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ARM Based Solar Powered Robot With Live Video Streaming And Monitoring System With Android Device

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Abstract

Shortage of non-renewable fuel in the future is an upcoming global issue; therefore renewable energy such as solar energy has gradually replaced non-renewable energy. However, the output power provided via the photovoltaic conversion process depends on solar irradiation. The objective of this project is to design and develop an ARM based Robot which is capable to track maximum light intensity. The efficiency of the solar energy conversion can be optimized by receiving maximum light on the solar panel. The main components of the robot consist of microcontroller namely ARM7LPC2148, PIC16F877A microcontroller motors , RF Tx and RF Rx the PC with mat lab for speech identification. This robot is programmed to detect sunlight by using Light Dependent Resistors (LDR). Stepper motor aligns the solar panel to receive maximum light. Two modified DC motors will move the robot back to the original position once the robot is out of position. The robot is programmed using MPLAB. When ever there is shade or solar obstacle the user can give the speech command and get it moved to a place where it can get charged for better battery efficiency.

In this project we are controlling the robot using the speech processing using the PC . The user can speak into the mic of the PC and this is accordingly. While the solar does its job of tracking using the sensors . Thus the project becomes more efficient and easy to operate and install.

Keywords; *Lead acid, buck-boost,robotic vehicle, android device, solar tracker, photovoltaic.*

I. Introduction

THE term Robot is defined an electro-mechanical machine which was guided by an electronic circuit. It can be autonomous, semi -autonomous or remotely controlled. The branch of technology that deals with robot is called Robotics. In earlier days, batteries were used to provide power to the robotic system. But, the batteries when depleted could not be recharged, thus affecting the performance of the autonomous robotic system. To overcome this The solar powered robotic systems are often used for many years. However, when there is scarcity of sunlight the batteries in line could not be recharged when depleted. So, rechargeable batteries came into account for the first time in the mars exploration rover.

Today, the declining cost and increasing efficiency of solar energy technology has given rise to practical applications on earth from powering personal devices to provide utility-scale power. Solar energy provides a huge advantage for satellites because the addition of fuel supply for satellites can be avoided while launching them into orbit. But the advantages on earth are even greater: solar-generated energy provides abundant and pollution-free energy that's not dependent on fuel-delivery antecedent, foreign relations or the price machinations of energy brokers and large firm. Moreover, solar power generation provides energy when and where we need it, and is highly scalable to match the electrical demand. Since solar cells are reliable and easy to maintain.

In 1997 Gadevadikar.J developed "microprocessor based solar tracking system using stepper motor"[1]. In this system the microprocessor is being used to control the tracking system by interfaced with other components. The advantage using microprocessor is that many functions can be added on to it by adding extra components to implement the program memory, RAM, ROM, input and output Ports and ADC, this will cause high cost of the project.

In 2006 Jong kiung kiet (2006) invented "miniature solar tracker, "university Tun Hussien in Malasiya, this solar tracker was microcontroller based and single-axis tracking system using DC motor. The single axis tracking system spins on their axis to track the sun[2]. This project does not have an intelligent feedback to control the position of the solar tracker then it cannot track maximum sunlight.

Dr.shaik Meeravalli invented automatic solar tracker' Robot[3] electronics and communication department RRs college of engineering and technology Muthangi which is capable to track maximum light intensity was designed and developed And the base of the robot moves in all directions.

VANTER—Spanish acronym for autonomous unmanned exploration vehicle specialized in recognition—is a robotic exploration vehicle developed by Tomas de Jesus Mateo Sanguino & Justo E. Gonzalez Ramos at the University of Huelva, Huelva, Spain. The interest of this robotic system lies in the design concept, based on a smart host microcontroller. On this basis, our proposal makes a twofold significant contribution. On the one hand, it presents the construction of a solar tracking mechanism aimed at increasing the rover's power regardless of its mobility. On the other hand, it proposes an alternative design of power system performance based on a pack of two batteries. The aim is completing the process of charging a battery independently while the other battery provides all the energy consumed by the robotic vehicle. As a disadvantage, the robot can only be used when the battery is fully charged and must remain idle during the recharging process.

The objective of this project is to design and develop an automatic Solar Tracker Robot (STR) which is capable to

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track maximum light intensity. The efficiency of the solar energy conversion can be optimized by receiving maximum light on the solar panel. The main components of the robot consist of microcontrollers namely ARM 7, PIC16F877A, servo motors, cell phone with GPRS and the PC with Matlab for speech identification. This Robot is programmed to detect sunlight by using Light Dependent Resistors (LDR). Servo motor aligns the solar panel to receive maximum light. Two modified DC servo motors will move the robot back to the original position once the robot is out of position. The robot is programmed using MPLAB. Whenever there is shade or solar obstacle the user can give the speech command and get it moved to a place where it can get charged for better battery efficiency.

