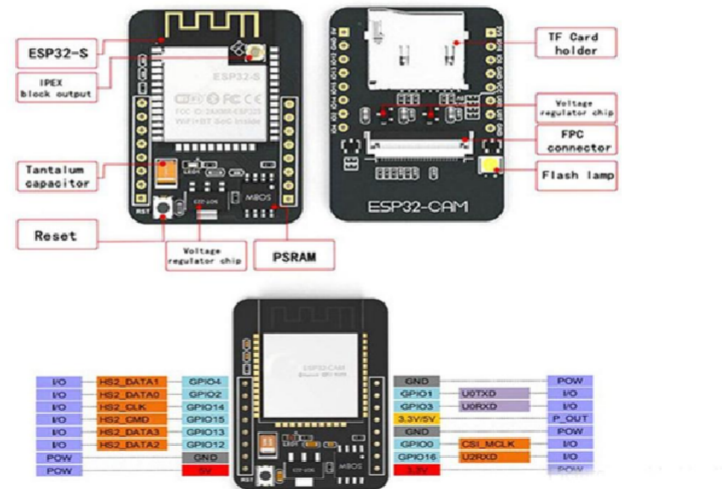


Fig:4.2.1:ESP 32 Camera Module

4.2.2 Specifications

- Very very small 802.11b/g/n WiFi + BT SoC module
- Low-energy twin-middle 32-bit central processing unit
- Supports up to 240MHz-250MHz, up to six hundred DMIPS
- In built 520 KB SRAM, and external 4M PSRAM
- Supports interfaces which includes UART/SPI/I2C/PWM/ADC/DAC
- It supports OV2640 and OV7670 cameras with inbuilt flash
- It supports for photographs WiFi upload
- It supports TF card
- It has multiple sleep modes
- Embedded and RTOS
- It supports STA/AP/STA+AP working mode
- It supports Smart Configuration one time click distribution community

- It support for serial neighborhood to increase and far flung firmware improve (FOTA)

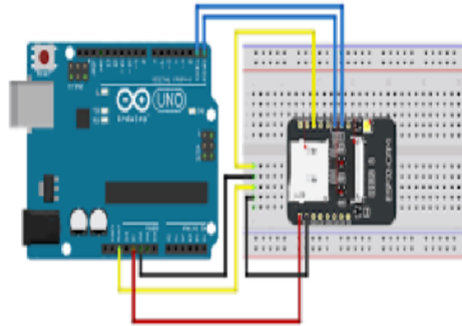


Fig:4.2.2:ESP 32 Cam Connection

4.2.3 Applications of ESP 32 Cam

- Surveillance
- Home Security
- Facial Recognition
- Climate Monitoring



Fig:4.2.3:Monitoring Using ESP 32 Cam

4.2.4 OV2640 Camera Module

It is a 2- mega pixel camera that is attached to the ESP Cam board to stream the video or to take the pictures of the surroundings.

It is used in many IOT and Embedded applications.

It produces Images and Video in JPEG and MJPEG format.

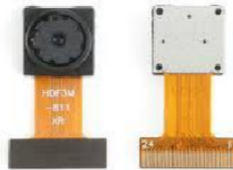


Fig:4.2.4:OV2640 Camera Module

4.3 UBLOX GPS MODULE

4.3.1 Description

Ublox NEO-6M is a global positioning device (GPS) module, is a famous, fee-effective, excessive-overall efficient GPS module with a ceramic antenna, inbuilt memory card/chip, and a battery that is included with a range of microcontrollers. Nowadays, GPS Modules are famous to find the location of a particular object and is mostly used in most of the IoT applications and Projects.



Fig:4.3.1a:Ublox GPS Module

GPS is generally used to determine the exact longitude and latitude (location) of any object this device will get connected to the satellite when it is turned on and starts sending the location coordinates to the user whoever using this device.

This is an updated GPS module that can also be used with mega v2. This GPS module is very simple to use, boosting the overall module performance along with your Ardu pilot or any other platforms.

