PROJECT PROPOSAL

A.Q.U.A DRONE

by

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ABSTRACT

Underwater drones are very important technology that is required for sea explorations. Development of such drones are increased in India for past few years. Underwater drones are used for underwater inspections of ships, pipelines and aquaculture. Nearly 70 percentage of earth is covered with water. Among these only 30 percentage have been explored the remaining regions are left unexplored. The importance of sea exploration is very high in these days. Due to increase in usage of plastics the plastic wastes are dumped into the sea. This can be monitored using these drones. In this project a drone is construed using PVC pipes, Arduino Mega and four propellers. The drone is controlled by the user from the surface. A camera is attached to the drone to monitor the underwater activities from the surface. The control is done by joysticks which are attached to the control unit.

Keywords: Life under water, ROVs, Drone, Robotics.

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1. INTRODUCTION

The project Aquatic drone is based upon the domain "life under water". The project is to monitor the underwater surface through the camera installed in the drone. The drone is controlled by the user from the surface. Live feed of the camera is given to the used through cable connected from the drone.

1.1 Background

70 percent of the earths surface is covered by water. But only 30 percent of these surface is explored. The remaining is till to be a myth for humans. To study about various surface of the earth's crust it is very important to study about the sea surfaces. Humans can reach only limited dept of the sea using the scuba diving equipment. But to reach higher dept there is need for a drone. The drone is used to monitor the underwater surface using a high performance camera. This camera takes pictures or gives a live video feed to the user in the surface. The underwater drones can be used to monitor various things such as pipelines, ships, ships wreaks, marine life and so on. The development of these drones in India is still under development.

1.2 Motivation

Underwater exploration is still a major achievement for us to understand the deep sea floors of our planet. Many researches are in still progress to explore the sea bed of our oceans and seas. Underwater exploration is very important for us because in recent years many waste has been dumped in the oceans and these waste have affected many living organisms. The survival of every living being is important for the balance of eco-system. Underwater inspection will also give the detail of population of fishes and other sea food, which makes easier for the fisher-men to know the exact location of the fish. Still in many places underwater exploration is done manually using scuba diving. But there are some limitations for that such as high pressure and lack of oxygen. To overcome this problem autonomous drone or remotely controlled drone can be used. These drones are much faster and more efficient then the scuba divers.

1.3 Problem Statement

Need of drones for underwater investigation such as fish monitoring, Ship hull monitoring and Pipeline Monitoring.

1.4 Market Research

Underwater drones can be broadly classified into automatic drones and remotely controlled drones (ROV). Under ROV there are many classes such as Work class, Light Work class, Observation class and Micro class ROVs. The different classes have different purposes such as monitoring, make repairs of ships and water testing. The usage of ROVs in India is still under implementation. The ROV manufacturing in India is very less as compared to other foreign nations. Still many works such as underwater pipeline inspection, underwater hull inspection and marine life monitoring is done manually. Many new startups have developed these kinds of underwater drones and are made for sale. Still there is a lack of small scale ROVs for the usage of aquaculture. A large ROV can be used for monitoring of fishes underwater but it may affect their living nature. To avoid this micro ROVs are used for aquaculture.

1.5 Feasibility

The proposed idea is very useful for the small scale users of ROVs such as fishermen. Since the size of the ROV is small when compared to the ROVs that is available in the market this can be easily controlled and operated for simple operations. Task such as monitoring of population of fishes in a certain area can be done very easily. The application of this ROV can be extended in many ways such as inspection of underwater pipeline, hull inspection of a ship and dam inspections. The number of propellers used is only four which saves most of the energy and the working time under water is estimated to be 3 hours. This ROV comes under micro class ROV and are very easy to operate. The live video feed is the most important part of the ROV. Due to the cheaper cost, easy installation, maintenance and environmental friendly the project is hundred percent feasible in the real time scenario.

2. IMPLEMENTATION

The drone is controlled by the user from the surface. The live feed from the drone is displayed to the used through the cable from the drone. The drone is made of of plastic material such as PVC pipes. The entire systems consist of two parts.

