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Research Paper

Vehicle parking management and reservation system using lab view

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Abstract

One of the challenges that we face from time to time in or daily life is parking our car. It has been estimated that it that 30% of vehicles takes a mean time of 7.8 minutes to occupy a parking spot. This not only leads to a waste of fueland timethat a driver consumes in looking for an appropriate parking spot, but also results in an additional loss ofthe above parameters for the other drivers due to the traffic congestion caused due to slow pace of the driver in search for a parking slot. The solution is to introduce a smart system which is both capable and efficient to solve the problem by not only allowing the end-user to view the available parking spot but also to book the slot in advance there by the user will know well in advance where he should go in order to park his vehicle.

Keywords: *Parking; Micro Controller; HTML; LabVIEW; GUI.*

1. Introduction

Smart parking Systems are required to reduce congestion and traffic jams caused by drivers searching for a vacant lot to park their vehicle. A case study performed on a small business district in Los Angeles, reported that cars cruising in search of parking space complete an equivalent of 38 rounds around the world, this burns gasoline of 47,000 gallons andas a result produces 730 tons of carbon dioxide [1]. Other studies have reported that most of the drivers spend atleast 3.5 to 14 minutes in a typical search [2]. These times adds up to a significant lose in productivity of cities [3]. This is mainly caused at peak hours where most of the reserved area gets full and this leads the driver in search for a vacant parking spot among other area which in turn generates more traffic congestion [4] [5].The system proposed in this paper introduces a micro-controller which is used to simplify the operation and make the system full automatic [6]. The idea of using a web browser for controlling the devices is not a new concept and is used in many systems, but traditionally the cost is high to overhaul a legacy system with capable technology has stunted embedded option [7]. The architecture is accessed through a local host server, the system acts as a server which is interfaced with the controller the resultant output of sever is displayed on a browser through a GUI based on the users command [7] [8] and also allows the user to get visual perception of the available vacant parking lot. This system can be accessed by the user via mobile or Wi-Fi ISP's. The sensor status is automatically update to the server so that the user is able to know in real-time status of the parking lot. From the GUI [8] displayed in the web browser the user, himself can reserve the vacant parking lot and with the help of security arrangement whichis a guarantee for the reserved space [6].Parking your vehicle is accompanied with an elevated risk of crashing due to lack of diver concentration on the road ahead [4] [5]. It is not known how a driver's mind responds or operates under workload and while parking the driveris subjected to presence whichcan contributes to increased risk of crashing. [7].Instead of givingrelative parking alerts to a driver,allowing him to make the right parking decision, the proposed 'smart parking'system providesa parking space based on the drivers choice and reserves the space [5]. Here we aims on solving the dynamically changing parking slot allocation problem based on simulated case study [6].By using a network composing of a large number of small sensor motes, it is relatively easy to obtain real-time data onchange in physical phenomena whichare difficult or even impossible to obtain in conventional methods[4] [10].

2. Methodology

In this work wepropose a suitable methodology is to find a vacant parking lot and reserve the space. This system is to assures that the driver that his reserved vacant space for parking is guaranteed and that the driver know the location of the vacant parking space in advance thus reducing the time required in searching for it.
The system is mainly organized in four main components namely the Field Sensor, The Micro controller, The Local Host, and finally the User Interface [8] as show in Fig1. We discuss the detailed design and implementation of each component. In the first phase, the field sensor [6] [7] [10] detects the status of the parking lot depending on the status at the instant of time the resulting output is sent to the micro controller which process the input.

