

Embedded Based Smart Car Parking System using Shared Memory

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Abstract— The objective of this paper is to find out appropriate solution of parking related issues in different aspects. Increasing concentration of human activity on limited land both in terms of residential activity and commercial activity causes the parking problem. Thus parking of these vehicles in shopping malls, theatre etc., is an emerging issue that people faces everyday while parking. Our proposed system focuses to provide the assistive for smart vehicle parking system using the concept of shared memory in Embedded System. In our proposed system we use the shared memory of two parking slots where accessed by the users. In the implementation and design process we use two UTLP KIT to operate the memory from one slot to another. The slot providing for parking is made by programming in Eclipse IDE with Ubuntu as operating system. While retrieving the vehicle the user should enter the respective allocated slot number for the user through keypad. After retrieving a vehicle the slot will become vacant and it will be shown as an available slot for the next user. Thus the cars are filled in an appropriate manner.

Key words: Embedded system, Unified Technology learning platform (UTLP), Shared Memory, Eclipse IDE

I. INTRODUCTION

Parking has become an emerging issue that people faces every day in their life. As per as survey carried out in India it is roughly estimated that out of 8760 hours in year the car runs for an average for only 400 hours leaving 8360 hours in parked condition. This problem occurs due to high percentage of vehicle ownership in every cities. Parking it after finding the suitable position manually requires more time consumption. Every car owner would wish to park the car as closely as possible to his destination so as to minimize his walking distance. This demand also leads to economic, social and environmental losses and with increase in population the problem becomes more critical. Thus our system of assistive for smart parking provides the information about the vacant slot where the vehicle has to be parked and also to provide proper management with context to traffic management. Thus it saves the time for the user and also saves the fuel of vehicles. The presented approach of car parking system can applicable for cinema theatres, malls, hotels and offices. In this car park management system, sensors are deployed to the parking lots to monitor and detect the occupation status of the parking lots, and to cooperatively process and transmit the information to a management system. By using the management system, the managers and administrators will be able to get the information about the parking field, including statistics and real-time information. In addition, the management system can alert the illegal mobility of the car parking in the field. The remaining part of this paper is organized as follows. Section 2 briefly describes the related works. Section 3 presents the description of the Hardware based on the requirements of the system. Section 4 describes the software

related to complement with UTLP. Section 5 describes the implementation of a prototype system. Section 6 reports the system simulation results. Finally, Section 7 concludes the paper with a discussion of our future works.

II. RELATED WORKS

In this section, we will review some studies on the application systems of automobile management based on wireless sensor networks. Developing applications for the management of automobiles have some specific difficulties, such as high speed mobility detection and prediction, mobile object identification and tracking, etc.

A. Anuj KNayak:

Et al. [1]2013“Robotic Valet Parking System” describes functional prototype of a robotic valet is built which parks the vehicle loaded. It was implemented by using UTLP Arm cortex A8 microprocessor unit embedded in TI-OMAP 3530 application processor. The central processing unit wirelessly controls the locomotion of robotic valets and the arrangement of vehicles in the parking area. A Prototype of a robotic valet is built which parks the vehicle loaded. The parking slip is provided once the engine off and reaches the loading bay. On producing the parking slip at the exit the robotic valet automatically retrieves the vehicle to the consumer.

B. Kairoek Choeychuen:

Et al. [2]2013 “Automatic Parking Lot Mapping for Available Parking Space Detection” explains about the parking space detection for the parking guidance system which make the drivers to park the vehicles efficiently. The parking slots be provided by using histograms of spatial features. An automatic thresholding for tuning object (car) detection in adaptive background model method is used to improve the quality of the image.

C. Harsh Kotak:

Et al. [3] 2013 “Automated Car Parking System with NFC Access” demonstrates that the parking system uses Near Field Communication (NFC) technology. NFC is a set of for smart phones and similar devices to establish radio with each other by bringing them into close proximity or touching them together, usually no more than a couple of inches. NFC Module is widely present in today’s smart phones and thus can be used to eliminate the need for parking tokens and/or cards. The automation and space management is managed by the ARM microcontroller by controlling the mechanical motors in transporting the car to an appropriate parking space.

D. Satish V. Reve:

Et al.[4]2012“Management of Car Parking System Using Wireless Sensor Network ” explains about Management of Car Parking System Using Wireless Sensor Network aims to proposes an advance solution for managing and monitoring

free parking space and automated guidance for user to park the car. In this system all the Infrared sensor(IR sensor) sense the status of the car space and accordingly transfer the information to the AVR controller. AVR sensor sense the status of car parking space and displays the information on the LED screen for the user, thereby reducing the time for the driver to find vacant empty space and almost reduce the chances of entering into the unusual space which might lead into the traffic jam.

