# Pick and place of Robotic Vehicle by using an Arm based Solar tracking system

S. Senthilkumar1, L. Ramachandran[2], R. S. Aarthi[3]
[1,2,3]Assistant Professor, Department of ECE, EGS Pillay Engg. College, Nagapattinam.

***Abstract*—***Robots have become important over a wide range of applications--from manufacturing, to surgery, to the handling of hazardous materials. This paper will address one of those problems: positional control. The wireless communication technologies enabled for controlling and monitoring the robot. This paper discusses a protocol which intimates the information if any object is available in front of robotic vehicle using IR sensor which is placed in pick and place robot. This robot system is attached with robotic vehicle powered by using solar tracking system on the top of same vehicle. This paper discusses solar tracking system and controlling robotic mechanism which is mainly controlled by using authorized person with the help of pc or laptop. Arm processor senses the sun light intensity from two different direction using.*

***Keywords— Pick and Place Robot, Sensors, Solar tracking System, wireless Communication Protocol.***

## I. INTRODUCTION

A tracking system must be able to follow the sun with a certain degree of accuracy, return the collector to its original position at the end of the day and also track during periods of cloud over. Sun tracker which works efficiently in all weather conditions regardless of the presence of clouds furlong period and also to investigate the effect of using two-axis sun tracking systems on the electrical generation of a flat photovoltaic system (FPVS).

In this paper, solar tracking system has solar panel for operate a pick and place robotic application using Arm 7 processor to speed up of system performance. Automatic solar tracker is performed by using two LDR's which are placed on top and opposite of solar panel .Microcontroller senses the sun light intensity at every sun falling time and it goes to that corresponding values from LDR to ADC circuit As solar tracking system, an robotic application is performed in a same amount of power which got from solar panel [3-6].

The pick and place robot is a microcontroller based mechatronic system that detects the object, picks that object from source location and places at desired location. For detection of object, infrared sensors are used which detect presence of object as the transmitter to receiver path for infrared sensor is interrupted by placed object. Robot picks it with end effectors, and moves along way gantry and finally place it on destination [2]. If another object causes interrupt, it again does the same job. Whole process is controlled by Arm 7 processor. This pick and place robot is placed in vehicle which is controlled by authorized person.

IEEE 802.15.4 standards support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between devices. The modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other.

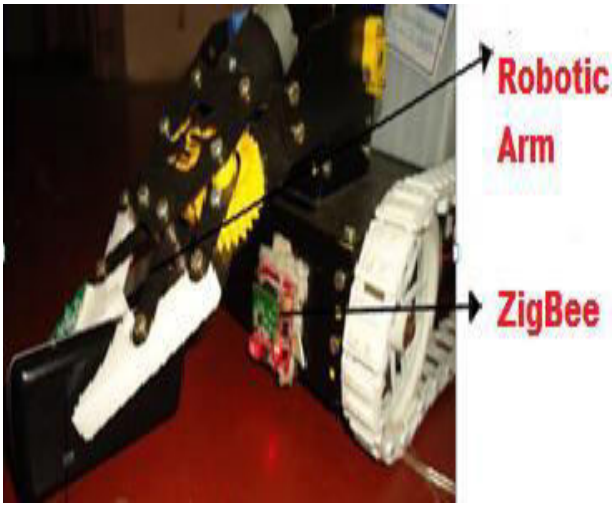


***Fig 1.*** *Pick and Place Robot*

In figure 1, A Basic robotic vehicle for pick and place any object is represented. Infrared sensor used for sensing the object for communication systems .It gives the signal to the input of Analog to Digital converter circuit for digital value of measurement. It is powered by using ST system.

Photo detector is having its output high, since receiver of sensor can receive photons from transmitter as no object I in its path to interrupt. This signal is sent to the microcontroller which is burnt with program which tells what operation is to be performed at this stage. For understanding operation, Let the name of gantry motor be M1 and that for end effecter motor is M2. Now as

microcontroller detects that object is placed, it moves motor M1 in say clockwise direction for a fixed time due to which whole arm moves towards picking platform.

It is recommended that an intersection of pick and place robot mechanism system be implemented as part of vehicle robotic system. Thus IR sensors are used with robot. Zigbee is used for communication purpose and transmit the controlling info or Command for the movement of pick and place robotic application derived by authorized person.

## II. EXISTING SYSTEM OUTLINE

ST System: The system consists of two axis sun tracking system on wheels comprises of 9v, 440mA simple solar panel and The two LDR sensors are placed on two sides of the panels in the twice direction north east west and south. This set up acts like sensor module [5]. The LDR sensors are connected to the comparator circuit which is controlled by comparator driver IC LM324 and to 8051 microcontroller.