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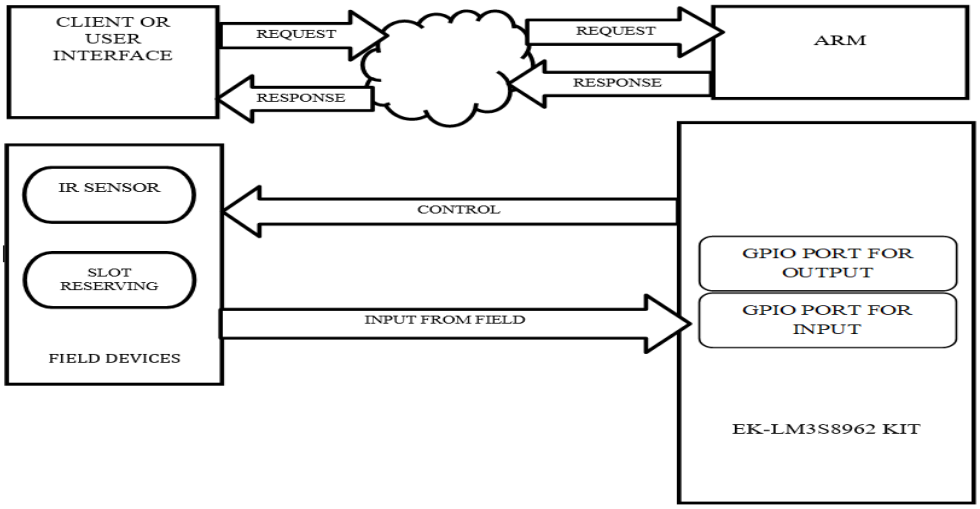


Fig. 1: Process Flow Diagram.

Based on the input given by the field device to the micro controller. The status of the parking slot is updated on the local host server. When the user views the GUI [8] based web page provided by the given URL [11]. The state of the parking slot is visualized by the GUI based on the output of the micro controller stored on the local host server. The Hardware and Internet Protocol required to achieve this is given below:

3. Description of smart parking system

3.1. Sensor

Sensor is the device which converts the physical quantity into electrical or electronics data. Here the role of the sensor is to identify whether any cars are parked in the slot where the sensor has fixed. If any car is already there in the slot or parking space it will send the information inform of voltage. For this identification purpose IR sensor [6] [12] is used in the parking slots sensor is designed to emit IR rays always when the transmitted IR rays is received back by the receiver this information will be transmitted to the microprocessor. Based on the output from the sensor the microprocessor response will be it is defined by the program which is dumped in the processor. IR frequency of 38 kHz so that the noise can be avoided

3.2. Controller

The Controller used here is an ARM architecture based microprocessor is acting as controlling unit it is interfaced with both the units named user interface and filed devices[6][10].The microprocessor continuously monitors the states of the parking slot and send the result through the local host server which the displays the status of the parking through a GUI [15] which diver can view in real time.

3.3. Local host and UI

Local host is a system which has control and user interface is configured as a server. And the User interface page is converted to HTML format this HTML has its own URL. The created HTML is saved in a location of the server by accessing the URL [11] the system can be accessed. In client system, the system acts as server and a local network will be created by the systems which are connected to a local network and are able to get the parking system field statists. Generally local host is to make the system as server and access the own system files with the help of URL. URL is for a source that is assigned by the local system itself. There is no need of IP address and TCP/IP or lwIP [14] protocol for this setup. The User interface [15] is graphical page designed to control the processor as well as displays the status of parking slot graphically. All the field data and the processor are controlled by the systems and are graphically displayed in the user interface that makes the interaction very simple and adaptive for the user. The GUI will be in the form of HTML [16] page so it will make the interaction easier and globally but here it is only done in with local host, it will not include any internet protocols. The GUI will be displayed on an OLED [17] display which in turn represents the user smart phone or laptop. Controllers analysis for non-linear system has been reported [20-32].

3.4. Slot reserving system

Slot reserving control is powered by DC gear motor it helps to open and close the gate of the parking slot. Based on input from the microprocessor when it gets reserving command it automatically closes the gate and when the vehicle arrives it automatically opens the gate. To implement this proposed system, when a vacant parking slot is reserved by the driver, the system must make sure that this parking slot is not taken by ananother car. In case of off-street parking resources, it is easier to block drivers from taking the parking slots that has been reserved by another driver. The system can initiate an ID check at the gates of garages and parking lots. If the driver has already reserved the parking lot the gates automatically opens and a parking spot number is provided. Otherwise, itis rejected, or permitted to park in the garage if there are any vacant or unreserved parking spots. However, this technique is expensive, the hardware is not easy to install and maintain. Anothermethod is to make use a light based system installed at each parking slots, where different colours represents different parking spot states.

