International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 05 | May -2017 www.irjet.net p-ISSN: 2395-0072

Solar Rescue Robot

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Abstract - *The project is developed mainly for the rescue operation using a robotic vehicle powered by solar energy. The robotic vehicle is controlled wirelessly for remote operation. The main advantage over the existing robot is that it uses solar charging battery. At the transmitting end Zigbee device is used, control commands are sent to the receiver, to move the robot in all for directions, that is either backward, forward, left or right. Body movement is controlled by the two motors at the receiving end interfaced to the microcontroller. The main advantage of this robot is to sent the corresponding signal to the controller when a disastrous situation is detected. The advantage of the adequate range is provided by the Zigbee device application transmitter which acts as a remote controller, while its receiver end is fed to the microcontroller to drive the DC motors using a motor driver IC for necessary work. The project also has an wireless camera which is interfaced so that the person controlling it can view the operation. Apart from this, it also contains several sensors like the gas sensor for gas detection, temperature sensor to detect the temperature, human detection sensor or the PIR to detect the presence of humans, fire sensor for fire detection.*

Key Words: **Sensors, Lcd, MC, Zigbee**

1.INTRODUCTION

Robots are used commonly in many diverse fields. The advantages being its accuracy and toughness. The main drawback being in its reliability as it requires a power supplying unit , as the battery used for charging in the robots is carried by the human. The robotic System is powered by solar panel. Even though there is a system available for the automatic recharging of batteries with the solar panels, its not practically used in the robots which does another function. The solar robotic systems are often used for many years. One of the main idea of this project is the implementation of solar tracking mechanism (MPPT) Maximum power point tracking. MPPT varies the electrical operating point of the modules so that able to deliver maximum available power which is based on I/V sensors. However, when there is scarcity of sunlight, the batteries can not be recharged when depleted. Photovoltaic are used for the conversion of sunlight into electricity. Photovoltaic were initially used to power small and medium applications, that are powered by a single solar cell to grid homes powered by a photovoltaic array. The design consists of two separate battery units working alternately. Thus, one of the batteries receives the charge current from the PV system while the other provides energy required for robotic vehicle. The charger system is used here. It consists of DC to DC converter which is controlled by the micro-controller using a PWM signal applied to one of its terminals and supplies each battery according to a programmed algorithm. The switching system consists of two selectors with their function is connecting electrically the charge and discharge paths between the batteries, the charger module, and the load system. Solar-generated energy provides abundant and pollution free energy. Today increasing effciency of solar energy technology which is also a eco- friendly technology has given rise to use it in practical applications like powering personal devices.

2. BLOCK DIAGRAM REPRESENTATION

The block diagram mainly consists of

- Micro-controller
- Crystal oscillator
- LCD Module
- Motor Driver
- Zigbee
- Dc Motor

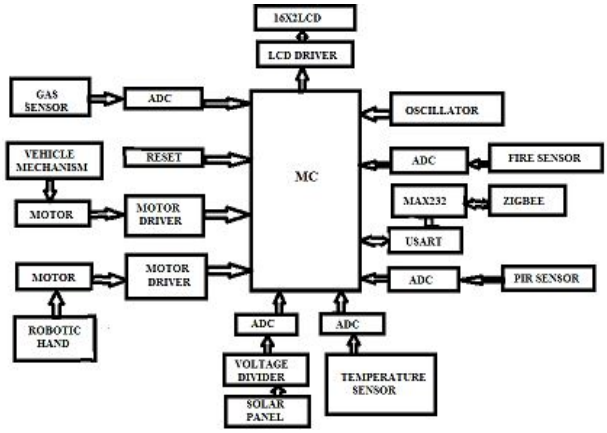

Fig -1: Block Diagram

Microcontroller is the heart of the project. Atmega32 belongs to Avr family. The circuit diagram mainly shows four sensors. The PIR sensor is represented by a combination of a switch and a resistor in series. LM35 works as temperature sensor. Gas sensor and ame sensor are represented by two potentiometers. Sensors are connected to port A of MC

