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Library Assistat Robot

Robots in Library Management System

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***Abstract*— This paper demonstrates the application of Robots in library management systems. A robot is designed that follows a predefined line to keep track the library book shelf arrangements. The number of the book that has to be taken is given as input to the robot. Robot gets the data of book by comparing the saved RFID number with the books in the shelves. If the particular book which is to be found out by the robot matched with the saved book detail, then the robotic will send a notification to the shelf unit. The corresponding shelf tray will move forward and the book in the tray will deposit the book in the basket of robot. The robot will return the book to the collection centre. Thus the customer can deliver the book from the collection centre. This helps and simplifies the job of monitoring the arrangement of books and also reduces the manual routine work done by the library staff.**

Keywords*— *RFID, library management, shelf unit, shelf tray.

I. INTRODUCTION

Robotics is a key technology in the modern world. Robots have taken their first steps into homes and hospitals, and have seen spectacular success in planetary exploration. In this paper the RFID technology is used. It is mainly focused on the book detection and reducing the human work. Robot technology has been widely deployed into various applications to improve productivity. Inventory tracking is a tedious but important process for inventory management. In particular, a library easily contains hundreds of thousands of books that are frequently borrowed and returned back to the shelves. To facilitate users to easily locate a particular book, books are placed in dedicated areas and sorted in a running sequence based on their so-called call numbers. Library staffs have to ensure that the books are placed in order, an extremely labour intensive and time consuming process. Library staffs first need to perform shelf reading, i.e., manually search for books that are misplaced in the wrong book sequence, then pick up the book and insert it in the correct location. . Typically they have to pick the books and hand it over to the person to whom the books are being issued. This might be an easy task in case the library floor area is small. Also, to search for the books by humans takes a lot of time as many a times the books gets overlooked by the human eye. To automate this process of book finding and picking we suggest a robot which will be able to find out the book with the required tag and then bring it to the desk.ie; what we are working towards here, is an autonomous robot that will help a library user to find a book and retrieve it from the shelf.

II. LITERATURE SURVEY

In older days libraries required more manual power to manage, In particular, a library easily contains hundreds of thousands of books that are frequently borrowed and returned back to the shelves. Typically we need a librarian to pick the books and hand it over to the person to whom the books are being issued. This might be an easy task in case the library floor area is small. Also, to search for the books by humans takes a lot of time as many a times the books gets overlooked by the human eye .i.e. Running of library manually is a difficult task. It is time consuming &laborious. We can overcome these drawbacks through our proposed paper. In this method we are going to maintain an autonomous service robotic assistant whose functionality includes the assistance of individuals within a library environment. The evolution of robotics started in the twenty first century. The 'robot' term was firstly coined in early 1920 by a Czechoslovakian dramatist, Karel Capek in his play entitles "Rossum's universal robots". Robota is the original term of robot that widely used since it has been introduced to the public. Robota is a czech word which means 'slave laborer'. On 1942 science fiction author Isaac Asimov used the term 'robotics' in his short story "Runaround". Robotics means study of robot. Three Laws of robotics have been introduced in "Runaround". It describes the three basic rules that robot should follow to operate without harming or cause injury. The laws are:

a) A robot is not allowed to harm a human or cause injury to a human being whatever be the condition.

b) A robot must always follow the direction or order given to it by the human being as much as it does not contrast or conflict to first law.

c) A robot must protect its own existence as long as it does not make conflict to first and second law

AuRoSS: an Autonomous Robotic Shelf Scanning System Renjun Li, Zhiyong Huang, Ernest urniawan, Chin Keong Ho 2015 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Congress Centre Hamburg Sept 28 - Oct 2, 2015. Hamburg, Germany.

This paper elaborates on the key enabling robotic technology for the fully autonomous system, namely, a navigation system with surface tracking capability. A Radio Frequency Identification (RFID) reader is carried by the navigation system to identify the RFID tags embedded in each book. Based on the tag information, a tracking report that highlights missing and misplaced books is generated for

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the end users. To ensure successful identification, the surface tracking requires high accuracy, for which we propose a filtered Hough transform and a macro-mini manipulator structure. Tests of the AuRoSS system in a library show high accuracy in the scanning performance.