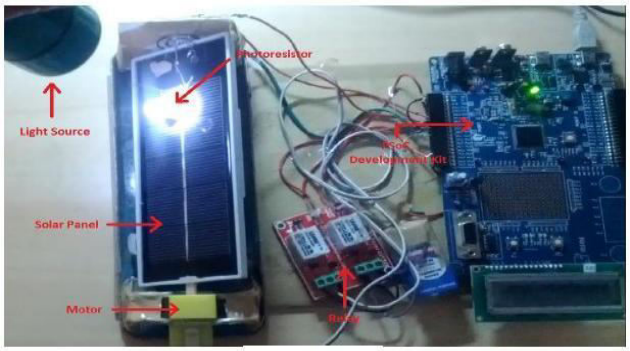


***Fig. 2*** *Two axis ST system*

In figure 2, two axis ST systems is represented for getting Maximum power from sun that is stored on Dc battery. Robot Mechanism: The robot has two-fingered arm to pick and place the objects. The robot is controlled using Zigbee protocol. The Battery status will be continuously measured and sent back to the monitoring unit through Zigbee. The monitoring section consist a PC with Zigbee transceiver, VB based user interface used to control the unmanned exploration vehicle [9]. Since we are using solar-based system, power consumption is reduced. It's movement for pick and place object is controlled by sending the command .

## III. PROPOSED SYSTEM OUTLINE

The system consists of two sensor named as LDR and IR sensor. LDR Sensor is mainly applicable for solar tracking system which senses the light intensity from sun. For this system, robotic vehicle model is represented. Robotic vehicle consist of pick and place robot with ST system.IR sensor is mainly applicable for detection of object in front side of pick and place robot that movement is fully controlled by authorized person.

### 3.1 Solar Tracking System

A solar panel is a collection of solar cells. Although each solar cell provides a relatively small amount of power, many solar cells spread over a large area can provide enough power to be useful. Photo Credit: Rooftop PV modules/DOE. Solar cells produce direct current electricity from sun light which can be used to power equipment or to recharge a battery.

In this way we can ensure that a required power is always maintained for performing pick and place robot with IR sensor to detect any proximity to the object sensor will give a pulse to the Arm 7. The microcontroller will turn on the buzzer which will alert the user to operate pick object ant it will place on the destination.

### 3.2 Pick and Place Robot System

Here a DC motor based BUGGY is used. The µC will increase and reduce DC speed control via Pulse width modulation. User sends command through Zig-bee to operate the movement of pick and place robot. This system is fully powered or performed by using solar tracking system which is controlled by user.

### 3.3 Intercommunication System

Here we are designing a system in which two LDR's resistance value is compared by the controller Arm 7.Based on higher value of LDR solar panel will track on that side. For example ,LDR 1 is greater than LDR2,then the system will track on to the side of greater value of LDR.This comparison process is performed continuously by Arm 7 processor .So it will keep the solar tracking system on Running state to get the maximum power from sun.

LDR sensor: LDR sensors (Light Dependent Resistor) sense light intensity range or value is mainly used for solar tracking system .this output signal or resistance value is very important in this paper. Different LDR's have different specifications, however some of the LDR's have fairly standard resistance of 1 MOhm in darkness, and a resistance of a couple of kOhm in bright light (10-20kOhm @ 10 lux, 2-4kOhm @ 100 lux).Uses for Light Dependent Resistors Light dependent resistors are a vital component in any electric circuit which is to be turned on and off automatically according to the level of ambient light. Fig no.3 shows the construction of LDR sensor.

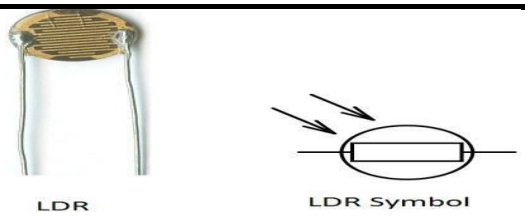


***Fig 3.*** *Construction of LDR sensor*

Here two LDR sensors are used which placed on top and opposite of the solar panel. This sensors output is fed to the ADC circuit that detects the digital value for comparison of two LDR's value.

When the light is fell in LDR sensor it sense the corresponding resistance value that is displayed in LCD display .From that comparison value of two LDR sensor Arm 7 lpc2148 is easily identify which direction has to move. This processor sends the command to move either leftward or rightward based on the comparator output to dc geared motor driver module. In this way it can be automatically tracked by using motor.