The Ublox GPS module generally consists of 4 PINS TX, RX, VCC, and GND. You can download the blynk software for using this GPS and converting the settings and and many more. It is certainly suitable s/w program.

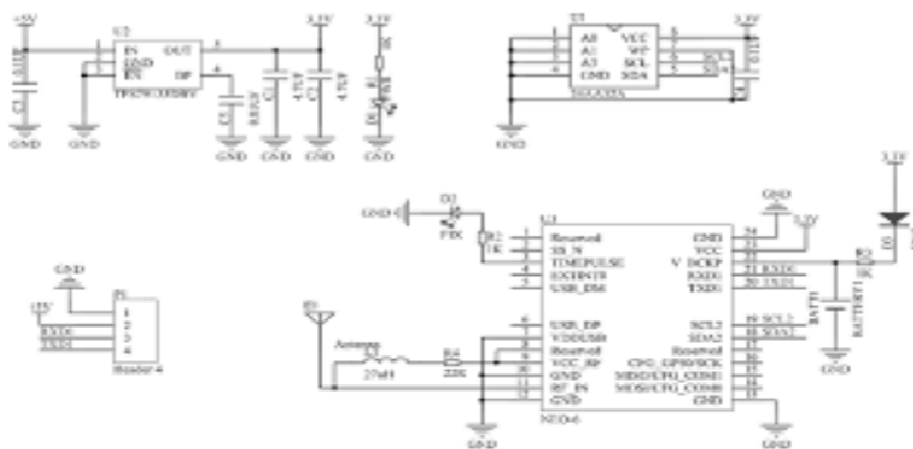


Fig.4.3.1b:Pin diagram of GPS Module

4.3.2 Features/Specifications of UBLOX GPS Module

- Frequency of 5Hz position replace
- To keep configuration settings EEPROM is used.
- Inbuilt Rechargeable battery for Backup power supply
- Bloodless begin time : 38 seconds, Hot begin time :1 seconds
- Input supply voltage: 3Volts
- Separated 18*18mm GPS Antenna.

4.4 ARDUINO UNO

4.4.1 Overview

Arduino UNO is a prototype/software platform that is based upon a simple to use hardware and software. It has a main circuit board, that is easily programmable

(microcontroller) and organized s/w program referred to as Arduino Integrated Development Environment (IDE), this is useful to write and upload our software code in our PC.

The key features of Arduino UNO are:

- 1) Arduino UNO boards are capable of examine the a/n or dig'l ip signs from particular sensors and flip it to an o/p which includes activating the motor, and turning LED on and off, and to directly connect to the cloud and various other movements.
- 2) You can also control your functions in the board with the useful resource of sending a hard and fast of commands to the microc'ller at the board through Arduino IDE.
- 3) Unlike the maximum previous programmed circuit board, Arduino doesn't require an extra part of hardware component (programmer) for to upload a fresh code to the arduino board. USB cable can be used in for this purpose.
- 4) Moreover, Arduino IDE uses a simplified model of C++ program, it makes less complex to discover ways to software program.
- 5) Finally, Arduino produces a favoured shape thing that breaks all the functions of the microcontroller to the accessible packages.



Fig:4.4.1:Arduino UNO

4.4.2 Features/Specifications of Arduino UNO

The functions/specifications of Arduino Uno consists of the following:

- Working voltage : 5 volts
- The enter voltage will vary from 7volts to 12volts

- The input voltage vary from 6volts to 20volts
- Input/Output pins are fourteen
- Analog pins are six
- The DC Current for all ip/op pin is 40 mA
- The DC Current for three(3V) Pin is 50 mA
- F-Memory is 32 KB
- SRAM : 2 KB
- EEPROM : 1 KB
- CLK Speed : 16 MHz

