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Automatic Storage and Retrieval Robot Using Embedded System

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Abstract:- ***In industries the storage and retrieval of items is the main task. This is usually done by human which is a labor intensive task, is often repetitive and sometime results in breakage of items. The main aim of this paper is to build up an automatic storage and retrieval robot to perform the above task, which is a cost efficient and space saving. At the same time accuracy and speed for performing storage and retrieval is maintained. The main purpose of this project is to improve existing warehouse management system that occupies manpower, on paper data recording operation. The performance of the present system is enhanced by using embedded system.***

KEYWORDS: Microcontroller, Sensor, RFID, DC Motor, ASRS.

1.INTRODUCTION

The automatic storage and retrieval system are major material handling support system that are commonly used in automated factories, distribution centers, warehousing and non-manufacturing environment. The automatic storage and retrieval system is an important key part of the rapid market changes along with the consideration of limited space, high labor cost, requirement of flexibility, reliability, management control. Automatic storage and retrieval system is an integrated computer control, automated product transferring system consisting of the storage shelves system, the storage retrieval equipment and the input-output points. It requires the knowledge of mechanical, electrical, electronics and computer in its design. Generally in industries control and speed of production storage delivery system are done by classic human operator and consequently stocking and withdrawing management become more difficult along with this it consumes more time. Therefore, a fully automated storage and retrieval robot is implemented in order to find the solutions for
all this problems. It consists of special mechanism which is responsible for storing and withdrawing at predefined location by using RFID reader, PLC integration, shelving technologies etc.

By considering the above problems the aim of our project is to reduce the time consumption required for storing and withdrawing the object by embedded system and RFID combination.

The remainder of this paper is organized as follows: section II describes the literature survey; section III describes the proposed system; section IV illustrates the methodology; section V describes the result; section VI describes the application; section VII describes the conclusion.

2. LITERATURE SURVEY

Della Reasa Valiaveetil [1] et.al. proposed the automated library system which is the cost effective and space saving alternative to comman document shelving technologies. ALS is a turnkey design and software solution focused on reliability and maintainability.

Ashana joy [2] et.al. proposed an highly developed fully automatic storage and retrieval system. The performance of this system is enhanced by using PLC integration where it coordinates the operation and control of ASRS. ASRS is complex in design and fabrication which needs exclusive study of transmitting devices, power circuitry.

M.M. Rashid[4] et.al. proposed a new design of an automatic storage and retrieval system using wireless communication.
The experiment deals integrating both mechanical element and electrical knowledge. This research implemented ASRS by using simple mobile robot instead of using very expensive and complex structure based ASRS.

3.PROPOSED SYSTEM
BLOCK DIAGRAM

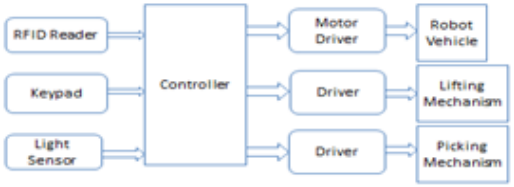

Fig1. Block diagram of automatic storage and retrieval robot

The basic block diagram of automated storage and retrieval robot is given in **figure**1. It consists of various blocks. In this block diagram first block is RFID reader which is used for scanning the card to define the rack location, second block is keypad which consist of two switches. One is used to define the storage and other is use to define retrieving. Light sensors consist of LASER and LDR which are used for detection of location of the rack by robot. LDR is placed on the robot and the LASER is placed on the rack. Microcontroller read the Command from RFID reader, keypad and light sensor and gives instruction to the motor driver. Two motor drivers is used to drive the motor for controlling the robot for horizontal movement. One motor driver is used for drive the motor for lifting mechanism i.e. vertical movement and one motor is used for sliding mechanism.

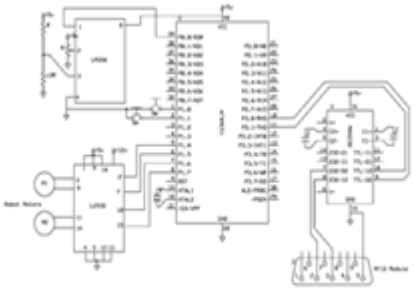

Fig2. Circuit Diagram

WORKING PRINCIPLE

Working of system is as follows:-

1. Location of initial position:

Initial position acts as home to the moving robot. Ones the robot moves to do the task given by the user, at the end of the task, the robot should be able to return to its home position.

2. Location of input/output area:

It is the rack where the stored items are handled by the robot. User put the items on that area and the robot will store the item in the rack. The area also been used for retrieving the item. Once the retrieval command is executed, the robot will take the object from storage location and put the object in that area.

3. Storage rack:

It is the location for the robot to neatly arrange the object into storage rack. It has four slots (2x2).

