



International Journal of Control Theory and Applications

ISSN : 0974-5572

© International Science Press

Volume 10 • Number 11 • 2017

High Speed Regularization of Traffic Congestion using Cmos Camera and Processing the Image with Altra DE2 FPGA Board

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Abstract: In this paper a smart car parking system is proposed based on field programmable gate array. The field programmable gate array combines with image processing technique for automatic parking of vehicle in huge building area. A CMOS sensor camera captures the image and process the image in FPGA board for automatic parking of vehicle during heavy traffic in the building area. The result is carried using image processing toolbox and process the result in grayscale format to display on VGA monitor. The image captured in SDRAM can be taken at anytime snapshot and uploaded to a PC as a BMP/JPG file. The main purpose of using FPGA is that the image is processed with high speed computation for parking the vehicle without any accident for parking the vehicle. Finally the car is parked without any congestion, without any accident, and placed in the particular slot to prevent unauthorized traffic in huge building area.

Keywords: Smart Car Parking system, CMOS Sensor camera, ALTERA DE2 board, FPGA.

INTRODUCTION

The automatic parking system prevents accident where the traffic congestion is huge in parking environment. The technology include a sensor for processing the input image, and a computer for monitoring the input sequence, FPGA kit for controlling the vehicle movement in the parking environment which keep an optimal tracking path, and suggest the path automatically for the safety of driver. However, If the vehicle enters into parking environment is huge in number it is very difficult to control therefore, automatic parking system has become the research focus and it will be studied in this paper.

The automatic parking system processed with the following steps 1) for detecting the parking space accurately, 2) then to plan the path to reach the goal accurately, 3) track the path for short distance. Once the park moment is started, then the system starts to search the space area available for the parking system which accurately fit into the parking space and then the driver needs to park the vehicle without any damage. The shortest path is calculated when the parking space is available, and then the space is reserved for the corresponding vehicle which accurately fit into their position and there will not be any empty space.

The proposed system has hardware part and software part embedded into the interfacing board (FPGA) which accurately analyzes the parking area is in correct congestion with the respective control. This system can join with the security department to justify the parking system effectively such as positioning the car if a person able to forget it corrects parking location. So in this paper, the novel automatic parking technique is proposed with Altra DE2 board for reducing the traffic congestion control and also the security needed to the driver without any accident in the proposed system. Therefore the overall system is prevented in the entire security system.

LITERATURE SURVEY

In 2009 Noor hazrinhany Mohammed has proposed smart parking for reservation system for short messaging services and it has a minor advantage its is enhanced with security such as password protection and its disadvantage is that cost is very high to manipulate the design. In order to prevent the cost and without password FPGA altra DE2 proposed. In 2012 Jihoon yang has proposed smart parking with wireless sensor network and it has the advantage of using android application for better interface and disadvantage of reservation feature is not available for the user. So we propose without reservation FPGA Altra DE2 board is proposed for automatic parking of vehicle. In 2014 Rashid proposed automatic parking fee collection based on Number Plate Recognition its advantage is that parking will have less interaction with the user using magnetic card and its devices. And its disadvantage is that number plate is different in terms of color, size and type vary from country to country. In this proposed system there is no number plate with different size and color, the FPGA kit try to solve this problem and this technique can be easily designed and implemented for future use. In 2015 karbab proposed network wireless sensor with RFID for security system in the car parking and theft also easily identified. The advantage of using this management is low cost and gate open with RFID TAG. The disadvantage of this method no driver guidance is needed in the parking lot. The FPGA and mat lab image processing toolbox is proposed to overcome this advanced features in automatic parking system.

