Automatic Car Parking System Using Raspberry-Pi with Cloud Storage Environment

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Abstract-In the present world,the increasing number of vehicles along with irregular parking leads to traffic congestion in many areas. But the existing system defines uses wide range of sensors to regulate it. In automatic parking system enables driver to locate the available parking slot even in traffic congestion area using Raspberry-pi and stores the data of the driver in cloud to enable scalability and accessibility. Each authenticated user uses their own allocated slot and the others are provided with different available slot. The available slots are provided to the user in any range of accessing the parking slot.

Keywords: traffic congestion; automatic car parking system;Raspberry-pi;cloud

I. INTRODUCTION

In recent days,the tremendous use of vehicle and their usage by the people are in high range. In that cause the parking facility of those vehicles plays a major role in smartworld because of their parking insufficiency in the places like hospitals, supermarkets, colleges, office, schools, cinema halls etc. To overcome this problem some more techniques are dropped out which make the way to reduceour effort in every possible way to enhance the parking system. According to recent statistics, approximately 30% of all intrusion is caused by exasperate driving towards the parking slot. The drawback is effectively processed by enhancing Internet of Things, which defines the processing both with physical and mental behavior of the objects in real time. Consequently the Cloud with IOT makesan fruitful pair to enroll the car parking facility.IOT made a great consequence in smart cities [1]

Hand-held devices+ Physical objects+ Controller, sensors, Micro devices + Internet = Internet of Things.

II.INTERNET OF THINGS

Internet of Things are being an important criteria for the creation of Smart Cities.This factors allowparking facilities and secures transportation and its management [2].Emergence of the elevation in the rangeof sensors and its effective usage with low cost feature, the proposed process can be implemented by using Internet of Things. In proportion to the latest report issued by "The International Parking Institute [3]",we initiate that possible successful process and parking ideas have been flourished. So that IOT plays an important role in smart and digital world to process with effective man less work and intelligent processing system with utilizing both hardware and software techniques.

III.LITERATURE SURVEY REVIEW

i.)Automatic car parking with visual indicator[4]

The process is carried over by the Arduino sensor and Led light to indicate the space availability of the parking slot.Uses ultrasonic sensor to sense the arrival and presence of the vehicle in the parking area. It also provides the system with some values as Usage of Arduino is slight effective than other sensing devices.Does not involves complex process to execute this system. But the usage of LED light is used at every parking slot, which is not compatible for wide area implementation of the system.

ii.) Smart Parking System using optic Wireless Sensor Network [5]

The main theme of this system is to enhance the use of video cameras which are distributing in the parking area and define the license plate of the vehicle and enhance the parking facility.

Wireless sensor network with smart parking provides, Mostly cost-effective.Wireless Sensor Network is easy to manage and process.It also faces some pits and falls as ,May result in system failure as they are not so powerfully process.License plate detection and its processing makes more complex and its accuracy may vary which is slightly impossible.

iii.)Smart parking reservation system using Bluetooth and Zigbee sensors [6]

This process involves the use of Bluetooth medium to enhance the vacant slot for parking and to

@IEEE 978-1-7281-1524-5

verify driver's identity .In addition to that Zigbee device is utilized to detect the presence of the vehicle. It can also be process as Independent of Internet usage. It is not depend on any centralized system .But it included with some disadvantages Bluetooth accessing is processed to certain limited range.Installation and maintenance makes a challenging one.If the driver is ideal the connection gets discharged and new slot has to be book which is not time effective.

iv.) Smart parking system using IR sensor [7]

Feedback mechanism is used in this system in order to enhance the parking slot availability.To detect the parking spaces Infrared sensors are used in this process Parking slot is utilized properly, with frequent analyzing. The cost to build up the system is quite less. But usage of IR leads to Traffic congestion - The availability of the vacant slot in the parking area could be detected only after when the car arrives inside the parking slot, in certain case the space is not found the driver have to get ward off from the area

v.)Smart Parking System using RFID [8]

Here possess a unique RFID tag which is defined by the RFID mechanism to match with the tag stored in the database for the incoming vehicle, which is being read by the RFID reader at the incoming position of the vehicle. Slightly cost effective and process a fastest method of identification. Even by using this method, more than one RFID tags are read at a time, in case of the unusual damages of the RFID the precise process to enhance the working of the system is not properly managed.

IV.PROPOSED SYSTEM

In recent days, Internet of Things plays an important field in day-to-day life that enhances various set of services to different task to alternate mode of usage. Any person can access the system without the knowledge of the technique involves in it.This system can process the parking slot effectively anywhere in the available area through well-deserved parking localization.

Fig:1 represents the accessing of the each node (which here as user/driver) and the way the system enhancing the cloud environment. The proposed parking system contains various components and also its functionalities are described below with their processing technique and its working methodology.

