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Solar Powered Unmanned Marine Robot using Radar System

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***Abstract* - Monitoring the marine borders is a very difficult task and the security at these borders is of high importance. In order to understand the global climate and environmental changes, marine exploration is necessary. This helps in research areas for the purpose of various data collection, weather monitoring, pH sensing. Using these data disaster prevention like tsunami and earthquakes can be done. Garbage disposal facilities are absent in many places. Hence the practice of dumping garbage into nearby water bodies has become a major issue. This type of dumping causes a negative impact on the environment. Today's existing systems provide the applications of cleaning, weather monitoring, pH sensing, etc. using batteries as their only source of power. Replacing the batteries from time to time becomes a major drawback. To overcome existing system drawback and to provide multifunctioning, we are implementing smart robotic vehicle which provides live video acquisition, data acquisition to understand climatic changes and radar detection using solar power also as a source of energy.**

Keywords - WSN [wireless sensor network], conveyor belt, cloud based surveillance system, Arduino, Bluetooth module, wireless camera, solar panels

I. INTRODUCTION

Today, many organizations make use of robots for carrying out risky or tedious jobs. Military organizations use robots within integrated systems that include video screens, sensors, grippers and camera. As per the application, robots are of different shapes and sizes, and may be either autonomous or remote controlled machines. Robots are also used in many other applications such as weather monitoring, pH sensing and cleaning of water bodies.

Grounds, aerial and marine are the groups into which the military robots can be classified. Since all autonomous actions cannot be completely controlled by the machine itself, thus involvement of humans in practically every aspect of their operation is required.

All the applications employed in the robot work on the energy from the batteries. But when these batteries are drained out, it is hard to replace them from time to time. In order to overcome these issues, in this paper, we have developed an autonomous robot which is cost effective and uses the solar power as the source of energy.

II. LITERATURE SURVEY

In papers [1], [2], [5], [8] - [10], WSN [Wireless Sensor Nodes] are used in order to acquire the various data like pressure, humidity, temperature and pH which are used to predict and analyze the various changes in the environmental climate and are also used for water monitoring. In paper [6], the usage of cloud based surveillance system is used in our model for storing the data from WSN in the cloud. In papers [3], [4], RADAR system is used and this concept is taken in our model. The radar system uses the sonar with a servomotor to build a radar prototype. Whenever an object is detected the video is recorded using a wireless camera. This idea of using a wireless camera with a system which can be operated from a remote location was taken from the home automation features as in paper [10]. In paper [7], a floating waste scooper was developed which used a conveyor belt in order to remove the floating waste from the water bodies. This method of using a conveyor belt is adopted in our robot model.

III. METHODOLOGY

The system makes use of an Arduino Mega 2560 processor to which an ultrasonic sensor, Bluetooth module, pH sensor, temperature, humidity and pressure sensor BMES

