

Autonomous Piloted Tethered Submersible Vehicle Used For Marine Intervention Incorporated With Instantaneous Retrieval System

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Abstract- The purpose of this study was to make the existing AUV more compact in size and enhance its performance characteristics by incorporating electronic components such as Arduino which is capable of multitasking in fraction of seconds and collaborated with high power thrusters. This enhances the potential of AUV to explore greater depths but as the depth increases more factors are needed to be considered which affects the desired results. These factors are going to be further discussed within the paper. For a pure streamline motion of AUV underwater and to reduce any unnecessary drag force the contour of the AUV is inspired by a Torpedo. The AUV prototype is been designed on CAD software like Solidworks/Inventor/Autodesk Fusion 360.

Index Terms: Autonomous Underwater Vehicle, Underwater Robotic Vehicle, Unmanned Vehicle.

I. INTRODUCTION

Robotic submarine i.e. an Autonomous Underwater Vehicles (AUV) is extremely challenging research area and valued for both their expand ability and replace ability because they will be deployed in hazardous environments without risking human divers. This emerging field is extremely economical as AUVs has the potential for reasonable scalability makes it ideal for giant scale and future data collection tasks. An Autonomous Underwater Vehicle (AUV) may be a robotic device that's driven through the water by a propulsion system, controlled and piloted by an onboard computer, and maneuverable in three dimensions. The task of the designers is to develop an idea for an AUV that's smaller and cheaper than existing ones. Sensors on board the AUV sample the ocean because the AUV moves through it, providing the power to form both spatial and statistic measurements. Multiple vehicle surveys increase productivity, can insure adequate temporal and spatial sampling, and supply a way of investigating the coherence of the ocean in time and space

The paper comprises of following section as follows :

- 1) Abstract
- 2) Introduction
- 3) Design
- 4) Results or Finding
- 5) Conclusions

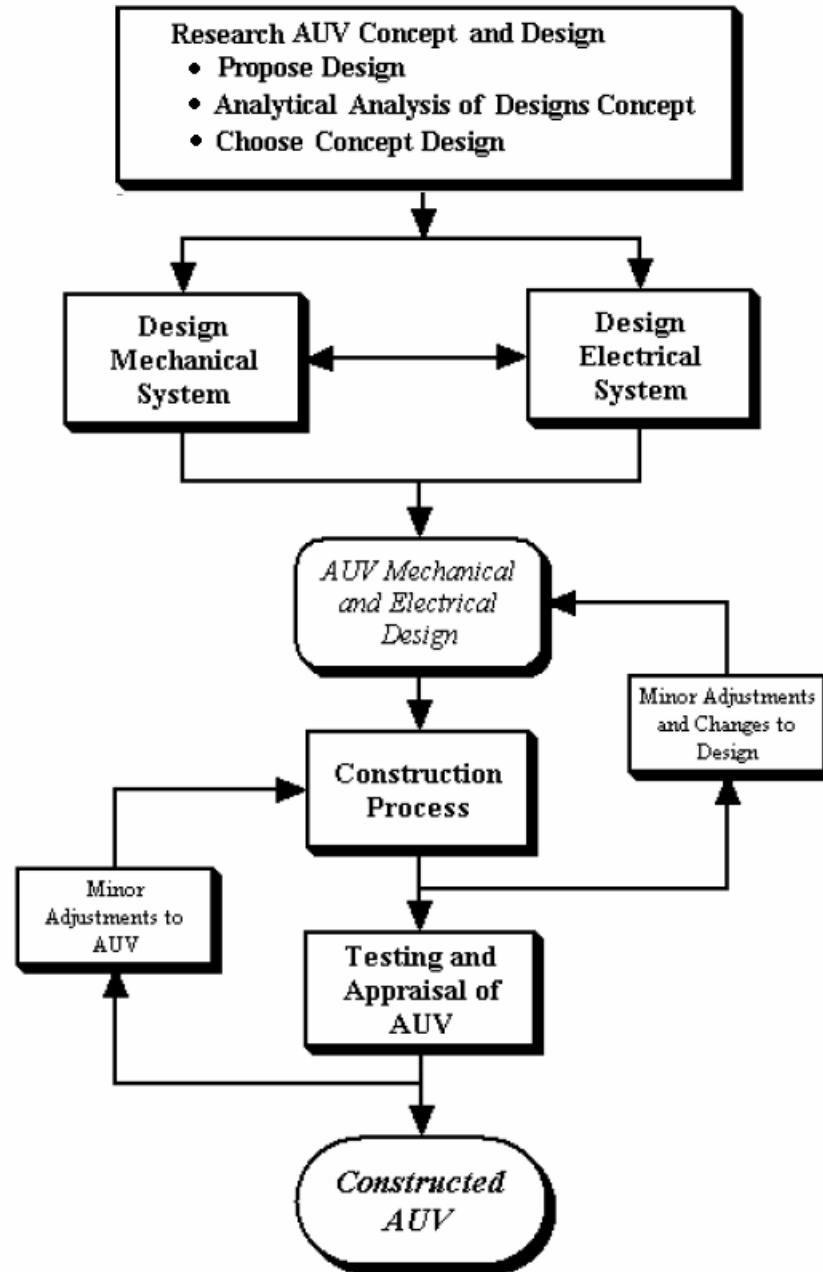


II. DESIGN

The Design Or The Auv Is Inspired By The Design Of Torpedo Due To The Various Factor That Come Under Considerations While Maneuvering A Device Under Water (For Example: Thrust Drag Unstable Water Currents) . The Auv Is Designed On Fusion 360 And There Are Many Ways To Fabricate The Hull Of The Auv Which Is The Main