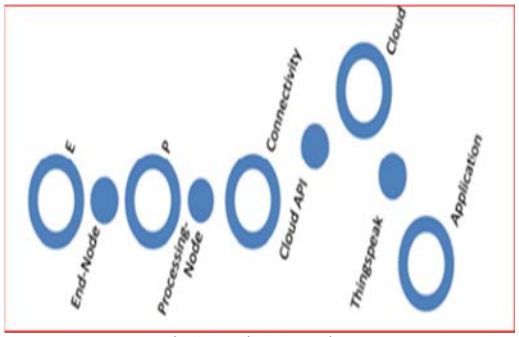

Fig 1: Node processing

Centralized server: It contributes the maintenance of the databases that contains all the basic and secure information about the user and also the parking slot spaces.

Raspberry-pi: It is the microcontroller, which is main constitution of the system used to process all the basic work of our parking system and this is pre-loaded with camera, Wi-Fi module etc.

Image capture: The Pi-camera which is in microcontroller processed to capture the image of parking slot area frequently and continuously to make validation of the slots to ensure that it is filled or not filled.

Navigation system: It processes the signal for the availability of vacant parking area to the user and makes exact path and location to navigate the user to reach the accurate destination.

Display device: It makes the whole system visible to the admin side which is processed as to modify the parking system allocation as with the use of monitor or system that make visible picturized visual display of parking area.

User device: It is available to the user to make stable connection with the parking system to enhance accessing of parking facility.

V.IMPLEMENTATION

In our proposed system, we process separate access to both authorized and un-authorized user to make use of the processed system. The main component of this system is Raspberry-pi, which functions like existence computer. This consists of many inbuilt module and handling devices which can be effectively used without the external need. The precise components like Wi-Fi module, Pi-camera, Radio receiving and transmitting module, wireless antenna to make connection with radio frequency to collect data and signals.We proposed the process with mobile/web application in which user can make self-preregistration before they enter the slot for parking. They can make use of that registered area of parking with a whole of 24hrs with different parking

slot in the same area. To enhance the frequent accessing of the concern parking system each registered user have to make login with the generated ID that progressed at the time of registration.

The details of each registered user has been delivered to the cloud environment which makes the accessing so easier for accessing at different times in any slot of time in a particular day which prevents from tremendous loss of user information .The (Smart Parking System) SPS that specifies raspberry-pi along with pi-camera which makes visual capturing of parking area along with parking vehicle. This camera makes the action by placing on the top of indoor parking ceiling of the parking slot area. Hence the camera makes a regular survey processing on every parking slot in the system to maintain the spontaneous information about the free and filled parking area.

The fig.2 defines the overall structure of the car parking system and it contains visual idea of represents the slot with various components .It processed its accessing to the system to the reference user by using contains some control points on each parking slots which will be used as reference points for the camera.It defines some of the known HTTP and CoAP protocols to enhance the multiple and single slot processing in the parking area.

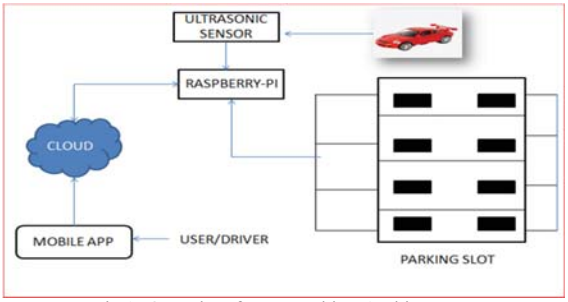

Fig 2: Overview for car parking Architecture

These are effectively processed by commonly known websites that build with JSON interfaces. Any availability of slot in the parking area the changes updated automatically to the server. Then user can access this stored information using internet from any location. And this information is used by parking operators to effectively collect information at any medium and access concern, the Fig 3: defines the basic communication between the different clients with the SPS central server. Once the registration has established in the system after parking of the vehicle in the slot, the concerned vehicle should authorized with regulating the recognition algorithm. It also provides the gateway, which would allow the car that is recognized by the system. Otherwise it makes the vehicle to authenticate with precise delivered information to make the system used effectively. The gateway is processed its work even in the entering and exiting place of the system.

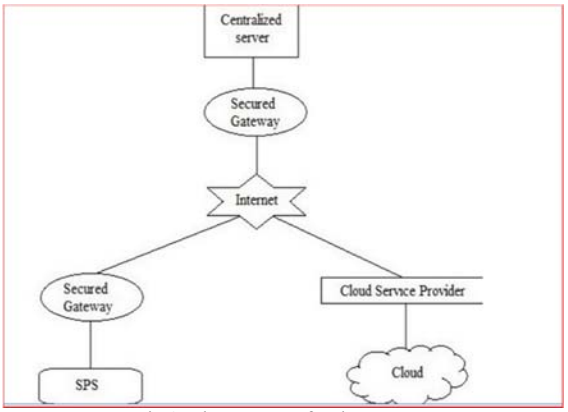

Fig 3: Flow process for the system

VI.METHODOLOGY

The proposed system is divided into small sub-unit system which are as display sub-system unit, making authentication of the user, effective positioning of the car, Slot allocation process, management of slots. At the starting process of the system, the required data is collected from the ultrasonic sensor for contributing the available of parking slot in the defined area. When the car arrived, then its image is further captured for authentication and user verification. Secondly, the captured image is processed in MATLAB, which is mostly recognized for the license of the specified car. In addition to that each ultrasonic probe defines the parking time of each vehicle.