Inventory tracking is a tedious but important process for inventory management. In particular, a library easily contains hundreds of thousands of books that are frequently borrowed and returned back to the shelves. To facilitate users to easily locate a particular book, books are placed in dedicated areas and sorted in a running sequence based on their so called call numbers. Library staffs have to ensure that the books are placed in order, which is an extremely labour intensive and time consuming process. Library staffs first need to perform shelf reading, i.e., manually search for books that are misplaced in the wrong book sequence, then pick up the book and insert it in the correct location. Radio Frequency Identification (RFID) technology has been introduced to ease shelf reading, such as by using hand held RFID readers nevertheless the task is still time consuming and the user still cannot easily interpret the RFID results to see if the books are sequenced properly. Smart shelf, on the other hand, uses many RFID antennas that are placed at many strategic locations so as to scan the RFID tags. The high infrastructure cost and implementation complexity remains a barrier for this technology to be widely adopted

A Research on Autonomous Position Method for Mobile Robot Manipulator based on Fusion Feature Mingfang Du, Junzheng Wang, Lipeng Wang and Haiqing Cao Jianjun Fang, Zongyu Gao, Ji Lv and Shide Zhang College of Automation College of Automation Beijing Institute of Technology Beijing Union University Haidian, Beijing City, China Chaoyang, Beijing City, China 2013 IEEE/RSJ Mechatronics and Automation Aug 47,Takamatsu, Japan**.**

The cooperative work process and the automation work flow of the no man keeping watch library which takes the robot as its centre and uses the internet of things technology are firstly introduced in this paper. A new data format of the RFID electronic label for books is designed, and the robustness of positioning of the manipulator is improved by the information fusion of the RFID label source and the CCD sensor source installed on the manipulator. A position method named THREE STEPS by the combination of fuzzy position, area position and accurate position is advanced, and the complex books positioning and grasping question is transformed into the world coordinate solving question of some point on the objective book. The fuzzy CMAC (cerebella model articulation controller) neuron network is adapted to realize the non-line relationship of fusion feature and manipulator position. And direct vision servo control architecture is used when designing the manipulator position system. The experiment result has proved this method can help the manipulator realize the accurate position and rapid catching.

In this system, the robot is a kind of mobile robot with wheels whose main part is an Automatic Guided Vehicle (AGV). A manipulator with a camera and a RFID reader at its front part is installed on the AGV. The road in the library is divided into some areas according to the types of books and every area has its road signs. The wireless image acquisition module on the AGV can acquire the road signs' picture and send them to the remote PC through wireless internet. The program in the remote PC will process the pictures and calculate the AGV's control parameters which are send to the robot controller's speed-governing system to realize the PWM speed-governing control of the direct-current dynamo .

III. SCOPE OF THE PAPER

This paper aims to build and design the Library Assistant Robot which has the capability to look for a specific book in a shelf, asked by any user, and when it is found, to deliver it as soon as possible to the user. Tracking of items on shelves is an important but time-consuming task in inventory control. In particular, books in public libraries are frequently borrowed and returned, even misplaced, and proves a challenge to be tracked on a daily basis. This Library assistant robot is an autonomous service robotic assistant whose functionality includes the assistance of individuals within a library environment.

IV. PROPOSED METHODOLOGY

The hardware is implemented as a robot unit and shelf unit independently. Firstly enter the name of book which we want to issue using keypad. The robot end sends a data to the shelf end using data modem. Line follower robot follows the track and reaches the shelf end. The IR sensor matches with the shelf unit. The RF reader scans for the RF tag and matches with the corresponding book. If both the robot and the shelf end get synchronized the arm in the shelf end pushes the book into the basket. Thus the robot unit follows the path back to home.

