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Remotely Operated Ground & Underwater Vehicle

[1]G.Rurik Fernando,[2]V.G.S Archana, [3]V.Ganesh,[4]Nadar Ajith Kumar Udaya Kumar
[1]UG Students, Dept Of MECH, Kings Engineering College
[2]Assistant Professor, Dept Of ECE, Kings Engineering College
[3]Associate Professor, Dept Of MECH, Kings Engineering College
[4]UG Students, Dept Of ECE, Kings Engineering College
[1]rurikfernando@gmail.com, [2]archanavgs@gmail.com[3]vgan31@gmail.com[4]kumar.ajith334@gmail.com

Abstract— **Remotely operated vehicles (ROVs) is a tethered underwater vehicles that is used to carry out operation in depths, that pressurized vehicles carrying humans become impractical or uneconomical. Due to high initial and operating cost ROVs are used only in research, underwater building construction, maintaining oil rigs and pipelines. By understanding requirement of new technology in fishing, ship building industry and various industries. we developed a new phase of vehicle (ROG&UVs) that can operate both in ground as well us underwater at low cost mainly concentrating fisherman, Data collected by ROG&UVs from exploring sea is compared with satellite data provided by government which helps us to identify the exact fish location. Bottom crawling is a technique in fishing industry which cause severe damage to seafloor ecosystems by this new proposed light attractive fish technique we can overcome the bottom crawling and also increase the productivity rate. ROG&UVs is designed in a way so that it can be modified easily depending on the requirement of various industries like underwater Non-destructive testing, cage culturing, ship building etc.**

I Introduction

WE developed a new phase of vehicle Remotely Operated Ground & Underwater Vehicle (ROG&UV) that can operate both in ground and water. ROG&UV is equipped with a video camera, propulsion system, sensors, light and Fish attractor. Vehicle can provide us with live feed of display ,sensor present in vehicle give us temperature ,pressure ,depth readings, which is also equipped with leak detection, direction of vehicle heading.ESSO-Indian National Centre for Ocean Information Services (INCOIS), providesPotential Fishing Zone advisories to the fishermen on a monthly basis along the Indian coast. By matching the data from ROG&UV and potential fishing zone exact location of fish can be identified. Fish are attracted to light during night Based on the biology of visual discussion, green and white is thought can attract the most bait fish at night. Green have the shortest wavelength and is the best colour for penetration in fresh water lakes and other inter coastal waterways. Due to that fish and shrimp in bottom get attracted and harvesting is done in topside maintaining seafloor ecosystem neglecting bottom trawling technique.

II Design

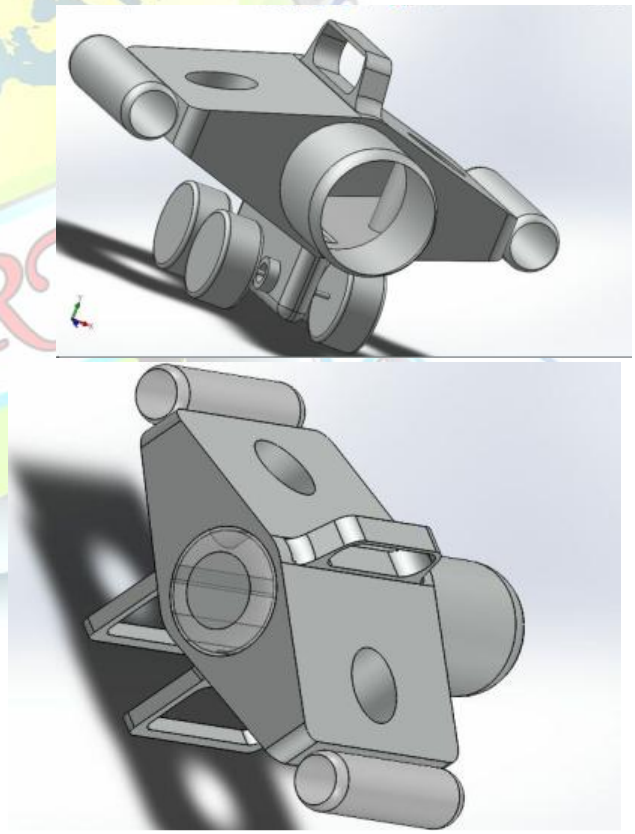

Fig1. 3D Design

The model will have a cylindrical body with a transparent acrylic in the front where the camera will be located, a foam top and everything surrounded by

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a small, tight cage. The four thrusters would be placed on the wing-like structures (two on each one, facing two axes) for movement. Components such as the ground unit would be placed on the
cage with the ability to be removed if needed. The idea is to calculate the buoyancy of the ROG&UV only by the components it will by carrying without considering the body. PVC Schedule 40 pipe 6 inch is used as the chamber to seal the electronic components.

