

Solar Based Machine for Management of Plastic Wastes

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Abstract: *At present nearly 56 lakhs tones of plastic waste is produced in India per year so the main aim of this project was to reduce plastic waste and to create a machine which is small, lightweight and easy to operate in rural and urban areas. Day by day our environment is polluted by large amount of plastic wastes. However, there are several plastic wastes recycled & reused, they are not done effectively. In order to prevent the environment pollution caused by plastic waste. The waste plastic is shredded & coated over aggregate & mixed with hot bitumen and resulted mix is used for pothole repair. This will not only strengthen the pothole and also increases its durability. Pothole is one of the most visible and annoying forms of distress associated with bituminous pavement deterioration from the point of view of a road user. Potholes have always been a problem for highway maintenance agencies because their repair is costly and time-consuming. This project will help to fill plastic waste in liquid form in pothole and patch the pothole for lifetime.*

Keywords: Pothole, Pothole Repair Machine, Plastic Waste Management, Environmental Pollution, Embedded System

I. INTRODUCTION

Vehicular traffic has been rapidly growing over the recent years with more privately owned vehicles taking to the streets each day. The situation is further exacerbated by the decline of railroads. These factors in conjunction with inclement weather result in a major challenge that transportation departments throughout the country face – road damage in the form of potholes. Potholes are not only the cause of significant damage to vehicle suspension systems but in severe cases result in serious accidents and permanent injury. Year-round pothole repairs are also a major reason for the depletion of state funds. Thus there is an impending need for pothole repair techniques that are cost effective as well as long lasting. But due to repeated loading and weathering on roads, a pothole may be caused which may affect the human life very badly. A pothole is a structural failure in a road surface, caused by failure primarily in asphalt pavement due to the presence of water in the underlying soil structure and the presence of traffic passing over the affected area.

Day by day our environment is polluted by large number of plastic wastes. However, there are several plastic wastes recycled & reused, they are not done effectively. The utilization of plastic waste in bituminous mixes enhances its properties and also its strength.

The key disadvantages of delayed repair of potholes are

- Economic loss due to higher fuel consumption
- Enhanced pollution
- Need of more material due to repair of larger size potholes
- The major threat to the environment is the disposal of waste plastic. In a highway, the potholes and corrugation are the major problem. Plastic pavement will be a better solution to the above stated problems.
- He associated ecological and health effects of plastic waste disposal are many, and existing solutions can only tackle small portions of the waste.

- As plastic does not break down naturally, it is polluting natural systems, including rivers and oceans. The production, use and disposal of plastics also creates significant greenhouse gas emissions throughout the different stages of the plastic value chain.

We designed a manually operated machine which will clean the pothole on the road, and will discharge the required amount of concrete to fill the pothole and to do a levelling process on the discharged concrete using the roller. Therefore the pothole on the road may be filled completely and hence the accidents occur due to the pothole may be reduced. So our project is to make a machine which helps the society in promoting the road safety and to reduce the difficulties in patching the pothole and also reduce the usage of human power, and hence saves the time.