IR sensor works on object's Effect. It consists of a LED transmitter and a receiver. The transmitter transmits the signal in one direction. This transmitted signal is then reflected back by the obstacle and received by the receiver. So the total time taken by the signal to get transmitted and to received back will be used to calculate the distance between the Infra Red sensor and the object. In fig no.4 describes the principle of IR sensor.

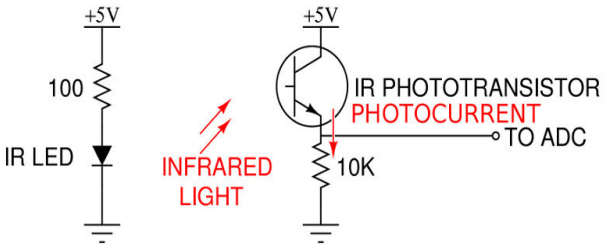


***Fig 4****. Principle of IR sensor*

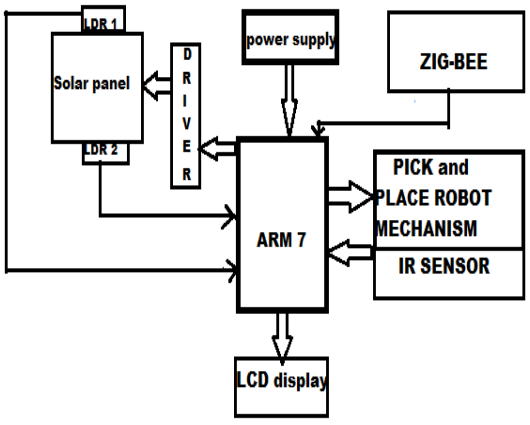


***Fig 5****. System structure*

In figure4: Infrared light between IR LED and IR phototransistor is represented. Infrared sensor used for sensing the object for communication systems .It gives the signal to the input of Analog to Digital converter circuit. Initially we will assume the rest position of entire system, i.e. state when no object is placed. At this stage, photo detector is having its output high, since receiver of sensor can receive photons from transmitter as no object.

Buzzer: Buzzer is used in a system to indicate or to grab the emergency attention occurred. Buzzer act as a panic horn which indicates the need of instant attention as in the condition goes haywire.

DC motor: DC motors are used to physically drive the application as per the requirement provided in software. The dc motor works on 12v. To drive a dc motor, we need a dc driver called L293D. The dc motor driver is capable of driving two dc motors at a time. In order to protect the dc motor while from a back EMF generated by the dc motor while changing the direction of rotation, the dc motor driver have an internal protection suit.

## IV. SYSTEM STRUCTURE

The hardware of the system is shown in fig 6. The main components are described as below. Liquid Crystal Display: LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and two rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD. LCD can also used to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem. LCD is flat panel display, electronic visual display, or video display that uses light modulating properties of liquid crystals. Liquid crystals do not emit light directly.

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays. They are common in consumer devises such as video players, gaming devices, clocks, watches, calculators, and television and have replaced cathode ray tube (CRT) displays in most applications. They are available in a wide range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn in. LCD is more energy efficient and can be disposed of more safely than a CRT.

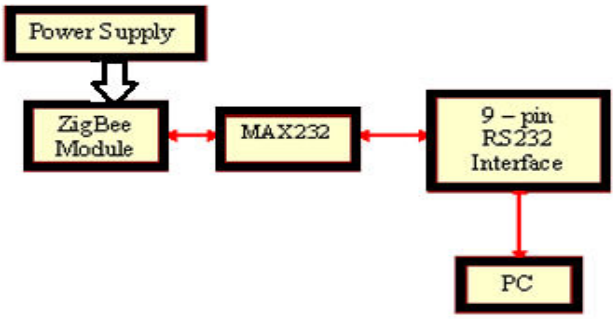


***Fig. 6** Control system*

ZigBee: ZigBee is a specification for suit of high level communication protocols using small low power digital communication module require as the Radios based on IEEE802 standard for personal are networks. ZigBee devices mainly used in mesh network form to transmit data over longer distances, passing distanc through intermediate devices to reach more distance ones ZigBee is used in the applications that require low data rate long battery life, and secure networking. ZigBee has defined rate of 250 kbit/s, suited for periodic data or singl signal transmission from a sensor to the input device Applications include traffic management system, and othe consumer and industrial equipment that require short rang wireless transfer data at relatively low rates.