3. OPERATION

The circuit diagram implements the Atmega32 for the controlling action. To enable movement of vehicle and rotation of camera three motors are used, in which two motors for the rotation of the rear wheels and one motor for the rotation of camera. The two motors used for vehicle movement are interfaced with microcontroller using an L293D IC and the motor for camera rotation is interfaced using another L293D IC. The input pins of L293D ICs are connected to port B of microcontroller. The circuit also consists of a virtual terminal. The PD0/RXD pin and PD1/TXD pin of microcontroller are respectively connected to RXD and TXD pins of virtual terminal. Virtual terminal is a tool in Proteus, which is used to view data coming from serial port and also used to send the data to serial port. The information sensed by the vehicle is displayed in a 16*2 alphanumeric LCD. Eight data lines of LCD are connected to eight pins of port C of microcontroller.

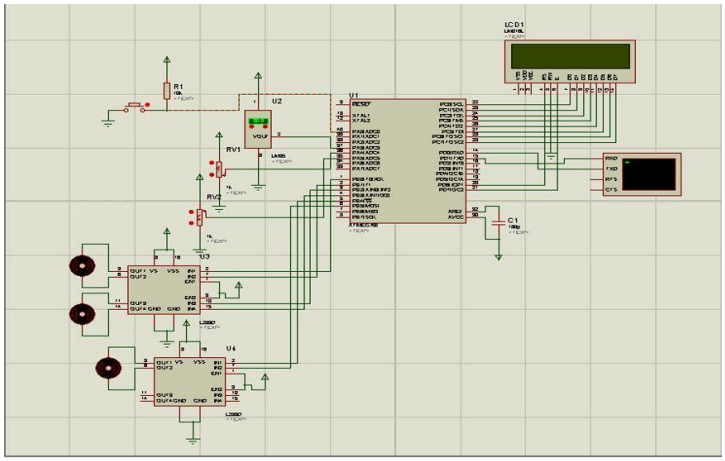

Fig -2: Circuit diagram of the proposed prototype.

The working of PIR sensor is shown by pressing the switch connected in series to the resistor ON, which represents the presence of a human body. The LCD will display letter Y corresponding to letter P which indicates the presence of human body. If the switch is in OFF position then letter N will be displayed. Similarly by varying the potentiometers which represents other sensors, the corresponding values will be shown in LCD. The microcontroller is programmed such that inputting the letter w in virtual terminal results in rotation of two motors used for movement of rear wheels in clockwise direction, so that vehicle can move in forward direction. Inputting letter s results in rotation of wheels in anticlockwise direction so that vehicle can move in reverse direction. Inputting letter a results in the rotation of motor used for left wheel in anticlockwise rotation and other motor in clockwise rotation, so the vehicle can turn left. Inputting letter d results in the clockwise rotation of motor used for left wheel and anticlockwise rotation of motor used for right wheel, which enables motor to turn left. Similarly inputting the letter c will result in clockwise rotation of motor used for camera and inputting the letter v will result in anticlockwise rotation

4. EXPERIMENTAL SETUPS AND RESULT

The figure shows the experimental setup of the Solar Powered Rescue Robot. It consists of Atmega32, Passive Infrared sensor, Gas Sensor, Temperature Sensor, Fire sensor, camera, DC motor, Zigbee , Solar Panel.

Solar powered robotic vehicle is designed to operate in all four directions mainly forward,backward,left and right. The robotic vehicle is wirelessly controlled for remote operation by using a wireless language called Zigbee. Remote operation is achieved by any computer. An interfacing wireless camera is used so that the person controlling it can view the operation. Apart from this, different sensors are used such as gas sensor for gas detection, fire sensor to detect fire, temperature sensor to detect temperature and human detection sensor to detect the presence of humans.