2.1 Drone

The drone is the major part of the proposed idea. This drone goes underwater and takes the live video from below surface. The drone consist of seven major parts such as

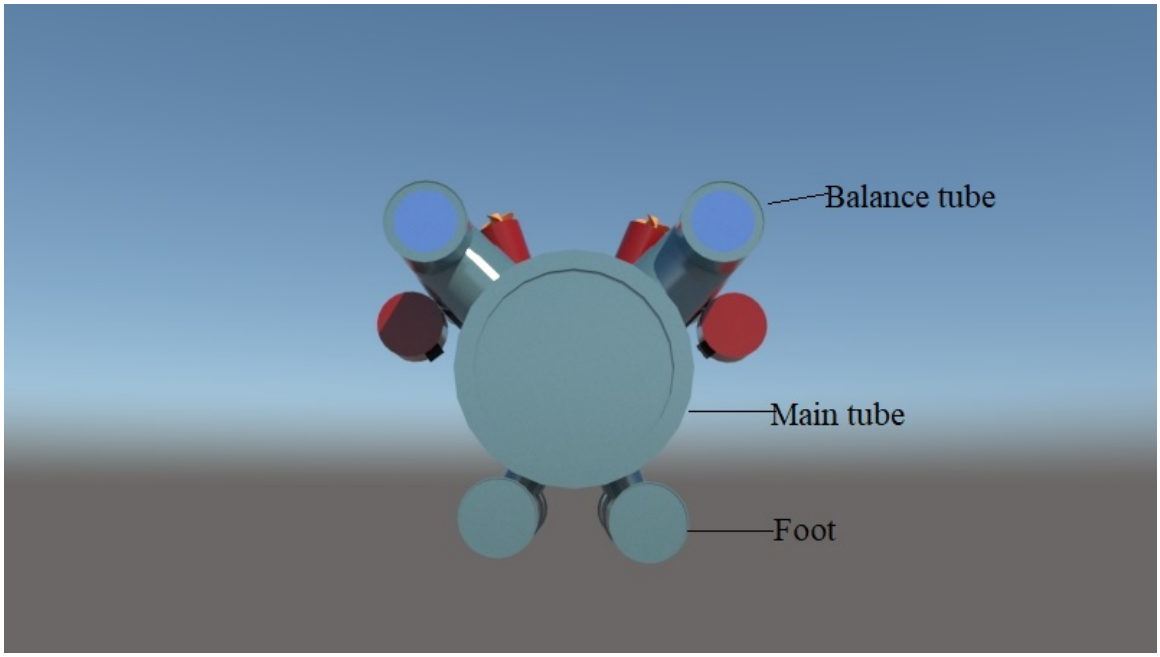

Figure 2-1: Front View of Drone

1. Primary tube
2. Balance tube
3. Foot
4. Vertical Propeller
5. Horizontal Propeller

6. Camera

7. Led light

The primary tube is the main structure of the drone. It consists of the battery and other important things such as microcontroller for controlling the propeller. The balance tube and the foot are directly connected to the principal tube. The LEDs are placed in the balance tube to give more quality to the video that is taken underwater. All the structures are air sealed so that water cannot penetrate into them. The foot and the balance tube are used as stabilizers for the primary tube. The navigation of the drone is controlled from the surface using the control unit. Arduino mega is used as the controller of this drone with 12V battery as its power supply. A 12Mp digital waterproof camera is used for video recording.

