

AN IOT BASED ROBOT FOR OBJECT TRANSFER

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Abstract :Robotics have become an important part in developing world and here the robot is used inside a warehouse. The task of the robot is transiting the object inside warehouse or in a given environment. It mainly includes three process grabbing, transporting and stationing. The object is recognized depending on the Radio frequency identification [RFID] tag placed on each object and based on the information in the tag they are categorized and have different destination point and here there are three destination point based on the tag information. The locomotion of the robot for performing the task is on the base of a line follower robot. The performance of the robot in warehouse or the current status of warehouse can be analyzed using Internet of thing [IOT] through an application. Here box is considered as the object and the analyzed data contain information about the number of boxes collected at each destination point and the number of boxes left at the initial point.

IndexTerms - Radio frequency identification [RFID] tag, Internet of things [IOT], Infrared [IR] sensor .

I. INTRODUCTION

Robotics is one which have been developed many years ago and after that many researchers and development has now being done on it. They are advanced in algorithms, sensors and automation technology that stand to support nearly in every aspects of modern human life. Mostly they have been adapted in industry to assist human, but nowadays it is used for lot of purposes. Even though robots are made with high precision and accuracy there are lot of limitations at the same time. By using robots in manufactory or warehouse we were able to reduce the human error to zero and increasing the production rate to an extend which was not possible to achieve by human labour and they are also used in places were humans have a high chance of getting injured such as highly temperature manufactory area etc. The main reason for developing automated system is to condense the manpower and also to reduce the time duration required to perform the task. It incorporate both hardware and software part.

Internet of thing [IOT] is one which relate or connect any data with internet. i.e. it is the expansion of internet connecting physical devices or any objects in environment with internet. It is mainly used for remotely monitoring data and also for controlling. when internet of thing is implemented in industrial space it is called industrial IOT and in industry the IOT is mainly used for real time monitoring.

The paper discuss about the details and the functions of the robot for transiting an object inside a warehouse. The task of the robot is to grasp, transport and place the box. The robot pick the box from initial stage and it can transport three box together to the destination point. Each box consist of an RFID tag and the tag contain information about the different color. The boxes with same color have one destination point and another have another destination point and depending on the color there are three destination points. Using IOT the current status of the warehouse is analyzed i.e it shows the information about the number of boxes collected at each destination point and the number of boxes left at the initial point for transportation.

The rest of the paper includes literature survey, block diagram of the system, hardware description, software description ,result and conclusion.

II.LITERATURE SURVEY

There are different methods for grasping and transporting the object. In some papers the author have described about the line follower robot to track the path for the movement of the robot and the another method used for tracking the path is by image processing using camera. By the use of camera for tracking the path there is chance of getting blur image and hence the further process cannot be proceed, and this will affect the working of the system. The identification of object is also explained with different methods and the devices which are mainly used for identifications process are radio frequency identification [RFID], barcode and color sensor. The use of color sensor for identification of object is more difficult as compared to other methods. By the use of color sensor it is difficult to distinguish and detect the color from the environment. The use of barcode for identification process is very costly as compared to other methods and it is difficult to scan the barcode because the barcode scanner required a direct sight with the barcode to scan or to read the code. Only by reading the barcode the object can be identified and rest of process can be carried out. The use of RFID tag is the simple and easy method for identification of object. It does not need direct sight between the reader and the tag for reading the information and hence it is easy to use and it is more accurate than other methods [1] [2] [3] [4].