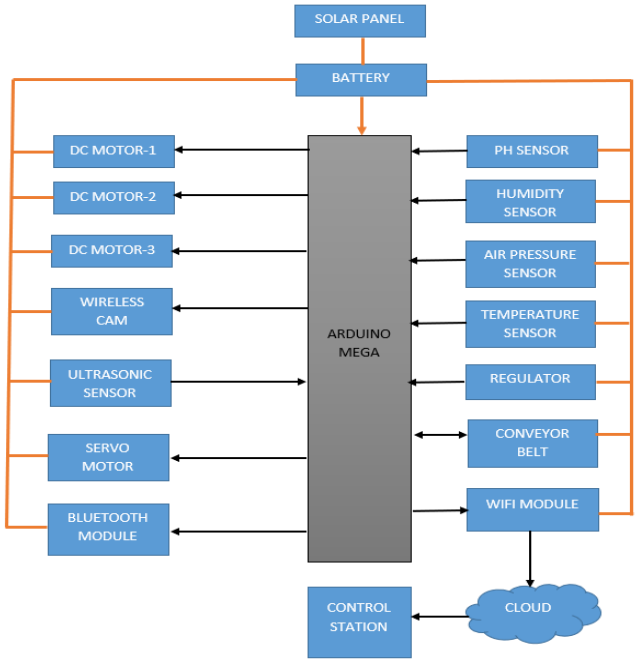

Fig. Block diagram of solar powered unmanned marine robot

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BMP180, Wi-Fi module ESP8266, motor drivers, three DC motors and a servo motor are connected. Two DC motors are used for the movement of the robot in front, back, left and right directions which is done manually by a mobile phone using the Bluetooth module. Another DC motor is used for the movement of the conveyor belt which is used to collect small waste materials from the surface of the water body and is dumped into a waste bin. The ultrasonic sensor detects if any object is present on the surface of the water and stops robot movement if an object is detected and a servo motor is used to rotate the ultrasonic sensor. The robot can predict the distance of the object from the robot. The wireless camera sends live video footage or images to the control station using the Wi-Fi module. The pH sensor is used to detect the pH of the water body. BMES BMP180 sensor gives the temperature, air pressure and humidity values of the surrounding area. The pH, temperature, air pressure and humidity values are uploaded to cloud which can be used for further analysis. The entire robot is powered using solar panel and battery.

A. *ADVANTAGES*

- Small in size and harnesses solar energy for its operation.
- Helps in eradicating water pollution caused by floating waste.
- Surveillance of sea boarders.
- Prediction bad weather conditions in remote water areas.
- Detects potability of water.

B. *DISADVANTAGES*

- The robot's movement can be hampered by wind and other external factors.
- Solar energy cannot be harnessed at all times (at night, during storms, etc.). Hence, a backup battery is required.
- Collecting waste from water surface is only possible in calm waters. Hence, collecting waste cannot be done in turbulent waters.

C. *APPLICATIONS*

- Real time videos from remote places can be viewed.
- Monitoring the environmental conditions can be helpful for weather forecasting.
- Cleaning floating waste from water bodies.
- Testing the water pH and checking potability of water.
- Data will be uploaded to cloud/server, which can be useful for further analysis.
- This system can be used for navy operation.

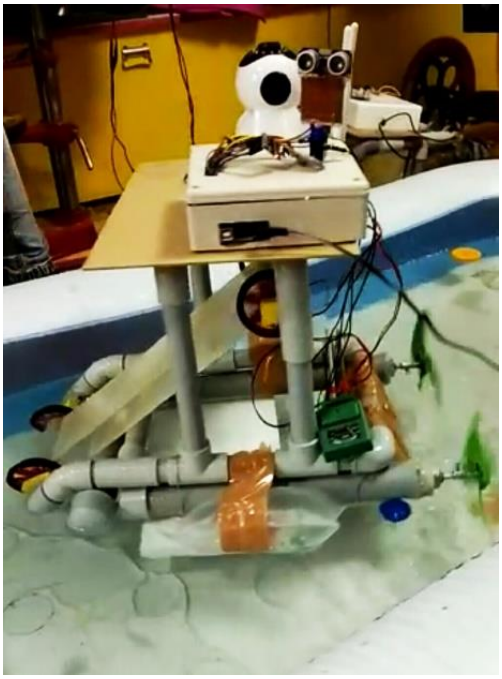

Fig.2 Solar Powered unmanned robot

IV. ACKNOWLEDGEMENT

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V. CONCLUSION

The continuous naval border monitoring is decisive as it determines the outcome of national security. Garbage disposal needs to be taken care in order to protect the bio diversity of the region along with the analysis of the various other parameters like temperature, pressure, pH levels, etc. in order to take the right measures for the changing environmental conditions. In this paper, we have built a marine robot which is multifunctional, reliable, and cost effective which can be used in the naval borders along with its radar system. It can also be used in water bodies to remove floating waste and sense water pH and other parameters required for weather forecasting. It is efficient and has a continuous power system which uses solar power as the source of energy.

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