International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Smart Vision-Base Parking with Building AI Processor

Renuka Mehetre[1], Prof. Monika Rokade[2]

[1]PG Student, Sharadchandra Pawar College of Engineering, Junnar, Pune, India
[2]Assistance Professor, Sharadchandra Pawar College of Engineering, Junnar, Pune, India

A B S T R A C T

Recently, there has been interest in intelligent parking systems a growing number of different methods for detecting parking lot occupancy they are in the studio. In this paper, we present vision-based parking occupancy detection with built-in AI processor. Employment fisheye lens camera, several parking slot states are identified one device. We measure the recognition speed of AI processor v designed system and determine the optimized configuration with a software simulator. The highest recognition rate is measured to 94.48% in configuration 64 number of training data s Data size 256 bytes.

I. INTRODUCTION

As the number of vehicles increases, a parking lot is created the guidance system has received a lot of attention for driving efficient parking space. Parking guidance system provides convenience to vehicle drivers when searching for a free space parking space easy. As part of parking guidance systems,finding the occupancy of each parking space is important component. There are ways to check the occupancy of parking spaces divided into two types, which are called sensor approaches and vision-based approaches [2]. In the past,Sensor-based approaches are widely used for presence detection vehicles using ultrasonic or magnetic sensors sensors [3]. The data obtained by the sensors is stored in a parking server and information about the status of parking is delivered to vehicle drivers [3]. However in sensor based system, one or more sensors are required for each parking space and the information obtained by the sensors is dependent on adjacent state of the parking slot [3]. In order to address these constraints, vision-based approaches for parking detection slot occupancy is constantly being investigated. Generally when detecting parking occupancy based on visionsystem, many cameras capture images of multiple parking spaces and each occupancy of a parking space is identified by the use of an image processing techniques such as feature extraction or adaptive threshold values [4]. Recently, learning-based algorithms such as convolutional neural network (CNN) or U-Net also proposed in vison-base approaches [1]. In these cases, the images taken the cameras are transmitted to the parking server and the parking lot the server performs the job detection algorithm. This feature leads to a high load on the system network and requires a high parking server performance.vehicle in embedded system, parking server only receives identified information about the status of each parking space. Due to resource limitations, the embedded system has a problem executing the parking lot occupancy algorithm detection. To solve this problem we use embedded AI processor for parking space occupancy classification [5].

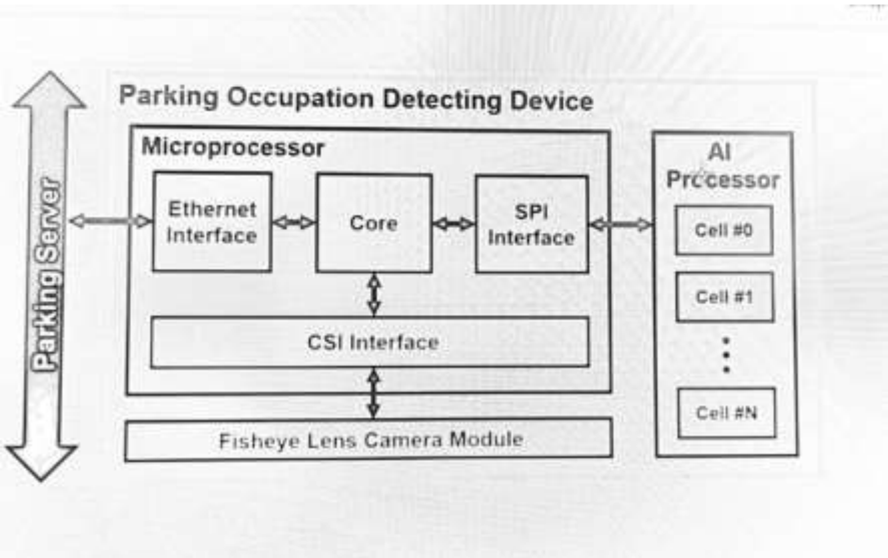

Fig. 1. Architecture of proposed device

II. PARKING OCCUPANCY DETECTION

A. Parking occupancy detection device

Architecture of the parking lot occupancy detection device is in Fig. 1. The device consists of a microprocessor, fisheye camera and AI processor. Microprocessor receives fisheye camera image data via CSI interface and communicate with the AI processor via SPI interface. There are several in the AI processor cells, and each cell stores a training dataset and a