4.4.3 PIN Diagram of Arduino UNO

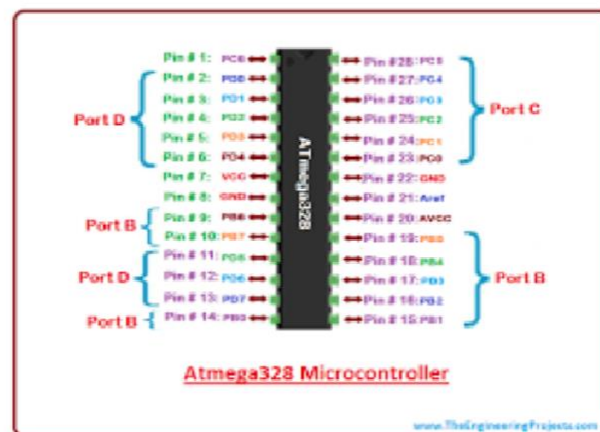


Fig:4.4.3:PIN diagram of ATmega328 Microcontroller

Power Supply

The Arduino Uno power supply can be done using a USB cable or an outdoor electricity supply. External strength factors specifically embody AC to DC adapter in any other case the battery. The adapter can be given as the connection between the device and the board for giving the software code.

Input & Output

The 14 virtual pins that are present on Arduino Uno can be used as i/p & o/p with the assist of the capabilities like :

1) pinMode(), 2) digitalWrite(), & 3) Digital Read().

Pin1 (TX) & Pin0 (RX) (Serial): This pin is used to transmit & attain TTL serial statistics, and these are connected to the ATmega8U2 USB to TTL Serial chip equal pins.

External Interrupts (PIN 2 and PIN 3): External pins can be associate with set off an interrupt over the low value.

PINS (5V, 3V)

The pins that are present in the Arduino are places where you can join wires to make/construct a circuit. Generally, they have black plastic 'headers' that allow you to simply plug the wire into the Arduino UNO board. The Arduino has many exceptional varieties of PINS, everything is categorized on the board and used for different functionalities.

GND (PIN 3): Short form for "Ground". There are numerous Ground pins in the Arduino UNO, any of which can be used to ground the circuit.

5V (PIN 4) & 3V(PIN 5): As you may think, the 5V PIN resources 5 V of current, and the three(3V) PIN supplies three.3V of power. Mostly we use this PINS (5v and 3.3 v) for our projects.

Analog (6): The 6th PIN of the Arduino consists of set of Analog PINS that are categorized as PINS 0 to 6 (A0 – A6). The set of the analog PINS. These PINS can accept the analog data into the Arduino UNO.

Digital (7): Apart from the Analog PINS there are also the digital PINS which are useful for taking the digital input. There are thirteen virtual digital PINS in Arduino.

PWM (8): You may have also noticed a tidle (~) adjacent to the some of the PINS (3,6,9,11 in UNO) These PINS are acted as the regular digital PINS and also they can be used for PWM.

AREF (nine): It is defined as Analog Reference used for some external supply. You can also use this PIN alone according to the situation or the project which you are working in. The voltage is in range (0-5V).

Reset Button

Arduino also has a reset button. By pressing it, it will connect the reset pin to ground and restart the code that is loaded in the Arduino UNO. This can also be very useful in case your code doesn't work. It is very important button in Arduino as Arduino cannot repair itself in case of any damage.

Power LED Indicator

Under the Word "UNO" there is a small LED available in the circuit which will glow whenever an plug is connected to it. It denotes whether the device is turned on or not if its not turned ON there may be something wrong in the Circuit

TX RX LEDs

These PINS are one of the Important PINS of the Arduino, Tx refers to Transmitting and Rx refers to Receiving PIN. The LED's are responsible for knowing the status like uploading the code into the Arduino and indicate us whether the Arduino is receiving and sending the data or not.



Main IC



Voltage Regulator

4.4.4 Types of Arduino boards

- UNO
- Micro
- Nano
- Due
- LilyPad
- Decimila
- Bluetooth

4.5 ULTRASONIC SENSOR

4.5.1 Introduction

As the name indicates, ultrasonic or degree sensors senses the distance using the ultrasonic waves.

This sensor emits the ultrasonic waves and then decides the operation based on the wave resulted. The operation is pretty simple it measures the time take by the transmitted wave and received wave.

