International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Special Issue 39 (KCCEMSR) (March 2016), PP. 91-93

AN RFID BASED WAREHOUSE ROBOT

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***Abstract*—RFID being a recent fashion in industry holds numerous applications including Restaurants, Warehouses, Healthcare and what not in its domain. The target of this project is to generate a Robot with Line following module and RFID technology integrated within. Servo motors and Infra-Red sensors administer its Movement and Line following. Tags on the Items are read by the robot and they are identified thus. Items are then picked up and placed at their required locations. The storing and retrieval of Data is done with the help of RFID tags and Transponders. For demo and analysis a small white platform with a black line to be followed will be used. Markets today are seeing RFID as a boon for tasks like livestock identification, automatic vehicle identification systems, library & warehouse maintenance etc. this paper aims at studying the outcomes and implementation of a line following module and RFID technology on a Robot for the task of warehouse management.**

***Keywords*— Line follower, PIC Microcontroller, Receivers, RFID tags, Servo motor, Transponders.**

I. INTRODUCTION

A. Outline

Collection of data is the core job of an RFID system. The use of tags and transponders in it help achieve the purpose of data storage and retrieval. Tags, Readers, Antenna and Software comprise the four salient parts of an RFID system. This grouping of a Robot and RFID will deliver a significant key to warehouse administration. Using this RFID robot the purpose of arranging and allocating goods in a warehouse will be served.

B. Scope

The following are the scopes of this RFID robot.

1. Controller board, motor driver and RFID for reader module are included in the circuit design.
2. Microcontroller programming achieves the software development of the Robot.
3. Identification of goods and their locations is done by RFID tags.

II. PLATFORM SETUP

A. Mobile Vehicle

The line tracking concept is experimented on mobile robot. The vehicle implements differential drive approach using DC motors, their speeds controlled by PIC Microcontroller.

B. Infra-Red Sensor

A reflective photoelectric sensor consisting of a standard infra-red LED and a photoelectric transistor has been fitted in the vehicle.. Infra-red sensor produces current at the output which is proportional to the amount of light it receives.

C. Software Setup

For the mobile vehicle to work ideally for line tracking in a smooth manner the software programming is a must. As for choosing the programming language a lot of options are available, but we prefer C for its universality. The controlling software for the testing has been developed using C sharp.

D. RFID

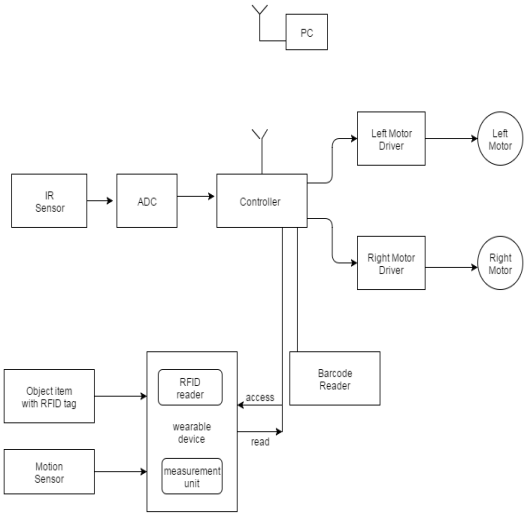
It's a system for storing and remotely retrieving data using wireless technology operating with 50 KHz to 2.5 GHz. It comprises of 3 basic elements: RFID tag, reader/writer and a host line of business system. Data encoded on the tag contains a variety of information about the object including item description through EPC.

III. METHODOLOGY

A. Hardware System Overview

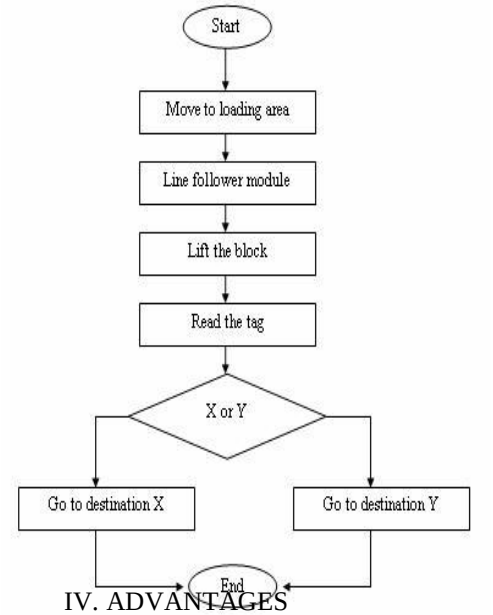
The skeleton of robot has been made from aluminum, driver motors and sensors. The IR sensors have been fitted at the bottom of front and sides of the robot for smooth tracking of line. It comprises of one MCU as the brain of the control system. A half-duplex communication

channel with RFID reader and two channels of output are held by this system. One channel of output is to motor driver for locomotion and other to indicator.



B. Simulation of RFID robot

For simulation of the function of the RFID robot, a small white platform is built with a black line on it for line tracking. The robot will move from a start point to the loading area while following the black line (based on the pre-loaded program). After which the acquisition of sample block and reading the Tags will then be performed. After the identification of the item is done, the robot will take the block to its terminus using the line follower module.



IV. ADVANTAGES

1. Achieves better inventory control.
2. Antenna supported for data scanning.
3. Has storage checking location.
4. Robots can work 24/7 so warehouse won't ever need to close.
5. Designed and programmed with a number of safety routines to protect themselves, products and people who work with them.
6. Usually smaller than forklifts, thus amount of storage space will be improved.

V. LIMITATIONS

1. The robot will show an error or need assistance if the label is unreadable or isn't at its place.
2. Products have to be clearly labeled so that the robots can deal with them.
3. In many case businesses have to actually build an entirely new high-tech warehouse to make use of these robots. That can be very expensive.

VI. CONCLUSION

A. Future scope

1. Add database to the host computer.
2. Develop a GUI for controlling the robot.
3. Implement GPS module into the RFID robot navigation system.
4. Robot can be extended using the GSM and ZIGBEE technologies.
5. We can investigate how tag density and height influence the navigation of the robot.
6. Smart control algorithms, fuzzy logic can be employed to optimize our algorithm.

The RFID robot could be configured to perform various applications. However in the prototyping stage the robot might not be able to accomplish all its tasks successfully. The application of this robot has a good potential not only in warehouse management but also in libraries, supermarkets, offices, buildings etc. this robot will manage goods automatically according to the database programmed in the robot. This will save cost and time. `

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