

HEB**Smart Librarian Management System Using IOT****CASS***M.Benisha¹, A.Surya², M.Vinoth Kumar³& L.M.Merlin Livingston⁴,*

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ABSTRACT

Internet of Things (IoT) is a promising technology for the future with the development of the new generations of internet and with millions of devices getting connected to the internet every day, the. In this paper, by exploiting IoT, mobile technologies made easy and efficient for library management. The main objective of this proposed work is to decrease the burden of the library user to track a book and to fetch it from its location. Here the local positioning system and embedded tags on the book is utilized to communicate with each other and with the user's smartphone. With much ease, the user can interact with the library server to check whether the book is available and if available to locate it right to its position. A proposed robot can replace a librarian who finds the books requested by the users. The robot that is controlled by a raspberry pi controller that mimics the functions carried by the librarian starting from the query placed by the user, searching from the database, finding the position of the books in the library racks and finally fetching the books. In this model the robot gets the input request through the system or smart phones, searches the book from the Jscript database, and gets the position index of the book. Then the robot determines the position of the book and captures it, and it is returns this value as output to the users. Some experimental results disclose the validity and usefulness of our proposed management method in the library.

Keywords— Image Conversion, Distance measuring, IOT, Raspberry Pi

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I. INTRODUCTION

The world is saturated in the internet and now the Internet of Things is also gaining a lot of consideration. But the application of the internet technology in library management is at its infancy. In a library, books are arranged in shelves based on their classification of subject. There is a lot of movement of these books in and out of the library and so there is every possibility that these books get misplaced. When such misplacement of books occurs, it becomes a tall order for both the librarian and the user to search for the books. Though the OPAC gives the rack and the access number of the books, it is always an uphill task to even find the rack in huge libraries. The scenario becomes worse if the books are misplaced. So a system that could lead the user directly to the place where the book is placed would come in very handy and it also saves a lot of time. It also helps in finding the misplaced books.

Now that everyone has a smartphone and is connected to the internet, the doctrine of building a connected library system where the user can utilize his mobile phone to connect to the library system and also find the position of the book through a local positioning system would prove to be very useful. The aim of the concept in this paper is to build a “Smart Library System” with facilities to issue, return and even locate the book using an authenticated Robot.

The Internet of things provides "connected devices" and "smart devices by the internet networking of different physical devices, vehicles, buildings, etc embedded with various electronics, software, sensors, actuators, and network connectivity that enables different objects to communicate. Objects are allowed to be controlled remotely across various networks by IOT, providing opportunities for more direct interaction of the physical world with the systems, and resulting in improved efficiency, accuracy and reduced human intervention. Various systems can be automated using IoT, like automated home, automated hospital, but here we'll focus on IoT based automated library management system.

Library management is a part of institutional management that focuses on particular set of issues faced by library management professionals and libraries. Library management consists of regular managerial tasks, as well as intellectual decisions and fundraising responsibilities.

II. EXISTING METHODS

A novel smart librarian robot with RFID technology is proposed in [1]. The Librarian robot designed can be kept in an experimental environment is able to say greeting properly based on estimation results of human behaviour using a laser range finder, talk with a library user with a natural language, and search books depending on a user's request. When the robot explains where a requested book is in the library, it points out a target position using a laser spot while the body and head are also turned around to the direction of the target.

Robotic process mechanization [2] is the utilization of programming with manmade brainpower and machine learning abilities to deal with high-volume; repeatable assignments that beforehand

required a human to perform. Robot is an automated machine. In library administration, librarian is needed for management of books. To lessen curator inconvenience we have created robotization in library to speedy transport of books utilizing robotic arm. Library management robotic system is combination of software used to manage the library database and hardware used to manage the book handling. This system helps to keep the records of whole transactions of books available in a library. A robot is modular design of sensor operated motors to manage the library.

A new JRM2030 RFID reader module proposed in [3] is used to locate and search books with electronic labels on the bookshelves. The system software is designed by using LABVIEW. And the book positioning system can search books by typing in the title of them, and get the distance between the tag and the reader referring to the strength of wireless signal. In this paper, the hardware and software of the system are designed in detail, and the experiment results are given.