III. PROPOSED SYSTEM

The block diagram of the proposed system is shown below.The aim of the system is to transiting the box from initial place to the destination point using a robot. The initial points and destination points are fixed, there are three destination points

based on the information on RFID tag and one initial point. The robot will automatically grasp the box from initial stage and will drop it at different destination based on the information in the RFID tag. For grasping and dropping the box the path is tracked by robot using infrared IR sensor pairs i.e it act as a line follower. The robot identify or recognize the box by use of RFID tag and the RFID tag is placed on each box and the RFID module is placed on the robot. . On each box an RFID tag is placed and the tag number indicate the different color and based on color there are three destination point. The boxes with same color have same number on the tag. Here mainly three colors are used red, blue and green. The boxes with same color have one destination point and other have another destination point. A single arm is used for grasping the box. The robot can carry three boxes at a time in a box holder which is placed on the robot. The holder have fixed place for the boxes, the box with same color have one fixed place. To remotely monitor the status of warehouse an application and Internet of thing [IOT] is used. IOT is used to connect the data i.e. the number of boxes collected at the three destination and at initial stage with the internet. The status include the information about the number of boxes collected at three destination point and the number of boxes left at the initial stage for the transportation and its corresponding date and time. Three IR pairs are used for detecting the path and two for detecting the positions for the robot to stop at initial and destination point and one for detecting the obstacle. Motor driver IC is used for the rotation of motor for the movement. The robot consist of four wheel for the movement. Servo motors are used for grasping and placing the boxes and also for rotating the box holder .LCD is used to display the working status of the robot.

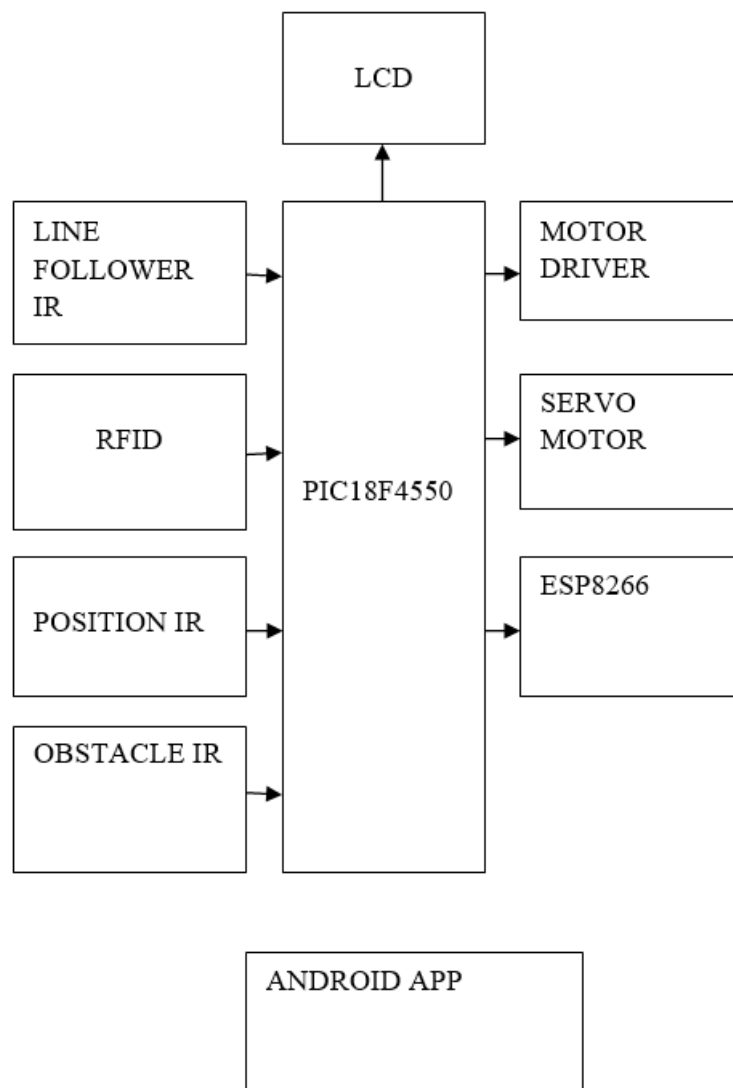


Figure 1: Block of proposed system

IV. HARDWARE DESCRIPTION

The hardware part of the system include microcontroller, motor driver IC, servo motor, IR pairs ,LCD, RFID module and ESP module.