In this project we are controlling the robot using the speech processing using the PC. The user can speak into the MIC of the PC and this is then processed and sends to the robot using the RF TX. At the other end the RF RX will get the data and then will drive the robot accordingly. While the solar does its job of tracking using the sensors. Thus the project becomes more efficient and easy to operate and install. The user can also view the live video on to the PC from the cell. The cell will have the android application which the user has to execute and then keep the cell on the robot and the video sent will be received in the PC for this the user has to stop the MatLab program and then execute the video application and thus can get to know the status through the video. When ever there is shade or solar obstacle the user can give the speech command and get it moved to a place where it can get charged for better battery efficiency.

II. Implementation Of The System

The implementation of the system is divided into two parts, the first part is controlling the robot using speech commands and second part is the video streaming from the android device which is kept on the robot robot to view the live videos at server side by using the GPRS. Block diagram is shown below fig 1.1 and fig 1.2.

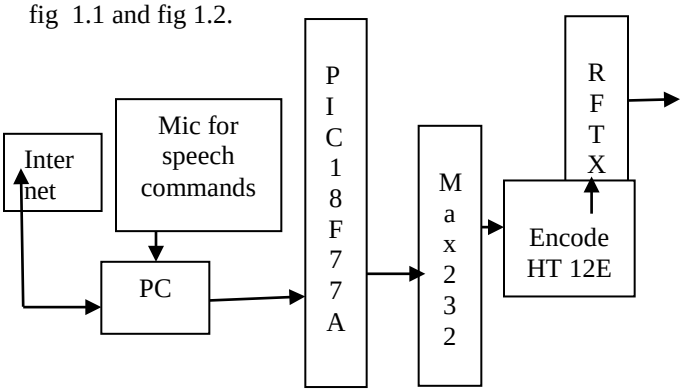

Fig 1.1 controlling Robot with speech commands at server side

In the fig shown above we are giving the commands to the robot through speech to the PC having Mat Lab coding .speech recognition By the process of the MFCC that is Mel frequency ceptral coefficient and vector quantization. The speech is converted into text format and it is processed by the RF Tx and at the receiver side the speech signal is received and accordingly the robot moves that is shown in fig1.2.In the figure as shown the LDR are used to align the solar panel in the to the direction where the sunlight intensity is maximum the resistance value varies from 100 ohm to 1k ohm. The stepper motor align the solar panel to 45 degrees. And Relays are used to control the robot in the specified direction. The live videos is possible by the android application that is developed on the android mobile kept on the robot. To receive the video at the sever side JAVA application is developed. Server sends the IP address to the client through this the live video streaming is possible. Flow chart for the live video streaming is shown in fig 1.3