METHODOLOGY

Many smart parking system for automatic parking of vehicle in theatre, huge building and in the apartment is proposed in a wide variety. But all parking system are available are time constraints i.e. it takes some time to park the vehicle without any congestion in the traffic network. The new method which proposes with image processing technique embedded within an interfacing board find simple method to solve the traffic congestion problem. And this system alerts the driver in case of any accident while parking the vehicle. The edge detection with sobel operator is assigned to identify the edges in all the corner of the image and the information processed in computer vision. The information processed into the FPGA board can be analyzed without any traffic in

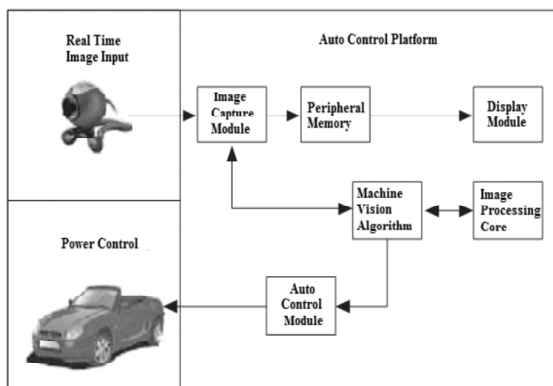


Figure 1

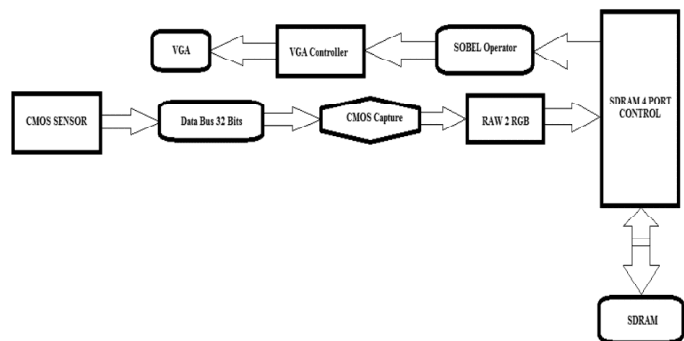


Figure 2

traffic environment. Most preferably information gathered from Cmos sensor finalizes the output result when traffic congestion is huge.

Initially the image is acquired in the cmos sensor camera for processing the input image. The input image acquired is RGB format and the image acquired in cmos sensor camera is known as image acquisition. The input image is in RGB format and its is converted into gray conversion for enhancing the output so sobel operator identifies the edges in the image. Gamma correction is achieved for enhancing the image for image enhancement. Edge detection for gamma reference image is done using sobel edge detection algorithm. Sobel operator is an edge detection algorithm which identifies the edges and detects the boundaries between region and the image. Edges detect the boundaries and object which separately delineates each and every object and detect the background image.

