International Journal of Academic Information Systems Research (IJAISR)
ISSN: 2643-9026
Vol. 6 Issue 5, May - 2022, Pages: 14-16

Design and Simulation of an Automatic Car Parking Slots Detection System in Commercial Buildings

Kafuko Denis[1], Mubiru Baker[2], Njubo Nelson[3], Mutyaba George William[4], Kibirige David[5], Kitone Isaac[6], Dr. Primrose Nakazibwe[7], Dr. Rita Makumbi[8]

Department of Electrical Engineering, Ndejje University, Kampala, Uganda
kafukodenis256@gmail.com[1],beckytrisha61@gmail.com[2],tag.nnt@gmail.com[3],mutyabageorgewilliam@gmail.com[4]semkibirige@gmail.com[5], kitonei@gmail.com[6]
[7]Directorate of Research and Innovations, Ndejje University, Kampala, Uganda
pnakazibwe@ndejjeuniversity.ac.ug
[8]Directorate of Quality Assurance, Ndejje University, Kampala, Uganda
barymaks@yahoo.co.uk

Abstract*: This Paper focuses on Automating Car Parking spaces, based on slots detection system, that depends on Arduino microcontroller, infrared sensors, servo motors, liquid crystal display, and LED lights for indicating the free slots inside the parking area. This creates awareness amongst drivers when arriving at busy commercial building which have shopping malls and offices. Congestion at the entrance and time wasting are some of the challenges that are solved in implementing this project. The project was designed and simulated using Proteus 6 Software. It was also tested using the different parameters and the results displayed proved its potential to be implemented on a physical scale.*

Keywords— Parking, Simulation, Microcontroller, Sensor, Building, Proteus

1. INTRODUCTION

There is a growing number of commercial buildings today in Uganda, which has resulted into lack of parking space. Therefore, the current structural designs have in-cooperated parking floor spaces in these buildings. However, the parking slot allocation is still a problem to both customers and the clients working within the building. Different studies have focused on parking system. Several systems based on Internet of Things have been designed by innovators over the years, one of the main drawbacks of this model is its limitation in application, since it requires internet access and knowledge to access information of different parking places [1][2].The other systems that were designed only issued parking tickets to clients entering the building. In this paper an automatic car parking slots detection system was designed and simulated using Proteus 6 software. This system enables the client to access full details of the availability of parking space at the entrance of the parking floor in real-time without need for internet [3]. The information is displayed on a billboard and permit or deny is issued based on the current state of the parking slots. This project is environmental friendly, since it delivers real time information, which limits unnecessary movements during the search for parking space, hence reducing on the rate of carbon emission into the atmosphere.

2. METHODOLOGY

The system was designed and simulated using Proteus 6 software. Below are the building blocks that were used for the project.