4.5.2 Working Principle

The Working of the Ultrasonic sensor is similar to the radar operation. This sensor converts the electrical energy to the waves. It has the frequency of 18kHz. The HC SR04 ultrasonic sensor has a frequency of 40kHz.

This sensor is mostly used in IoT projects and applications, where the thing has to identify the obstacles or any person passing in front of the device it takes the necessary actions based on the code that the user has uploaded into the Arduino.

The Working of this sensor is quite simple it uses the ultrasonic waves for calculating the time interval between the transmitted wave and the received wave. Based on this interval it takes the actions.



Fig:4.5.2:Ultrasonic Sensor

4.5.3 Working

The working of this module is very simple. It converts the electrical energy into the waves which is similar to the operation of the RADAR.

As soon as it gets the power supply the sensor starts generating the ultrasonic waves and starts calculating the time and stops it when the ultrasonic wave is received again.

Based on this time interval this does all the necessary actions based on the conditions that are given by the user and performs all the operations based on the software uploaded.

4.6 L292D MOTOR DRIVER

4.6.1 Introduction

L293D circuit is a very popular 16-Pin Motor Driver IC. Which is used for making so many IoT Hardware projects. As the name suggests that it is used for driving the motors, these motor drivers are used where the DC Motors are used.

The working of this driver is very simple, for the automobiles which has less than 36 volts as the operating voltage can be managed by the virtual circuits like Op-Amp, Timer circuits Arduino, PIC etc.,

4.6.2 Working Principle

Using L293D Motor driver is quite simple. There is an IC that is embedded onto the circuit and it works on Half H-Bridge. A H bridge is a set up used to drive the motors each in both clock wise direction and viz. This IC is used to wake up the vehicles in the automobile industries.



Fig:4.6.2a:L293D Motor Driver

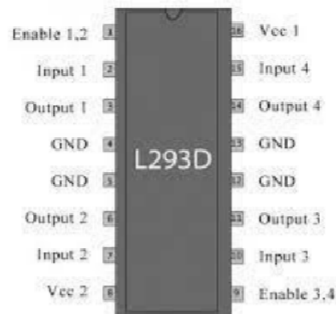
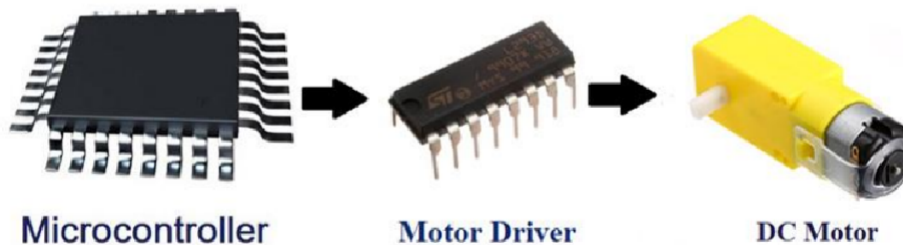


Fig:4.6.2b:PIN diagram of L293D

The above diagram is the PIN configuration of the L293D Motor Driver, there are 16 pins. 16th pin is the Vcc Pin and the Ground pins are at the positions (4,5,12,13).



The above diagram is the schematic view of the working of the Motor driver. The three main components that are required to run a vehicle is Microcontroller, Motor driver, DC Motor.

Motor driver generally needs Microcontroller and a DC Motor for the machine to run.

4.7 DC MOTORS

4.7.1 Introduction

A DC Motor is an electric powered machine that runs on direct current. It runs on the principle of electromagnetism. It follows basic electromagnetism principle which states that when the current is supplied the electromagnetic field is created outside the motor which makes the motor to rotate.



Fig:4.7.1:DC Motor

These type of motors mostly used in many IoT projects, which are responsible for the vehicles to drive. These motors are used as wheels.

4.7.2 Advantages

- Cost efficient
- High Reliability
- Speed control is easy
- Full torque at zero speed
- High motor power density
- Less Inertia
- Easy to service and maintain

Chapter – 5

RESULT AND DISCUSSION

5.1 FINAL PROTOTYPE

Given below is the final prototype of the boat after making all the necessary connections. The Source code is uploaded in the arduino for both ESP 32 Cam and UBLOX GPS Module.



