IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 7, July 2016

Automated Resource Planning System for library using ASRS Robot

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Abstract: In this paper, we study about Automated Library System (ALS) which is a cost effective and space saving alternative to common document shelving technologies. Addressing the need for space efficiency, secure and automated document and records handling, ALS is a turnkey design and software solution focused on reliability and maintainability. Automated Storage and Retrieval Systems (ASRS) are designed for automated storage and retrieval of book items. Retrieval of items is accomplished by specifying the item type and quantity to be retrieved. The computer determines where in the storage area the item can be retrieved from and schedules the retrieval.

Keywords: ALS, ASRS.

I. INTRODUCTION

The automated storage and retrieval systems (AS/RS) are major material handling support systems that are commonly used in the automated factories, distribution centres, warehousing, an non-manufacturing environments. Their applications vary widely from a simple storage and retrieval system for small parts to central systems where production, assembly, and manufacturing operations are concentrically located around them. This paper summarizes the literature study of a Robotic automated storage and retrieval system and development of a dedicated automated storage and retrieval system for YCCE Flexible manufacturing system laboratory. The prototype model of automated storage and retrieval system developed consist of the control hardware and software communicating over a field bus network

In Automated resource planning system for library using ASRS designed for automated storage and the retrieval of items and is accomplished by specifying the item type and quantity to be retrieved. The computer determines where in the storage area the item can be retrieved from and schedules the retrieval. It directs the proper automated storage and retrieval machine (SRM) to the location where the item is stored and directs the machine to deposit the item at a location where it is to be picked up.

A system of conveyors and or automated guided vehicles is sometimes part of the ASRS system. These take books into and out of the storage area and move them to the librarian. To store items, the pallet or tray is placed at an input station for the system; the information for inventory is entered into librarian‘s computer terminal and the ASRS system moves the load to the storage area, determines a suitable Location for the item, and stores the load. As items are stored into or retrieved from the racks, the computer updates its inventory accordingly. Books are often stored more densely than in systems where items are stored and retrieved manually. Within the storage, books can be placed on trays or hang from bars, which are attached to chains/drives in order to move up and down.

The equipment required for an ASRS is a mobile robot which move laterally to place objects in the correct storage location. ASRS is a much faster way of organising the storage of books.

II. RELATED WORKS

A. Automated Library System Using Robotic Arm

Pick and place robotic arm is used to pick a book and place on conveyor and it forward towards counter. They are directed in both X and Y directions to place the book. There are many different types of pick and place systems. Examples include portable material handling systems, industrial manipulators. This pick and place robotic arm with wheels can be easily moved from one place to another. A pick and place robot manipulator can be used to pick an object and place them in an orderly manner to get a final destination A pick and place requires little operator and provides maximum output with efficiency. It is widely used in different industry to pick a different material and place in desire location.

AT mega 16 is a low power AVR 8-bit Microcontroller. It is advanced RISC architecture. AT mega 16 is high performance low power Atmel AVR 8bit microcontroller with 8kb of in system self-programmable memory.131 powerful instruction present in AT mega 16 .Most of single clock cycle execution and 32*8 general purpose register are working, fully static operation. Two 8-bit timer/counters with separate prescalers and compare modes, and one 16-bit timer/counter with separate prescaler, compare mode, capture mode. Special Microcontroller features are on power reset and programmable brown-out detection, external and internal interrupt sources. Operating voltage 4.5-5.5v for AT mega16.32 programmable I/O lines are present in AT mega 16. A conveyor belt uses a wide belt and pulleys and is supported by rollers. Many types of belt conveyor system are available. A belt conveyor system consists of

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two pulleys with an endless loop of carrying medium. The conveyor belt rotates around the system. If both of the pulleys are powered then automatically material on the belt are moving towards counter. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley.

B. Automated Material Handling System (AMH)

Automated materials handling refers to the management of material processing by use of automated machinery and electronic equipment. In addition to increasing the efficiency and speed by which materials are produced, shipped, stored, and handled, automated materials handling reduces the need for humans to do all of the work manually. This can significantly cut down on costs, human error or injury, and lost hours when human workers need heavy tools to perform certain aspects of work or are unable to perform the work physically.

Automated Materials Handling is a space-saving system that combines self-service check-in with automated sorting for quicker return of your materials to the stacks. It improves service for libraries and archives patrons and makes work easier for its staff by simplifying the return process. This technology eliminates much of the time that was spent accepting items at the front desk and clearing patrons‘ records, so circulation staff can devote more time to serving patrons.

