Detection and Removal of Floating Wastes on Water Bodies

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Abstract- **With increase in population, the scenario of cleanliness with respect to waste management is degrading tremendously. The overflow of garbage in river side creates unhygienic condition in the nearby surroundings.The floating bodies on the river water will cause a severe problem to the environment and is a big risk to the future. These floating wastes will not be dissolved easily in water. So these unwanted suspended objects will cut off the oxygen,hence creates oxygen deficiency which directly affects the marine life. Also these wastes are a threat to aquatic animals.Our project aims at detecting floating wastes in water using infrared sensor and cleaning in an efficient way.The information of every action taken will be sent to the corresponding authority through GSM.The project can be implemented for both flowing and stagnant water. The major advantage of the project is that the people of control station need not have to go to every nook and corner to clean wastes, instead can monitor from one end easily. Finally, the water bodies will be free of all floating wastes and the sanity of the river, and its dependent living beings will be safeguarded.**

Keywords - **Renesas 64 pin microcontroller, LCD display, IR sensor's pair, DC Motor, GSM, Flow sensor, Cube suite+ software tool.**

I. INTRODUCTION

With increase in population, the scenario of cleanliness with respect to waste management is degrading tremendously [5]. The overflow of garbage in river side creates the unhygienic condition in the nearby surroundings. We have all witnessed in recent times that the pollution of water bodies is one of the major problems. The quality of water in major rivers has deteriorated to a greater extent.

There is a universal reverence to water in almost all of the major religions of the world. Most religions believe water as "holy". The purity of such water, the belief in its known historical and unknown mythological origins, and the inaccessibility of remote sources elevate its importance even further. The Ganga, Narmada, Krishna, Yamuna, Cauvery, Godavari and Tapti are those affected by pollution. The reasons for this are the discharge of substantial amount of industrial effluents in the river, domestic wastes and other activities.

The floating bodies on the river water will cause a severe problem to the environment and is a big risk to the future. These floating bodies do not dissolve easily in water. So these unwanted suspended objects will cut off the oxygen exchange between atmosphere and water, hence by the deficiency of oxygen in water, it directly affects the marine life. Also consuming these wastes will affect marine life. These floating bodies are responsible for carrying the harmful pathogens from one area to another area, by creating the pathogenic colonies causing the problems like Diarrhoea, cholera and other health diseases.

So above criteria's are responsible for unbalancing the ecological conditions of the nature. Hence in order to overcome these problems, our project aims at detecting floating wastes and cleaning them in an efficient way using infrared sensor.

Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat and humans [4]. Living organisms, particularly marine animals, can also be affected through entanglement, direct ingestion of plastic waste, or through exposure to chemicals within plastics that cause interruptions in biological functions.

Humans are also affected by plastic pollution, such as through the disruption of the thyroid hormone axis or hormone levels. We know that pollution is a human problem because it is a relatively recent development in the planet's history before the 19th century. As industrialization has spread around the globe, so the problem of pollution has spread with it.

II. METHODOLOGY

Block diagram of the system is shown in Figure.

Whole system works on two voltage levels, 5V and

12V generated by voltage regulator. Renesas microcontroller controls and co-ordinates the whole system.
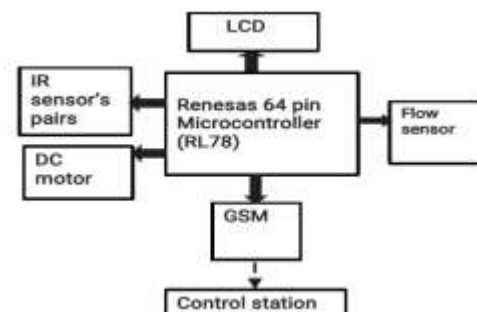
Figure: Block diagram of detection and removal of floating wastes on water bodies.

Ultrasonic sensors are placed at certain distance from one another, these sensors detect the floating wastes by a 180 degree range. They are usually placed on a pole. They are placed along the river banks.

We use infrared sensors for the prototype [1]. If the floating wastes are detected by the sensors, the signal will be sent to the authority via GSM. By using GPS the location will be tracked by the authority. The floating barricades then come into action and remove the wastes present. The barricades operate with the help of DC motor. If the sensor comes across boat which has greater speeds, the light is flashed by the LED placed with the sensor so that the person driving the boat does not come near the sensor placed. The flow sensors are used in knowing the rate of water flow. If the wastes are flowing underneath the water they get stuck at the rotor of the flow sensor and that message is also sent to control station as "blockage. A flow sensor is used for worst case where it detects, if the IR sensor is absent in that part of the water [1].

III. COMPONENTS

The following section, gives details about the components used in this project. The main components used in this project are Renesas 64 pin microcontroller, LCD display, IR sensor's pairs, DC motor and GSM.

A. Renesas 64 Pin Microcontroller

Renesas is the latest automotive microcontroller family that offers high performance feature with exceptionally low power consumption over a wide and versatile extension of items. This microcontroller offers rich functional security and embedded safety characteristics required for new and advanced automotive applications. The core structure of microcontroller CPU supports high reliability and high performance requirements.

The RX Family of 16-bit microcontrollers is a feature rich, general purpose MCU covering a wide range of embedded control applications with high speed connectivity, digital signal processing and inverter control. The RX microcontroller family uses a 16-bit enhanced Harvard CISC architecture to achieve very high performance.