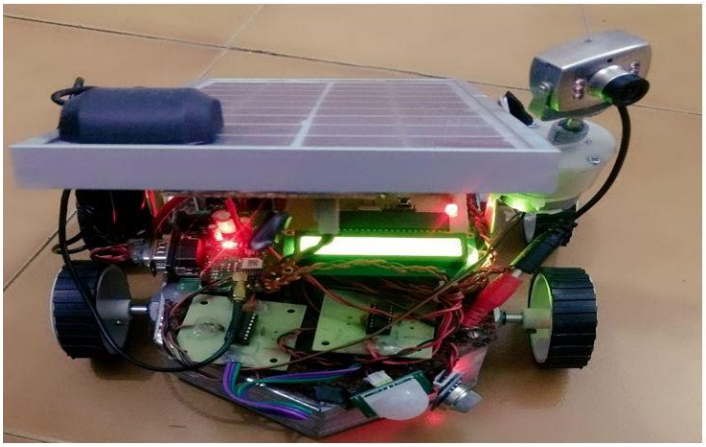

Fig -3: Experimental Setup of Proposed prototype

Liquid Crystal Dislpay is a flat panel or visual panel that uses the light modulating properties of the crystal. The Liquid Crystal Display is used to display the state of sensors and the results are transmitted is shown below.

The passive infrared sensors are used to detect the presence of human body in motion. They work entirely by detecting the energy given by other objects. PIR sensors don't detect

or measure "heat", instead they detect the infrared radiation emitted from an object. LCD display Y corresponding to P which indicates the presence of human body. In the absence of a human body LCD will display N.Gas Sensor which identify the toxic gases and here the LCD display Alert corresponding to G which indicates the presence of toxic or combustible gases. An IR based flame sensor detects and respond to the presence of a flame or fire.The LCD displaying Alert corresponding to F which indicates the presence of the flame. LCD will display Safe otherwise. LM35 temperature sensor is used to detect temperature .The LCD displaying temperature of surrounding air corresponding to T . The robotic system is powered by solar panel. The charger system is used here. It consists of DC to DC converter which is controlled by the micro-controller using a PWM signal applied to one of its terminals and supplies each battery according to a programmed algorithm. The robotic vehicle is wirelessly controlled for remote operation. At the transmitting end using Zigbee device, commands are sent to the receiver to control the movement of the robot either to move forward, backward and left or right etc. At the receiving end two motors are interfaced to the microcontroller for the body movement. The Zigbee application device transmitter acts as a remote control that has the advantage of adequate range, while the receiver end Zigbee device is fed to the microcontroller to drive DC motors via motor driver IC for necessary work.

5. CONCLUSIONS

The main theme of the work is making a self-sustainable human-independent robotic system with the following ideas; create a Robot that can work on some projects without any human help and use a renewable power source as main energy supplier. Combining these two concepts, very powerful robotic systems could be assembled contributing to the whole aspect of the life in future.

6. REFERENCES

[1] Bishnu Prasad Gautam, Katsumi Wasaki and Narayan Sharma, \Robotics in remote and hostile environments", IEEE TransEnergy Conversion , 2002;17:16.

[2] Gao Junyaol, \Comparison of photovoltaic array maximum power point tracking techniques", IEEE TransInd Appl , 1998;34:82231.

[3] Kimberly Shillcutt, \Robots for environmental monitoring", 1998 IEEE re-gion 10 international conference on global connectivity in energy, com-puter, communication and control(TENCON'98), 1998.p.41013.

[4] A. T. I. Fayeez, V. R. Gannapathy, \Actuation and power electronics options for apping-wing robotic insects",IEEE Transactions on Power Electron-ics,Vol 11, No 2, March 1996.

[5] Pallavia A. Malwade, \Optimal Eciency Control of an Induction Motor Drive", IEEE Transactions on Energy Conversion,Vol. EC-2, No. 1, March 1987.

[6] Yogesh V. Bangalkarl, \Real time implementation of DTC based on Sliding Mode Speed Controller of an Induction Motor", 16th international conference on Sciences and Techniques of Automatic control & computer engineer-ing, STA'2015, Monastir, Tunisia, December 21-23, 2015.

[7] Giorgio Bartoln & Alessandro Pisano, \Output-feedback control of container cranes: a comparative analysis", 41st IEEE Conference an Decision and Control , Las Vegas, Nevada USA, December 2002..

[8] A.B.Nanda & Niti Rani, \Performance Improvement of a SRM drive with Sliding Mode Controller", APEC 2001. 2016 International Conference on Circuit, Power and Computing Technologies

[9]] Ned Mohan, Undeland and Robbin, Power Electronics: converters, Appli-cation and design John Wiley and sons.Inc, Newyork, 1995.