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A Smart Robotic Vehicle To Survey The Ocean

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Abstract: **Ocean exploration plays a vital role in global climate control and understanding environmental change and helps in research areas for the purpose of oceanographic data collection, pollution monitoring, offshore exploration, disaster prevention like Tsunami and earthquakes. Today's Existing systems are a data buoy which provides weather forecasting, Survey ships which are huge and heavier and satellites which are cost inefficient. To overcome existing system drawback and to provide multifunctioning, we are implementing smart robotic vehicle which provides live video acquisition, exact location co-ordinates ofthe device to the user, metal detection, automatic and manual control ofthe device. In this paper, we are developing a smart Robotic vehicle which is cost effective, small in size, consumes less power and has various applications towards oceanographic research.**

***Keywords*—Unmanned Underwater Vehicle (UUV), ARM-LPC2148,Metal Detector, IR sensor, GSM, GPS, DC Motors, Wireless Camera.**

I. INTRODUCTION

Ocean Exploration and Navigational Research is leading because of the advancement in the technology and supporting computer vision techniques. Sailboats are developed in order to measure environmental parameters such as temperature and pressure variation and provides information to the user.The key characteristics of a sailing boat are, wind is the only source of propulsion and it is not remotely controlled; hence robotic sailing boats are emerged for various tasks on lakes and oceans. Robotic sailing includes developments in mechanical, electronic, and intelligent self-steering systems as well as automatic sail control. The existing robotic sailing boats perform a specific task but it doesn't have both automatic and manual control over any sort of collision. The sailing robot provides a reliable connection for monitoring, debugging and remote control in case of emergency.

Considering all the drawbacks of existing robotic sailing boat we are proposing a smart robotic vehicle which will perform many tasks such aslive video acquisition, exact location co-ordinates of the device to the user, metal detection, automatic and manual control of the device. The proposed model performs the complex tasks of sailing boat navigation fully automatic and also with human assistance. This smart robotic vehicle offers major advantage compared to existing sailing boats.This device will require minimal electrical power to adjust its control surfaces.

The main objective of the project is to designand develop a smart robotic vehicle for Oceanographic Research which will provide video footage of the ocean , detects metals under ocean and have automatic and manual control in case of emergency.

II. LITRATURE SURVEY

a) "The papers mentioned mainly focus on how to handle an autonomous robot vehicle in considerations of errors and disturbances". Theauthors propose an unmanned underwater vehicle (UUV) with high maneuverability to be controlled in strong tidal currents. [1][2].

b)"Development of a Swimming Humanoid Robot as an Experimental Platform of Human Swimming". In this paper, Changhyun Chung and Motomu Nakashima proposes a study on developing a humanoid robot for research of human swimming. In order to replace a swimmer as a subject. [3]

c)"Towards the electromechanical design of an autonomous robotic sailboat".In this paper, Vilas Boas, J. M.; Silva Junior and their team members proposes the techniques and tools for the development of an automated sailboat driven primarily by wind power combined with a power system that is capable of generating electricity through photovoltaic cells. [4][10]

d) "Reactive path planning for autonomous sailboat using an Omni-directional camera for obstacle detection". In this paper Van Guo, Miguel Romero and their team members propose a routing strategy for obstacle avoidance using an Omni-directional camera based obstacle detection.[5][9]

f)"A Survey on Applications and Challenges ofUnderwater Wireless Sensor Node". Sahana Salagare, P.N. Sudha, Karthik P. In this paperauthor discussed about challenges and applicationsof underwater devicessuch as UWSN. [6][7][8]

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As seen in many paper, modeling the autonomous robot by studying its behavior using error detection and correction method can be observed. We have analyzed the probable behavior of an autonomous robot which helps to develop our concept. Later authors mainly concentrate on the survey of shallow water where usually strong tidal currents are present, but we deal with autonomous robot which sails on surface of water and also performs some of the functions of unmanned underwater vehicle. Then next author adapts some of the waterproof designs and swimming motions for the maneuverability of autonomous robot, we can adapt the solar energy concept and storage battery; we can also incorporate the concept of obstacle distance estimation and its angle as information given by rest of the papers.
Referring the ideas mentioned in the research papers we have come up with the new conceptual embedded device which has multiple applications as we have discussed in our application.

III.PROPOSED SYSTEM

The proposed projects explain about the sailing robot which explores interpretation of video footage, the identification of sailing features, human-robot interaction, vehicle control, position estimation. This smart Robotic vehicle which activates automatically and manually control the moving object in the water It capture and sends the information to the pc.
We deal with autonomous robot which sails on surface of water and also performs some of the functions of unmanned underwater vehicle. This robot is used for locating the position of the system using GPS and GSM, detects metal present in the ocean, IR and ultrasonic sensor is used for short and long range obstacle detection respectively. Here we have used ARM-LPC2148 controllerwhich has Low power real-time clock with independent power and dedicated 32 kHz clock input. It is a Single power supply chip with Power-On Reset (POR). The manual controlling of the device is achieved using DTMF (Dual Tone Multiple Frequency).

The working prototype model is as shown in the figures.