Analysis

Maximum recorded stress = 1.497 ×10^7

Factor of safety = (ultimate strength)/ (working stress)

= (4.07×10^7)/ (1.497 ×10^7) => 2.7

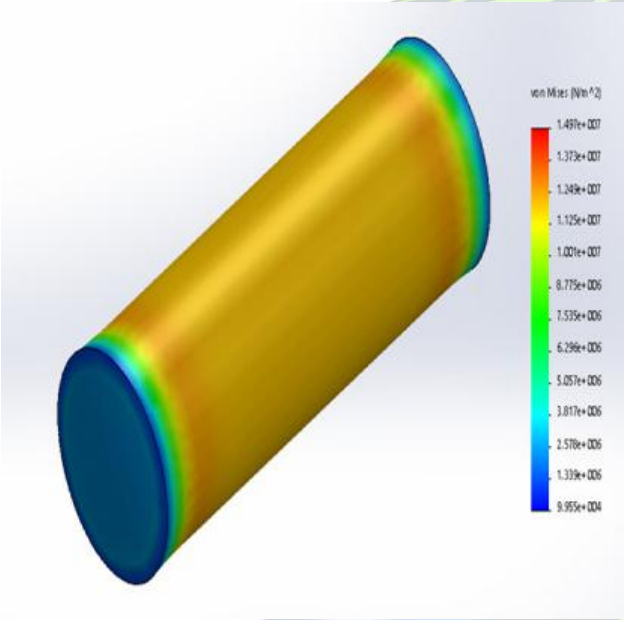


Fig2. Analysis

IIILiterature survey

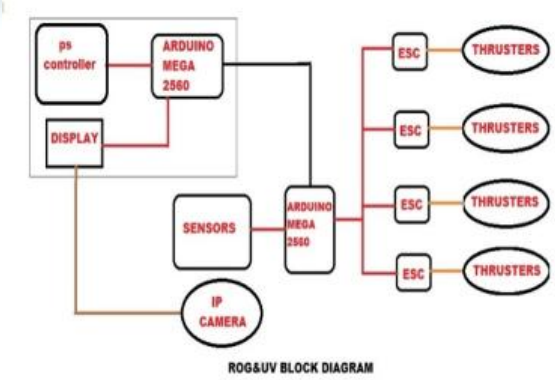
There is not enough information as to say who invented the first ROV. Regardlessof that, there are two who deserve a lot of credit to the upbringing of this technology. The Programmed Underwater Vehicle (PUV) was a torpedo developed by Luppis-Whitehead Automobile in Austria in 1864, however, the first tethered ROV, named POODLE, wasdeveloped by DimitriRebikoff in 1953. The U.S.A. NAVY has been recognized for advancing the technology to levels of operation that could fit into recovering of objects lost during at-sea tests. In 1966 ROVsbecame famous when US Navy Cable Controlled Underwater Recovery Vehicle (CURV) systems recovered an atomic bomb lost off Palomares, Spain in an aircraft accident. Shortly after in 1973, the Pisces III saved the pilots of a sunken submersible off Cork, Ireland with only minutes of air remaining.

After the NAVY did its work, commercial firms that saw a promising future in this technology to be used in offshore oil operations brought the technology even further. Two of the first ROVs developed for offshore work were the RCV-225 and the RCV-150. These ROVs were developed by Hydro-Products in the U.S.A. Many other firms developed a similar line of small inspection vehicles. Nowadays, the search for oil has taken us into deeper regions of the oceans. ROVs have become an essential part of such work.

IV Proposed System

ROG&UV has two microcontroller one at topside and another one in vehicle which is programed and connected via the 80m CAT6 tether. Communication between the Topside Arduino (Master) and the ROG&UV Arduino (Slave) is maintained. Play station controller is connected with arduino master and programmed which generates signal packets and send it through cat6 cable to aurdino slave. Arduino slave receive packets controls esc through pwm signal and sensor readings are send back to the topside master aurdino by this two way communication is established. Brushless motor is used us thrusters which is precise by electronic speed controller which can be controlled using pulse width modulation signal. Neutral buoyancy is maintained in vehicle where two thrusters are used for vertical movement and another two thruster is used for horizontal movement. Ip camera which is linked to a laptop passing 80m cat6 cable to obtain live feed from ROG&UV.

