UNDERWATER REMOTELY OPERATEDVECHICLE

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Abstract **–Since its beginning, around the 50s decade, untilpresent days, the area of underwater vehicles has considerably grown through time; those have been used for many tasks and applications, from bomb searching and recovery to sea exploration. Initially, these robotswere used mainly for military and scientific purposes.However, nowadays, they are very much extended into civil's, and it is not hard to find them being used for recreation. In this context, the present research is an effort to make a walkthrough of evolution in this area, showing a diversity of structure designs, used materials, sensor and instrumentation technologies, kinds and the number of actuators employed, navigation control techniques, and what is new in development trends. The paper gives a clear starting point for those who are initializing into this research area; also, it brings some helpful knowledge for those who already have experience. The proposed ROV can reach up to 100 m underwater, thus solving the issue of divers who can only reach 30 m depth. In addition, the proposed ROV can be useful in underwater applications such as surveillance,**

Keywords – : ROV; underwater exploration; video capture; real time; vision;

I. INTRODUCTION

The world's oceans cover 2/3 of the Earth's surface and have been critical to human welfare throughout history. Since its beginning, around the 50s decade, until present days, the area of underwater vehicles has considerably grown through time; those have been used for many tasks and applications, from bomb searching and recovery to sea exploration. Our scientific understandingof the deep sea is expanding rapidly through the use of a variety of technologies the first scientific explorations were conducted primarily through the use of diving and human occupied submersibles, complemented by a variety of other technologies such as towed or lower instrument, trawls, dredges, autonomous seafloorinstruments, and deep-sea drilling. More recently remotely operated and autonomous vehicles have begun to revolutionize seafloor exploration, often returning superior data at reduced costs. In the near future, seafloor observations linked by fiber-optic cables and satellites will return massive amounts of data from coastal and deep-sea sites. The motivation of this research is that it is impractical to manually explore the underwater section of the ship anchored or waiting to be docked Immediately inspect the cracks on ship underwater would reduce unwanted risk. Exploring partial underwater environment is dangerous and impractical for human, especially in precise tasks or needs more time to complete the task. A ROV is a tethered unmanned underwater robot. They are common in deep water industries such as oil and gas exploration, telecommunications, Geo technical investigations and mineral exploration. ROV may sometimes be called Remotely Operated Underwater Vehicle to distinguish it from remote control vehicles operating on land or in water

II. OBJECTIVE

- Learn the science principles necessary to constructand ROV.
- Detection of foreign objects in underwater.
- Compare the technology of an ROV to othertechnologies.
- Live footage viewing.
- Rescue operations in freshwater bodies
- Underwater surveillance.

III. MATERIALS & METHODS

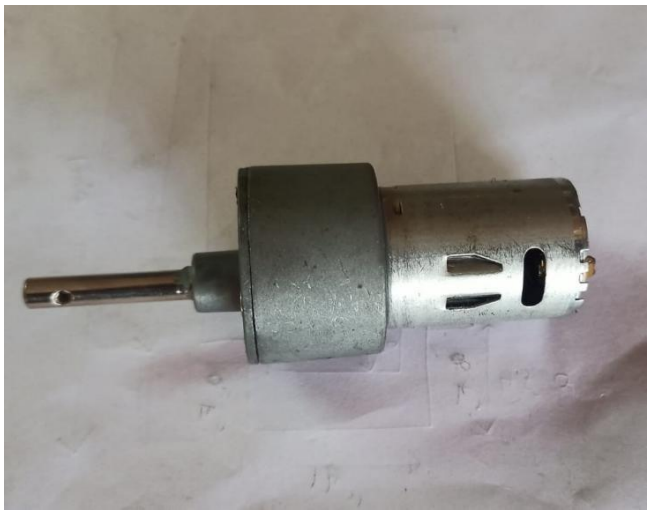
The material selection was carried on the objective to provide a low-cost underwater surveillance easy to operate and accessible by everyone

METHODOLOGY

- Selection of prototype.
- Selection of propellers of required torque and power.
- Designing of frame of the ROV using solid works.
- Assembling of the PVC pipes.
- Installation of camera.
- Supplying power through a lithium polymer battery.
- Making the ROV waterproof.
- Final testing and waterproof checking
- Using for underwater surveillance.

1. DC MOTOR

Direct current (DC) motor is a type of electric machine that converts electrical energy into mechanical energy. DC motors



take electrical power through direct current and convert this energy into mechanical rotation.

Fig 1- Johnson geared motor(1000rpm)

Specifications

- Base Motor RPM: 1000
- Operating Voltage: 6-18 V
- Rated Voltage: 12 V
- Rated Torque: 0.8 kg-cm
- Stall Torque: 3.5 kg-cm

2. Gearbox Dimensions: 25×37 (LxW) mm

PVC PIPES

PVC is a white plastic pipe commonly used for plumbing and drainage. PVC stands for polyvinyl chloride, and it's become a common replacement formetal piping. PVC's strength, durability, easy installation, and low cost have made it one of the most widely used plastics in the world. The operating pressureof the Schedule 40 PVC is 358 psi.

Fig 2- PVC Pipe

3. HOSE CLAMPS

Screw clamps consist of a band, often galvanized or stainless steel, into which a screw thread pattern has been cut or pressed. One end of the band contains a captive screw. The clamp is put around the hose or tube to be connected, with the loose end being fed into a narrow space between the band and the captive screw. When the screw is turned, it acts as a worm drive pulling the threads of the band, causing the band to tighten around the hose (or when screwed the opposite direction, to loosen)

Fig 3 - 1/2 Band clamp

4. ENDOSCOPY CAMERA

A camera is an optical instrument that captures a Where, $\mathbf{Cp=I^k t}$,visual image. At a basic level, cameras consist of sealed boxes (the camera body), with a small hole (the aperture)that allows light through to capture an image on a light- sensitive surface (usually a digital sensor or photographic film). Cameras have various mechanisms to control how the light falls onto the light-sensitive surface. Lenses focus the light entering the camera. The aperture can be narrowed or widened. A shutter mechanism determines the amount of time the photosensitive surface is exposed to light. Endoscopycamera is waterproof camera with led lights provide near the lens.