## V. ARM 7 PROCESSOR

LPC 2148 is a microcontroller with an internal ARM processor. In this project it gets signals from the light dependent resistors and is used to drive a geared motor to get maximum intensity of light. For this, the microcontroller uses PWMTCR, PWMTC, PWMPR, PWMPC, PWMMR0, PWMMCR, and PWMPCR register to control the direction of the solar panel using pulse width modulation. Zig-Bee operates in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe; 915 MHz in USA and Australia, 2.4 GHz in most jurisdictions worldwide. The zig-bee network supports both star and tree typical networks, and generic mesh networks.

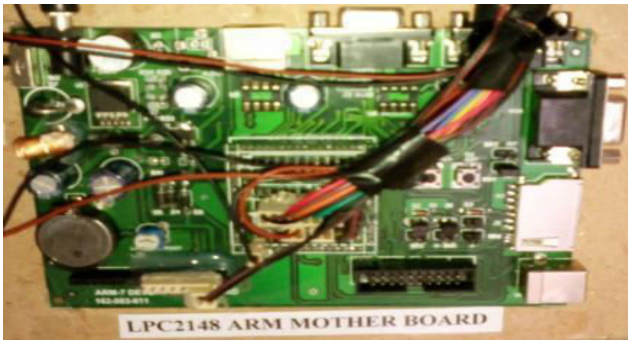


***Fig7** . lpc2148 Arm mother board*

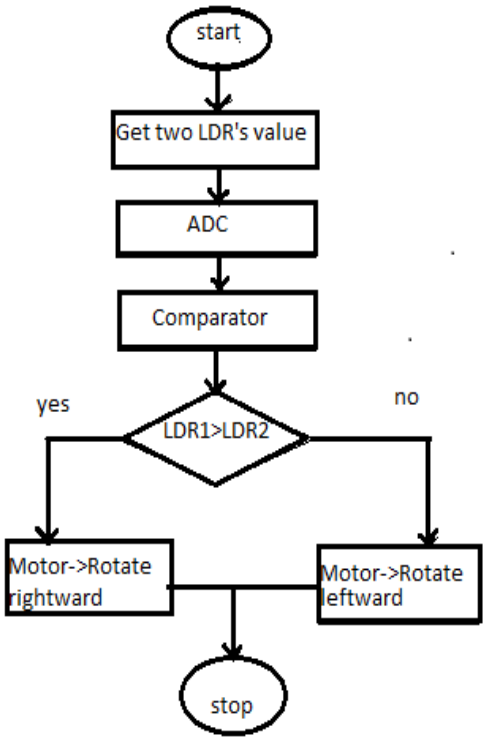


***Fig 8**. Operational flow of the ST system*

## VI. OPERATIONAL FLOW

The system operational flow is depicted as fig 7. The ARM7 processor read sensing output from ADC circuit, then it is given to the comparator circuit .ADC's output and find the solution for some basic condition for comparison. Processor sends the command to the DC motor driver for rotating the solar panel that is operated with DC motor to get the maximum power from for solar tracking system. Here ARM 7 processor takes effort for operating two systems are Solar Tracking System and also Pick and Place Robotic mechanism which are attached in the robotic vehicle that is controlled manually and automatically with the help of wireless communication module Zig-Bee. Power is stored into the chargeable DC battery for using during the bad weather condition. This project design is mainly used to increase the endurance of robotic application.

## VII. OVERALL SYSTEM ON VEHICLE

The wireless communication technologies are rapidly spreading many new areas, including the automation and the importance of the use of wireless technologies in the data acquisition, building control, monitoring systems and automation of manufacturing processes will grow.. Robots are also useful to do jobs in areas and in situations that

are hazardous for human. Here whole systems will be controlled by using ARM 7 microcontroller.

Robotic vehicle consist of Solar Tracking System and Pick and Place Robotic mechanism. The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32- bit code execution at maximum clock rate. For critical code size applications, the alternative 16- bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46

GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of- sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general- purpose applications. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

***Fig 9****. Two systems on robotic vehicle*

In Figure 8, solar tracking system and pick and place robot on a single robotic vehicle which is controlled by authorized person with Arm 7 processor.

## VIII. CONCLUTION AND FUTURE ENHANCEMENT

Thus, we have discussed PC operated Zigbee based pick and place robot controlled by authorized person which could be able to pick and place an object in industrial area using advanced wireless technology zigbee. This system will have a proportionate increase in the level of getting maximum power that limits the sources of energy. Instead of IR sensor will use camera for viewing object and web server concept will be used for controlling this overall system from anywhere and everywhere in the world.

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