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Underwater Surveillance Device

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Abstract: ***Remotely operated underwater vehicles (ROVs) are underwater robots driven by a remote control where an individual operates it from the surface. The series of tethered wires send signals between the operator and the ROV. Mostly the ROVs are equipped with a propulsion system, a camera to show live pictures of the underwater activities, and lights. Other equipment is added depending on the specifications required. Our underwater surveillance device includes sensors that measure parameters of water such as temperature and turbidity, an Esp-32 camera. Our team was determined to recreate such an ROV to fulfil any surveillance operation up to 30 meters' depth which is a partially wireless device controlled by a joystick remote control.***
Keywords: ROVs, Portable, Cost efficient, Sensors, Underwater Surveillance Device.

I. INTRODUCTION

India is 2nd largest producer of fisheries in the world irrespective of that there is a huge gap between supply and demand in the domestic market. Fish Farming India is committed to playing a vital role in bridging the gap by manufacturing freshwater fisheries in northern India. Sea Food/ Sea Products export touched an all-time high of 11.28 billion in F.Y. 2019 on robust demand for frozen fish in overseas market. Hence increase 28% per annum for the last decade. Frozen shrimp maintained its position as the export item accounting for 38.28% in quantity and 64.50 percentages the total earning in the dollar term. Shrimp export is increasing by 16.21% in terms of quantity. Traditionally freshwater fish has been in much demand globally but as the market opens up for freshwater fish. We have already started an innovative plan for promoting and producing freshwater fish by fish pond/ cape culture, RAS, and bio floc technologies. Fish farming India outset to establish a hygienic and healthy fish market having moderate and high potential for fisheries. We are planning to establish a modern wholesale market with the help of fish farmers across the country. All aquaculture sites are required to watch their fish and nets on a day today. Today, visual inspections conducted in fish farms are normally carried out by fixed camera systems, divers, to a or large industrial ROVs.

Fish Farmers use manual techniques to measure parameters on the surface of water. Utilizing divers for inspections is dear and represents significant HSE risks.

Industrial ROVs have traditionally been very costly and require extensive training to operate. Fixed cameras are limited when it involves reach and adaptability. With an underwater drone, you have a mobile underwater camera that allows you to carry out your underwater inspections efficiently and simply. In combination with your existing fixed cameras, underwater drones offer you the complete picture of your assets below the surface.

During the last 30 years, the necessity for oceanic cartography, sea exploration, under water constructions such as dam's bridges and underwater oil extraction has led to the creation of an underwater vehicle that can be controlled from distance. Remote Operated Underwater Vehicle shortened as ROV may be a tethered underwater vehicle. In this thesis from here on the term "Remotely Operated Vehicle" is going to be referred to as ROV. ROVs were created to help individuals to fulfil their needs fast and with minimum risk for their lives.

In order to explain the theoretical, practical aspects and to understand how a small-scale ROV works this thesis was formed. In the following thesis step by step instructions are going to be given so as explain the way to make a totally operated ROV, which is in a position to manoeuvre in any direction the water. The manoeuvrings of the robot is achieved with the assistance of 4 brushless motors. The ROV has an on-board camera for monitoring and recording underwater life. Finally, the robot is
tethered with the controller's side via Ethernet cables.

Aquaculture is the key source of food, nutrition, income & livelihood for millions of people around the world.

II. LITERATURE REVIEW

In [1], In this paper, a low-cost surveillance for monitoring the aquaculture has been shown. The system can control the changes in water parameters, tank state, and fish behaviour during the feeding process. They monitored water parameters are the temperature, conductivity, turbidity, and the presence of oil layer over the water. The tank state parameters monitored by the system are the illumination, the water level, and therefore the presence of workers. Finally, the fish behaviour is monitored with the fish swimming depth sensor and velocity sensor, and the sensor that lets us know the amount of feed falling. The topology and architecture have

been detailed. Low-cost sensors are designed, calibrated, and deployed. Smart algorithms were designed to diminish the utilization of energy within the data transference from the node to the database.

[2], In this thesis the simulator is a useful tool for testing the movement of an ROV. Moreover, it is an essential tool for the testing of computer vision programs.

The versatility and repeatability of this simulator is the main advantage. It can greatly assist the development of ROV and AUV.