Component Of The Design As It Holds All The On Board Electronic Components Responsible For The Maneuverability Of AUV . Once The Design Is Completed The Auv Can Be Tested And The Required Adjustments Can Be Done To Get The Desired Results.

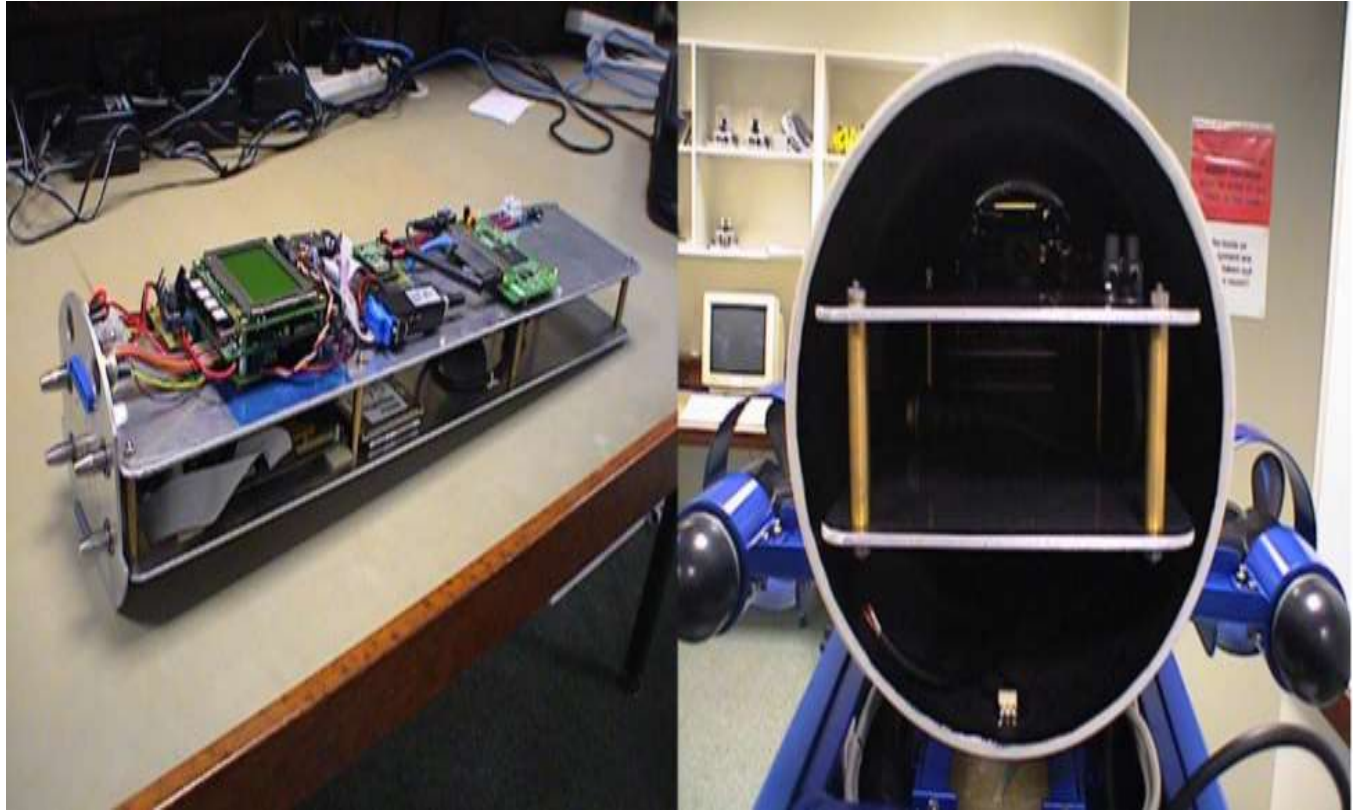
The Stages Of Developing A AUV Is Explained Below In Flow Chart For Better Understanding



HULL DESIGN :

The hull is the important component as it will house all the components . since the hull is spherical in shape it provide high structural integrity and can be easily made airtight. the hull is designed in such a way that it provides easy maintenance .the material of the hull should be highly resistant to corrosion as it would be exposed to a salt water environment submerging to dive in to greater depths the downward force acting upon vehicle must be increased to counter act the buoyant force as the vehicle mass remains constant . this can be achieved by two ways .[1] incorporating ballast tanks . it involves the use of pumps compressed air to regulated the

movement of water inside the ballast tank .[2]the second applicable method is incorporating high power thrusters facing downwards but this method is ineffective due to its high power consumption and ineffective at greater depths . Auv are designed to have residual buoyancy to reduce the size of the ballast tanks or the force required by the thrusters to achieve the task of submerging