4. Movement of robot:

The robot must be able to move in horizontally and vertically. Separate motors will be used for different moving mechanism.

FLOWCHART

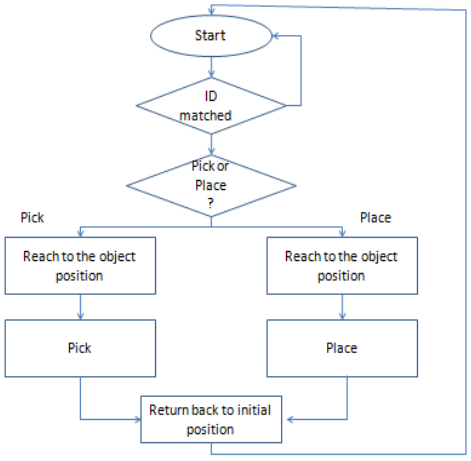

Fig3. Flowchart

TECHNICAL DETAILS

Technical Details of Components are as follows:

Microcontroller:-P89C51RD2 is an 80c51 microcontroller with 64kb flash and 1024 bytes data ram. The flash program memory supports both parallel programming and in serial in-system programming. Operating voltage is 5v and frequency from 0 to 40 MHZ.

RFID:-passive RFID tag is a tag that does not contain a battery. The power is supplied by the reader. The frequency is of 125 KHz.

Switch: micro switch, on/off switch.

Fig4. on/off switch

fig5. micro switch

Motor: 10 RPM Center shaft DC motor is high quality low cost dc gear motor. Although motor gives 10 RPM at 12V but motor runs smoothly from 4V to 12v and wide range of RPM and torque.

Sensor: Here two types of sensors are used i.e. LED and LASER for position detection. LDR is a light dependent resistor which has resistance that varies according to the light intensity. It does not have polarity.

Motor driver: L293D

Voltage regulator: 7805 is voltage regulator IC. It gives a regulated voltage of 5v at its output. It has three pins i.e. input pin, output pin and ground pin.

4. METHODOLOGY

The system design is developed by following software tools:

1. Circuit diagram and PCB layout is made using PCB designer.
2. Programming and testing is done in Keil2.5 software .
3. dumping is done in Flash Magic software.

5. RESULT

The experiment with the prototype shows successful placing of object to the right location as defined by the user. The movement of robot is controlled by dc motor. In this system the robot can handle a weight up to 50 gm. Weight depends on rpm of the dc motor. The rack is designed according the robot capacity. The rack is in the 2X2 matrix. The position of rack depends on the height gear channel. First position of block of the rack starts at height of 14.5 inch. The block height is 2 inch.

Comparision of some system with Proposed system:

	ASRS using embedded	ASRS using PLC integration	ASRS using wireless
1	Microcontroller-80c51	PLC controller	PIC16F877A
2	Support serial communication	Support serial communication	Support serial communication
3	Sensors-RFID, LASER and LDR	Wireless sensor and capacitive sensor	Retro-Reflective photoelectric sensor

6. APPLICATIONS

1. It is used in industries to move high volume of loads into and out of storage.
2. It is used in libraries to sorting the books.
3. It is used in various warehousing and distribution.
4. It is used in pharmaceutical and automotive industries.
5. It is used where modeling and managing the logical representation of the of the physical storage facilities are required i.e. racking.
6. It is used where certain products are often sold together or placed near the delivery area to speed up the process of picking, packing and shipping to customer.

7. CONCLUSION

This Automatic Storage and retrieval robot deals with integrating both mechanical elements and electronics knowledge. Mechanical elements of the project provide tools for the Automatic Storage and retrieval robot to fulfill its robotics task while electronics elements deals with the control of the movement of each object. This system is used in small infrastructure and reduces the time consumption than manual one. This research paper is based on embedded system.

8. REFERANCES

[1] Della ReasaValiaveetil, Veena K, Sindhu T.V, Bency Varghese A, LinuBabu, "Automated Resource Planning System for Library Using ASRS Robot" , IJARCCE, Vol.5, Issue 7, July 2016.

[2] Ashna Joy, B.Padmanabham, A. Abinaya, "Advanced Technology of Automated Storage and Retrieval System using PLC Integration" , IJETT, Vol.9, March 2014.

[3] Smita U. Chakole, "Development of Robotic Automated storage and Retrieval system", IJCER, Vol.3 Issue 3, March-2013.

[4]M.M. Rashid, BannaKasemi, MahmudurRahman, "New Automated Storage and Retrieval System using wireless communication ", IEEE, 17-19 May 2011.

[5] Xiaofegng Fu, Bo Zhang, Hansheng Yu, "Vehicles Routing and Scheduling Algorithm for an Automated Storage and Retrieval System of a Warehouse" , IEEE (2015).