International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 11 Issue 09, September 2022

Plastic Collecting and Water Sampling Water Rover

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***Abstract*—The electronics assembly and embedded system of a water rover are discussed in this paper. The goal of this project is to create a system that makes it easier to gather water samples and collect floating plastic debris using a micro-controller and sensors. Experimental research methodology was applied. The research process starts with a literature review, followed by the collection of materials and research components, the design of a system, the testing of the system, and finally the drawing of conclusions. The movement operation, parameter checking, and waste and sample collecting are the three components that make up the water rover. Different electrical sensors and controlling units make up the water rover system. Water pumps make up the final component of water sample collection system. This research's test findings demonstrate that the water rover performed as intended. It accomplishes the United Nations' Sustainable Development Goal for Responsible Consumption and Production.**

Keywords—Arduino, Rover, Microcontroller, Location, Postion, Data)

I. INTRODUCTION

The Water Rover is a water-based rover that is self-contained. The Rover aids in the collection of previously accumulated plastic and therefore minimising the cost of additional plastic recycling. The level of water contamination can be calculated by collecting and isolating a sample in a syringe. As a result, the region's principal sources of water contamination can be identified, and suitable interventions to protect water quality can be offered. The Rover has the potential to have a substantial impact on clean water and sanitation procedures, as well as life beneath the water, which will help to maintain ecological balance in the environment. It strives to accomplish the United Nations' Sustainable Development Goal for Responsible Consumption and Production. The goal is to reuse and recycle as much previously accumulated plastic as possible.

II. LITERATURE REVIEW

[1] *M.F. Mukhtar, M.I.F. Rosley, A.M.H.S. Lubis, N. Tamaldin, M.S.F. Hussin*

The goal of this research paper, River Trash Collector System (RTCS), is to create a system that can remove floating trash, oil, fuel, and detergents from the water to address the issue of water pollution and protect the Malacca River, one of the main tourist attractions in Malacca, and its marine life

[2]*Raimund Bleischwitz, Catalina Spataru, Stacy D. VanDeveer, Michael Obersteiner, Ester van `der Voet, Corey Johnson, Philip Andrews-Speed, Tim Boersma, Holger Hoff and Detlef P. van Vuuren*

The purpose of the nexus idea in connection to the Sustainable Development Goals of the United Nations is examined in this article (SDGs). They talked about a five-node description and offer viewpoints that could result in a rethinking of climate policy that has the support of supply-chain managers and resource-rich developing nations.

[3] *Gaurav Nandurkar, V. B. Vaidya, Gulshan Shende, Diksha Dange, Dnyaneshwar Mohadikar*

The goal of this project is to use a "water floating garbage cleaning machine" to remove trash from water bodies like rivers and lakes. With components like a conveyor belt attached with fins, a motor, batteries or solar panels, propellers, floating pipes, a collecting tray, etc. fitted together, this machine will function on a chain drive mechanism that is controlled by an RF module remote control arrangement.

[4] *Prof. Kanchan D. Ganvir, Pranay R. Nerkar, Lokesh W. Ghate, Harshata H. Bhagat*

This study describes a technique for effectively and efficiently collecting rubbish from inland waterways, which include rivers, canals, and lakes. Cleanliness of the environment, safety, and the well-being of individuals are additional major goals of the research. The trash or debris collecting system is specifically controlled and supervised to use in highly maneuverable vessels outfitted with means for collecting floating solid and liquid trash, storing waste on the vessel, and discharging the waste from the vessel to

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ISSN: 2278-0181
Vol. 11 Issue 09, September 2022

a storage area, either for ashore purposes or as garbage transporter.

[5]*Valada, A., Velagapudi, P., Kannan, B., Tomaszewski, C., Kantor, G., Scerri, P.*
They propose a low cost multi-robot autonomous platform in this research for a variety of uses, such as depth buoy verification, flood disaster mitigation, and water quality monitoring. They provide a description of the system's hardware layout, control framework, and software architecture in addition to the experimental findings from a number of field tests. They also go over their preliminary efforts to create the system for water quality monitoring, where a group of specialised sensors on a boat automatically sample the physical quantity being monitored and gives the operator online situational awareness Regarding the area's observed water quality.