III. PROPOSED SYSTEM

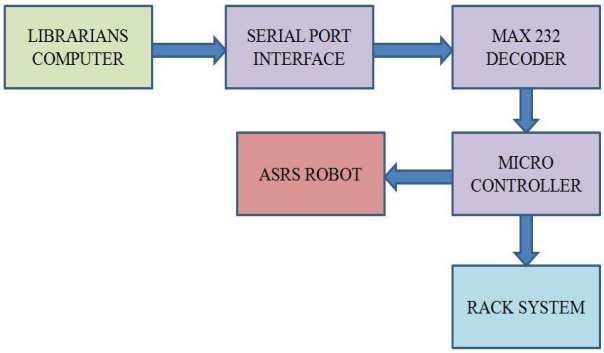

Fig 1.Proposed System

The systems operate under computerized control, maintaining an inventory of stored items. Retrieval of items is accomplished by specifying the item type and quantity to be retrieved. The computer determines where in the storage area the item can be retrieved from and schedules the retrieval. It directs the proper automated Storage and Retrieval Machine (SRM) to the location where the item is stored and directs the machine to deposit the item at a location where it is to be picked up. The software is to be built using visual basic.net.

In RS-232, user data is sent as a time-series of bits. Both synchronous and asynchronous transmissions are supported by the standard. In addition to the data circuits, the standard defines a number of control circuits used to manage the connection between the DTE and DCE. Each data or control circuit only operates in one direction that is, signaling from a DTE to the attached DCE or the reverse. Since transmit data and receive data are separate circuits, the interface can operate in a full duplex manner, supporting concurrent data flow in both directions.

The MAX232 is an IC, first created in 1987 by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.The MAX232 (A) has two receivers (converts from RS-232 to TTL voltage levels), and two drivers (converts from TTL logic to RS-232 voltage levels). This means only two of the RS-232 signals can be converted in each direction. Typically, a pair of a driver/receiver of the MAX232 is used for TX and RX signals, and the second one for CTS and RTS signals.

PIC micro controllers are low-cost computers-in-a-chip; they allow electronics designers and hobbyists add intelligence and functions that mimic big computers for almost any electronic product or project. The programming of the system is done using a PIC micro controller 16F877. This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit micro controller packs Microchip's powerful PIC architecture into a 40-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. It is has five ports. I.e. port A, port B, port C, port D, port E.

ASRS robot is a micro controller based robotic arm, its movement is controlled by geared servomotors. A robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm. The arm may be the sum total of the mechanism or maybe part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement. The links of the manipulator can be considered to form a kinematic chain. The terminus of the kinematic chain of the manipulator is called the end effecter and it is analogous to the human hand. Programmed micro controller PIC is used to control the actions of a robotic arm. Movement of the ASRS robot includes determining the location of book, then moves to the location and performs picking or placing operation. An Electric motor is a machine, which converts electric energy into mechanical Energy. Its action is based on the principle that when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming‘s Left Hand rule. By Lenz law, "induced emf must oppose the supplied EMF driving the coil'. When motor ON, the back emf is small then current is in forward direction through the coil. So current became large. The total storage capacity of one storage aisle depends on how many storage compartments are arranged horizontally and vertically in the aisle. There are one row and six columns are present with the single rack.

DOI 10.17148/IJARCCE.2016.5797

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IV. SOFTWARE IMPLEMENTATION

The system software was developed using the following software tools.

- VISUAL BASIC.NET
- PROTEUS ISIS
- MP LAB

Visual Basic .Net is a user‘s standpoint, the visual part of an application is provided within a window. This is the graphical interface that allows the user to see the input and output provided by the application. This user interface is referred to as the graphical user interface (GUI). From a programmer‘s perspective the GUI is constructed by placing a set of visual objects on a blank window, or form, when the program is being developed. For example, consider which shows how a particular application would look to the user. From a programmer‘s viewpoint, the application shown in figure is based on the design form shown in figure. The points displayed on the form are a design grid used to arrange objects on the form and are only displayed during design time.

Proteus is software used to design circuits, PCB layouts etc. Proteus combines advanced schematic capture, mixed mode SPICE simulation, PCB layout and auto routing to make a complete electronic design system. The PROTUES product range also includes our revolutionary VSM technology, which allows you to simulate micro-controller based design, complete with all the surrounding electronic.

MPLAB Integrated Development Environment (IDE) is a comprehensive editor, project manager and design desktop for application development of embedded designs using Microchip PIC micro MCUs and ds PIC DSCs. The initial use of MPLAB IDE is covered here. How to make projects, edit code and test an application will be the subject of a short tutorial. By going through the tutorial, the basic concepts of the Project Manager, Editor and Debugger can be quickly learned.