PROPULSIONS:

This is one of the most important factor while designing a AUV as it's the main source of power consumption and it positioning determines the degree of freedom which can be controlled. since the auv travels at a constant speed thrust generated by the motors is equal to the friction or drag of the vehicle

$$Thrust = Drag = 0.5\rho s^2 A_{CD}$$

WHERE ρ :Density of water

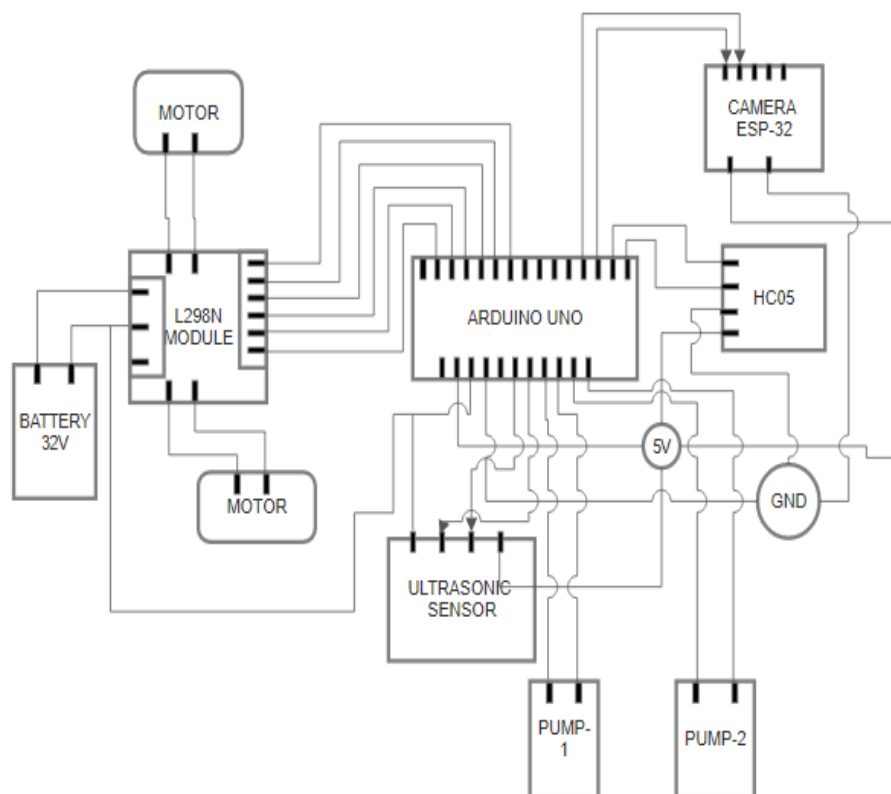
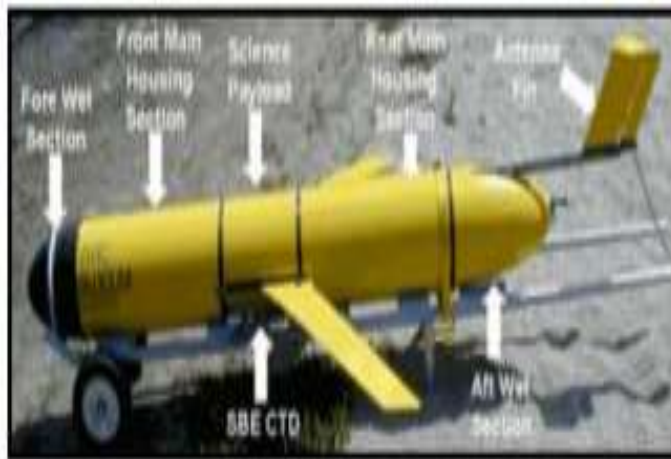
s : Speed

cd :Drag Coefficient

We know that as speed of the vehicle increases the power consumption too increases. Now thrust power in terms of thrust and speed can be expressed as

$$Thrust Power = Thrust \times s = 0.5\rho s^3 A_{CD}$$

Therefore AUV are operated at constant speed due to scarcity of power supply. power: electrical power is provided by li-ion batteries which are connected in a parallel arrangement and a safety fuse to eliminate any short circuit if any electrical or electronic device malfunctions. due to limited power supply the types of components that can be used are limited and components are selected with minimum power requirement .connections: below is the connection of arduino with all the electrical and electronic component [4]. Also, the drag & thrust are depended on the most important factor that is the shape & design of AUV. As mentioned in [7], it states that AUV's which have a torpedo shaped body have less drag & can travel long distances as compared to non-torpedo counterpart.



III. CONCLUSION

With the current design & material specifications, we can hereby come to a conclusion that the AUV will be ready to serve the purpose of monitoring, inspection & data transmission effectively. Also, it can be used as a reference for designing varied types of Underwater Vehicles which can work on a variety of applications. Not only, the AUV is packed with enough power to sustain longer, but also, modifications in areas like waterproofing, adding sensors & weight distribution will add up to the advantage of making it a complete operateable model.

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