III. METHODOLOGY

In this methodology there are mainly five phases. They are as follow.

A. Problem Identification-

When it was decided to focus on one of the Sustainable Development Goals set forth by the United Nations, the process of problem identification got under way. The first step of the project was gathering data on all UNSD's objectives. The next step was to pinpoint a variety of societal, commercial, and environmental problems. Team members and mentors had meetings and group discussions to decide on one problem domain.

The problem of plastic contamination in the world's rivers has received significant attention. Study was done on the literature, the situation of the world today, the market, and the need for a solution.

B. Problem Statement-

The problem statement was formulated, the work area (plastic water pollution) was selected, and potential solutions were evaluated using information from a previous market study and a sub-domain. There was some discussion about potential workable approaches. The MVP (Minimum Viable Product), along with other features, was chosen as the product's building blocks. A rover that uses the least amount of power is an atomic unit.

MVPs: Capability to collect plastic; isolation and collecting of water samples and getting exact location by GPS positioning.

C. Research and Market Survey-

A thorough investigation of currently available models and market requirements was conducted. All of the technological prerequisites for building such a rover were gathered in detail.
Electronic component and controller was chosen for Electronic part of rover. Different sensors like GPS, HC05 Bluetooth module are chosen.

D. *Design Phase-*

A small compartment is made for every electronic controller and converter after the outside design of the rover is completed. All BLDC motor calibration was completed and linked to the rover.
EasyEDA is used to build circuit diagrams. We wrote an algorithm for the control, movement, and action portion taken by the rover since we choose the Arduino UNO as the controller. We used a 150-gram, 11.1-volt, 2200-mAH Lipo Battery to reduce the weight of the rover. Arduino IDE was used to write code.
Circuit Diagram is given below:-

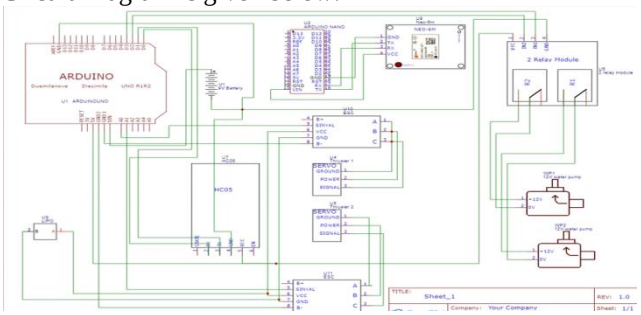

Fig.1- Electronic Circuit

Block Diagram is given below:-

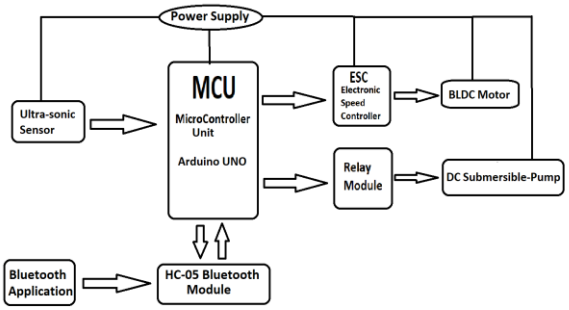

Fig.2- Block Diagram

E. Testing and Improvement-

1] All the codes for the Neo-6M(GPS Module), submersible pump, BLDC Motor and ESC(Electronic Speed Controller), and conveyor motor are written separately and then combined in accordance with requirements.

2] Before sampling the movement, the ESC and BLDC motor were fully calibrated. The output of each component was examined separately to assess its effectiveness

3] We can manually control the Rover using the HC05 (Bluetooth module) from a mobile smart phone.

4] For manual control we used one application which is available on play store. (Arduino, Bluetooth, controller published by Giumig Apps)

5] For movement of rover in water, following chart is created.