E. Jae KyuSuhr:

Et al.[5] 2014 “Sensor Fusion-Based Vacant Parking Slot Detection and Tracking” describes that vacant parking slot detection and tracking system that fuses the sensors of an Around View Monitor (AVM) system and an ultrasonic sensor-based automatic parking system. This system helps to provide information about the parking slot marking detection, parking slot occupancy classification, and parking slot marking tracking. It detects parking slots in individual AVM images by exploiting a hierarchical tree structure of parking slot markings and combines sequential detection results.

F. Matthias R. Schmid:

Et al. [6]2011 “Parking Space Detection with Hierarchical Dynamic Occupancy Grids” describes about the use of a hierarchical three dimensional occupancy grid for the detection of parking spaces. Applying a three dimensional grid provides the additional benefit of supporting a variety of other functions including height estimation using a single environment representation type. The presented approach derives the distance to obstacles and walls and thus is able to represent the free space that forms parking spaces.

III. HARDWARE DESCRIPTION

A. ARM Cortex A8 Microprocessor:

The ARM Cortex-A8 processor is highly-optimized by ARM for performance and power efficiency. With the ability to scale in speed from 275MHz to 1.35GHz, the ARM Cortex-A8 processor can meet the requirements for power optimized devices with a power budget of less than 300mW. ARM Cortex-A8 processors offers comprehensive integration, software and hardware enablement, and one of the broadest performance ranges for ARM solutions available today. The main advantage is that it has high operating systems and Real time operating support. RTOS run applications with very precise timing and a high degree of reliability. Instructions based in formationis accepted.

B. TI-OMAP 3530:

OMAP 3530 platform is a powerful system-on-chip that includes the perfect balance of power efficiency and high performance. The OMAP 4 processor balances processing across four main engines: a programmable multimedia engine based on TI’s C64x DSP and power-efficient, multi-format hardware accelerators; general-purpose processing based on the dual-core ARM® Cortex™-A9 MPCore™ supporting symmetrically.

C. Character LCD & Graphics LCD:

UTLP consists of 3.5 inch Graphics LCD with touch interface. UTLP has the option to external bigger LCD’s

through photo frame on board. The character LCD which guides the user to follow the instruction for either parking or for retrieving by display the instruction as a character in 16x2 displays.

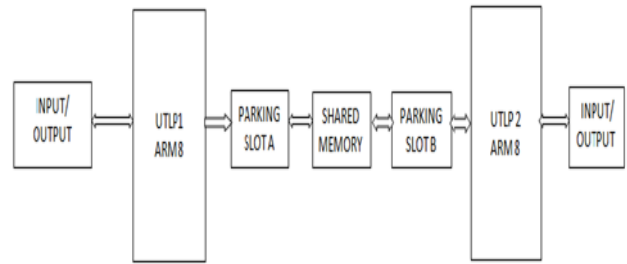


Fig. 1: Block diagram of proposed system

Guides the user to follow the instruction for either parking or for retrieving by display the instruction as a character in 16x2 display. It shows the status about the either vacant or available position as characters in the character LCD. The graphical LCD gives the colour code indication for both parking and retrieving. Thus the parking and the retrieving is differentiated by different colour codes.

D. Seven Segment Display:

The seven segment display shows the available or the retrieved slot number in numerical format. It provides slots for 36users. It increments the slots by one for every new user. It increments until 36. If any occupied position becomes vacant the corresponding vacant slot number is shown as a available slot number for the next new user. Thus decimal to hexadecimal code conversions are made in the program and it is being displayed for the users.

E. Keypad Interface:

The 6x6 keypad interface is connected to the control sensor header of the UTLP kit. The control sensor header is the keypad connector of UTLP. Keypad consists of 36 keys and the parking slot is made available for the 36 users. The vehicle which is to be parked or retrieved is decided by the input obtained from the keypad. The Key 1 is assigned as for parking which is being displayed in the control panel. The key 2 is assigned for the retrieving. If any other key is pressed rather than above these two keys in the first choice it is shown as not available in the character LCD.

IV. SOFTWARE DESCRIPTION

A. Eclipse IDE:

Eclipse is an integrated Development environment because it contains a workspace and an extensible plug-in to work. It supports the features of Java. It has a editor, debugger and source control. It can create many web based applications. It facilitates and encourages the development of third party plug-ins. Eclipse consists of a workspace where we will store more than one source code.