Fig:5.1:Final Prototype

5.2 WORKING

The main agenda of this project is to surveil the lakes or ponds and capture the photos and videos of the surroundings and send the data i.e., image, video and location coordinates to the nearest base station.

These things can be achieved by using some components which we have used in the project they are Ublox GPS Module and ESP 32 Camera.

ESP 32 Camera is used to send the photos and videos to the nearest base station. This Camera has inbuilt Wi-Fi module which is used to connect our personal device through Wi-Fi.

Using this device is pretty simple.

The IP address of the ESP 32 Camera is noted and the same is given in the chrome. After clicking 'Enter' the browser will be redirected to the ESP 32 camera, and we can see the video in our device's screen. Below is the image showing video streaming that is done by ESP 32 Camera.

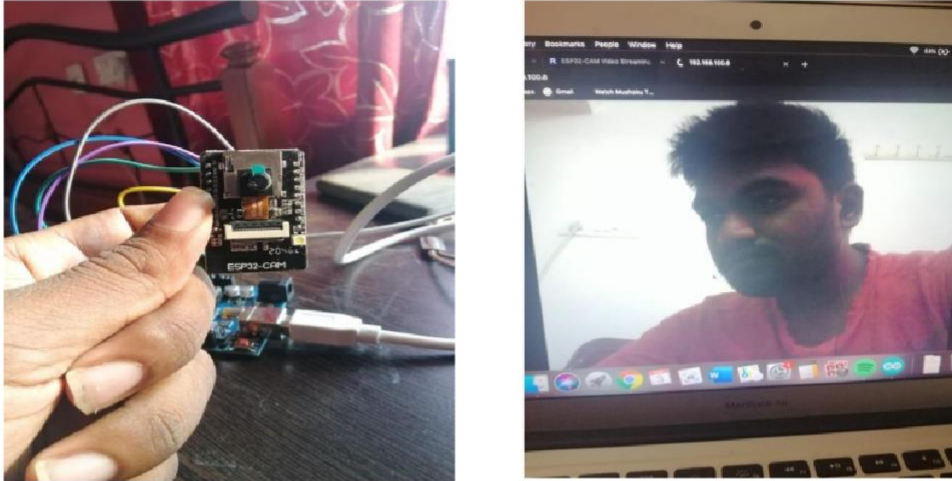


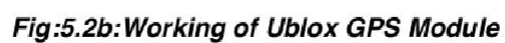
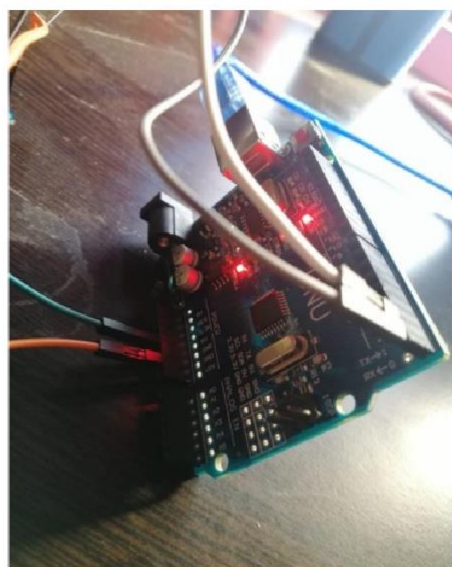
Fig:5.2a:Working of ESP 32 Cam

Taking pictures and videos using this device is very simple for taking the pictures we have to use the extension 'JPEG' at the end of the copied address.

For taking Video similarly we have to use 'MJPEG' at the end of the address, which denotes "Motion JPEG".

The Location of the boat is obtained by using Ublox GPS Module. Similarly the operation of this device is also simple. The Source code required for its operation is uploaded in it. After switching on the device the transmitter gets connected with satellite so that it can send the location coordinates to the device. As soon as the GPS Module gets connected with the satellite we can see the location coordinates in the Arduino interface as we can see in the given below image.