1- Clockwise rotation
0- Stop

Movement	BLDC(LEFT)	BLDC(RIGHT)
Forward	1	1
Right	1	0
Left	0	1

Fig.3- Movement of rover

6] After testing, we found that the rover's weight was slightly more than expected and that it was being raised

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from the front, so we positioned the BLDC motors on either end of the rover for best efficiency.

7] Before gathering data, the submersible pump is tested separately. In order to acquire data, we connected the HC-05 (Bluetooth module). We utilised a syringe to gather water samples, and the Bluetooth module allowed us to use a relay module to turn on and off the submersible pump.

8] The length of the required wire is calculated from the location of the component to the controller compartment. And a soldering iron is used to solder all wires.

IV. ALGORITHM

Step 1: Start
Step 2: Initialize the timer, variable
Step 3: Take input choice from User
Step 4: Case 1- Rover will move Forward
Case 2- Rover will move Right side
Case 3- Rover will move left side
Case 4- Rover will not move
Step 8: Rover will take coordinates of its location with help of GPS module when user selects the input.
Step 9: Rover will start collecting samples after user's command
Step 10: End

V. HARDWARE USED

A. *Arduino UNO-*

The open-source Arduino platform is used to create electrical projects. With Arduino, you can write and upload computer code to a physical programmable circuit board (commonly called a microcontroller) using a piece of software called the IDE (Integrated Development Environment), which runs on your computer.

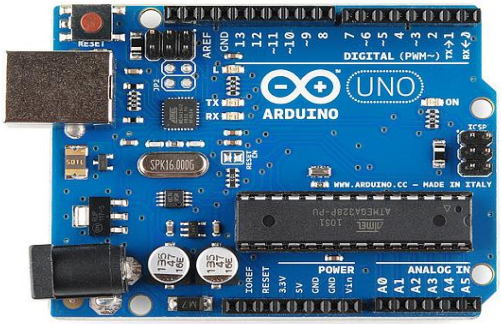

Fig.4- Arduino UNO (Source- Google)

B. *HC-05 Bluetooth Module-*

A Bluetooth module called HC-05 is developed for wireless communication. This module can be set up as either a master or a slave. Maximum range for this module is about 10 meters.

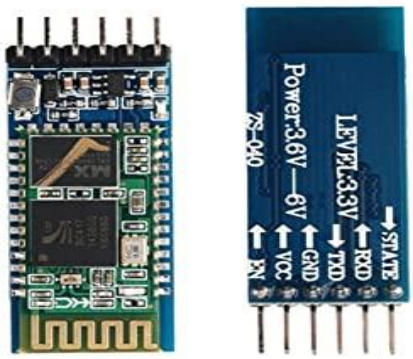

Fig.5- HC-05 Bluetooth Module (Source- Google)

C. *NEO-6M GPS Module*

Location and timing data are provided by the Global Positioning System (GPS), a satellite-based navigation system.

Fig.6- NEO-6M GPS Module(Source- Google)

VI. SOFTWARE USED

A. *Arduino IDE-*

The Arduino Software (IDE) includes menus, a toolbar with buttons for basic operations, a message window, a text console, and a text editor for writing code. In order to upload program and communicate with them, it connects to the Arduino hardware.

B. *EasyEDA-*

EasyEDA is a web-based tool that enables hardware engineers to design, model, exchange, and review schematics, simulations, and printed circuit boards publically and privately.

VII. CONCLUSION AND FUTURE SCOPE

Solar energy can be used to power the entire project. It is upgradeable so that it can go farther across oceans. It is possible to mount multiple sensors to establish a closed loop with feedback that may be relayed to the microcontroller, enabling total autonomy. It is simple to scale up prototypes for both large- and small-scale applications. Data in real

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time may be made public. It can also be altered to monitor aquatic life.

To conclude, the water rover will serve as a first step toward achieving the defined goal and, ultimately resolving the issue at its origin. We are able to develop solutions for problems like water pollution by combining our interdisciplinary knowledge of electronics, mechanical engineering, and basic programming.

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