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Solar Based Machine Management System for Plastic Wastes

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Abstract: *Solar thermal applications vary widely across many different fields. This research aims to introduce the concept of using solar thermal energy in a new application for recycling waste plastic for use in 3D printing. In some countries or regions, waste plastic is not collected for recycling and thrown into landfills. This leads to serious local and global environmental pollution. In additive manufacturing, plastic is one of the main materials used to build 3D models. In this work, we suggest a novel way to produce extruded filament for 3D printing from waste plastic using solar energy. The concept relies on using a Scheffler fixed focus solar collector to heat the barrel of a filament extruder rather than using electrical heaters. The barrel of the filament extruder is heated by a receiver in the focal point of the solar collector. The molten plastic is then extruded through a nozzle to produce filament. This method is shown to be feasible as this paper presents the design and testing of the solar extrusion system where the receiver is heated to 160°C and regulated for a short time. The maximum receiver temperature is shown to be 229°C which is sufficient for*

Keywords: Solar

I. INTRODUCTION

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 are 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

II. LITERATURE SURVEY

Dr.R.Vasudevan,(2007) - stated that the polymer bitumen blend is a better binder compared to plain bitumen. Blend has increased softening point and decreased Penetration value with a suitable ductility Zahra Niloofar Kalantar(2012) - Many researches on PMA mixture have been conducted for the past two decades. Although addition of virgin polymers to asphalt for the purpose of enhancing the properties of asphalt over a wide temperature range in paving applications was contemplated quite some time ago, recycled polymer added to asphalt have also shown almost the same result in improving the road pavement performance as compared to virgin polymers. Amit Gawande (2012) - The quantum of plastic waste in municipal solid waste (MSW) is increasing due to increase in population, urbanization, development activities and changes in life style which leading widespread littering on the landscape‟ Sunil J. Kulkarni (2015) - Minimization of waste material is important aspect of the modern growth and development initiatives Plastic is used in various domestic and industrial applications. Use of plastic bags and bottles is very common

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II. METHODOLOGY & PROJECT DESIGN

Block Diagram:

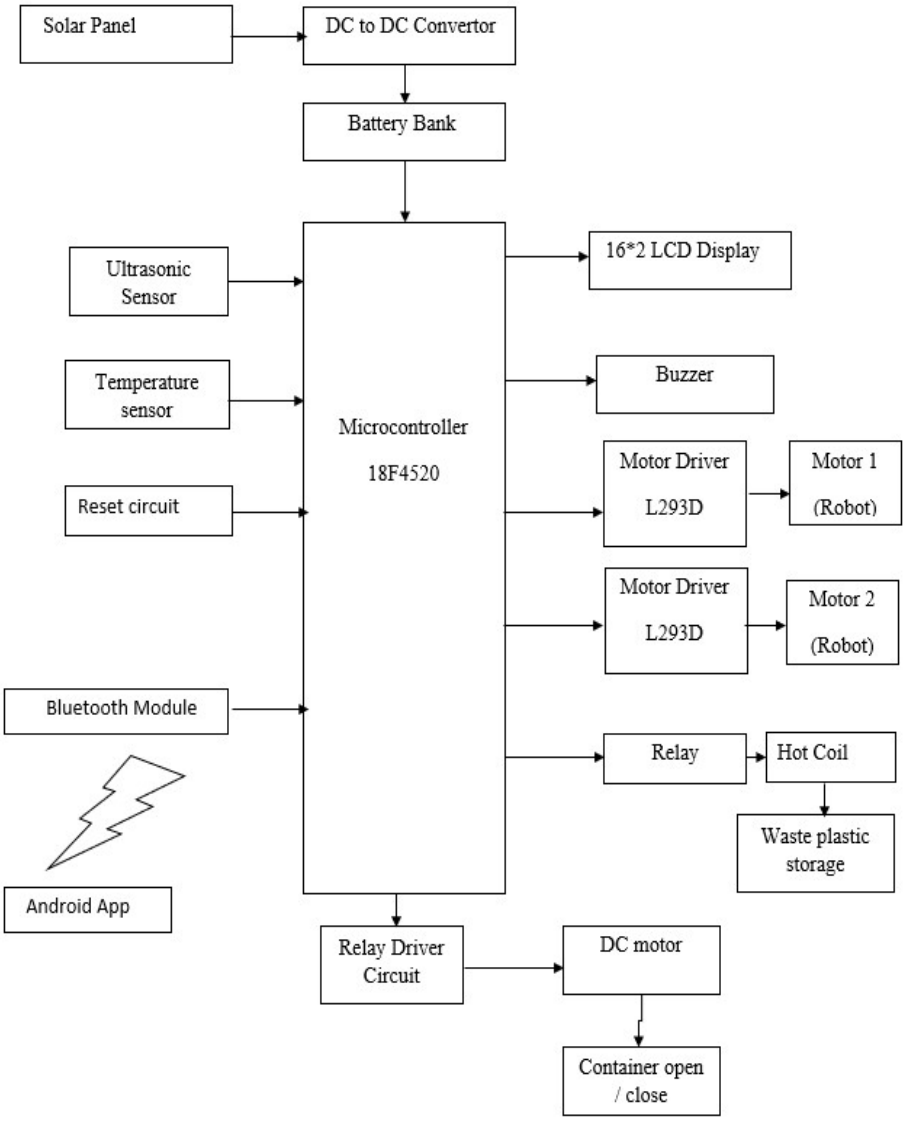

Fig : Block Diagram

List of Hardware and/or Software Tools

- PIC 18F4520 microcontroller
- Solar panel
- Rechargeable battery
- Motor driver IC
- ultrasonic Sensor
- temp sensor
- LCD display
- Bluetooth MODULE
- Relay driver circuit
- DC motor

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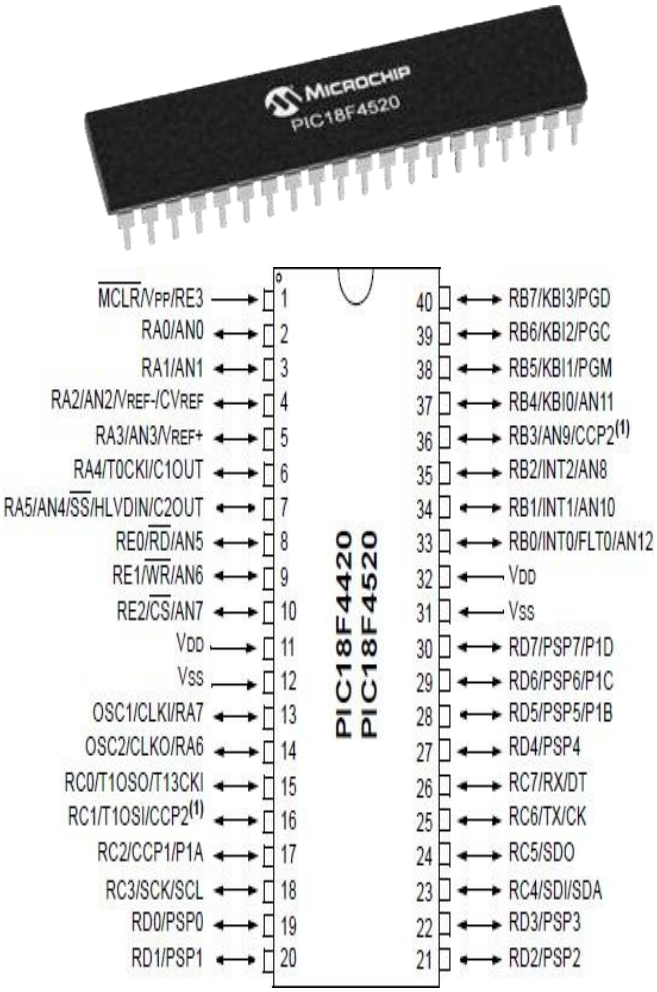
Software Tools:

- PCB wizard for PCB designing
- Protel SE99 for Circuit designing
- MPLAB IDE software
- EMBEDED „C" language

PIC 18F4520 microcontroller



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 isaccessibleno matter which bank isselected – this selection is done via 8- bits Program memory is 16-bits wide accessed through a separate program data busand address bus inside the PIC18.
Program memory stores the program and also static data in the system.On-chipExternal
On-chip program memory is either PROM or EEPROM.
n The PROM version is called OTP (one-time programmable) (PIC18C)

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features	PIC18F4520
Operating Frequency	**DC-40 MHz**
Program Memory (Bytes)	32768
Progarm Memory (Instructions)	**16384**
Data Memory (Bytes)	1536
Data EEPROM Memory (Bytes)	**256**
Interrupt Sources	20
I/O Ports	Ports A, B, C, D, E
Timers	4
Capture/Compaer/PWM Modules	1
Enhanced Capture compare PWM Modules	1
Serial Communicationg	MSSP . Enhanced USART
Parallel Communications (PSP)	Yes
10 bit Analog to digital modual	13 input channel
Resat (& Delay)	POR ,BOR RESAT instruction stack full stack
Programmabal Highe / low – voltage Detect	Yes
Programmbel Brown out resat	yes
Instruction Set	75 instruction and 83 with extended instruction set enabal
Packages	40 pin PDIP 44 pin QFN 44 pin TQFP

Solar panel

A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect. These cells are arranged in a grid-like pattern on the surface of solar panels.

Thus, it may also be described as a set of photovoltaic modules, mounted on a structure supporting it. A photovoltaic (PV) module is a packaged and connected assembly of 6×10 solar cells.

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When it comes to wear-and-tear, these panels are very hardy. Solar panels wear out extremely slow. In a year, their effectiveness decreases only about one to two per cent (at times, even lesser).

Most solar panels are made up using crystalline silicon solar cells.