VII.AUTHORIZATION OF USER

In the parking facility, the enhanced system should also define security procedure which is carried over by car license plate recognition identificationITS and ETC. In past days the recognitions process is enhanced with some of the analysis process with edge, color and also with Adaboost training. Ernst [9] put forward a mechanism which can take over the processing with MCT (Modified Census Transform). It enhance the parking facility process with image processing and character recognition which automatically identifies the vehicle by reading the license plate and ensures the authorized person to access the vehicle.

In order to build the system with the required process consists of some process as

extraction of number plate, characters segmentation process, and characters recognition process [10-13]. Before enhancing the license plate accurately, the captured image of the vehicle is transformed into binary format [10].Following Fig. 4 debits the process of the parking system

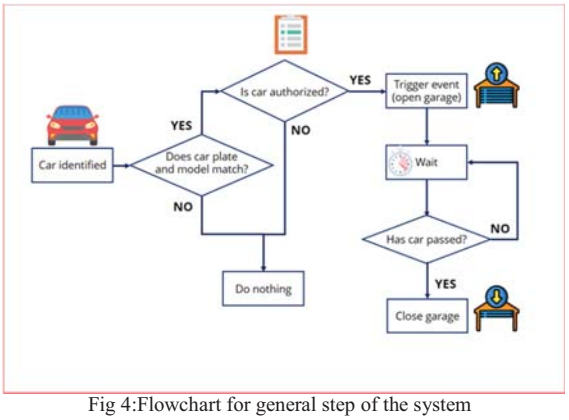

Fig 4:Flowchart for general step of the system

A. RGB to binary conversion

The captured image is convert the camera image into grayscale , so that it can be deformed into RGB images as required.[12]. The processed image is resized into concerned 800x600 pixels.After that, the image is transformed into 0 and 1 combined digital for each pixel as referred as binary image.

B. Image Filtration

Every component is assigned with the integer number. After that their values related to width and their height are calculated, on to that the minimum and maximum height and width of the labeled images are given with concerned values. Heightmin = 5px,Widthmin = 2px,Heightmax = 80px, Widthmin = 90px.

Each values obtained are compared with the referenced value .If the height compared is less thanTmax-h and if it is greater than Tmax-h, then the concern image will be considered for further processing. Otherwise the object will be diminishing. The result of the about specified process is enhanced with number plate along with objects that is same that of the number plate specified. Then the remaining areas left over the specified techniques are calculated.The objects specified with the areas that are almost within the reference areas are remains for further processing.

C. Analysis and Dilation

For inserting pixels into the processed image, weuse dilation (morphological) operation which inserting the pixels in the boundaries of the concerned objects. This process groups the numbers and character in the recognized number plate.

D.*Accurate location of License Plate*

The plate number is exactly processed by defining 1- the object is remains imageand as more than 1 –it eliminate the objects that are near to the border.

E. Character Recognition

To recognize plate numbers, each character must be analyzed. a. Binarization of the recognized license plate. Segmentation of each character .Template matching to recognize license plate numbers [13].

F. Performance Measure

In order to recognize the characters, certain approaches are carried out are: autocorrelation, Structural Similarity Index (SSI) and Mean Square Error (MSE).

VIII. RESULTS

Just few steps forwards to enhance the smart city mission, the scope of unplanned parking for accommodating the congestion due to growing vehicle population have become uncertain. A cloud based environment with end-to-end smart parking solution powered by IOT(Internet Of Things) is where the technology, economy, and the user experience come together to create a more smarter living with sustainable communities, which is the basic need in the upcoming hour of digital world. Such solution give up their hands to improved traffic less flow with less congestion in available area, better mobility anywhere which result in sufficient living conditions. Added efficiency to traffic monitoring and improved panning will process return on time and money investment and savings. It also helps improve revenue by providing the real time visibility into the availability of optimal parking spaces acrossthe city. Thus the idea of smart parking solution will be one another feather in the crown.

IX.FUTURE SCOPE AND WORKS

Currently a web based application has been developed. A multi-platform mobile application is in the scope of development. Structured Real time implementation.The broad idea of the proposal has been put into a prototype model. In future processing, the project will be engaged real time with a novel architecture. GPS and map integration. At present incorporating GPS inside the system is difficult since the city is unplanned. In the future, a GPS based solution will be implemented. Therefore it won't be just a satellite location anymore, but the user can get real time distance and directions to the destination.

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