category value data file [5]. In the parking lot occupancy detection device, image data that represents the free state or the

occupied state of the parking lot slot are trained in each cell. When new image data parking slot are transmitted to the AI processor, each cell calculates distance with trained data. By selecting a category value the cell that has the minimum distance AI processor performs the classification.

B. Occupation detection flow

Image data obtained from a fisheye lens camera to be pre-processed to be used as AI input data processor. Original fisheye camera shot a the pre-assigned parking slot areas are shown in Fig. 2 (a). Due to the wide angle of view, employing a fisheye the camera lens has the advantage of identifying more parking spaces slot in one device. It is pre-assigned from the original image the parking slot areas are divided into grayscale.Each separate parking slot image is resized to fixed data sizes that are supported by the AI processor. Resized image the data is merged into one-dimensional data to transfer to AI processor via serial interface. Pre-processed data they are used for training data or AI recognition data processor.

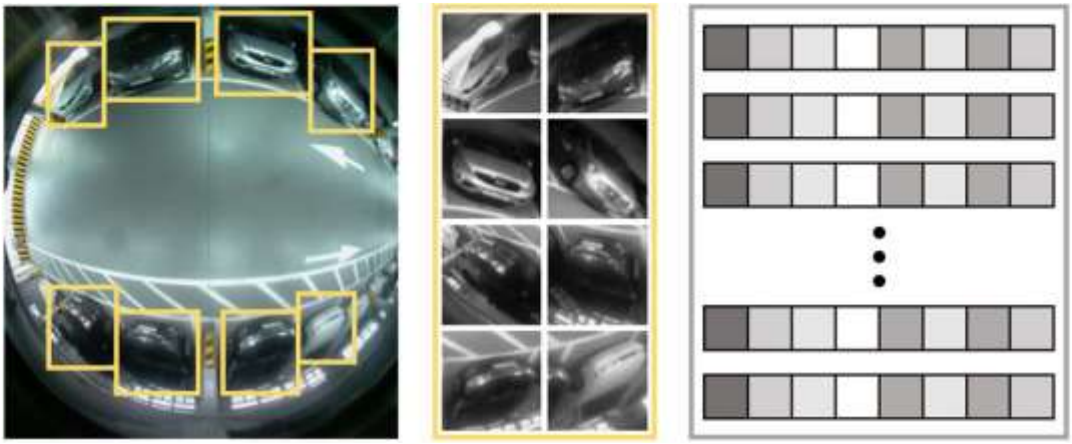

Fig. 2. Fisheye lens camera image and pre-process flow

III. SIMULATION

Before the hardware implementation of AI processor v of the proposed system, we measure the recognition rate using a a software simulator that models the same functionality AI processor. By changing the count configurations cells and data sizes, we measure the recognition speed at different AI processor specifications and determine optimized model in the

proposed system. When considering the implementation in the embedded system we limit the overall cell memory size to

16KB and simulate with four cases as in Fig. 3. We will prepare 210 parking spaces image data that is captured by a fisheye camera to perform simulation. The dataset consists of 120 vehicle numbers occupied images and 90 free images. For recognition speed test, the training data for each category is selected randomly with the number of cells entered. Remaining dates which are not selected in the training process are used as a test data. To obtain an optimized training case, we perform this procedure 10,000 times. Giant. 3 represents the maximum recognition rate of each specified configuration. Model with 64 number of cells and 256 bytes training data size has the highest recognition rate 94.48%.