4. Results and discussion

Result is visualized in both simulation as well as in real-time implementation of the proposed system. The obtained results are as followed:

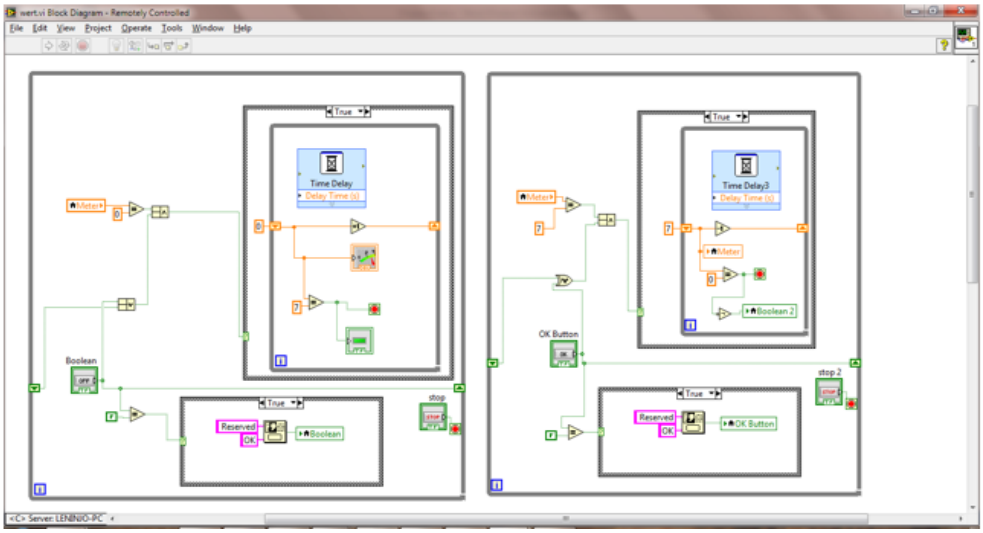


Fig. 2: Block Diagram.

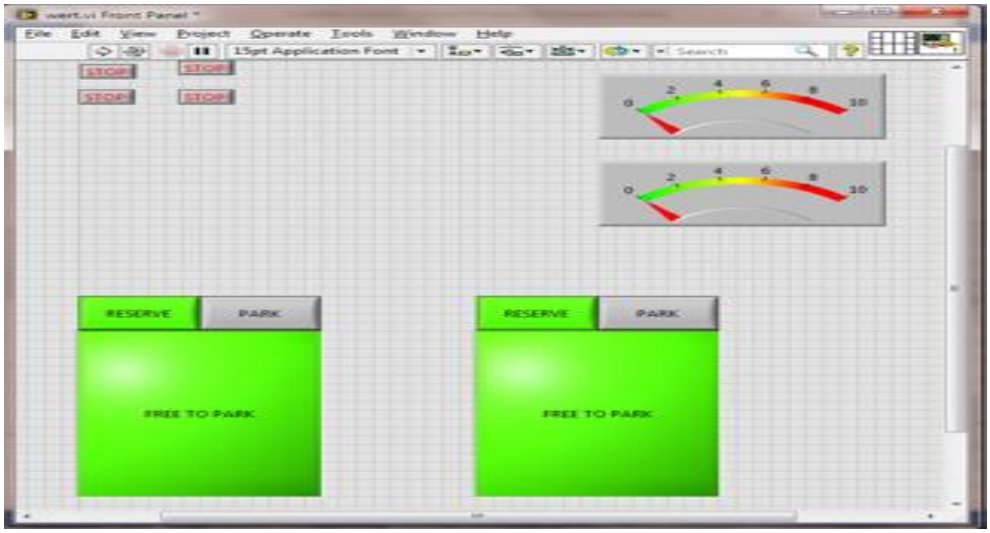


Fig. 3: Front Panel of VI.