Traditional library management is time consuming, laborious and low library circulation rate. The Radio Frequency Identification (RFID) has the characteristics of waterproof, anti-magnetic read distance and the label data can be encrypted, large storage data capacity and other technical features. University library management system based on RFID is proposed in [4] and elaborates the overall structure design of the system including the system hardware and software environment.

Application of robot for library management system is discussed in [5]. Library administration is an undertaking asset arranging framework for library, used to track things owned, orders made, and bills paid, benefactors who have acquired. Humanity has dependably strived to give life like qualities to its antiquities trying to discover elective for himself to do his requests furthermore to work in a scary situation. The well-known idea of a robot is of a system that looks and works like an individual. In this very creating development, time and labour are restriction for finish of undertaking in extensive scales. The automation is playing important role to save human efforts in most of the usual and frequently carried works. One of the most applications is library management Communication patterns within library and examples for their use [6] describe the advantages of using JSON serialization in such a system.

Electronic documents and resources have changed the entire paradigm of education and research [7]. Students, teachers, professionals, academicians and researchers may get their information on their desktop/laptop/Smartphone through electronic platform. The availability of Information and Communication Technology (ICT) and their use has also produced some challenges amongst the library professionals to make optimum use of information resources available. It has been observed that in spite of awareness programs, several e-resources are being underutilized or less used.

An easy and user friendly library system to the users to ensure a systematic approach towards library management so as to efficiently utilize the time and energy of the employees is proposed in [8]. Automation of library system is a convenient approach, as all the library devices can be managed from one place by implementing Internet of things (IOT). We are allowed to tap into high-tech functionality and luxury that wasn't possible in the past in RFID.

In the present systems employed there are special methodologies for arrangement of books, journals, DVDs and so on. These techniques need to be strictly followed in order to help the users find their book or their requisites. [9] Helps in finding a solution to this tedious problem faced by most libraries in an easy way.

[10] Describes a unique robotics project, Comprehensive Access to Printed Materials (CAPM), within the context of libraries. As libraries provide a growing array of digital library services and resources, they continue to acquire large quantities of printed material. This combined pressure of providing electronic and print-based resources and services has led to severe space constraints for many libraries, especially academic research libraries. Consequently, many libraries have built or plan to build off-site shelving facilities to accommodate printed materials. An autonomous mobile robotic library system has been developed to retrieve items from bookshelves and carry them to scanning stations located in the off-site shelving facility.

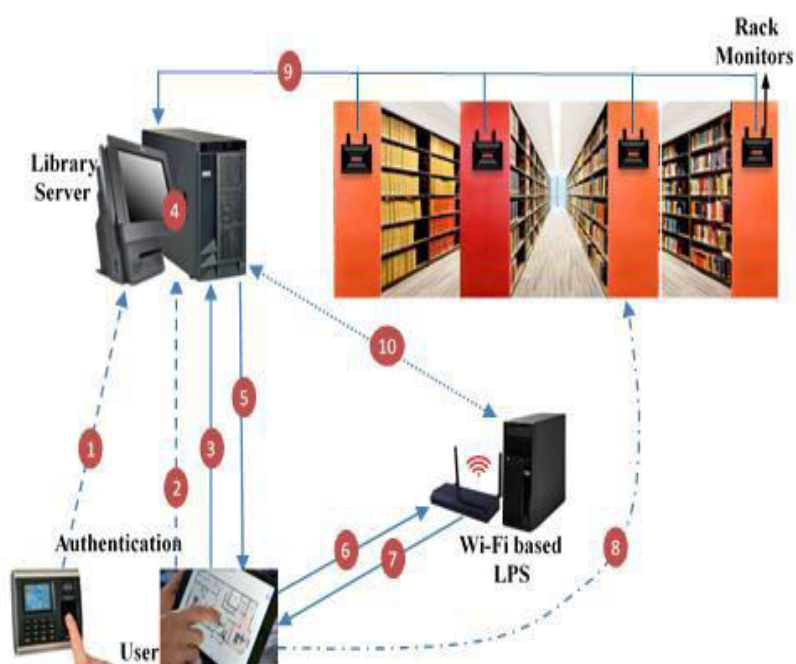


Fig. 1. Existing system – Block diagram

III. PROPOSED SYSTEM DESIGN

The proposed library management system architecture is drawn below.