V. PERFORMANCE EVALUATION

We evaluate the performance of the proposed resource planning system schemes via simulations. We first simulated the circuits using the Proteus ISIS software. The components to be used are placed and connections are made. The simulations are run to check errors. The errors are corrected and circuits are obtained.

The microprocessor circuit is designed in the Proteus ISIS work space. The components such as microprocessor, max 232, and other components are placed and physical connections are made. The circuit was checked by running simulation. The errors were corrected and the microprocessor circuit was obtained.

The PCB layout of the circuit is then obtained using Proteus ARES.

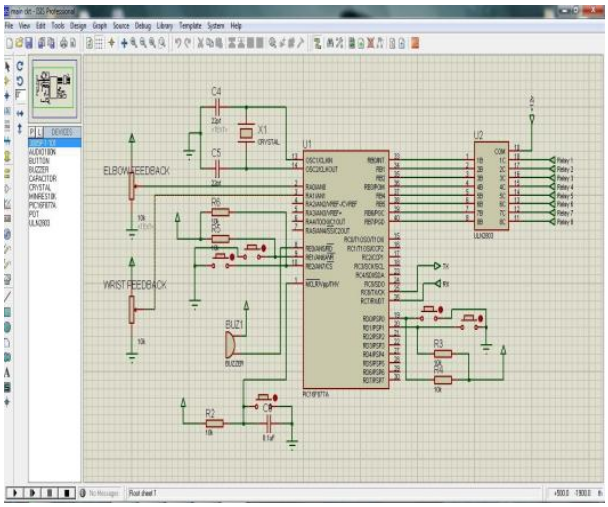

Fig 2.Microprocessor Circuit Simulation

The relay circuit is designed using Proteus ISIS. The components such as dc motor of robotic arms, wheels and ejection systems in racks, relay IC‘s are placed. Physical connections are made and circuits were checked and an error less circuit for the relay circuit is obtained, after simulation. Then the PCB layout of the circuit was obtained using ARES. These PCB layouts are used for further fabrication processes.

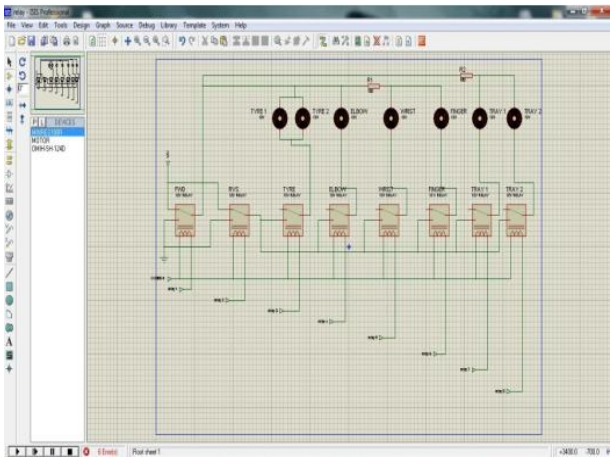

Fig 3.Relay Simulation

Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects. A programmer can create an application using the components provided by the Visual Basic program itself. Over time the community of programmers has developed new third party components, keeping this programming language to modern standards. Programs written in Visual Basic can also use the Windows API, which requires external function declarations.

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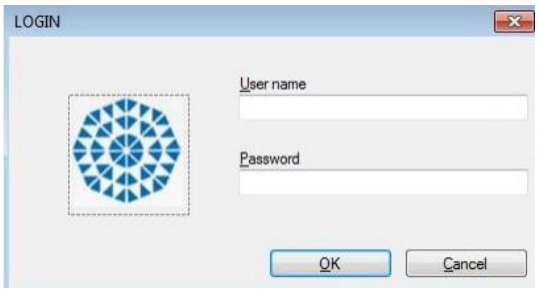

Fig 4.Login Window

Fig 5.Control Panel Window

VI. CONCLUSION

In this paper, we automate our Library which plays an important role in academics. So as a responsible staff we decided to implement an automated library system, on the basis of the literature review we have done. ASRS systems are designed for automated storage and retrieval of book items. Retrieval of items is accomplished by specifying the item type and quantity to be retrieved. The computer determines where in the storage area the item can be retrieved from and schedules the retrieval. Automated Library System (ALS) is a cost effective and space saving alternative to common document shelving technologies. Addressing the need for space efficiency, secure and automated document and records handling, ALS is a turnkey design and software solution focused on reliability and maintainability.

ACKNOWLEDGMENT

The authors would like to acknowledge the Principal of IES College of Engineering, Kerala for his co-operation to complete the project successfully. We would like to thank all the other contributors for successful completion of the project.

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