IV. IMPLEMENTATION

To verify the functionality of our proposed system, we implement a parking lot occupancy detection device shown as Fig. 4(a). The parking lot occupancy detection device consists of microprocessor, fisheye camera and AI processor. The AI processor is implemented in a programmable location gate array (FPGA) with a specification determined by simulation result. Giant. 4(b) shows the experimental parking model taken with a fisheye camera. We measure accuracy of the designed system in an experimental environment and obtain an accuracy ratio of 80.36%.

V. CONCLUSION

In this paper, we propose a vision-based parking space occupation detection with built-in AI processor. According to using an AI processor and a fisheye camera the proposed system identifies the occupancy of multiple parking spaces simplified image processing. We perform software simulation before hardware implementation to determine optimized AI processor specification. Consequently a 64 cell model with a data size of 256 bytes is selected with a recognition rate of 94.48%. We implement an AI processor in FPGA with optimized specification. Accuracy is measured in an experimental setting and scored 80.36% accuracy ratio.

CONFIRMATION

This study was supported by the Ministry of Industry and Trade & Energy (MOTIE, Korea) under Industrial Technology Innovation program. No. 20006566, “Development built-in artificial intelligence module and system based on neuromorphic'

REFERENCE

1. Monika D.Rokade ,Dr.YogeshkumarSharma,”Deep and machinelearning approaches for anomaly-based intrusion detection ofimbalanced network traffic.” IOSR Journal of Engineering (IOSR JEN),ISSN (e): 2250-3021, ISSN (p): 2278-8719

2. Monika D.Rokade ,Dr.YogeshkumarSharma”MLIDS: A MachineLearning Approach for Intrusion Detection for Real Time NetworkDataset”, 2021 International Conference on Emerging Smart Computingand Informatics (ESCI), IEEE

3. Monika D.Rokade, Dr. Yogesh Kumar Sharma. (2020). Identificationof Malicious Activity for Network Packet using DeepLearning. International Journal of Advanced Science andTechnology, 29(9s), 2324 - 2331.

4. Sunil S.Khatal ,Dr.Yogeshkumar Sharma, “Health Care PatientMonitoring using IoT and Machine Learning.” IOSR Journal of Engineering (IOSR JEN), ISSN (e): 2250-3021,ISSN (p): 2278-8719

5. Sunil S.Khatal ,Dr.Yogeshkumar Sharma, “Data Hiding In Audio-Video Using Anti Forensics Technique ForAuthentication"IJSRDV4I50349, Volume : 4, Issue : 5

6. Sunil S.KhatalDr. Yogesh Kumar Sharma. (2020). Analyzing the roleof Heart Disease Prediction System using IoT and MachineLearning. International Journal of Advanced Science andTechnology, 29(9s), 2340 - 2346.

7.D. Jian and C. Lin, "Vision-Based Parking Slot Detection Based on Endto- End Semantic Segmentation Training", 2020 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, USA, pp. 1–4, 2020.

8. X. Ling, J. Sheng, O. Baiocchi, X. Liu, and M.E. Tolentino, "Identifying parking spaces and occupancy detection using vision-based IoT devices,”2017 Global Internet of Things Summit (GIoTS), Geneva, Switzerland,pp. 1-6, 2017.

9. S. Deshpande, “M-parking: Using a guidance system for vehicle parking hierarchical wireless sensor networks," 2016 IEEE Annual Consumer Communications & Networking Conference (CCNC), Las Vegas, NV, pp. 808-811, 2016.

10.R. A. Hadi and L. E. George, “Vision-Based Parking Lots Management A system using an efficient adaptive weather analysis technique,” 2019 International Conference on Developments in eSystems Engineering (DeSE), Kazan, Russia, pp. 522-525, 2019.

11.Y.H. Yoon, D.H. Hwang, J.H. Yang, S.E. Lee, "Intellino: Processor for Embedded Artificial Intelligence," Electronics 9, No. 7: 1169, 2020