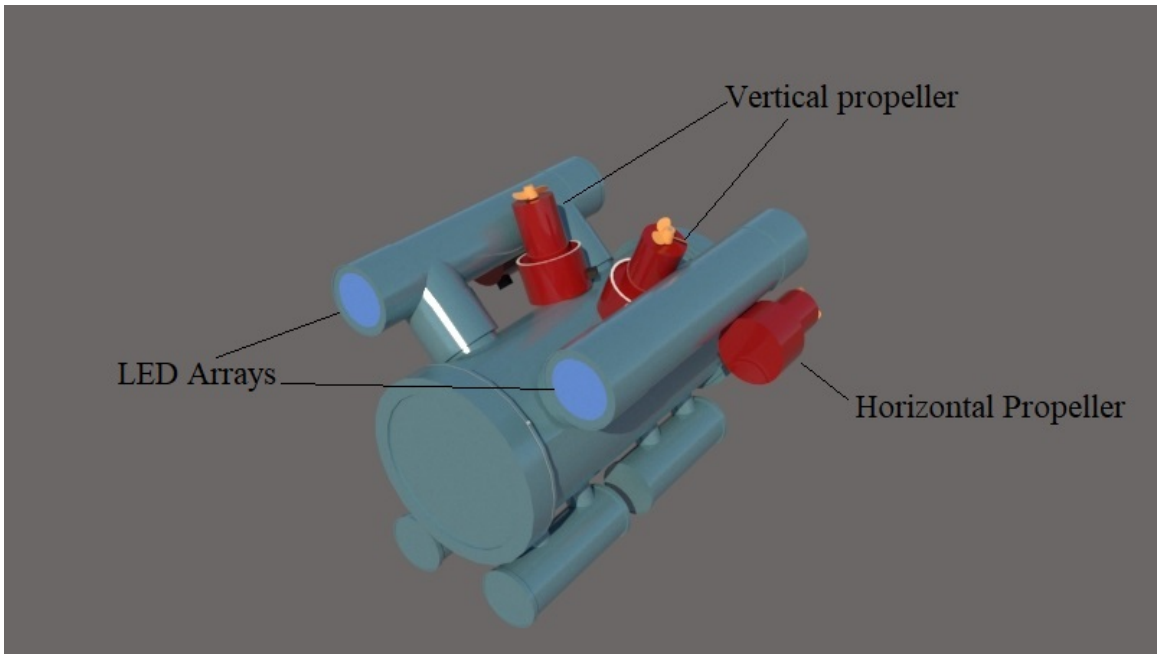

Figure 2-2: Side View of Drone

The live feed of the video is transmitted by USB cable from the camera to PC. The camera is also powered by the same 12V battery. Three dual H-Bridge LP298N Motor drivers are used to run the propellers and the LEDs. To maintain a constant voltage supply the motor driver is also used to control the LEDs. The motors used for the propellers are 12V DC boat bilge pump motors. These are underwater pumps which can also be used for

the movement of the drone using the propellers. The figure 1 represents the front view of the drone and figure 2 shows the side view of the drone.

2.2 Control Unit

The control unit is the part which controls the drone from the surface. It has two joysticks to control to navigation of the drone. One joystick is used for the control of depth of drone underwater and other is used to control the forward and backward direction of the drone. The video feed is not included in the joystick it is done separately in the PC. The USB cable is responsible for the transmission of video from drone to PC. The LEDs present in the drone is also controlled by the control unit. The block diagram of the drone and control unit is shown in figure 3.

