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Paper Authors
Tupakula Niharika, Dr. B. Vijayakumar

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Design and Fabrication of Underwater Robots

Tupakula Niharika
M.Tech, Computer Science & Engineering, Vidhya Jyothi Institute of Technology, VJIT, Hyderabad

Dr. B. Vijayakumar
Professor, computer Science & engineering, Vidhya Jyothi Institute of Technology, VJIT, Hyderabad

Abstract
An autonomous robot that can travel in the underwater environment is referred to as an underwater robot. It is outfitted with tools, sensors, and actuators. In several recent underwater operations and major studies, submersible robots have been crucial. Due to the widespread usage of autonomous unmanned robots for activities including investigating underwater resources, environments, and life as well as performing military and scientific missions underwater, there has been a surge in research in this area. Underwater robots are significant and useful equipment for carrying out a variety of tasks, and they are finding more and more uses in exploring and observing underwater habitats. The design and construction of an undersea robot are challenging tasks because of the different ambiguities in the underwater image and the dynamic characteristics.

Introduction

The term "submerged robot" or "Underwater Robot " refers to such a robot system which is built with the required instruments, several sensors, such as oxygen, sonar, and other sensors, and also actuators to enable that to move in the environment. Underwater bots are becoming increasingly essential in the years in a wide range of underwater tasks and research. The widespread usage of automated guided robots for activities like researching undersea life, environment, and resources and performing scientific and military missions beneath water will result in a rise in research. These robots are significant and useful tools for carrying out diverse tasks, and they are finding a growing number uses in studying and analyzing aquatic habitats. Owing to a variety of uncertainties in the aquatic environment.

Reading Review

Implementing a mechanical and electronic framework and connecting subsystems were part of the design and development of the macho vehicle. The development of these frameworks led to the creation of the Mach, an reduced, base-overpowering, expansive underwater vehicles with great symmetry, particularity, and dependability. The Method was then shown, which involved using a computer simulation of a flooded car and the resulting identifiable verification of the key parameters [1]. Two polyvinyl acetate (PVC) tubes are attached on an aluminum frame in the MIT Orca autonomous unmanned vehicle (AUV). In order to lower the center of mass and increase the vehicle's correcting snippet, batteries are put in the base tube.

Every pipe seems to have a sliding card with electrical components affixed to it. The electronic hardware on these cards is connected to the PVC end plate via connections. The outside connections are located on the steel plate. With this setup, it is no longer necessary to disengage links in order to remove cards from tubes. Two side-mounted engines are used for even growth and vertical engines are used for depth control to provide propulsion. Six 12V, 3Ahbatteries are used to power these

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thrusters, while eight more 12-volt cells operate the other electrical equipment. Uncommon voltages and currents are measured using a locally accessible testing mechanism for power management purposes [2]. A biomimetic robot, or one that replicates biological processes, was created. It is propelled by two fins that aid in for the different underwater systems, a fuel cell has been developed that is more effective, cleaner, and simple to operate. The main benefits of this mixed fuel cell, which makes use of a mega with two rated power, are its low emissions and extended operating life. The fundamental characteristic of this cell [7] is likewise its tiny size. The different stress levels produced by such an under implosion were computed using finite element methods, such as ABAQUS or UNIDEX. The different stress waves were supposed to really be spherical in shape, with various stiffeners inserted, as well as the reaction was modeled.

Innovative Manufacturing

Firstly to start with, a CATIA model of the Under-water robot was made which is facilitating the whole designing and also gave an outline for the project. A P.V.C. (Poly vinyl Chloride) pipe of around 110 mm diameter and appropriate length was used as the main body for the under-water robot. An Acrylic sheet was cut into 4 square sizes of around 150 mm sides so as to cover the faces of the PVC pipe. The main purpose of Acrylic sheet was to make the way for camera transparent and to provide adequate strength for closing of pipe for making it water proof.

A cleaner, more productive, and cheaper to utilise source of energy for such different undersea systems is the fuel cell. The main benefits of this combination fuel cell, which makes use of a super-capacitor with multiple power levels, are its low emissions and extended operating life. The fundamental characteristic of this cell [7] is likewise its tiny size. Numerical simulation methodologies for such as Plax is as well as UNIDEX were employed in the estimate of the varied occupational stress which have been created by such an underwater outburst and also the multiple stress surges were supposed to be spherical moulded in which varied reinforcement bars have indeed been incorporated as well as the reaction has been modeled.

The setup had no leakage and hence experiment was successful. To tighten the rubber sheet nuts, bolts and washers have been used. holes were drilled by using drilling machine in both acrylic sheet and rubber pads.

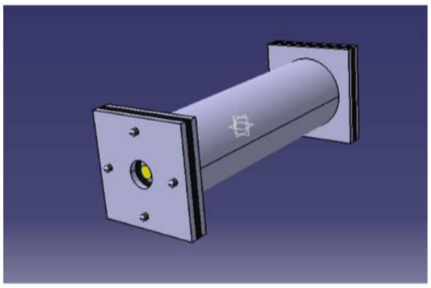

Fig 1 The Hull of submarine robot

The stand was made from thin aluminum hollow square cross section rods joined by drilling holes and tightening them with nuts and bolts.

