An Approach To Monitor Parking Space In Cities With IoT

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***Abstract*— Internet of Things is the next big thing, as almost everything developed now has a wide use of data which is then used to get the daily statistics and usage of every individual. The work mainly consists of constructing a display where each empty parking space will be shown and a camera module will be set up to detect the entrance of a car or any vehicle eligible to park at the lot and scan the vehicle registration number in order to provide a check whether the vehicle is registered to park or not. Moreover, a sensor sort of device will be placed at each parking area through which each space vacancy will be shown in order to determine the exact spot available. In order to surpass the project completion, we will be using raspberry pi with camera module mounted on it and other sensor alongside the project work.**

Keywords*— *IoT, Tensor Flow, smart, parking.

I. INTRODUCTION

The project proposal is initiated due to the current issues that is being faced by some regular every day, i.e. to find a parking spot. The idea is mainly to create a device with a camera module mounted on it which will help to scan only the cars entering and exiting a parking lot and will display the appropriate space remaining in the lot.

Some extra features has been added and that is , the camera module will also scan the vehicle license number in order to determine whether the vehicle is registered for that space or not, this will in fact help the authority to track down unregistered vehicle taking up the space in the lot. Another feature that can be added is with a viable sensor on each parking space, which will basically feed information to the cloud whether that space is empty in the lot or not and hence, a display of all the available space will be provided through which the vehicle entering can easily track down the space without wasting any time.

Some previous work entitles as to use the visual sensor network in order to determine the parking space and in order to do that encrypting of images or videos are being sent to the central controller which deals with all the decrypting and analyzing the contents that has been sent over. Another work, relates to real-time detection of vehicle entering and an automatic collection of parking fees which somehow gets declined if the real-time feature is not being focused on, as there are already several literature reviews on smart-parking system, hence other features are mostly being focused in.

II. METHODOLOGY

Two ways will be applied in order to get make the work successful:

- Vehicle Recognition via Cameras: Multiple cameras will be installed in the parking lot to monitor all parking space and then accumulate their conditions.
- Viable Sensor: Each parking space is equipped with a viable sensor, which will basically feed information to the cloud whether the space is empty or not.
- Provide any kind of warning or notification when any car is about to reserve the spot.

Ultimately, a device with data receiver inside will be installed in the entrance to properly convert the information and present it to users in a straightforward way.

The challenges that can be faced while doing the project would be, mounting the

cameras and getting proper feeds in the cloud and making a detection about vehicle's registration is also another challenge that needs to get overcome.

III. RELATED WORKS.

The paper [6] illustrates the use of smart parking facility with few standard method that is also IoT related and also for the ease of people in everyday life. Through an app the registration and issuing of parking slip and vacancy is denoted and will be updated in the app through cloud mechanism. The sensors are used in appropriate spot for the collection of data as per requisite. It only deals with the space being empty and issuing the ticket as applicable.

The paper [7] discusses about comparing 2 different paradigms: Compress-Then-Analyze (CTA) and Analyze-Then-Compress (ATC) when using a visual sensor system to analyze parking lot occupancy. CTA paradigm is to capture an image in real time and sending it to a processing unit to obtain information; ATC paradigm requires the visual content to be processed locally on the camera module itself before sending it off to be processed. The comparison is done to mainly compare energy consumption, bandwidth usage and, accuracy of data of both paradigms. ATC method was much more effective on that when deploying in the real world examples.

IV. SUPPLIES

A list of supplies that are needed for the smart parking lot:

- Raspberry Pi 3.
- RPI Adafruit Camera.
- SQL Server.
- Wire.
- Toy Cars.
- RFID Reader.

V. METHODS

A Raspberry Pi 3 with camera module was mounted on the Pi (shown in Fig: 1) and connected with a display to helps us configure the related software and build ups required in order to process the object identification with Tensorflow. The whole setup makes the work a pretty drastic, since it takes a lot of time to configure the set of libraries and other related operations to make the Raspberry Pi suitable to detect the objects as per described in the tensorflow terminologies. There were few challenges that was faced while doing this, and it has been listed at a later stage in the paper.

The first step was to setup the tensorflow in the Pi and make it detect objects which later on we are going to focus on making it restrict to focus on only one object. The Fig 2, shows pictures of the data that we have collected and which also shows a percentage of assumption of the object that the Pi was able to detect.

Fig 1: Raspberry Pi with camera module.

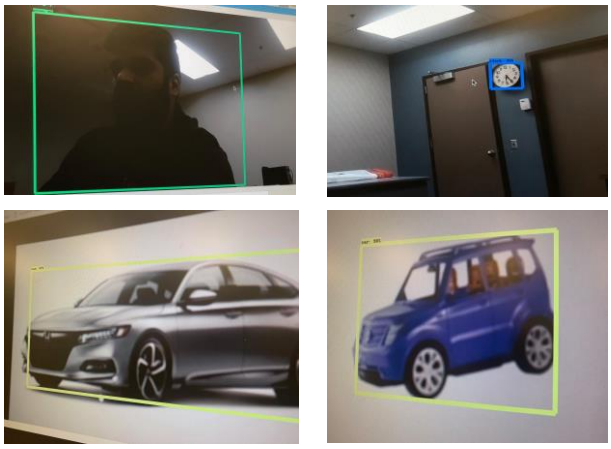

Fig 2: (a) a person with 95% accuracy. (b) A clock with 95% accuracy. (c) A car with 97% accuracy. (d) A toy car with 98% accuracy.

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