

UNDERWATER DRONE

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Abstract - We propose a novel modular underwater drone capable of mine detection and detonation. As the risk of attack through ocean has increased due to naval mines there is increasing need of an underwater surveillance. The invention concerns a group of vessels, having an unmanned surface vessel and an unmanned underwater vessel, wherein the underwater vessel comprises a location device, in particular a Sonar device, for sensing location data in the underwater area and one evaluation unit or more evaluation units, and the evaluation unit or the evaluation units are arranged in Such a manner that these comprise detection means for detecting a contact with the mine. With the help of this we can minimize the human loss and also eliminate the risk of accidental detonation of drone while deactivating it.

Key Words: Underwater, Drone, Naval Mines, Detection, Detonation

1. INTRODUCTION

Our project is concerned with the underwater surveillance using a drone or remotely controlled unmanned vehicle. We wish to develop a unmanned underwater vehicle which can be used for exploration and detection of hostile activities carried underwater. It also allows long-term monitoring of underwater habitats, monitoring an surveillance of ports, the impact of weather and ground activities. Each of this application requires long term presence that can cover a large area. Underwater surveillance system are employed to detect hostile environment which can otherwise prove for humans. Worldwide there are numerous locations which demand underwater surveillance to detect intruders. Possible intruders to which such locations may be vulnerable include, as well as thieves, enemy combatants, insurgents and terrorists. Underwater intruder detection systems must provide Sufficient resolution to distinguish an intruder who maybe a single Swimmer, approaching from any direction and at a distance (Say 1000 m) allowing countermeasures to be implemented. In principle the design of such systems could be based upon techniques used in known mine hunting systems ,say, but heretofore these have employed large aperture Sonar arrays and wide processing bandwidths—several hundred. Staves of hydrophones, wide-band coded transmissions and pulse compression processing techniques.

Need of the Project

Underwater mines or naval mines are explosive devices which are used in modern oceanic warfare for destroying ships and submarines. Underwater mines can prove fatal if they remain non detected. Most of this mine lie undetected. Currently there are minesweepers which can detect and detonate them the other method is to drop a sonar from a helicopter which will detect the mine by sweeping an entire area. But both of this methods are expensive and requires lot of manpower. Hence there is a need for remotely operated vehicle which will help in detecting and detonating the mine.

Objectives

- The main objective of this project to remotely detect and detonate the mine without human intervention and at a very low cost.
- To protect our coastline from foreign intruders.
- The drone should be small in size and so that it cannot be detected on Radar.
- Its aim is to replace the existing minesweeping method with a more safe and sophisticated method.
- Other than mine detection it should also be able to gather intelligence.
- The drone should be able to easily launch from any vessel.

2. LITERATURE SURVEY

Method for Detecting Naval Mines and Naval Mine Detection system- 2016 A group of vessels having an unmanned surface vessel and an unmanned autonomous underwater vessel, wherein the surface vessel has a drive and a control device, which is arranged in Such a manner that the Surface vessel is steered with regard to the autonomous underwater vessel taking the behavior of the autonomous underwater vessel into account, and the autonomous underwater vessel comprises a Sonar device, for sensing location data in the underwater area and one or more evaluation units, the evaluation units arranged in Such a manner so as to include a detection device for detecting a contact (MILEC) by the sensed location data, and a classification device for classifying the detected contact (MILEC) as a mine-like contact (MILCO) or a non-mine-like contact (NONMILCO), wherein the classification is accomplished by comparing the contact (MILEC) with

known mine information so that a mine-like contact (MILCO) can be identified as a mine contact (MINE) or as another object (NOMBO) and an area of sea can be autonomously cleared.

Underwater Surveillance by Thomas Edgar Curtis, Dorset Ryder, Lu, Mazzeo & Konieczny LLC- 2011 An underwater Surveillance system as claimed in claim wherein the system includes a detection processing system operatively connected to the beam forming Subsystem and configured and arranged to extract intruder echo data from noise and reverberation; a display processing Subsystem operatively connected to the detection processing Subsystem and operative to define tracks from the intruder echo data; and a display Subsystem operatively connected to the display processing Subsystem to display intruder images and tracks.

3. Construction

Following Components are used in Underwater Surveillance Drone:

- PVC Pipes
- CMOS camera
- AC motors
- Power Supply (AC)
- Arduino

In our project we have used a pipe with cm diameter and a length of 1.2 feet. The pipe on which motors are mounted is 2cm in diameter and 32cm in length from end to end. We have used PVC pipe in project because of their durability. The PVC is also very light in weight which makes the drone easy to carry. On the "H" structure all the four motors are mounted and the wires are also packed inside the structure, The "H" is made using a 2cm diameter PVC.

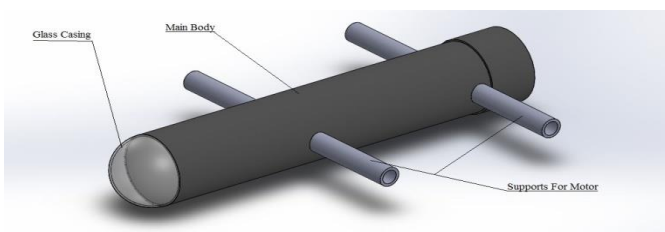


Fig -1: Design of Underwater Drone

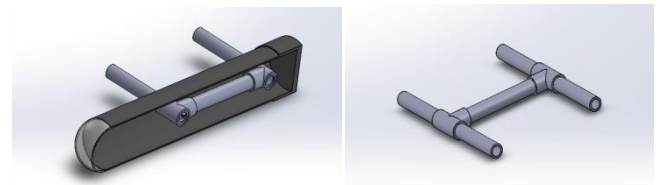


Fig -2: Internal Structure of Underwater Drone

The CMOS camera is mounted on the front of the drone in a transparent casing. It is controlled using arduino . While the images from the cmos camera are displayed on the screen. In underwater surveillance drone AC motors are paired with propellers to propel the drone through water and also control the depth of the drone. The AC motor will be using in our project will be of 220V. The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.