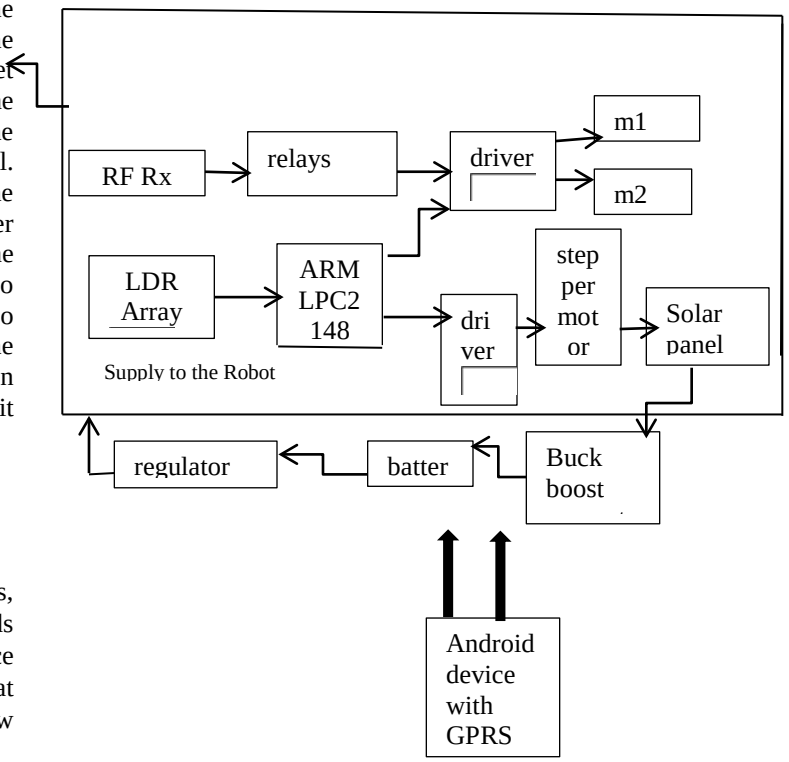

Fig 1.2 live video streaming from android device to the server

In the android application is executed and the device is kept on the robot on the other hand JAVA application is run on the server side. And is executed first the client requests to the server for the IP address if it finds the correct IP then the live videos are sent to the server as shown below.

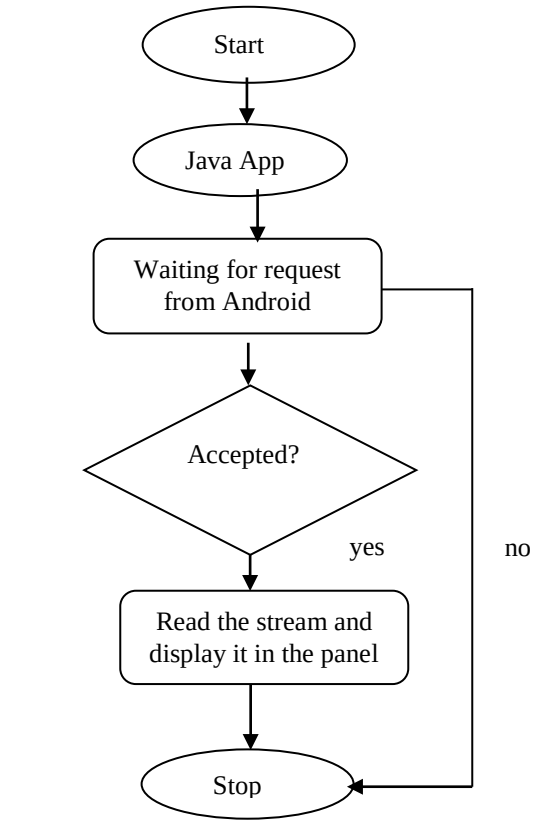

Fig 1.3 JAVA application at PC side

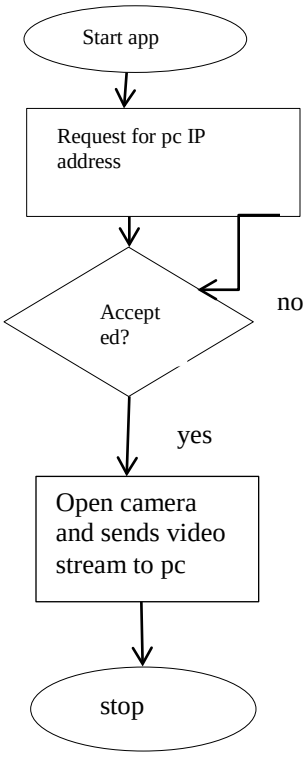

Fig 1.4 video streaming at Mobile side side.

So when the android device finds the IP address of the PC then it will send live videos to the server. By socket programming that is it will send the live video to the PC in sockets through. So GPRS connection should be at the client side and internet connection should be their at server side to send and to receive videos.

III CONCLUSION

Here we designed and developed a Solar Tracker system for the Vehicles which can make the maximum use of the solar and control the vehicle using speech commands to make the whole system more user friendly and understand the solar panel working and to design the necessary interface for the robot to read the data from the sensor and control the solar panel using the stepper motor. The same micro controller also has to be used to control the robot taking the command from the PC using the wireless technology.

REFERENCES

[1] Gadevadikar.J "miniature solar tracker, "university tun hussien in malasiya,
[2] Jong kiung kiet (2006) invented "miniature solar tracker, "university Tun Hussien in Malasiya.
[3] Dr.shaik Meeravalli "automatic solar tracker' Dept. of electronics and communication department RRs college of engineering and technology Muthangi
[4] Tomas de Jesus Mateo Sanguino & Justo E. Gonzalez Ramos "VENTER"at the University of Huelva, Huelva, Spain.
[5] D. L. Shirley, "Mars pathfinder microrover flight experiment—A paradigm for very low-cost spacecraft," *Acta Astronaut.*, vol. 35, pp. 355– 365, 1995.
Books:
[6] Android application and development-Wei Meng Lee

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