4.1. Simulation result

In the simulation part the desired system design of the project is developed in LabVIEW [14] and the output is simulated over there. Front panel of the LabVIEW is the GUI and it is provided with all the control keys and the response for the request is displayed in the front panel itself. Figure 3 shows the simulated response of the system in front panel. The same simulation of the front panel is converted as a HTML page and via that user can know about the status of the parking area. To run this control over the HTML the system is configured as local host this configuration is made by LabVIEW itself. [13]

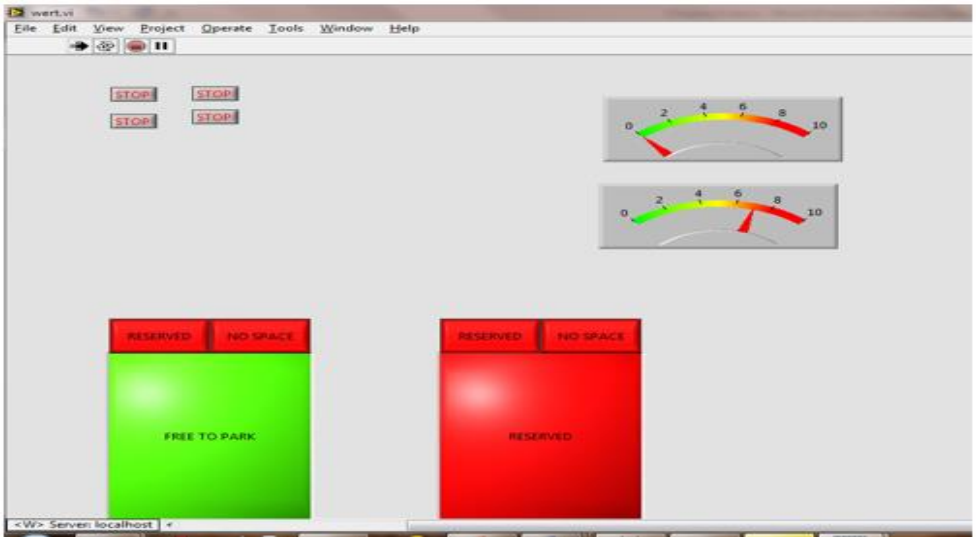


Fig. 4: Front Panel Simulation.

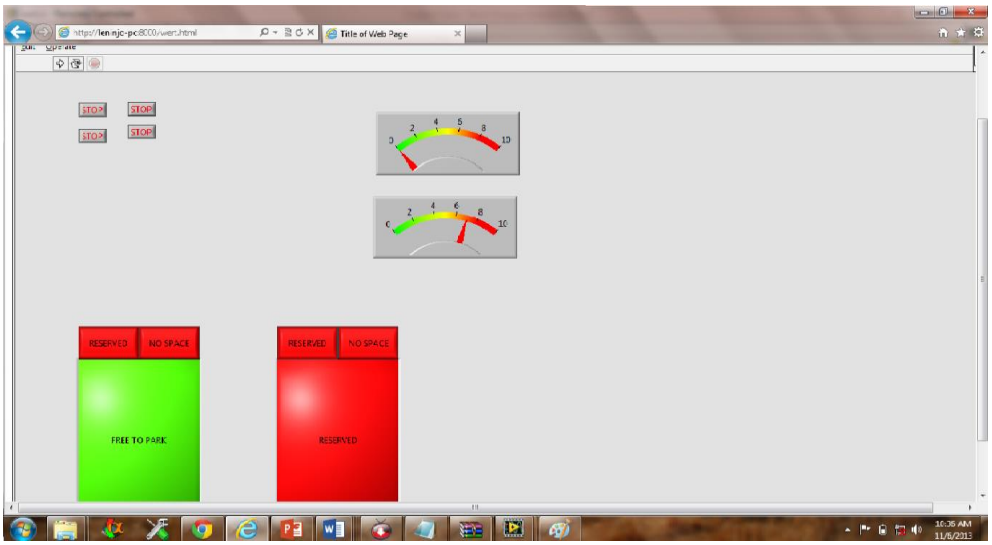


Fig. 5: Simulated Local Host GUI.