RESULTS AND DISCUSSIONS

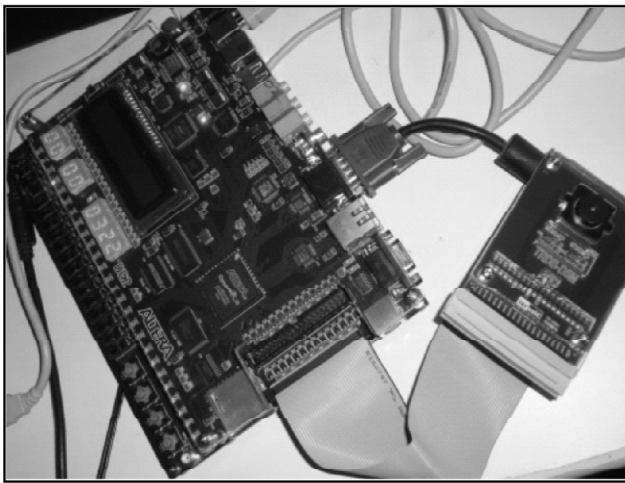


Figure 3: CMOS Camera Interfaced with DE2 Board

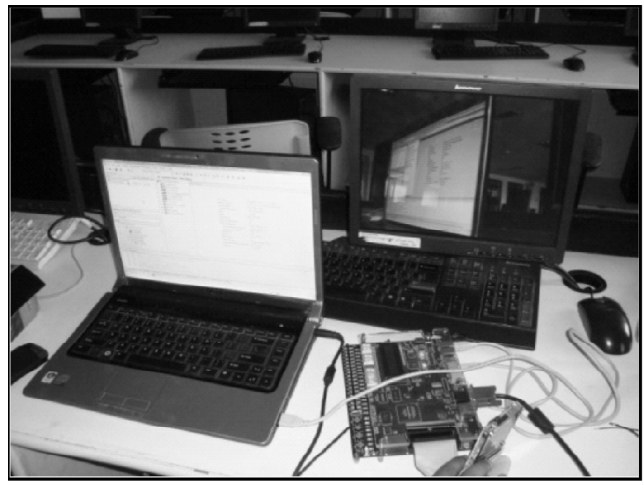


Figure 4: Real Time RGB Image

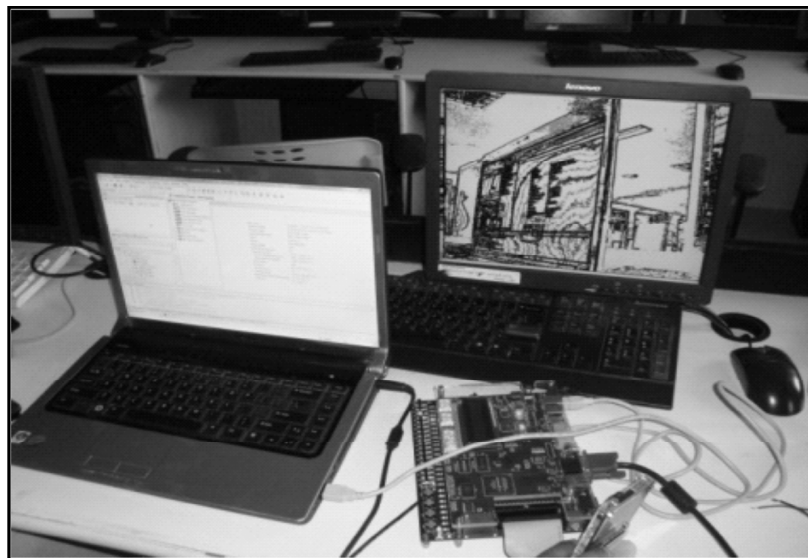


Figure 5: Edge Detected Output

Fig. (3) shows the input image of cmos sensor camera with DE2 board interfaced in the computer vision. The DE2 board output the result accurately and sends the information to the driver without any accident and reduces the traffic in the congestion control. Fig. (4) shows the RGB format which converts the input image into gray scale. The input image is programmed in quartus II software at each and every stage it is validated, test the result with high accuracy in the input image. The JTAG cable which transfer the information through long distance and process the image and simulate the result in FPGA board. Fig. (5) is the edge detected output which identifies the edges in the image based on the boundaries with top and bottom of the corner of all the edges in the slot for parking the vehicle.

CONCLUSION

The Smart Car Parking System presented here makes the system efficient in removing the traffic problem which arises especially in the town area where traffic congestion is high and insufficient parking spaces are indisputable. It does so by directing drivers and optimizing the use of parking spaces. Our method makes it possible to manage large area by just using several cameras. It is consistent to detect incoming cars because it uses actual car size with different images. It is cheap and easy-installed because of the simple equipments. Drivers can get useful real-time parking slot information from this system. The edge detection technique used relies on the pixellation of the captured image and provides a straightforward method for obtaining approximate outlines of the imaged objects. The future prospect of this project is that car space availability can be shown according to the model of car whether the car may fit in given space or not. Further the concept of e-parking can be implemented using this concept. Compared to IR sensor, it has been observed that it reacts to images very fast and due to use of hardware device in our project i.e. FPGA total latency of whole process is very less. FPGA technology provides the reliability of dedicated hardware circuitry with true parallel execution on a reconfigurable chip.

Although there are some advantages of using Sobel method for edge detection but this method is also having some disadvantages like it gives poor results for compressed images and it is subject to noise. So in future we will take care of these disadvantages by looking for other methods which can avoid these problems and gives better results.

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