4.1 Microcontroller

The controller is the core part of the system. To this controller all the devices are interfaced. Here PIC18F4550 is used as the microcontroller and it consists of five ports where port A and port E are the analog ports which can also be used as digital pins

and port B, port C and port D are the digital ports. To these ports the LCD, IR pairs, motor driver IC, and servo motors are connected. It also consist of a transmitter and receiver pin. The RFID module and ESP module is serially connected with the microcontroller. The transmitter pin of the RFID module is connected with the receiver pin of the microcontroller and transmitter pin of the microcontroller is given to the receiver pin of the ESP module.

4.2 Motor driver

The movement of the robot is done using four wheels. Motor driver IC is used to rotate the motor. A single IC can control or rotate two wheels both in clock wise and anti-clock wise direction. Here L293D motor driver IC is used. The motor driver IC consist of four input pin and four output pin. The input pins are connected with microcontroller and the two motors are connected across the output pins. Once the IR pair detect the path the controller give a digital value to the motor driver IC and hence it start to rotate and when IR detect any obstacle the motor will stop the movement.

4.3 Servo motor

The servo motor is used for grasping and placing the robot and also for the rotation of the box holder. The system uses six servo motor for various purposes. Four servo motors are used for grasping the box and it is placed on the arm portion at the base and at the leg portion and for rotating the arm for placing it in the box holder another servo motor is used. One servo motor is used to rotate the leg portion of the arm for reading the RFID tag which is placed on each box. These servo motors are connected to the port B and port D pins of the microcontroller. The controller will send PWM pulse to the servo motors.

4.4 Liquid crystal display [LCD]

The system consist of an LCD which is connected to the port D pin of the microcontroller. It is used to display the status of the robot. If the robot is working the word "FORWARD" is displayed and if the robot turn left the word "LEFT" and if it turn right the word "RIGHT" and if it stop working word "STOP" is displayed on LCD.

4.5 Infrared [IR] sensor

IR pairs are used to detect the path for the movement and they are placed at the front portion of the robot. Another pair of IR is used to identify the region where the robot want to stop for taking and placing the box .The IR pairs are connected to the port A and port B pins of the microcontroller.

4.6 RFID tag and module

The RFID tag is placed on each box, the tag consist of 12 digit number and the 10 character represent the tag ID and 2 character are the XOR of previous 10 character. The number on the tag represent the different color and based on the color the box have different destination point. Here three colors are considered red, blue and green. Here EM18 is used as the RFID Module and it is placed on the robot. The RFID module is connected to the port C pin of the microcontroller. The RFID module is serially connected with the micro controller. The transmitter pin of the RFID module is connected with the receiver pin of the controller. Once the module read the tag the number is get into the controller and based on the program the box color is identified.

4.7 ESP module

ESP module is a wireless module which can be used as an application of IOT. The module is serially with the controller .the transmitter pin of the micro controller is connected with the receiver pin of the ESP module.

V. SOFTWARE DESCRIPTION

Software used in the system are MP LAB IDE which is the platform used to write the program in embedded C and it is burned to the controller , Proteus is the drawing tool used to sketch the circuit diagram, Arduino software is used to write the program to the ESP module and the language used is embedded C and HTML. Embedded C is the language used burned to the controller and to ESP module both the embedded C and HTML is used.

VI. RESULTS AND DISCUSSION

The robot can carry three boxes at a time from initial stage to the three destination point. The time required to complete one round is 30 seconds. The movement of the robot is displayed on the LCD. Using IOT the number of boxes collected at three destination point and the boxes left at the initial point is analyzed through an application.

The system is used for the transiting the boxes inside a warehouse. Replacing the human by robot the labour cost and the errors occurred by the human can be reduced to an extend. The robot carry three box at a time and hence the delivery time can also be reduced

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