The device_ir_codes table contains the available IR codes for various devices. The field device_model_name contains the name of the current model, the data type varchar (200). The command_to_device field contains information about which command (on / off) corresponds to the current IR code, the varchar (100) data type. The IR_code_to_device field responds which IR code corresponds to the current state of the device, the data type varchar (20).

The proposed system is recommended for use at home or anywhere in the world, where is an Internet.

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5. NodeMCU is an eLua based firmware for the ESP8266 WiFi SOC from Espressif. // web: https://nodemcu.readthedocs.io/en/master/
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DESIGN OF HARDWARE AND SOFTWARE SYSTEM OF LIBRARY AUTOMATIZATION

Abstract. The issue considers the hardware and software system for library automatization problem. The problem is to create library information system and to develop indication system for fast-searching of needed books. There were observed problems with composing a networking system between hardware and software components, also considered ways of organization an interaction between user and system. The project is intended for facilitation of library’s maintenance and usage.

The main purpose of this project is to create a prototype of the hardware and software system “LightLib” to simplify and accelerate the problem solving of users and library staff.

To achieve this goal, the following tasks need to be solved:
– review of competitive products and existing analogues;
– choose the hardware and software components and software developments technologies;
– design and construction of the hardware subsystem;
– setting up and testing network connections;
– database development;
Considering the feature and requirements listed above, the most reasonable is to implement the software that consist of client-server architecture and the hardware that show the position of the chosen book. The server side was created on PHP language for web-service that provides interaction between library hardware and users. DBMS PostgreSQL is used for the database maintenance on the server side. The database structure is shown at the Figure 1. There are two applications on the client side, one of them for web-browser and another one for the mobile devices.

The hardware constituent of system represents huge set of indicative light emitted diodes, which are controlled by Arduino like microcontroller named NodeMCU. NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module [1]. NodeMCU board has embedded WiFi module that provides constant stable connection with server. Every time user wants to know where chosen book is placed. The server notifies a NodeMCU which is responsible for appropriate region of library. Then NodeMCU in its turn activates a LED located above the desired book. The way how small NodeMCU can control a wide scale region of LEDs is usage so called shift registers which expands microcontroller’s inputs. The Shift Register is another type of sequential logic circuit that can be used for the storage or the transfer of data in the form of binary numbers [2]. There are two ways of obtaining books: manual registration with the administrator of library and automatic registration procedure by using mobile application. The mobile application generates QR-codes containing current obtaining process information. QR codes are a popular type of two-dimensional barcode [3].

The web-service for common users divided into different segments, such as: “Registration in different library”, “Search the book”, “Return the book”, “Reading book description”, “Show library map”. Before searching the book users should be registered in the wanted library, after library registration user should wait for administrator to accept him. After this, the user will get access to the map of the library and books that exists there. Every time user wants to take the book, server will provide description of the book and allocation of that book on the library map. All provided information will be taken from the database of the registered library.

The web-service for administrator also divided into segments, such as: “Library registration request”, “Add the book to the library”, “Remove the book from library”, “Ban user from library”, “Change configuration of the library”. In the “Library registration request” segment, administrator will see the list of people desire to register in their library. Whenever the user steals the book from the library the administrator has all rights to ban him, and this information will be shared to all other library owners. The visualization of the foregoing is shown at the Figure 2.
Conclusion
The proposed system is recommended for different type of libraries, achieves, stocks. This system design for upgrading existing information system into more modern way. The system will provide user the better process of working with library.

On further steps toward design, this system will be add such activities like Mobile application for users of Android and iOS devices and Advance security system for prevention from robbery.

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