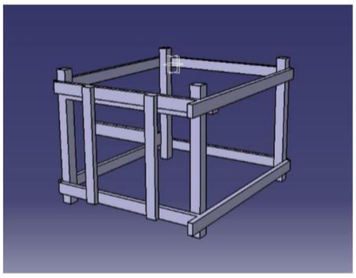

fig 2The aluminum frame for structural rigidity

For the robot to navigate in water, it requires a thruster. To accomplish this, a fan linked to a axis of an electrical Motor driver with just a 12-volt output was designed to move the robot in the appropriate direction. A leak-proof engine has to be constructed. Its engine was packed in a cellophane wrap that was the appropriate fit for this. Silica Gel was utilized to make sure the seal was impenetrable. Silica Gel was applied to the apertures used as covers with a caulking gun. After Gel had become dry, Cables

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trying to come out of the crankshaft have always been attached towards the factory SMPS for appropriate wattage which had been inspected by mini as well as the configuration was gone to the hot tub for testing. Successful testing resulted in the robot for the forward, backward and vertical motion

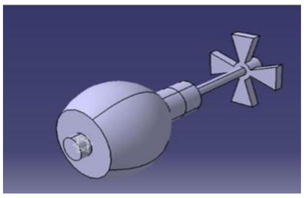

Fig3 Actuator 3CATIA model

For such goal of monitoring the aquatic environment, a camera has already been put within the hollowed PVC pipe with the aid of aluminium sheets.

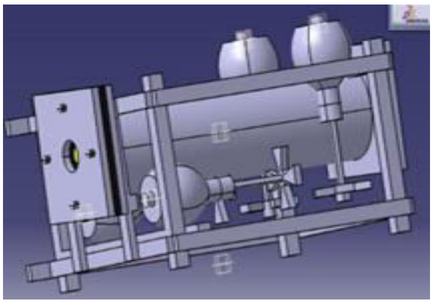

Fig 4 An Undersea robot's CATIA model

The undersea robot has also been connected with a sonar sensor, which it utilizes to assess its distance from creatures and underwater objects while moving through the water. In this project, fuzzy logic and a fuzzy logic controller are utilized to regulate the motion of the underwater robot's motors. This use is described in detail in the section below.

Obstacle Avoidance :

The gap here between robotics and objects functions as a terrible advantage when avoiding the obstacles. The robot must adjust its speed and near high in order to avoid the obstacle while it is close to a deterrent. The robotic determines an object is close when the values from every detector are not precisely the basic line values, and then obstruction-shirking behavior is activated. Because there is a greater requirement for crash mitigation, it might take precedence over conventional safety measures.

Result

This research facility underwater robot that provides a CAD perspective of the robot.

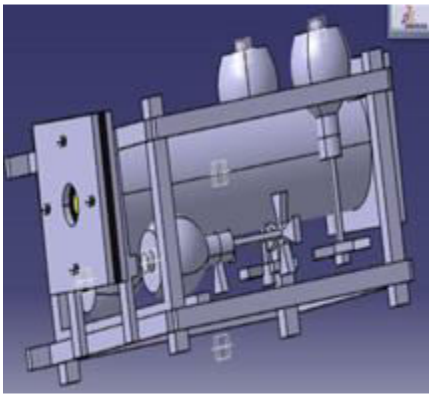

Fig 5 Internal structure of underwater robot

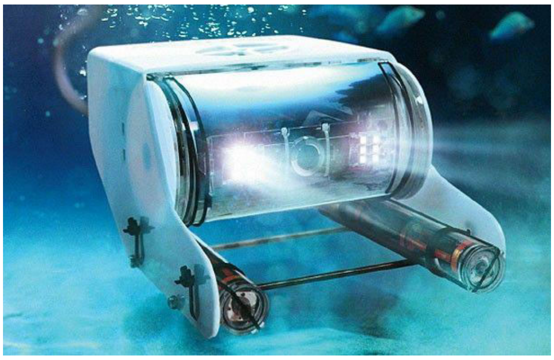

Fig 6 final image of fully furnishes robot

Conclusion

With several degrees of freedom and a novel design, an underwater robot is created. The motors are controlled by a fuzzy logic controller, fuzzy membership functions, and fuzzy logic, and the speed of the motors is maintained according to the requirements. The underwater robot's technical specifications.

Part	Specifications
Acrylic Sheet	110 mm
Rubber Pads Width Side Length	 7 mm 110 mm
Hull length	90 cm
Weight of Robot	8 kg (approx.)
Hull Material	PVC
Supporting Frame	Aluminium
Motor	DC Starting motor With high torque and RPM of 5000 rpm

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