VControlUnitStructure:



ROG&UV BLOCK DIAGRAM

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Fig3. Block Diagram

A. Arduino

The software used to control the Arduino is based on Processing, but uses C and C++ for greater control of the low-level Arduino hardware. A program for the Arduino was loaded onto the board prior to its use, so that the microprocessor could work on its own. The Arduino was needed not only to transfer user input to the thrusters and lights, but also to potentially read and send back sensor data.

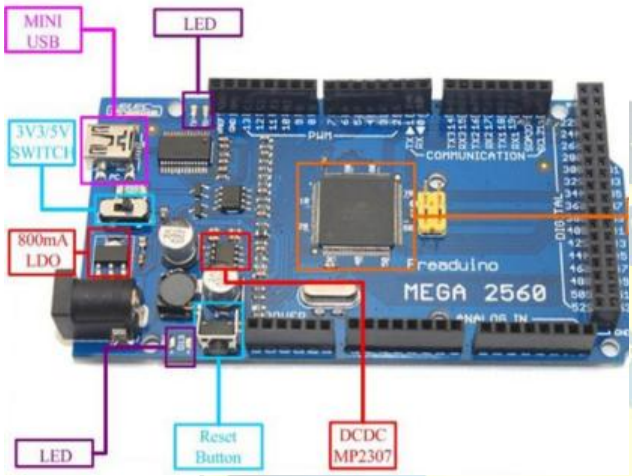

Fig4. Arduino Mega

Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to- adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards DC Duemilanove or Diecimila.

B. Electronic Speed Control

ESC systems for brushed motors are very different by design; as a result brushed ESC's are not compatible with brushless motors. Brushless ESC systems basically create a tri-phase AC power output of limited voltage from an onboard DC power input, to run brushless motors by sending a sequence of AC signals generated from the ESC's circuitry, employing a very low impedance for rotation. Brushless motors, otherwise called out runners or inrunners depending on their physical configuration, have become very popular with "electroflight" radio-control aeromodeling hobbyists because of their efficiency, power, longevity and light weight in comparison to traditional brushed motors. Brushless AC motor controllers are much more complicated than brushed motor controllers.

The correct phase varies with the motor rotation, which is to be taken into account by the ESC: Usually, back EMF from the motor is used to detect this rotation, but variations exist that use magnetic (Hall Effect) or optical detectors. Computer-programmable speed controls generally have user-specified options which allow setting low voltage cut-off limits, timing, acceleration, braking and direction of rotation. Reversing the motor's direction may also be accomplished by switching any two of the three leads from the ESC to the motor

Fig5.ESC

***C.*Thrusters**

Brushless DC electric motor (BLDC motors, BL motors) also known as electronically commutated motors (ECMs, EC motors) are synchronous motors that are powered by a DC electric source via an integrated inverter/switching power supply, which produces an AC electric signal to drive the motor.With the advent of cheap computers and power transistors, it became possible to "turn the **motor** inside out" and eliminate the brushes. In a **brushless** DC **motor** (BLDC), you put the permanent magnets on the rotor and you move the electromagnets to the stator.

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Fig6. Brushless Motor

Fig7. **P**ressure Sensor

***D* .Sensors**

The sensors of an ROV are used to provide information about both the ROV's environment and its system health. This information, transmitted as data to the operator. When looking for or designing sensors, a few key aspects are considered. The range of the sensor indicates the array of environments in which the sensor will function. The resolution of the sensor specifies the accuracy of the measurements collected. Also worth considering is the format of the sensor and its data: how it is connected to the system, what communication protocol it uses, and what level of control the operator has over it. Although typically insignificant for sensors, the voltage draw and power consumption of the device are also factored into the overall electrical requirements of the system. As with many other components, an ROV's sensors depend heavily on its intended functionality and environment.

E.Pressure Sensor

Pressure sensors are a must-have component for any ROV that dives more than a few meters. The pressure measurement itself is useful for staying within depth ranges that the frame material can handle. Additionally, the pressure can be used to calculate the current depth of the ROG&UV, often to tenths or hundredths of a meter. Knowing exact depth in an unknown environment can be very important for applications meant to inspect or map specific locations.