Installation of solar panels in homes helps in combating the harmful emissions of greenhouse gases and thus helps reduce global warming. Solar panels do not lead to any form of pollution and are clean. They also decrease our reliance on fossil fuels (which are limited) and traditional power sources.

Rechargeable battery

12V 2Ah Rechargeable Lead Acid Battery is normally use for robots in competition. Wired or Wireless Robots runs for a long time with high speed with this type of battery. Seal Lead Acid (SLA) Rechargeable battery is the most common general purpose battery.

Low cost, robust and less maintenance required are the advantages of SLA. But it is considered heavy weight for certain robotic application. To charge SLA batteries, you can use any general DC power supply as long as it provides the correct voltage to your battery.

Features:

- Rechargeable
- Recyclable
- No Memory Effect
- Able to use for most of the 12V controllers, motors or any other appliances

Specification:

- Voltage: 12V
- Capacity: 2Ah
- Size: 98mm x 43mm x 52 mm
- Weight: 0.450kg

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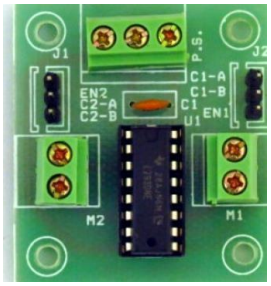
Motor driver IC



A motor driver IC is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver ICs act as an interface between microprocessors in robots and the motors in the robot. The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE,

Features:-
Driver chip: L298 dual H-bridge driver chip.
Operates up to 35V DC
Drive part of the peak current Io: 2A / Bridge
Logical part of the terminal power supply range Vss :4.5V-5.5V

Pins:-
Out 1: Motor A lead out
Out 2: Motor A lead out
Out 3: Motor B lead out
Out 4: Mo (Can actually be from 5v-35v, just marked as 12v)
GND: Ground
5v: 5v input (unnecessary if your power source is 7v-35v, if the power source is 7v-35v then it can act as a 5v out)
EnA: Enables PWM signal for Motor A (Please see the “Arduino Sketch Considerations” section)
In1: Enable Motor A
In2: Enable Motor A
In3: Enable Motor B
In4: Enable Motor B
EnB: Enables PWM signal for Motor B
ultrasonic Sensor
Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

Using IO trigger for at least 10us high level signal,

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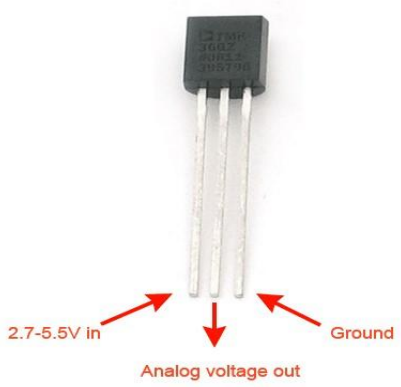
The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning

Temp Sensor

Outputs 10mV per Degree that can also be read directly on multimeter or read in to microcontroller. For example at 30 degree Celsius it will output 300mV at linear scale.

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35D is rated to operate over a 0° to +100°C temperature range.

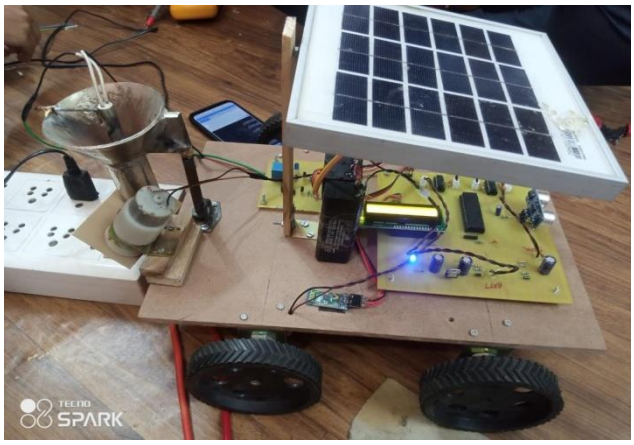


Applications

The LM35 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface and its temperature will be within about 0.01°C of the surface temperature. This presumes that the ambient air temperature is almost the same as the surface temperature; if the air temperature were much higher or lower than the surface temperature, the actual temperature of the

III. RESULT & APPLICATION

Result



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Application

- Water and soft drink bottles , food jar
- Cables , plumbing pipes
- Shampoo bottles , packaging
- Grocery bags , packaging
- Bottle caps , medicine bottles , chips packs
- Disposal cups , cutlery , packaging foam
- Food packaging , electronic goods , and defence gadgets
- Fishing nets , clothing , ropes

IV. CONCLUSION & SCOPE OF FUTURE WORK

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.

Scope oF Future Work

Plastic is one of the most popular and useful materials of modern times: we now use about 20 times more plastic than we did 50 years ago. Its popularity and widespread use is why handling it responsibly and correctly once it becomes waste is so vitally important. We can optimise the lifespan of plastics by reusing and recycling items as many times as possible

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