B. UBUNTU –Operating System:

Ubuntu is a Linux based Operating system. It is an open source Platform. It can be easily installed and very stable to Use. The user can creates his own web applications. It requires very less boot memory upto 2 GB. It is highly secured and reliable because it can access only the (API) for all hardware connected to it. By accessing this API for

initialising the hardware reduces the number of coding. It requires less CPU power. It maintains the speed as consistency.

V. PROJECT DESCRIPTION

The Unified Technology Learning Platform (UTLP) Kit which has TI (Texas Instruments) ARM CORTEX A8 processor unit embedded in the TI OMAP 3530 is the control unit for keypad and LCD interfacing. The two choices of either parking or retrieving is being displayed in the control panel. If the user chooses the parking option, the allocated slot is displayed in the 16x2 LCD display. After parking the vehicle green color will indication be displayed in the graphical LCD.

If the user chooses the retrieving option, the location of which the vehicle has to be retrieved back be indicated by the user through keypad. Once the vehicle is retrieved the red color will be displayed in the graphical LCD. Thus the slot position be incremented and displayed in the seven segment display for the further parking users. If the parked vehicle is retrieved it is automatically updated and that respective vacant position is shown for the next user. Thus the allocation of parking slot is provided on the basis of FIFO concept. The user who is entering first has the vehicle be parked first. Through the shared memory concept, the available slot and retrieving slot from the source can be accessed by both UTLF resources through wired protocol.

Parking slot A is designed to provide 36 slots which is ranged as from A1- A36 for 36 users. Parking slot B is designed to provide 36 slots which is ranged as from B1-B36 for 36 users. If the user enters the way nearby to the Parking slot A, the LCD display in the ULK 1 shows the available position and made it display in in the seven segment display. It increments the available slot by next for every new user. We have chosen the circular way of parking system for our proposed system. The parking slots A and Parking slot B is placed in different floors. Thus the memory of these two can be accessed in common by means of shared memory. When a car is retrieved the respective position is made as available for the next user.

VI. SYSTEM EVALUATION RESULT



Fig. 2: System Evaluation Result

The simulation result 1 explains about the choices mentioned in the control panel. The result 2 displays the

welcome screen in the 16x2 display. The option to be chosen from the 6X6 display. If the parking option is chosen the 16x2 displays the available parking slot and the corresponding slot number is indicated in the seven segment respective host MAC address where the user defined before. It provides different Application Peripheral Interface display. The graphics LCD display the green color as shown in the result 4. If the retrieved option is chosen in the keypad the car retrieval is indicated by red color shown in the result 6 with corresponding slot number. If the 36 slots filled the parking full is indicated by the result 9.

VII. FLOW CHART

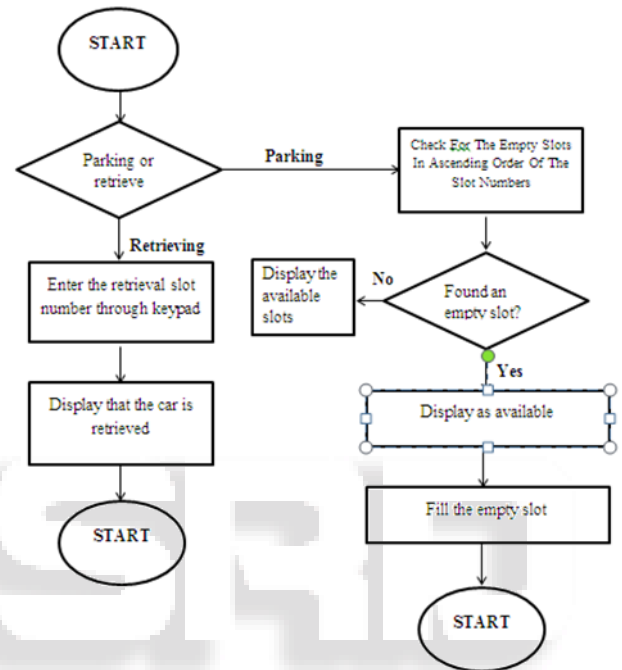


Fig. 3: Flow chart

VIII. CONCLUSION

Thus our proposed system helps the user to park the vehicle in the provided available slot. This reduces less time to search for the available slot. The usage of loading bay to park the vehicle takes more time to park the vehicle and user has to wait for some time until the parking slip generation. But in our system the user can obtain the vacant position and he/ she directly park the vehicle. Hence more users can accessed at a same time using the shared memory. This avoids the image processing technique and other Around view monitor technique for parking the vehicle. The implementation of this system in the circular parking system reduces the less floor space requirement. Thus different parking slots can be provided in different floors and it can be accessed by a common shared memory for multiple users.

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