F. Temperature Sensor

Temperature is important to know about for an ROV since as depth increases in the water, the temperature decreases. Additionally, for ROVs that work on or near oil platforms, an oil leak or explosion would have an impact on the temperature of the surrounding water which should be acknowledged by the ROV in order to alert people on the surface. Many ROVs collect temperature information through the use of thermistors. Thermistors are resistors whose resistance is greatly influenced by temperature. Their resistance varies linearly with the temperature multiplied by a constant. Depending on the value of the constant, temperature and resistance could be either proportional or inversely proportional.. This entire system can be made waterproof so that it can be attached directly to the ROV.

Fig8. Temperature Sensor

G. Gyro Sensor

A miniature gyro is often used in ROVs made by Oceaneering. Mini Gyros, as shown in Figure 36, combine tri-axial accelerometers, tri-axial gyros, and on-board processors running a sophisticated sensor fusion algorithm to provide static and dynamic orientation, as well as inertial measurements. This advanced yet compact technology can calculate acceleration, angular velocity, and changes in pitch, roll, and yaw. When the Mini Gyro is connected to a

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computer, a person could rotate the gyro and see a computerized model rotating in a nearly one to one ratio with their movements. The Mini Gyro has an advantage over other forms of determining orientation because it is able to collect data along three axes rather than simply one axis.

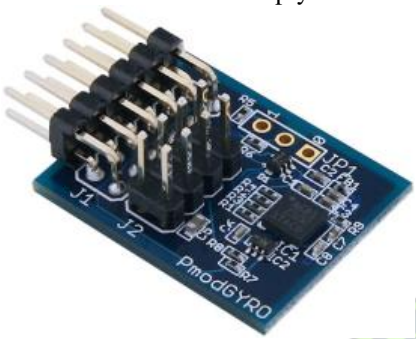

Fig9. Gyro Sensor

H. DisplayCircuitBoard

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

I. Ip*Camera*

An Internet protocol camera, or IP camera, is a type of digital video camera commonly employed for surveillance, and which, unlike analog closed circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet. Although most cameras that do this are webcams, the term "IP camera" or "netcam" is usually applied only to those used for surveillance. Its linked with laptop using Ethernet and live feed from vehicle is obtained.

VIGround Unit

Ground unit system contains four wheel drive system under ROG&UV which allow us to go in all terrain, it is controlled using simple DPDT switch.
Material Used:

– 4 x 100 rpm Motors (External geared) – 4 Wheels (Diameter = 10 cm) – Floor Mat as Track Belt – Iron Chassis – DPDT Remote Control – 12vTransformer as Power Source

Power Source

Power supply is given to vehicle from the topside AC to DC convertor is used which converts 220v to 12 20amp
Which passes through wire and reaches the bottom side.

VII Fish Attractor

Fishing light attractor is a fishing aid which uses lights attached to structure above water or suspended underwater to attract both fish and members of their food chain to specific areas in order to harvest them**.** Fish and some members of their food chain have color receptors in their eyes optimized for the light of their "space". Eyes that can see a single space color can detect changes in light intensity. This is equivalent to a world in black, white and shades of gray. In this simplest level of visual information processing, an animal can recognize that something is different in its space—i.e., that there is food or a predator "over there". Most animals living in a lighted world have an additional visual resource: color vision. By definition, that requires that they have color receptors containing at least two different visual pigments. To efficiently perform this function in water illuminated with light, an aquatic animal would have visual pigments sensitive to the background "space" color and one or more visual pigments offset from this blue-green region, say, in the red or ultraviolet region of the spectrum. This imparts a clear survival advantage to these animals because they can detect not only changes in light intensity but also contrasts in color.

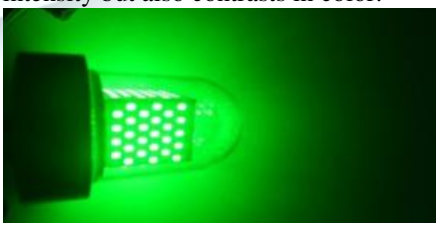

Fig9. Green Led

A. Bottom Trawling

Trawling is a method of fishing that involves pulling a fishing net through the water behind one or more boats. The net that is used for trawling is called a

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trawl. The boats that are used for trawling are called trawlers or draggers

As fish stocks decrease globally, fishing methods have become increasingly extreme. Destructive fishing practices refers to any type of fishing technique that destroys fish habitat and devastates the marine environment including bottom trawling, bycatch, the use of poison and explosives and ghost fishing. Trawling can be contrasted with trolling, where baited fishing lines instead of trawls are drawn through the water. Trolling is used both for recreational and commercial fishing whereas trawling is used mainly for commercial fishing. Trawling is also commonly used as a scientific sampling, or survey, method.