An endoscope is a long thin flexible tube with a camera at one end with led light and other with a USB port for live footage.

Fig 4- Endoscopy camera

5. LEAD-ACID BATTERY

The lead–acid battery is a type of rechargeable battery first invented in 1859 by French physicist Gaston Plante.It as the ability to supply high surge currents means that the cells have a relatively large power to weight ratio Most of the world's lead–acid batteries are automobile starting, lighting, and ignition (SLI) batteries.The capacity of a lead–acid battery is not a fixed quantity butvaries according to how quickly it is discharged. The empirical relationship between discharge rate and capacity is known as Peukert's law. **Cp** is the capacity at a one-ampere discharge rate,which must be expressed in ampere hours,

I is the actual discharge current (i.e. current drawn froma load) in amperes,

t is the actual time to discharge the battery, which mustbe expressed in hours.

k is the Peukert constant

Fig 5- Lead-acid battery

IV. DESIGN OF THE ROV

The underwater ROV was provided with 3 1000rpm DC motors for the movement powered by 12v lead battery. Two dc motors at sides provide the forwardand backward movement of the ROV.

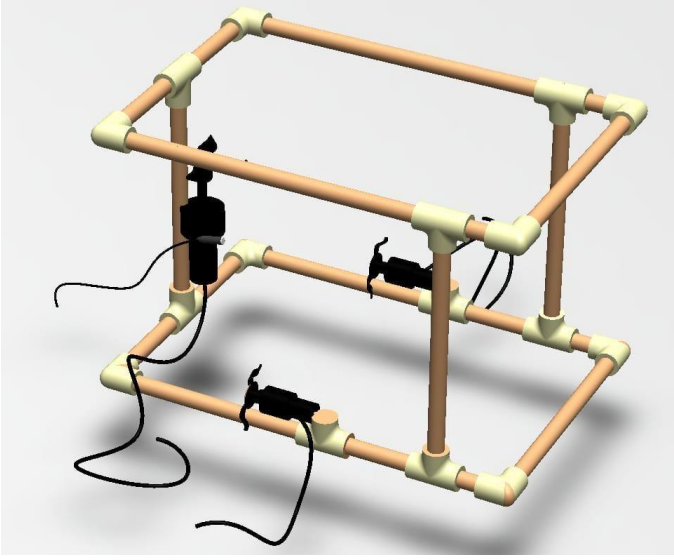


Fig 6- Cad model

And the dc motor at center provides the upward and downward movement for the ROV . The endoscopy camera provides the surveillance

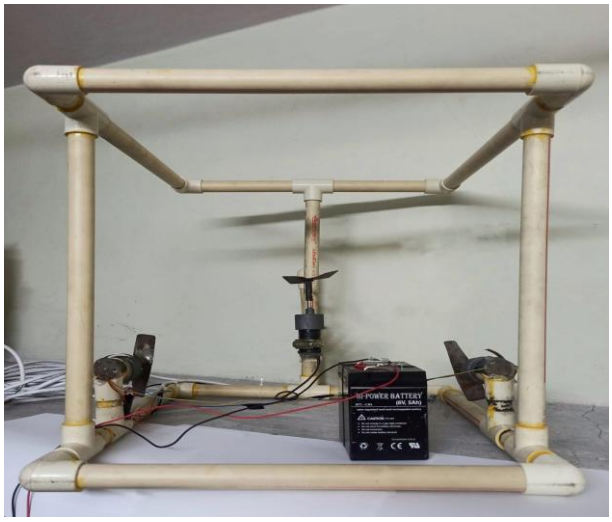


Fig 7- Underwater water ROV

V. RESULTS AND DISSCUSION

The underwater ROV when given input worked satisfactorily and gave minimum errors. The ROV has been operating successfully and providing live footage in surveillance of the water in inspection of foreign bodies. With the help of this ROV the necessity of human diving into water bodies in rescue operation for locating the persons can be eliminated.

VI. FUTURE SCOPE

i. Sensors are used in underwater ROV, whichsensing water temperature.
ii. GPS can used to navigate the underwater ROV inwhich position.
iii. Hydraulic arm are used to underwater welding.
iv. Robotics hands are used to pick up unwanted particle or environmental hazardous present inwater to throughout side water resource.
v. Further ROV can be constructed for dual purpose i.e. (aerial as well as underwater operations).

VII. CONCLUSION

In this project, we focused on the design of low cost underwater ROV for the live surveillance. There was some challenge to make every part of this ROV waterproof. We conducted testes in swimming pool,to observe the speed of the ROV and take check the proper working of the ROV.

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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/M IROV2MANUAL.pdf
3. MATE. “Underwater Robotics Competitions”.
4. Spring 2013.
5. http://www.marinetech.org/rov-competition-2/
6. May, Geoffrey J.; Davidson, Alistair; Monahov,Boris (February 2018). "Lead batteries for utility energy storage: A review". Journal of Energy Storage. 15: 145–
7. 157. doi:10.1016/j.est.2017.11.008
8. Endoscope Design and
9. Assembly, https://www.ebme.co.uk/articles/clinical-engineering/endoscope-design-and- assembly. Accessed 11th July 2020.