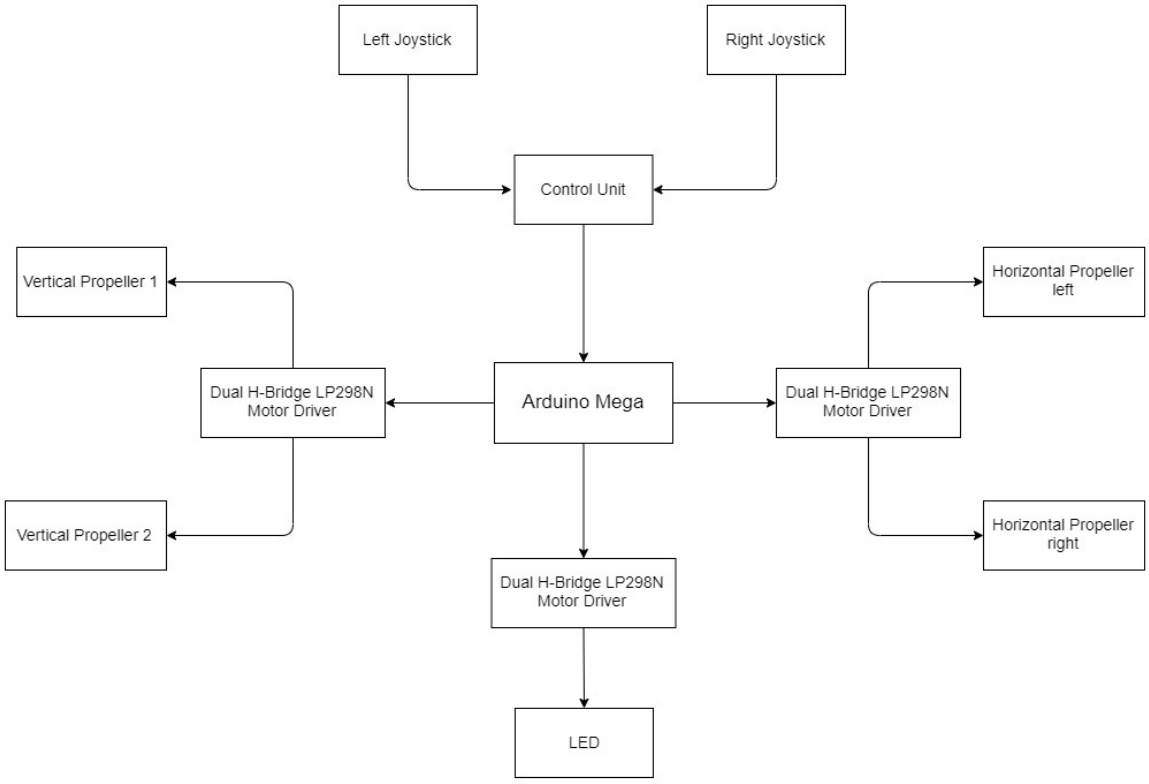

Figure 2-3: Block Diagram

3. COST ESTIMATION

Cost estimation of the project is given below. The software used in the project are open source.

3.1 Hardware Requirements

Table 3.1: Hardware

S.No	Component Name	Cost per unit	Quantity	Cost
1	Arduino Mega	1000	1	1000
2	12V Battery	300	1	300
3	12V DC boat bilge pump motors	1500	4	6000
4	LP298N Motor Driver	150	3	450
5	3 Axis Joysticks	200	2	400
6	LED Arrays	200	2	400
7	12MP Underwater Camera Module	2000	1	2000
8	USB Connector	500	1	500
9	PVC Pipes of different dimensions	-	-	3000

The total cost for the hardware is Rs. 14050. Considering Rs. 1000 as miscellaneous expenses the cost comes to Rs. 15050.

3.2 Software Requirements

The software used in the project is completely open source and is easily available.

1. Arduino IDE
2. Python
3. FreeCad

REFERENCE

1. M. Dumiak, “Lice-hunting underwater drone protects salmon,” IEEE Spectrum, Vol.54, No.4, pp.9–10, 2017.

2. K. Grythe, T. A. Reinen, and A. A. Transeth, “Autonomy levels versus communication in an underwater environment,” OCEANS 2015 - Genova, pp.1-8, 2015.

3. S. Bhattacharyya and H. H. Asada, “Single jet impinging vertical motion analysis of an underwater robot in the vicinity of a submerged surface,” OCEANS 2016 - Shanghai, pp.1–8, 2016.

4. S. Heunis, Y. Paichard, and M. Inggs, “ Passive Radar Using a Software-Dened Radio Platform and Opensource Software Tools,” 2011 IEEE RadarCon (RADAR), 2011.

5. A. Ribiere, “Emulation of obsolete hardware in open source virtualization software,” 2010 8th IEEE International Conference on Industrial Infor- matics, 2010.