If you want the same in map view we can just copy those coordinates and paste in any map apps. By doing this we can even see in which direction our boat is heading towards.



For driving the boat we have used two dc motors and a motor driver to drive these motors. The Source code is given to the Arduino for the Bluetooth module and the L293d Motor driver. This boat can be controlled by our mobile or any device which has Bluetooth. Given below are the images of the Bluetooth module and the Motor driver in working.

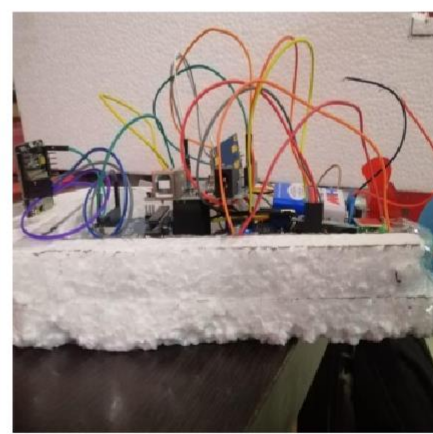
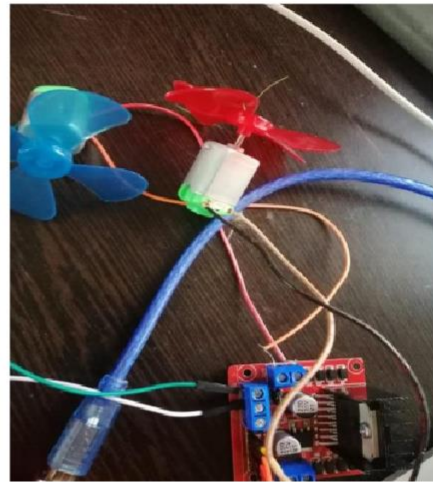
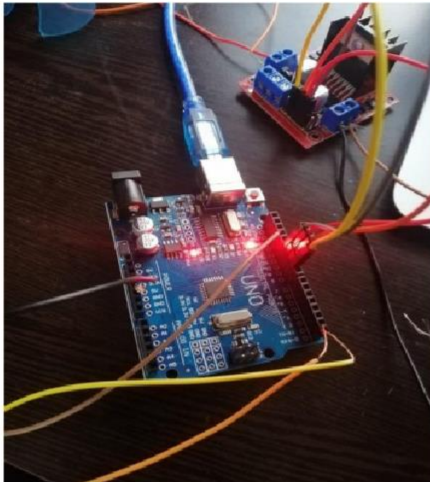


Fig:5.2c:Circuit connections of L293D and Bluetooth Module

Chapter – 6

CONCLUSION

This project is used to surveil the sea or ponds and capture the photos and videos of the boats and their location and sends all the data to the user. The main idea of our project is to make a RC boat which is used to capture all the photos of the boats that are in the ponds or seas and send their images along with the last location to the nearest base station. Because many boats are missing now a days due to heavy rainfalls and cyclones and the people are finding it difficult to track the lost boat. This is where our boat comes into play it surveils the sea whenever any boat passes it captures the image and sends that data along with its location to the base station. When the people come to know that so on so boat got lost the officials in the base station will check the data sent by our boat, if they find the lost boat they will rescue that lost by going there using the location that was sent by the boat.

This whole operation depends on the two major components in the device they are ESP-32 Cam and Ublox GPS Module. The ESP-32 cam has an inbuilt Wi-Fi in it which is used to control it and to receive the data i.e., Images or videos using the IP address of the ESP Camera. The IP address is copied and is given to the user so that he can see the video stream of the boat. This special type of camera also has a inbuilt LED light which will be useful to control the boat even in night times.

The next important component is the Ublox GPS Module which sends the location coordinates of the boat so that the people can know where the boat is present currently. This module has an transmitting/receiving antenna which will get connected to the satellite as soon as we turn it on and starts sending the location(coordinates) to the user

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