II. PROPOSED SYSTEM

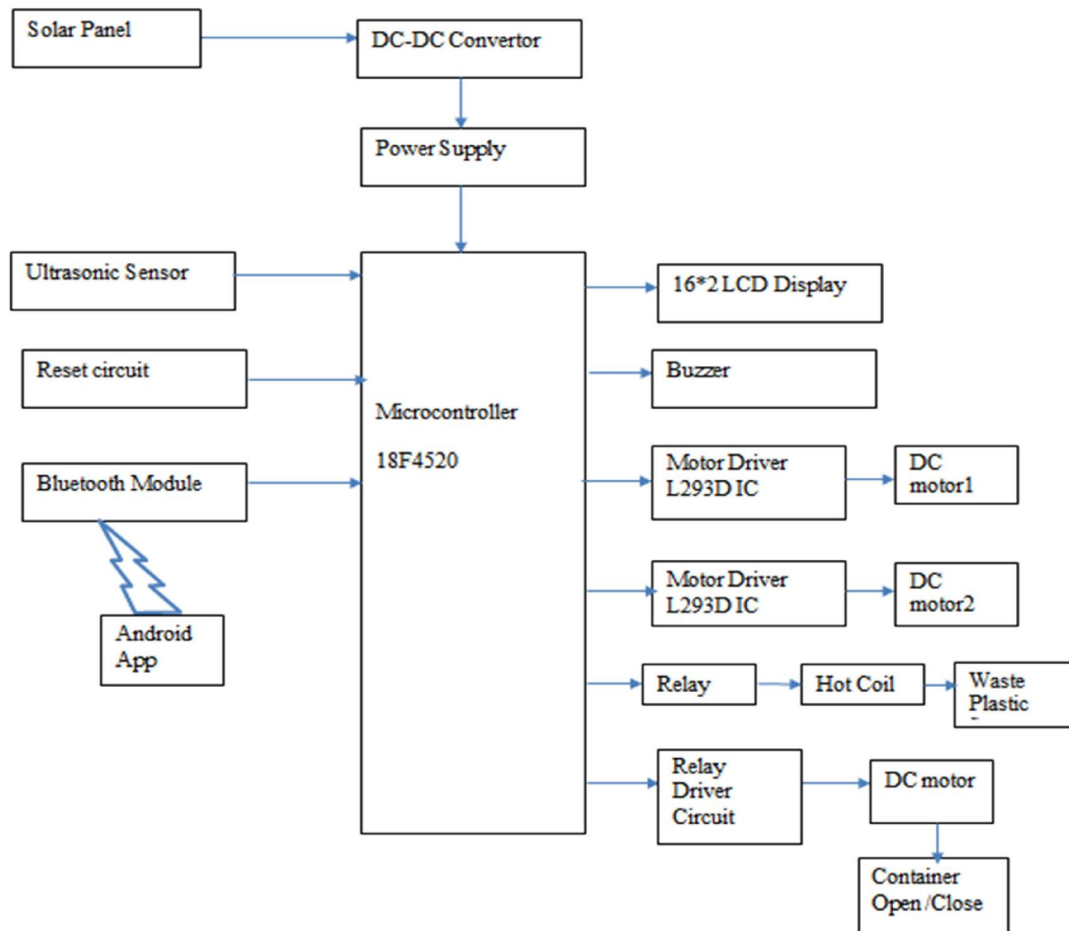


Fig. 1. Block Diagram

The project construction is design simple compare to other machine present in the market to repair pothole. The project construction is simple. The project consists of an aluminium container which is used to mix and heat the mixes. the container which is converted into a mixer by installing a DC gear motor of high torque with blade attach to the motor and an induction heater at the bottom of the container. We selected aluminium because heat transfer rate is high. The DC motor is given AC supply by connecting an adapter to the motor. The project cost is less compared to the other imported from abroad. The machine can be taken anywhere easily. To move container, we use Bluetooth module to send command wirelessly.

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2.1 PIC 18f4520 Microcontroller

It is an 8-bit enhanced flash PIC microcontroller that comes with nanoWatt technology and is based on RISC architecture. Many electronic applications house this controller and cover wide areas ranging from home appliances, industrial automation, security system and end-user products. This microcontroller has made a renowned place in the market and becomes a major concern for university students for designing their projects, setting them free from the use of a plethora of components for a specific purpose, as this controller comes with inbuilt peripheral with the ability to perform multiple functions on a single chip.

- Data Memory up to 4k bytesn Data register map - with 12-bit address bus 000-FFF
- Divided into 256-byte banks
- There are total of F banks
- Half of bank 0 and half ofbank 15 form a virtual (oraccess) bank that is accessibleno matter which bank isselected – this selection isdone via 8-bit
- Program memory is 16-bits wide accessed through a separate program data bus and address bus inside the PIC18.
- Program memory stores the program and also static data in the system.
- On-chip External
- On-chip program memory is either PROM or EEPROM.
- The PROM version is called OTP (one-time programmable) (PIC18C) The EEPROM version is called Flash memory (PIC18F).
- Maximum size for program memory is 2M n Program memory addresses are 21-bit address starting at location 0x000000



Fig. 1. PIC18f4520

2.2 Bluetooth Module (HC05)

It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard, and many more consumer applications. It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions. It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air. It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART).

