Under Water Surveillance & Rescue Drone with Camera

ABSTRACT

Highly developed drone technology enables the use of drones in a wide variety of areas. However, those drones are mainly used in the unmanned aerial vehicles. We believe that underwater drones will become a big research topic and find a market in the near future. We developed an underwater drone with a wide angle camera acting as the “eye" of the drone. And also an arm which acts as a helping hand of the drone. The designs are based on the open source hardware and will be shared as an open-source for contributing to the innovation of manufacturing including drone. The function of the wide angle camera is to update the live video footage to the surface control unit. The underwater drone was designed by extending the Cam module, arm, frame, and the printed circuit board designed by own team. As for the application of the underwater drone, we focused on to perform the Rescue Operation to save the person who is shrinking under the water, investigating Damages under the Ship Bottom, searching Loosed items, Under Water Search operations up to 45min, fish species in a natural lake to help protect the original environment. Experimental results show that the function of the underwater drone achieved at diving in the leak.

Keywords: Marine robotics, ArduinoNano, Sensor node, nrf24l10 module, video camera, Bldcmotors etc…

INTRODUCTION

Ocean covers around 71% of the planet and 44% of the World’s population is living along coastline. Oceans is the main sources of many natural resources including oil, mineral such as nickel, cobalt, even salt and sand.

Now a day’s, main problem in Seas and Lakes people are falling / grabbing in to water by the force generated by the water, Damages under the Ship Bottom generated by the sea, Loosed items Under Water, etc... They are many types of rescue systems are available in the world which are operated on the surface of the water areas only but not work under water perfectly. The profficional divers also stay up to max 20Min under the water it is due to the lack of sufficient Oxygen levels under water. Now a day the UAV vehicles are highly developed drone technologies enables the use of drones in a wide variety of areas such as in aerial photography for appreciating the beauty of nature, in natural disasters where direct human intervention is impossible, or in agriculture for spraying pesticides to exterminate noxious insects. Furthermore, Amazon is preparing to use drones for delivering packages to customers. In a word, drone technology brings innovation and opens new markets. However, these drones are limited to the unmanned aerial vehicles. We believe that underwater drones, which are autonomous robots capable of moving and operating in the water, will become a big research topic and find a market in the near future [2]–[4].

A camera acting as an “eye" is an essential component of a drone. 360-degree panoramic cameras are widely used in various fields, and 360-degree panoramic images have attracted more attention with the increased support of panoramic movies by YouTube and Facebook. We believe that an underwater drone with a function of 360-degree image taking is a state-of-the-art research field which will bring innovations in many areas. For example to perform the Rescue Operation to save the person who is shrinking under the water, investigating Damages under the Ship Bottom, searching Loosed items, Under Water Search operations up to 45min it may help to investigate and observes fish species in a lake, check the aging process of the walls of a dam, and so on [9]–[11].

A grabbing Arm is used to help to push / pull objects and classifying the objects. In manufacturing, open-source Hardware has been widely used in various areas for a long time. Open-source hardware was also defined recently and is making significant contributions into manufacturing innovations.

We developed an underwater drone that combines the hottest keywords in today's drone technology: "Wide angle camera", "underwater drone", "Rescue", "Surveillance", "Inspection", "deep learning", and "open-source hardware". Our model is designed based on open-source hardware, is equipped with a function of wide angle camera, and has the ability of transmitting live video footage. The body was designed using a free software application for creating solid 3D computer-aided design objects (Open CAD). The printed-circuit board was designed with frizzing. The underwater drone was equipped with wide angle camera lenses. The goal of this research was to use the underwater drone for investigating and observing the lakes, seas, and so on.

Methodology

The Figure-1 shows the block diagram of the proposed hardware of the underwater drone. The hardware of the drone involves Wide angle camera which will be responsible to transmitting live video feed to the base station and also Arduino Nano which will be responsible for executing tasks like collecting the data from the signal decoder and controls the various coordination of motors with the help of mini microcontroller. In the frame design of the drone, the main cylinder and propeller casings will be made using PVC, since PVC is lighter in weight also cost-friendly. One side of the will be transparent to capture the video by the camera. These data will be transferred to the base station without any delay. The power to the system will be given by Lithium-Polymer Battery because they are lightweight