In [3], This paper has described the design and development of an Underwater Remotely Operated Vehicle (ROV) with Fuzzy Logic Motion Control for a less deep water environment (up to
10m depth)

In [4], In this paper, an underwater conversation-based system is proposed primarily on IR, which can even be used through water for wireless verbal exchange of messages. The network will prove to be a very cheap choice for long, heavy physical wires running across seas, lakes, ponds, rivers and requiring great costs to lay these wires and maintain them. To reap this network, the computer uses an infrared transmitter receiver. It allows efficient wireless communication between two modules.

In [5], This thesis shows the design of an inexpensive Waterproofed Housing that contains a detailed description of one of the most difficult tasks with underwater ROVs, which is waterproofing the components so that they can be used even in great depth. There are many ways by which components can be waterproofed. This thesis describes two possibilities: permanently sealing electronics in epoxy and bottling. This thesis discusses all the considerations that should be taken into account when bottling components. These considerations help us to handle the ROVs and make the bottle able to withstand high pressures.

In [6], In this thesis, we saw how ROVs are made from PVC. In this thesis, the ROV is meant to be low-cost, portable, reliable. The ROV is 12 in x 12 in x 12 in and weighs about 12 lbs. In this thesis, the ROV is powered by batteries and can run for about 2-3 hours. The ROV is made from PVC. The system has no camera or sensors but has a magnetometer. The system has a 50 ft negatively buoyant tether and has been tested in Lake Tahoe. The cost per ROV is about $1,200.

III. PROBLEM STATEMENT

Most of the fish farmers use underwater sensors placed at fixed places using wires and ropes. Some farmers use manual techniques to measure units at the surface of the water. As conditions vary vastly depending on depth, these methods can provide poor or enormous pictures of the conditions in net-cage. Moreover, these techniques require frequent cleaning and maintenance. Underwater exploration is a high field restricted to the limited pool of skilled professionals. With increasingly more infrastructure & limited resources, this drives up cost & waiting time due to demand exceeding supply. ROVs can be useful for rescue teams to seek missing dead bodies as it is much related to shallow water activities. There are many constrain that could be restrictions for divers like pressure with stainability when the divers need to dive high deep inspection. Aquaculture is the key source of food, nutrition, income & livelihood for millions of
people around the world. Using an ROV allows the operator to take control over their fish farms. ROVs are used in aquaculture for the more efficient performance of net inspection, lighting feeding troubleshooting, and stock maintaining. The use of underwater ROVs has proven to be the most effective way for fish farmers to ensure a healthy fish crop.

Most of the solutions for the fish farms are based on underwater sensors placed at fixed depths, using wires or ropes. At some facilities, measurements for the water parameters are taken at the surface of the water using manual techniques to overcome these problems we are designing a low-cost Underwater Surveillance Device that can be easy to monitor underwater activities and to measure the parameter readings in no time.

IV. DESIGN METHODOLOGY

The purpose of this project is to design a device which can be used for underwater surveillance & to detect the temperature, Turbidity of water below water surface.

Our aim is to determine the underwater activities & also monitor them on display.

It will allow operator to capture photo & record video footage to explore marine life & monitor under water habitats & ground activities.

The consideration and planning for making of ROV are as follow:

1) Required specification, functions & component.
2) Design of ROV & CAD model.
3) Manufacturing of frame & Mounting the components on it.

A. Testing the model.

Required specification, functions & component.

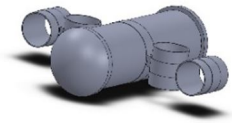
We had to design our ROV at lower cost & also we design a water proofing body structure of optimal size, less weight & minimum depth.

So 1st we start our research from research papers, videos, websites etc. then we get some more info about our project. Then we decide what we want in our project, then we Select components like motors, propellers, camera, body, PVC pipe, sensors etc.

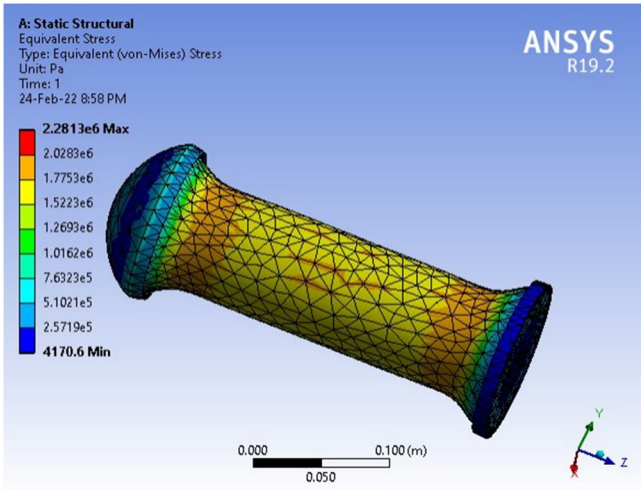
#Design of ROV & CAD model.