After completing all the configuration procedure LabVIEW will generate an URL it refers the HTML page. Internet explorer is the suitable browser for created URL by giving the URL address to the address bar the VI can be controlled. Figure4 shows the HTML page of the GUI. This simulated output gives a proper understanding to how the system could work in a real-life test.

4.2 Real-time output

Based on the simulation result the front panel VI is configured to compatible for the ARM processor by including the VI under the target of EK-LM3S8962.

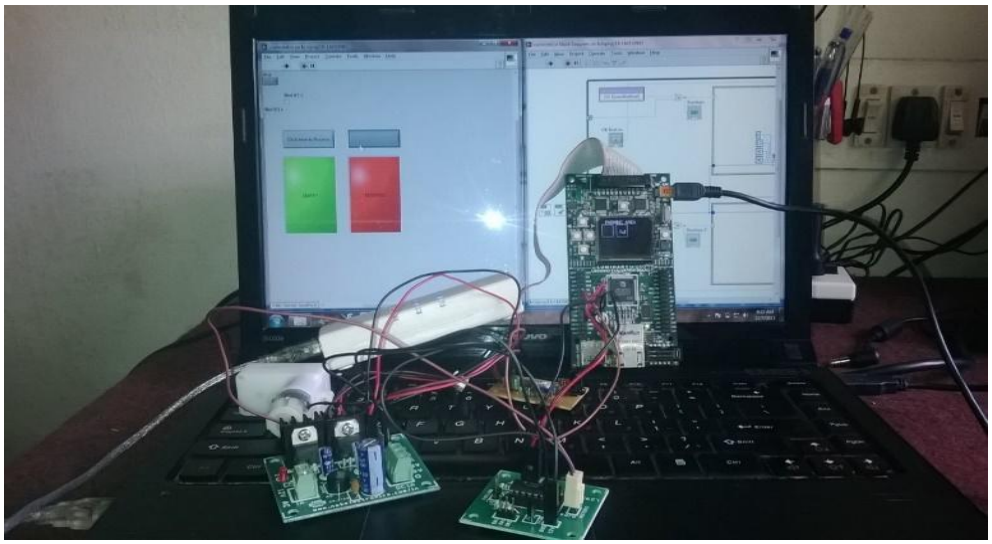


Fig. 6: Real-Time Output from the Processor.

The above Figure 5 shows the system setup for real-time implementation. The interfaced sensor will indicate the space occupied the vehicle in both display and VI's front panel if the space is occupied the OLED will show the TEXT full in graphical parking slot in front panel the slot colour will turn to red to indicate the vehicle if no vehicle in the slot will be in green colour the switches help to reserve and park vehicles.

5. Conclusion

The work done here will surely create the impact of reducing the traffic congestion over the vehicle populated urban area and will be more effective for the drivers to save their time and fuel by reserving the place for them to park their vehicle. The microprocessor which is used in this work is running by thumb instruction set which is one the fastest execution instruction set which will increase the speed of the processor and makes the entire process in an automated way. By means of automation all the manpower involved in older parking method is avoided and gives freedom to the driver to select the place for parking. though the project is fully automated one but it has some drawbacks they are likely the reservation system is semi-automated once the user need to park the car at his reserved place hen need to enter the passkey to open the gate it is time consuming process, and the simulation of the system has the option of remote access it has to be developed up to Ethernet option then only it can be access from the remote places. Reservation unblocking must be changed to fully-automated by changing the passkey method to recognition method. The system will also allow the user to gain a proper understand on how crowded the area they are about to visit is and judge the density of people present over there. These mentioned ideas are the some of the future scope

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