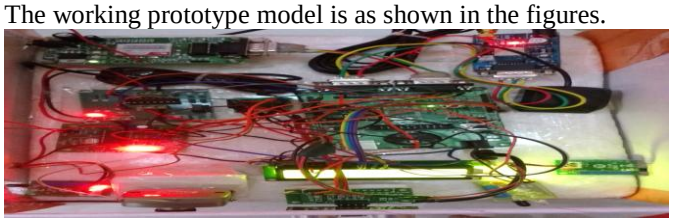
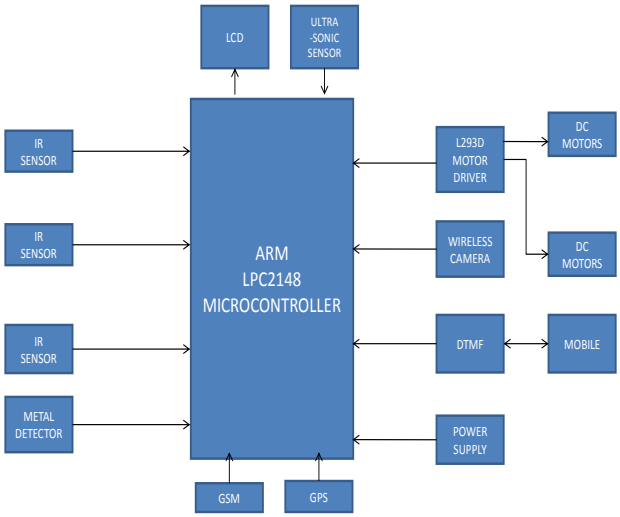


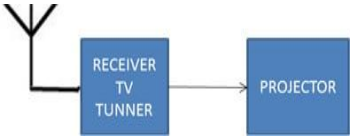
Fig 1- The figure shows the detection of obstacle by ultrasonic sensor

Fig 2- The figure shows the message about the co-ordinates, obstacle detected by the ultrasonic sensor and metal detector

IV. BLOCK DIAGRAM AND WORKINGOF ASMART ROBOTIC VEHCLE



A. BLOCK DIAGRAM OF SMART ROBOTIC VEHICLE



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V. WORKING

The whole system involves the ARM processor to which all the peripherals are connected like GPS, DTMF, GSM, LCD, Motor drivers and DC motors, Wireless camera and Sensors. The robot can be operated manually and autonomously too the manual operation can be controlled by mobile by the DTMF. The wireless camera sends the video footage to the projector through RF communication. The sensors detect if any obstacles are present in the surface of the water and under the water too. If present, then through the GSM a message is sent to the mobile indicating about the obstacle and it is also displayed in the LCD. The location of the robot is known by using GPS and it sends the co-ordinates of the location to the mobile and it used for tracking the location if the robot is lost. The output of the H-Bridge drives the DC motors and two DC motors are used to rotate the arms of the robot in front, back, left and right.

VI. ADVANTAGES

- It is cost effective and small in size.
- Collision avoidance is a challenging task for autonomous sailboats as they operate in an ever changing, unstable environment.
- Remote islands and regions that are sparsely populated could be supplied using smart robotic vehicle.
- Surveillance of the borders in the Mediterranean Sea.

VII. DISADVANTAGES

- The smart robotic vehicle cannot travel faster due to wind opposition and other external factors.
- The power backup is also a disadvantage.

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VIII. APPLICATIONS

- **Marine research**

Autonomous sailboats are suitable for automated data acquisition in the oceans. Sailboats can visit areas regularly and collect data of interest, such as salinity, chlorophyll, pH, dissolved oxygen, depth etc. Data can be transferred immediately. This can be of great help for oceanographic research.

- **Surveillance**

Surveillance of borders or other areas of interest is also an application that is suitable for autonomous surface vehicles. Unmanned boats can also go into areas that may be dangerous for humans.

- **Transportation**

It is likely that autonomous sailing robots can be used for transportation of goods in the future after some research and development. Such automatic transport system, without manning or fuel costs, could be commercially viable.

- **Intelligent sensor buoys**

An automatic sailing boat is completely energy autarkic and can therefore collect unlimited measured data from world's lakes and seas.

- **Safety on sailing boats**

This technology can be implemented on sailing ships of any sizes. The robot-system can interfere in dangerous situations and help the skipper to get the ship under control again.

IX. CONCLUSION AND FUTURE SCOPE

The Smart Robotic vehicle for oceanographic research is used to explore all the details on the surface of the water. This robot is used for locating the position of the system using GPS, detects metals present in the ocean and used for surveillance and rescue operation. In this paper, we introduce a successful working prototype model of manoeuvre sailing mobile robot andis designed for oceanographic research. It tracks the movement with the help of wireless cam attached to the robot through RF PRO wireless sensor network.
Further development is required to demonstrate the feasibility of a Smart Robotic Vehicle for long term use in open sea and helpful for oceanographers and scientists. Better camera can be used with high resolution and pixels. The long-lasting battery can be used instead of using power supplies.

X. ACKNOWLEDGMENT

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