Specification

- Bluetooth version: 2.0 + EDR (Enhanced Data Rate)
- Frequency: 2.4 GHz ISM band
- Modulation: GFSK (Gaussian Frequency Shift Keying)
- Transmit power: Class 2 (up to 4 dBm)

- Sensitivity: -80 dBm typical
- Range: approximately 10 meters (or 33 feet) in open air
- Profiles supported: SPP (Serial Port Profile), HID (Human Interface Device) and others
- Operating voltage: 3.3V to 5V DC
- Operating current: less than 50mA

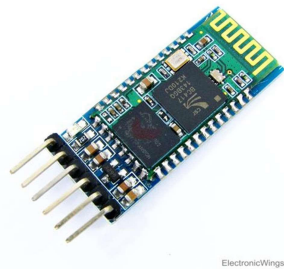


Fig. 3. Pulse rate Sensor

2.3 LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 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 characters (unlike in seven segments), animations and so on.

A 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.

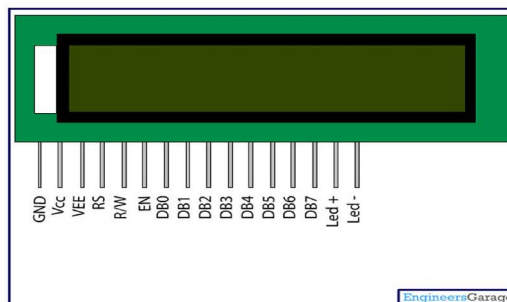


Fig. 4. LCD Display

2.4 Ultrasonic Sensor

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo.

Typically, a microcontroller is used for communication with an ultrasonic sensor. To begin measuring the distance, the microcontroller sends a trigger signal to the ultrasonic sensor. The duty cycle of this trigger signal is 10 μ S for the HC-SR04 ultrasonic sensor. When triggered, the ultrasonic sensor generates eight acoustic (ultrasonic) wave bursts and initiates a time counter. As soon as the reflected (echo) signal is received, the timer stops. The output of the ultrasonic sensor is a high pulse with the same duration as the time difference between transmitted ultrasonic bursts and the received echo signal.



Fig. 5 Ultrasonic Sensor

2.5 DC Motor

12V DC geared motors for robotics and small industrial application, connect to wheel and outer world, very easy to use and available in different RPM, Mounting holes on the body & light weight makes it suitable for in-circuit/pcb placement

- Output RPM: 100 rpm
- Input Voltage: 6-12 V
- Stall Current: 500 - 600 mA
- Shaft length: 2.4 cm
- Shaft diameter: 6mm with internal hole
- Motor weight: ~100gms

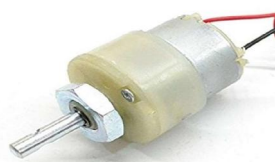


Fig. 5 DC Gear Motor

2.6 L293D Motor Driver IC

The L293D is a popular 16-Pin **Motor Driver IC**. As the name suggests it is mainly used to drive motors. A single **L293D IC** is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. So if you have motors which has operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Microcontrollers like Arduino, PIC, ARM etc.. Using this **L293D motor driver IC** is very simple. The IC works on the principle of **Half H-Bridge**, let us not go too deep into what H-Bridge means, but for now just know that H bridge is a set up which is used to run motors both in clock wise and anti-clockwise direction.

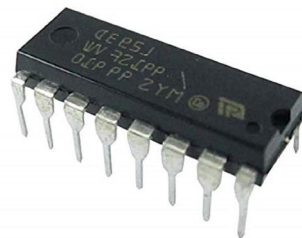


Fig. 5 L293D Motor driver IC

III. CONCLUSION

A promising way toward a future of better plastic waste management is recycling the material. This project demonstrates that it is possible to use solar power to generate sufficient heat to melt plastic to make 3D printing Element on a small, personal scale. Considering reproducibility, the system can easily be manufactured worldwide with available materials and basic skills. Future work can investigate how to scale up the system in terms of the size and quantity of plastic to be recycled using solar-powered systems. In addition, future work can be done to further make the system independent of electricity using solar energy to power the motor used to drive the extruder and other electrical

components in the system. However, this work is a crucial first step forward in exploring environmentally friendly energy methods to power plastic recycling.

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