Original Research Paper

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Engineering

DESIGN AND IMPLEMENTATION OF SOLAR POWERED AQUA-TRAMS

Abilash R S	Assistant Professor Electrical and Electronics Engineering, College Of Engineering Perumon
Aarathi Madhu*	UG Scholar Electrical and Electronics Engineering, College Of Engineering *Corresponding Author
Lekshmi C Senan	UG Scholar Electrical and Electronics Engineering, College Of Engineering Perumon
Akshay Ajith	UG Scholar Electrical and Electronics Engineering, College Of Engineering Perumon

ABSTRACT With increase in population the scenario of cleanliness with respect to waste management is degrading tremendously. The overflow of garbage in water banks of lakes and ponds create the unhygienic conditions in the nearby surroundings. The quality of water in stagnant water bodies has deteriorated to greater extent. The main motive of this paper is to clean lake water. For this purpose, an efficient aquatic trash collector is developed using an android controlled boat. The proposed model is equipped with a front loader for collecting trashes like plastic bags, bottles, beverage cans, food wrappers, paper bags etc. For the independent working of the unit a solar based charging system is implemented. The developed model is a great solution for minimizing water pollution to a greater extent.

KEYWORDS : ATmega 16, Bilge Pump, Gear Motor.

INTRODUCTION

In recent times the pollution of water bodies is one of the major problems. The quality of water in rivers has deteriorated to a greater extent [1]. 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.

Plastic pollution involves the accumulation of plastic products in the aquatic environment that directly affects wild life habitat and humans [2]

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.

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 in water and hence will cut off the oxygen exchange between atmosphere and water. Consumption of these waste will also affect the marine life. The proposed system aims to overcome these problems by cleaning water bodies.

AQUA-TRAMS is a remote controlled trash collector. The device consist of mainly two parts front loader and a floating base. The movement of both the units are controlled by an android app via Bluetooth. The front loader collects the floating wastes and transfers it to the waste storage at the base unit.

METHODOLOGY

The subjects of the study were canals and water bodies in our locality which were affected by the issue of plastic waste debris. Different kinds of plastic waste that found are,

- Plastic bags which we use in daily life.
- PET bottles of different beverages, oils etc.
- Plastic nets made of polyamides like nylons.
- Children's toys parts.
- Plastic containers used in everyday household life.
- Other minute sized plastic wastes.

Block diagram of the proposed system is shown in fig

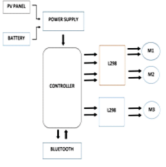


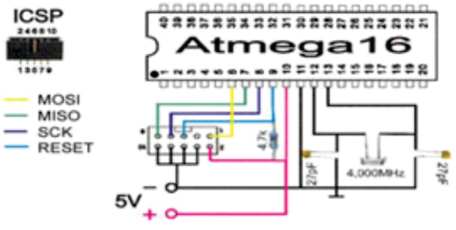
Figure 1. Block diagram of the proposed system

The whole system works on two voltage levels, 5V and 12V. ATmega 16 controller controls and co-ordinates the whole system. The PV panel and battery supplies power for the controller. Using two L298D motor drives, the motors are driven. The motors M1 and M2 are used for the movement of the base unit while the motor M3 controls the up and down movement of the front loader. The Bluetooth module connects the device and the remote control.

COMPONENTS

1. ATmega 16 Controller
2. Bilge Pump
3. PV Panel
4. Battery
5. Power Supply
6. L298 drivers
7. Gear motor

ATmega16 Controller



Atmega16 is an 8 bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. It can work on a maximum frequency of 16MHz. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.

Bilge Pump



Figure 2. Bilge Pump

A **Bilge pump** is a water pump used to remove bilge water. Since fuel

can be present in the bilge, electric bilge pumps are designed to not cause sparks.

Gear Motor

"Gear motor" refers to a combination of a motor plus a reduction gear train. These are often conveniently packaged together in one unit. The gear reduction (gear train) reduces the speed of the motor, with a corresponding increase in torque.

Bluetooth [Android application]

Bluetooth is a wireless technology standard for exchanging data between fixed and mobile devices over short distances using short-wavelength. **Android** is an open source operating system which means that any manufacturer can cause it in the phones for free of costs. Android is built on the open Linux Kernel. Furthermore, it utilizes a custom JAVA virtual machine that was designed to optimize memory and hardware resources in a mobile environment

PV Panel



A photovoltaic (PV) module is a packaged, connected assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

Battery

Selection of batteries is based on criteria i.e. maintenance. In the system a battery of 5V & 12V is used. Battery will charge on the solar energy or Battery charge.

Front Loader

In this system a front loader is used for collecting waste. The front loader is controlled using a motor drive circuit for the up and down motion. The front loader collects all floating garbage from water surface and collects it into the dustbin.

L298 Driver

The L298 is an integrated monolithic circuit in a 15-lead multi watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors.

RESULTS AND DISCUSSION

The project aims at detecting floating waste and its collection. Solar power is used as one of the power source s which is environmental friendly. The Bluetooth technology is used for the communication between the android app and microcontroller. Bilge pumps are used for the movement of base unit while gear motor helps in the motion of loader. Using this strategies, finally the water bodies will be free of all floating wastes ensuring the sanity of river and its dependent living beings.

CONCLUSION

Our love affair with plastic is choking the water bodies. This project provides an effective and efficient solution for saving our lakes and rivers. It is a non-conventional river cleaning method. The uniqueness of the project is that skilled workers are not required for driving the system, environmental friendly and easy operation. In this paper, a PV panel and battery act as a power source, a microcontroller for controlling the motor drives, and for communication Bluetooth is used.

The project can be used for cleaning rivers and ponds. Incorporation of GSM, GPS and ultrasonic sensors can extend the range of device. Devices like buzzers, cameras along with the sensors for further development

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