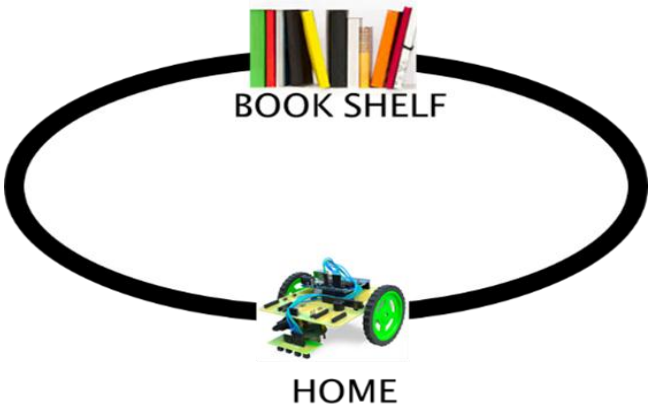

Fig1: Proposed System

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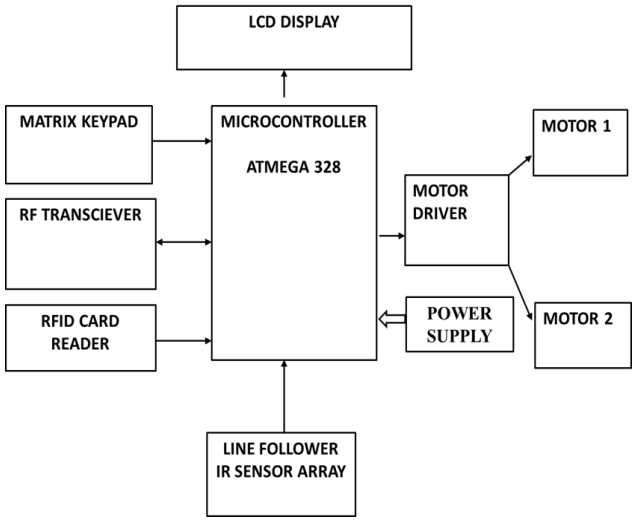

Fig2: Robot End Block Diagram

BOOK SHELF END

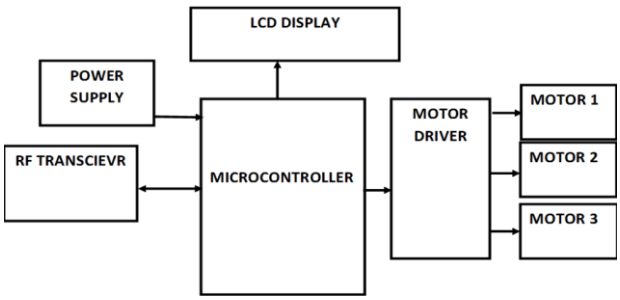

Fig3: Shelf End Block Diagram

The robot end consist of a line follower robot which works with ATmega328 microcontroller. The input is given using a matrix keypad. The name of the book is displayed in LCD. The RFID card reader scans for RFID tag placed in each book and the RF transceiver used to communicate between the two ends.

The shelf end consist of three motors driven using a motor drive which is used to push the book from the shelf to the basket in the robot, all the control is done by the ATmega328 microcontroller which inter links with the other microcontroller using RF transceiver.

V EXPERIMENTAL RESULT

Initially we are at the home position (000-blue, blue, blue).The required book's number is given as the input to the keypad (Say 101). The Name of the particular book will get displayed on the LCD. If the book number is wrong "INVALID BOOK NUMBER" will be printed. Next status printed will be will be "SEARCHING." of the book. At once the book gets matched with the book in the shelf, the robot starts slowly from its home position. When a sensor is on black line it reads 1 and when it is on the bright surface it reads 0 and sensor module gives the value into the controller to generate control signal as per the program. When both right and left sensors are on bright surface (read 0) the wheels gain speed. When left sensors moves in black region then left motor stops while right motor continue to move so that left turn takes place and robot returns on black line. When right sensor comes in black region then right motor stops while left motor continue to move so that right turn takes place and robot returns on black line. By correcting the path robot moves to the destination i.e. the shelf end.

Then at the destination point or book rack, the detection become 111(red red red). The robot attains a slow movement and stops. The book is then pushed into the basket and the robot collects the book. Again when the black line gets detected, it reads 1 (010) and the robot returns to home position where again the condition is 000.Then the LCD will print "BOOK DELIVERED". The robot will station at the home position till the next cycle begins. The robot is ready for the next task from the user.

Fig4: Complete System

Fig5: Robot End

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