The Major blocks of the proposed system are Raspberry Pi controller, Motor driver, IR Sensor, Camera etc. The software used are, Raspbian, HTML and Jscript, VNC (Virtual Network Computing) and Xming.

A. Raspberry Pi

In the proposed system the main component is the Raspberry pi –controller that controls the operation of the robot.

Raspberry Pi is specialized computer system and provides access to the on-chip hardware for generating any application i.e. GPIOs. By accessing GPIO, one can connect devices such as LED, motors, sensors, etc and can control them too. It contains an ARM based Broadcom Processor SoC along with on-chip GPU (Graphics Processing Unit). The CPU speed of Raspberry Pi varies from 700 MHz to 1.2 GHz. Also, it has on-board SDRAM that ranges from 256 MB to 1 GB. Raspberry Pi also provides on-chip SPI, I2C, I2S and UART modules.

First the input is given by the user to the input device that may be a (computer or a smart phone) then the input is sensed by the raspberry pi-controller, through the webserver it searches the database the required book along with the position. Based on the algorithm, the position, direction and the distance is computed. The 5V battery is used to control the raspberry pi module.

B. Motor Driver

L293D is a special Motor driver or Motor Driver IC, and it allows the DC motor to drive in all direction. L293D is a 16-pin IC which can control a set of two DC motors at the same time in any direction. It means that one can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

The motor driver L293D gives the instruction to the robot by specifying the position, distance and direction. It directs the robot wheels by changing the motors control. The entire module is controlled by a 9V power supply.

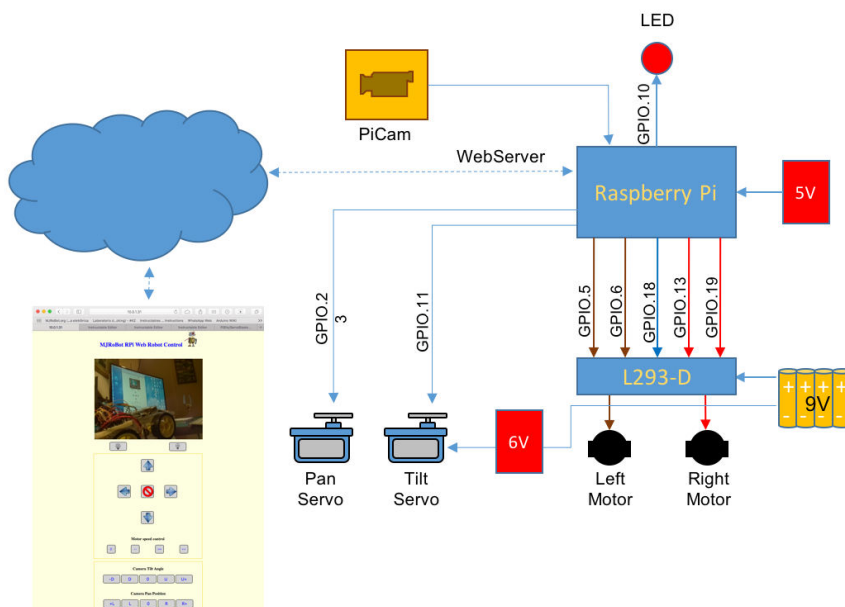


Fig. 2. Proposed system – Block diagram

C. Raspberry Pi Camera V2 Module

The Raspberry Pi Camera V2 features an 8 megapixel Sony IMX219 image sensor with fixed focus lens, it is capable of 3280×2464 pixel static images and supports 1080p30, 720p60, and 640×480p90 video