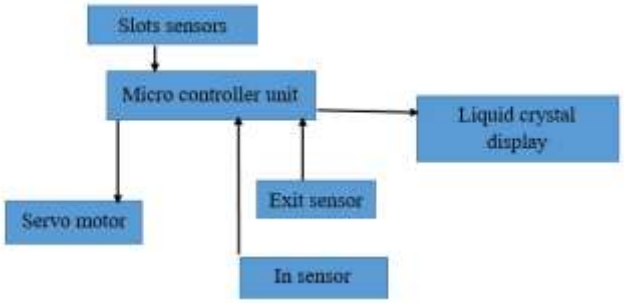

Figure 1: Block diagram of the project

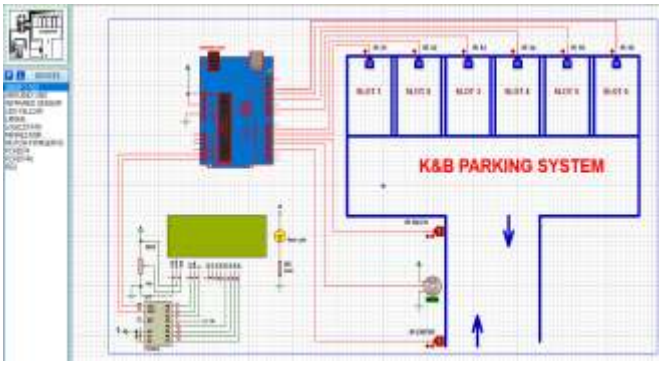

Figure 2: Project schematics in Proteus 6 software

Figure 3: Codes used for programming the Arduino

Operation principle of the project

The infrared sensor and servo motor are installed at the exit and at the entrance gate so as to automate the closing and opening of the gate. At the entrance gate the infrared receiver sends a signal to the control unit to notify about the presence of a car at the gate after which signals are sent back either to operate the servo motors at the gate in order to open the gate depending on whether there are free slots in the parking area. In this circuit IR sensors are installed in each of the parking slot. These IR sensors are connected to the Arduino pins. The reading will be displayed on the LCD which will inform the incoming car drivers and owners about the free space available inside the parking. When the slot is vacant, the IR photo diode will not receive any signal. Hence light will be on. If any reflected signal is received by the IR photo diode due to car, the received signal will be compared to the threshold value and if it is more than the threshold value then the RED LED will light (high). This process will be similar to all other slots, and whenever a car enters or leaves the parking area, the data is continuously updated. When a car enters or leaves the parking slot, the respective LED will glow immediately. If any of the parking slots is occupied, then a text message will be displayed on LCD so as the incoming car drivers can easily notice about the availability of more or no space.

Testing Results

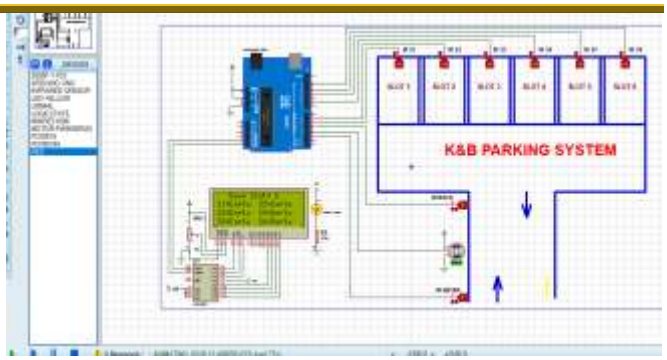

Figure 4: Simulation when parking slots are empty

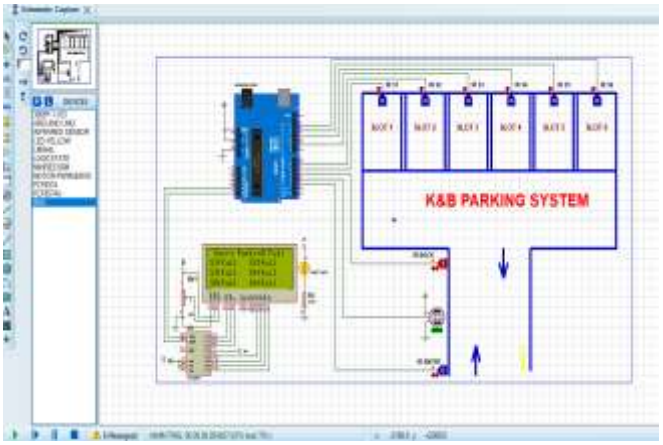

Figure 5: Simulation when parking slots are Full

3. CONCLUSION

The system was simulated with testing parameters and it worked as anticipated, it can therefore be physically implemented buildings with shopping mall and offices where there are various floors of parking slots to solves congestion at the entrance, in drives ways thus limiting time wastage. This system can also be integrated with ticket issuing capabilities by simply programming the Arduino microcontroller.

REFERENCE

[1] S. C. Koumetio Tekouabou, E. A. Abdellaoui Alaoui, W. Cherif, and H. Silkan, “Improving parking availability prediction in smart cities with IoT and ensemble-based model,” *J. King Saud Univ. - Comput. Inf. Sci.*, vol. 34, no. 3, 2022, doi: 10.1016/j.jksuci.2020.01.008.

[2] “Smart Parking System,” *Int. J. Innov. Technol. Explor. Eng.*, vol. 9, no. 2, 2019, doi: 10.35940/ijitee.b6537.129219.

[3] A. Ihsan, N. Fadillah, C. R. Gunawan, and M. Mursyidah, “Detection of Empty Slots in Car Parking

System Using Neural Network Method," in *IOP Conference Series: Materials Science and Engineering*, 2020, vol. 854, no. 1. doi: 10.1088/1757-899X/854/1/012052.