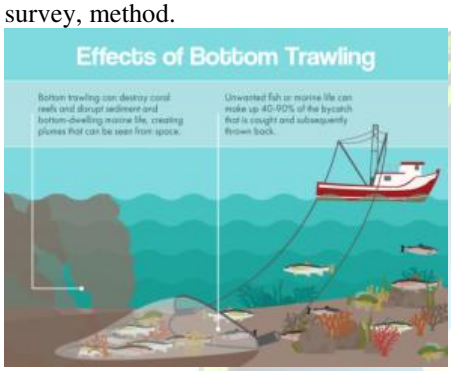

Fig10. Bottom Trawling

B. ESSO - Indian National Centre for Ocean Information Services

Potential Fishing Zone (PFZ) Advisory

The Ministry of Earth Sciences (MoES), earlier known as the Department of Ocean Development (DOD), initiated Marine Satellite Information Services (MARSIS) programed in June 1990, to device methods to use the oceanographic data, especially the satellite data to address the issues involved with the usage of oceanic resources. One of the objectives of MARSIS was the usage of remote sensing data and its applications for the management of coastal oceans and to devise the methods to use the satellite data to harvest food from sea. At this juncture, the scientists from marine sciences, remote sensing and fishery science collaborated to develop a technique that can use the remotely sensed sea surface temperature (SST) to identify the locations of fish aggregation. The concerted collaborative efforts of scientists from Earth Sciences, space and fishery science have resulted in successful demonstration of the application of satellite derived data for the demarcation of Potential Fishing Zone (PFZ)as a proxy to potential shoals of fish aggregation in the Indian waters.

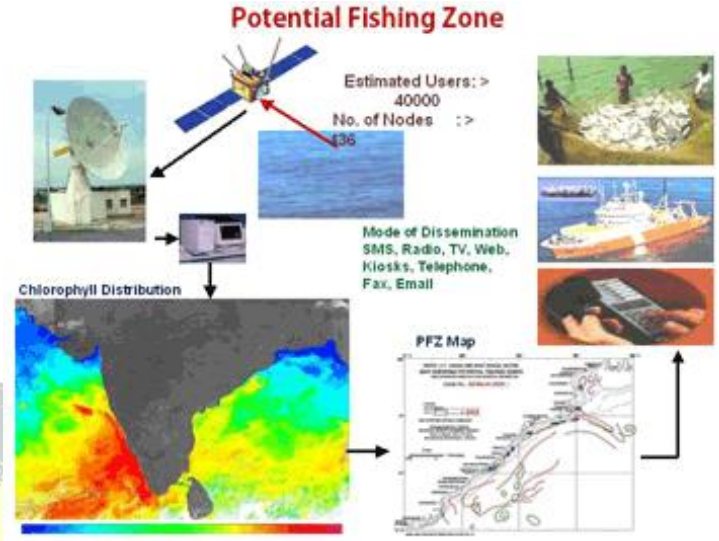

Fig11. Potential Fishing Zone

VIII Conclusion

The purpose of this project to develop a underwater vehicle in affordable rate for fisherman, which helps them to identify the fish location and also to propose a new technique in fishing industries neglecting bottom trawling to save ecosystem. It's designed in a way that it can be easily modified for various purpose like underwater Non-destructive testing, cage culturing, ship building etc.

References

1. The Engineering Toolbox. "Maximum operating and required burst pressure of PVC - Polyvinyl Chloride - pipe fittings". Spring 2013. http://www.engineeringtoolbox.com/pvc-cpvc-pipes-pressures-d_796.html

2. Eastern Edge Robotics. "ROV PROGRAM". December 2010. http://www.marinetech.org/files/marine/files/MIROV2MANUAL.pdf

3. MATE. "Underwater Robotics Competitions". Spring 2013. http://www.marinetech.org/rov-competition-2/

4. NOAA. Ocean. National Oceanic and Atmospheric Administration.gov. [Online] United States Department of Commerce, April 18, 2013. [Cited: April 20, 2013.] http://www.noaa.gov/ocean.html.