Fig -3: OV7670 image sensor

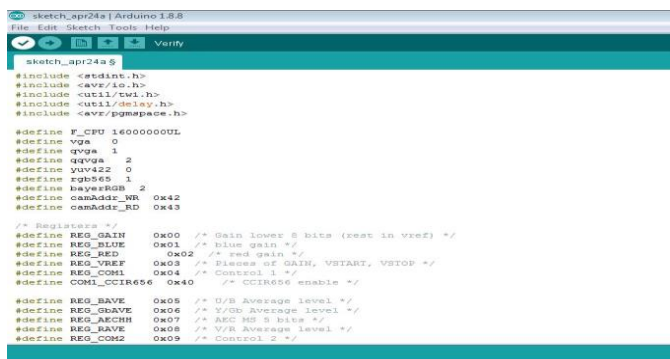
4. WORKING

The present invention relates an underwater vehicle, especially an AUV, autonomous underwater vehicle, and deals with the way the vehicle is constructed both with regard to the mechanics and how it will be connected to your display. The Drone's main frame or body will be made from PVC. We are using a non metallic element so that it cannot be detected by some modern mines which rely on magnetic properties of the target. The drone will be launched from a floating vessel or Ship using crane or a launching mechanism. The drone is connected to main vessel with help of cable. Here radio-waves are not used for controlling because they lose their strength in water while controlling using wi-fi or bluetooth offers a limited range. The operator controls all the action of the drone by sitting in the safety of the vessel. Once drone is launched into the water the thrusters are switched on. There are in total four thrusters in our drone. Two of this thrusters are using for propelling the drone while the remaining two are used to control the depth of the drone. We are using DC motors with propellers to control the movement.

A CMOS Camera is placed at the front of the drone for giving us live feed into the control room. The ultra sonic transducer is placed at the bottom of the drone for

detecting any mines. The ultrasonic transducer is also useful in low light conditions of underwater for propelling. The ultrasonic transducer is one of the main component used for detection. All this modules are connected to the control room through ECU or Electronic Control Unit. The microcontroller used in ECU is used to give commands to the module for functioning at the right time. It acts like a brain to the entire system. All this modules are powered using power module or battery which is placed on the ship deck. The cable used to connect ship and drone is more than 5km which placed on the deck in a rolled position. The cable is very long so that it can cover a large area without being noticed. Once drone detects the mine it can start the process of detonation. There are different processes for detonating the drone sometimes the drone acts like a torpedo and will blast once it comes in contact with the mine. While sometimes the drone will cut the cable attaching the mine to the ocean floor. We are proposing the drone will we place a blast around the drone and will leave the mine. The blast charge will be detonated using a wire which will attached to a drone. The drone will be than called backed to the launching ship and will be assigned for future operations.

ARDUINO PROGRAMMING



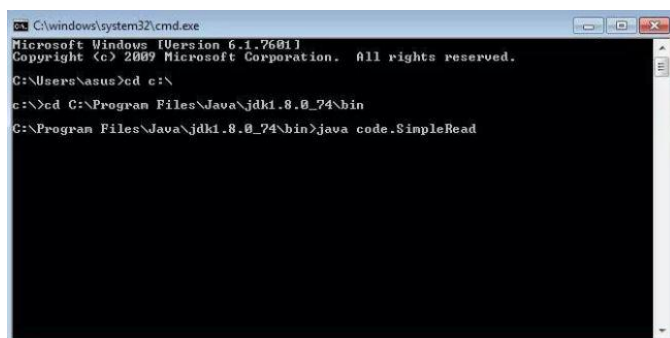
```
sketch_apr24a | Arduino 1.8.8
File Edit Sketch Tools Help
sketch_apr24a
#include <stdint.h>
#include <avr/io.h>
#include <util/cpl.h>
#include <util/delay.h>
#include <avr/pgmspace.h>

#define F_CPU 16000000UL
#define vga 0
#define qvga 1
#define qvga 2
#define Yuv422 0
#define rgb565 1
#define bytesRGB 2
#define camAddr_WR 0x42
#define camAddr_RD 0x43

/* Registers */
#define REG_GAIN 0x00 /* Gain lower 8 bits (reset in vref) */
#define REG_BLUE 0x01 /* blue gain */
#define REG_RED 0x02 /* red gain */
#define REG_VREF 0x03 /* Pieces of GAIN, VSTART, VSTOP */
#define REG_COM1 0x04 /* Control 1 */
#define COM1_CIRK66 0x40 /* CIRK66 enable */

#define REG_BAVE 0x05 /* UV Average level */
#define REG_GBAVE 0x06 /* YUV Average level */
#define REG_AECRH 0x07 /* AEC HD 8 bits */
#define REG_RAVE 0x08 /* V/R Average level */
#define REG_COM2 0x09 /* Control 2 */
```

Fig -4: Programming in Arduino IDE



```
C:\windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\nasus>cd c:\
c:\>cd C:\Program Files\Java\jdk1.8.0_74\bin
C:\Program Files\Java\jdk1.8.0_74\bin>java code.SimpleRead
```

Fig -: Program to save Images

5. CONCLUSION

Hence we have concluded that underwater drone performs a very important function in modern warfare. It will also limit the human loss due to mines. Research in underwater applications is active both from the technological and methodological point of view. Improved energy and power capability will enable longer missions, higher speeds, or better/additional sensors. The goal is to develop fully autonomous, reliable, robust decision making autonomous drones. There are still communication problems that are need to be solved.

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