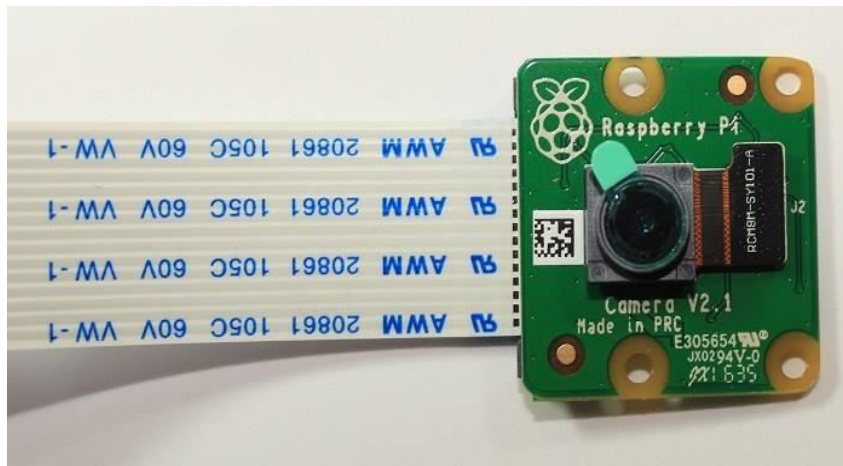


Fig. 3. Raspberry Pi Camera Module

IV. RESULT AND DISCUSSION

The process of obtaining the book using the proposed IoT based Management system is given below. The following steps have been carried out during the process.

A. Login

Login the Web page, to search the book availability in the library.