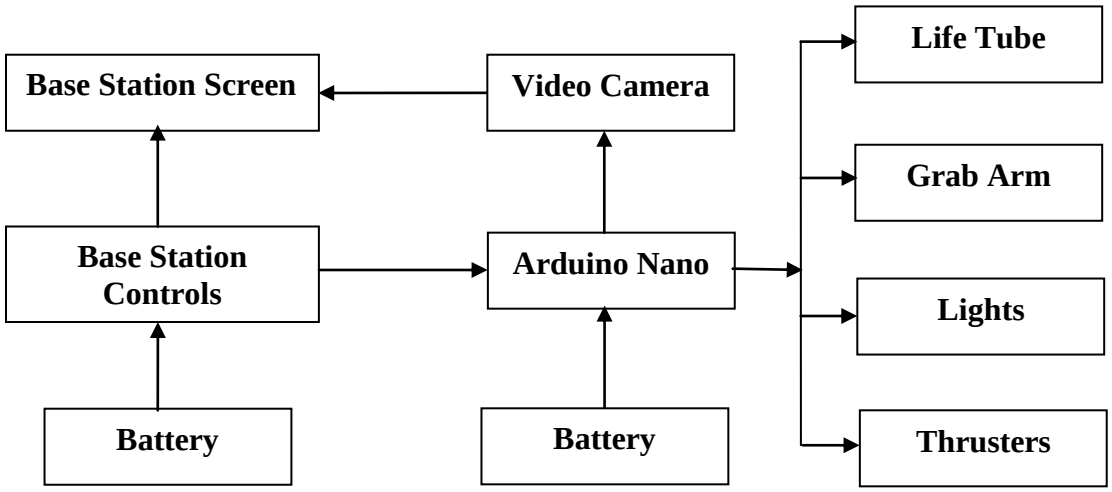

Fig-1: Block Diagram

CONSTRUCTION OF COMPONENTS

Hulls:

The upper and lower hulls were made from PVC tubing utilizing threaded end caps with O-ring seals for easily opening and closing each end of the hull, but at the same time ensuring watertight integrity. To support the electronic components inside the upper hull, two Perspex boards

were machined to size and PVC supports were attached inside the tube to allow the boards to be properly placed and to be easily slide in and out This Hull part account for the majority of the vehicle's volume and thus selecting proper size was critical. Selection of diameter of the PVC tubes was calculated on the basis of sizes of the Controllers and battery to be housed inside the drone.

Propulsion:

The propulsion section of the drone includes motors or motor controllers. It controls the speed and position of the ROV. Motors were selected according to their inherent watertight integrity, size specifications and low cost. Since, motors are to be placed outside the main body of the drone; their volume must be taken into consideration for designing the overall structure of the volume. A propeller-to-hull and propeller-topropeller interaction was done with the help of Arduino Microcontroller. We have used a total 3 brushless DC motor as thrusters. Out of which 1 motors is used for vertical movements and 2 motors for backward and forward movements. The speed of this motor will be controlled by the microcontroller to balance the movement of the drone in a particular plane.

Grab Arm:

The Arm Section is used to pick the Objects found in the water and also used to grab the objects inside the water

Life Tube:

We introducing the life tube concept which is used to perform the rescue operation to help the person inside the water. The life tube concept contains the compressed Nitrogen tank with an empty tube. By clicking the given button in the base station controlling unit it releases the compressed gas in to the tube and the tube extends itself and pull the person inside the water out.

Electric Power:

It is necessary to supply adequate power is being supplied to the drone, especially to every motor. Also, power consumption of motors will increase if the speed of the drone is to be increased. Components and sensors should also use minimum power for system functioning.

Controller:

To control the entire functioning of the drone Atmega328p controller is selected. It is a small-sized high performance microcontroller board with flexible digital interface. It is based on atmega328p chip. It has 20 multi-function GPIO pins. It contains everything needed to support the microcontroller. We will be operating 3 motors, one Arm, Video Stream and one Flash Light from this device. The total weight of the microcontroller is about 20 grams and the operating voltage is 1.8-5.5 V.

CONCLUSIONS

This paper presented an underwater drone equipped with a real-time camera to display Video underwater. The drone was also equipped with Grab Arm, Life Tube and Flash Lights to inspect under water conditions. Programming of the algorithms was done using open software tools which allows adding more functionality to the underwater drone. The design and configurations of the drone are very flexible and low-cost hardware increases its potential use in the study of marine flora and fauna, As for the application of the underwater drone, we focused on to perform the Rescue Operation to save the person who is shrinking under the water, investigating Damages under the Ship Bottom, searching Loosed items, Under Water Search operations up to 45min, fish species in a natural lake to help protect the original environment operations. These make it easier to upgrade new sensors to the configuration. In future, we aim to make more advancement in underwater drone

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