Features

1. General-purpose register: 8 bits × 32 registers (8 bits × 8 registers × 4 banks)
2. ROM: 512 KB, RAM: 32 KB, Data flash memory: 8 KB.
3. On-chip high-speed on-chip oscillator.
4. On-chip single-power-supply flash memory (with prohibition of block erase/writing function),
5. On-chip debug function.
6. On-chip power-on-reset (POR) circuit and voltage detector (LVD).
7. On-chip watchdog timer (operable with the dedicated low-speed on-chip oscillator).
8. I/O ports: 16 to 120 (N-ch open drain: 0 to 4).
9. Timer: 16-bit timer: 8 to 16 channels.
10. Watchdog timer: 1 channel Different potential interface.
11. Can connect to a 1.8/2.5/3 V device.
12. 8/10-bit resolution A/D converter (VDD = EVDD =1.6 to 5.5 V):
13. 6 to 26 channels.
14. Power supply voltage: VDD = 1.6 to 5.5V.

B. LCD Display

Liquid Crystal Display (LCD) is used to display the message when floating wastes are detected. LCD display will be activated by Renesas microcontroller when infrared sensor sends the signal to it.

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications.

A 2x16 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom character animations.

16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. All the commands and information of the project are displayed using this module.

C. IR Sensor's Pairs

Infrared sensor is used to detect the floating wastes, after that it sends the signal to Renesas microcontroller for further processes[1].

An Infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. The sensors measures only infrared radiation, rather than emitting it is called as a 'Passive IR sensor'. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (light emitting diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode,

the resistances and these output voltages, change in proportion to the magnitude of the IR light rays.

D. DC Motor

NR-DC-ECO is high quality low cost DC geared motor. It contains Brass gears and steel pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. These spindles rotate between bronze plates which ensures silent running. The output shaft rotates in a sintered bushing. The whole assembly is covered with a plastic ring. All the bearings are permanently lubricated and therefore require no maintenance. The motor is screwed to the gear box from inside.

E. GSM

GSM Global system for mobile communication) is used for the purpose of Data transport takes place via GPRS (General Packet Radio Service)[6].

The ubiquity of the GSM standard has been an advantage to both consumers (who benefit from the ability to roam and switch carriers without switching phones) and also to network operators (who can choose equipment from any of the many vendors implementing GSM). GSM also pioneered a low-cost, to the network carrier, alternative to voice calls, the Short message service (SMS, also called "text messaging"), which is now supported on other mobile standards as well. Another advantage is that the standard includes one worldwide Emergency telephone number, 112. This makes it easier for international travellers to connect to emergency services without knowing the local emergency number.

One of the key features of GSM is the Subscriber Identity Module, commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. Alternatively, the user can also change operators while retaining the handset simply by changing the SIM. We are using SIM800 GSM Module in our Project.

F. Flow Sensor

When the amount of collected wastes increases, the speed of flow of water decreases. Using flow sensor, this can be detected.

Water flow sensor consists of a plastic valve body, a water rotor and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signals. When water flows through the rotor components, magnetic rotor rotating, and speed along with the flow of a linear change.

Water flow sensor fundamentally solves the differential water-gas valve flap type high pressure and start water valve easy disoperation appear dry and shortcomings. It

has reflected sensitive, long service life, action quick, safe and reliable, joins convenient traffic advantages such as the start low, deeply the general user affection.

G. Software Tool Used

In this project we are using Cube Suite+ software. The cube suite plus is integrated development environment provides simplicity, security and ease of use in developing software through iterative cycles of editing, building and debugging. Easy to install and operate, Cube suite plus offers a highly user friendly development environment featuring significantly shorter build times and graphical debug functions.

Cube suite plus bundles all the basic software necessary for Renesas IDE software development. Cube suite plus is compatible with Renesas hardware tools including the E1 on-chip debugging emulator, which facilitates advanced debugging.

IV. RESULTS AND DISCUSSIONS

The project aims in detecting floating wastes and actions towards it could be taken by respective authority [3]. The GSM technology is used for the communication between the sensor and the control system. Finally, the water bodies will be free of all floating wastes and the sanity of the river, and its dependent living beings will be safeguarded. For our prototype we use two IR sensors as left and right. Whenever the waste is detected for the first time the left count is taken to be 1 and the process continues till count=4.Similarly for the right IR sensor.

Fig.shows the display as GSM Initialized

Fig.shows that test SMS has been sent to the mobile as a part of GSM communication

Fig.shows after a count of 4 on left side, left side waste is more

Fig. shows right side has started to take a count from 0

Fig. shows the right side has reached a count of 4 and right waste is more

V. CONCLUSION

The uniqueness of the project is that it has not been taken up so far. This project was implemented to provide a solution to irregular waste disposal to the water bodies. Using IR sensor and flow sensor, we can detect floating waste on water bodies and extent of pollution caused by unwanted toxic disposal from the waste which is floating on water.

These sensors are further fed to the microcontroller which would help the GSM module to send the notification to the respective authority regarding the status of the collection of waste inside the bag, which is placed near the barricades.

Here we using sensor unit for sensing the floating waste and check the water levels, microcontroller for controlling and for communication we have used GSM module. We can effectively clean the solid waste floating on water bodies [2]. Finally, the water bodies will be free of all floating wastes and the sanity of the river dependent living beings will be safeguarded. The project is helpful because the people need not have to go every nook and corner of the water to clean, instead can easily monitor from control station

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VI. FUTURE SCOPE

1. The project can be used to clean up major rivers like The Ganga, Narmada, Krishna, Godavari and Tapti etc.
2. It can also be used in oceans, using sensors which detects in a circular manner.
3. If the pole on which sensor is placed gets misplaced and the sensor gets affected a camera can be used to capture the image and send that information to the authority.
4. The sewage water could also be treated. A Flow sensor senses the blockage that happens in the path.
5. During the generation of electricity from water, if there is any obstacle seen at the turbines they are easily detected.
6. Forklifts can also be used to cleaning the floating wastes.
7. We can use devices like buzzers, camera along with sensors for further development.
8. It will be helpful in sewage water treatment.

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