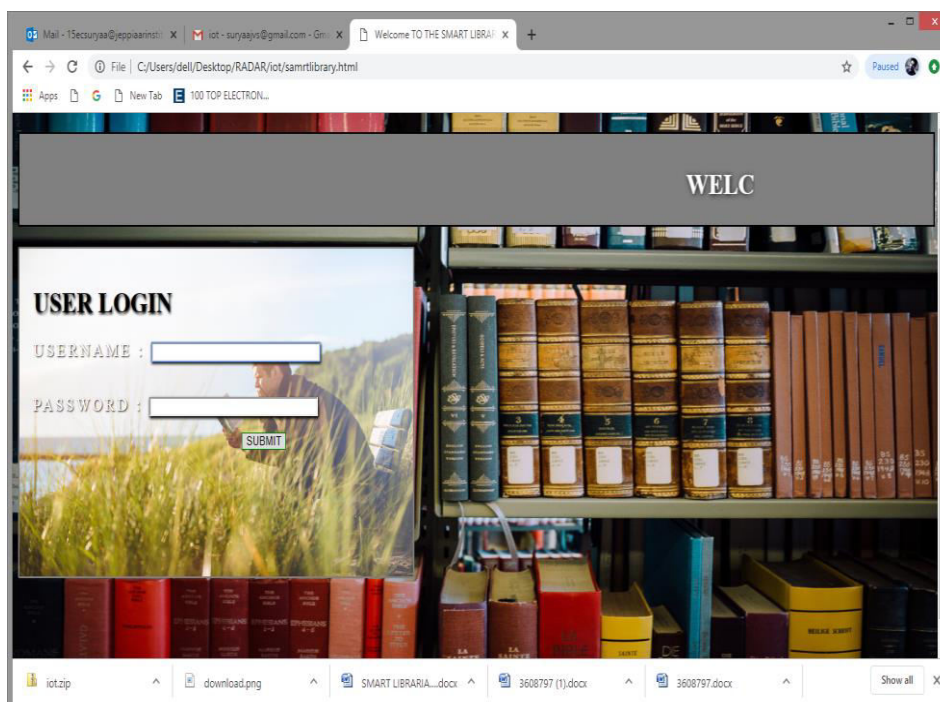


Fig 5. Web page Login

B. Enter the book to search

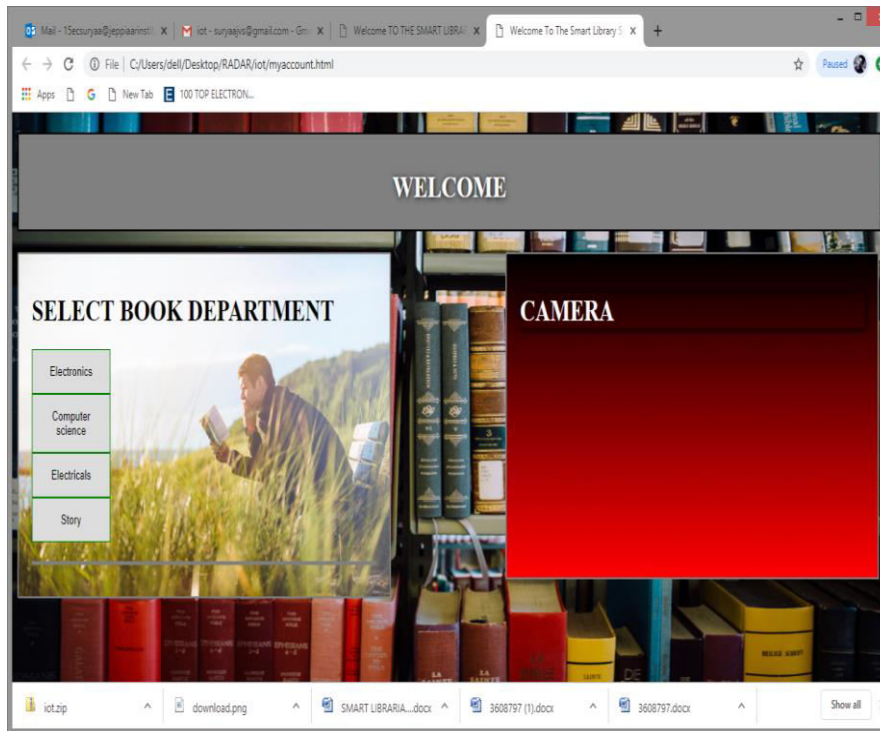


Fig 6. Web page Login – Book Search

- C. If the book is identified it sends back the row and column number of the book.*
- D. When the input is given to the robot it runs to the location of the book.*
- E. When the location is identified it searches for the book.*
- F. It checks the book if it is required by the user or not.*

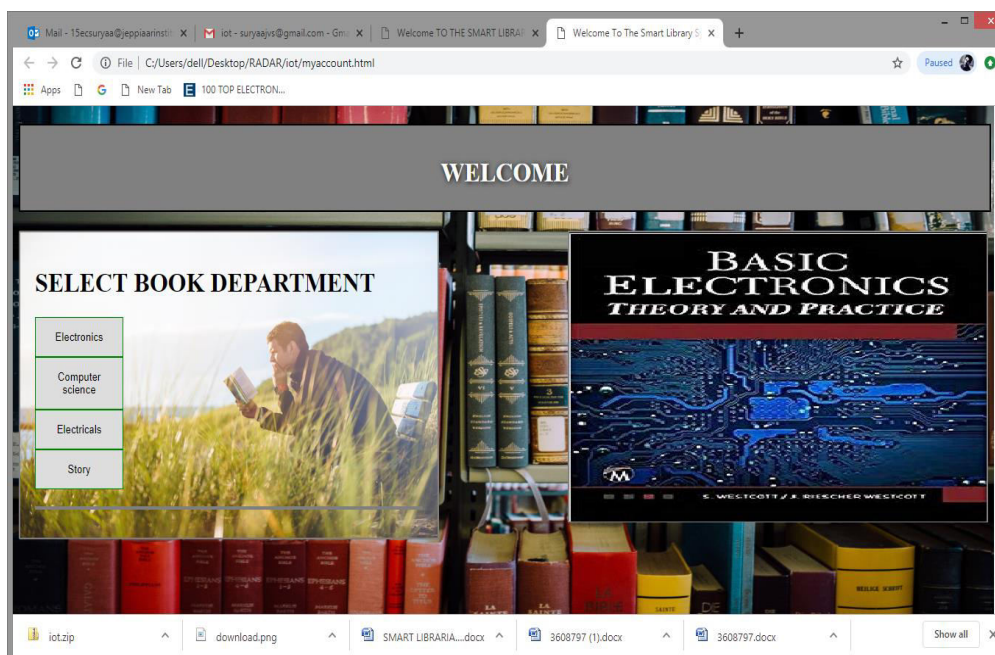


Fig 7. Web page Login – Book Found

V. CONCLUSION

In this paper, we have exploited IoT and mobile technologies for easy and efficient library management. The major goal of this proposed work is to reduce the burden of the library user to track a book and to fetch it from its location. Here we have used the local positioning system and embedded tags on the book to communicate with each other and with the user's smartphone. With much ease, the user can interact with the library server to check whether the book is available and if available to locate it right to its position.

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