We search lots of design on internet, websites, papers, then we get some design like this….

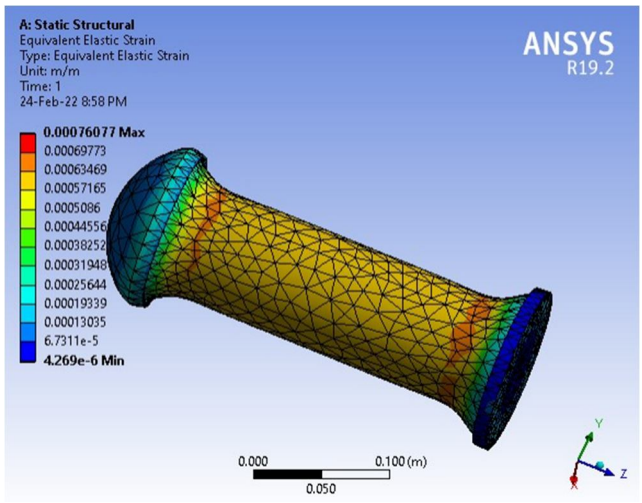
#But we chose this type of design



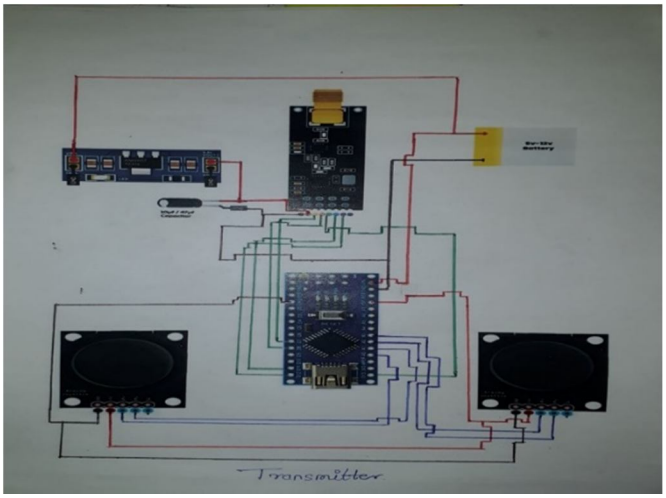
V. SOLUTION



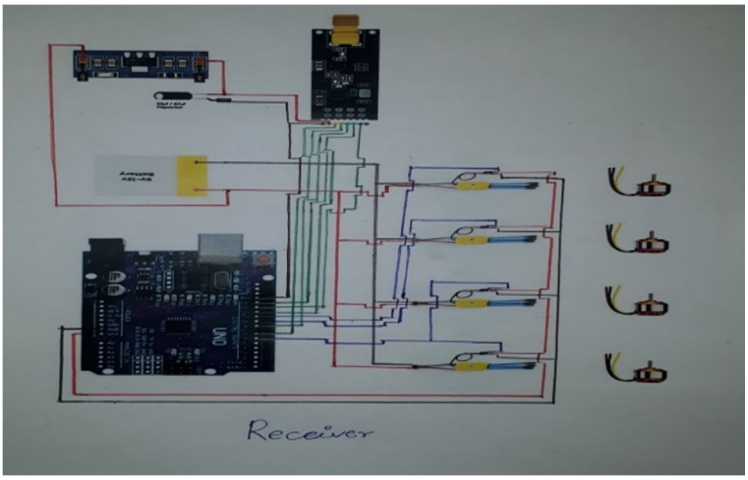
Stress Analysis



Strain Analysis



Transmitter Circuit Diagram



Receiver Circuit Diagram

VI. RESULTS

The project is in working condition but there is an issue with the water proofing of the main body. As few amount of water is enters the main body. There is a slight delay in the transmission of the signals due to improper connection of the cat 6 wire. Due to this delay of transmission signals the motors that should be running at same speed on same time are not rotating at same speed there is a few seconds lag between the motors. The time of lag between the motors leads to misbalancing of the surveillance device.

VII. CONCLUSION

In this paper, we have presented an underwater surveillance device, which consists of software and hardware to inspect the underwater activity and to measure the water parameters such as temperature and turbidity. We look forward to deploying our device into the commercial farming pond as our future goal. To check for existing problems and come up with an outcome solution that we can effectively improve the productivity of farming. Through our device, we want to capture the experiences of expert farmers by establishing a farming big data database and developing an expert system through the collection and analysis of water quality data and underwater images. To overcome the issues of visibility of underwater images we have to equip our device with the best camera quality.

VIII. ACKNOWLEDGEMENT

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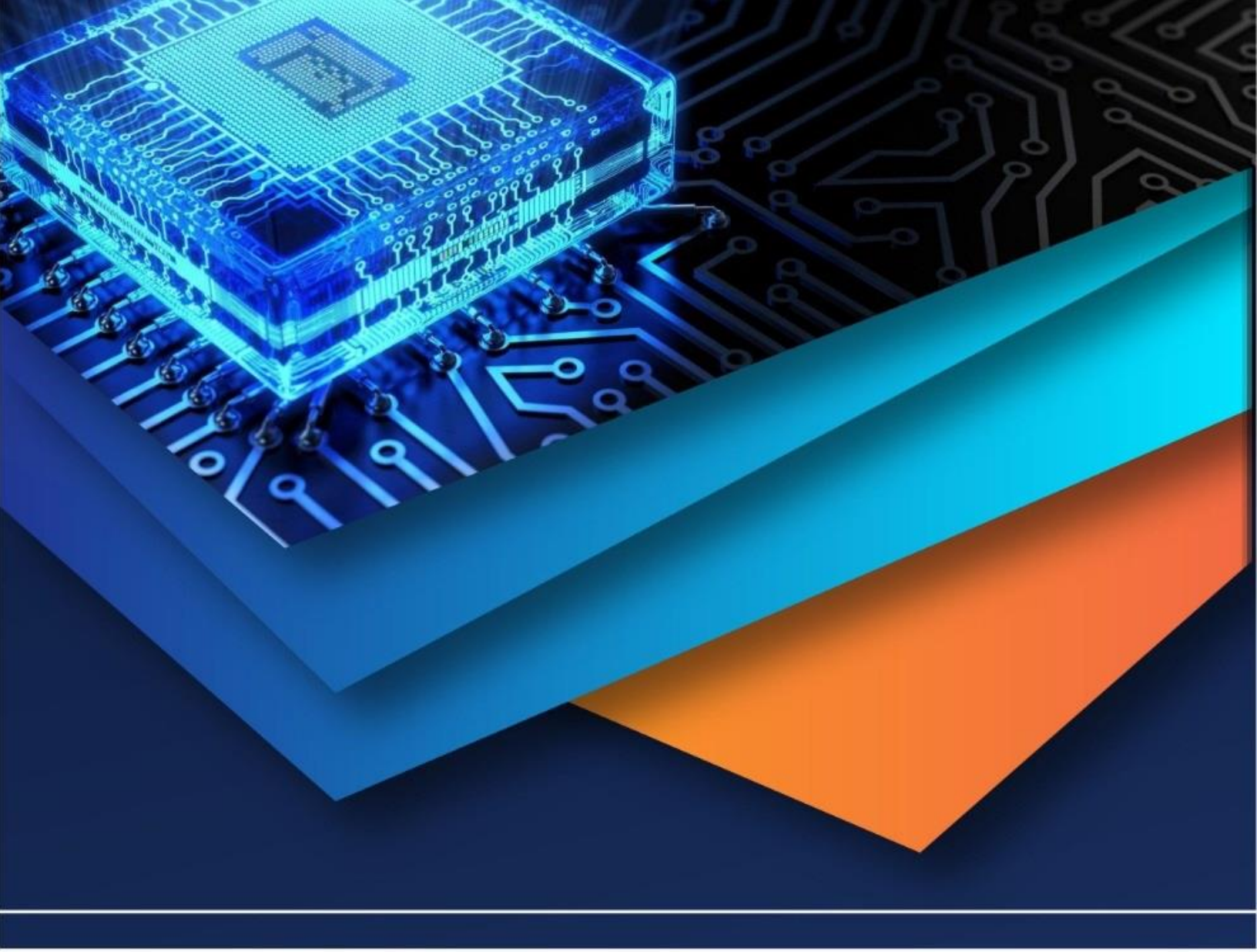

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