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1. Introduction

1.1 Purpose:

The purpose of this application is to make the parking process faster and smoother with the help of technology, by giving the number of slots available in each zone. This would help the user find a place without problem.

1.2 Document Conventions:

This document is following the IEEE standards, and the data base system requirements. This app is using the HTML, CSS and JavaScript standar.

1.3 Intended Audience and Reading Suggestions:

This documentation is mainly directed for developers that would like to create, improve or use this system for their enterprise's parking lot.

2. Overall Description

2.1 Product Perspective:

The origin of this project comes from "ISC Taller Vertical 2016". The Computer Science Department teachers and people from Intel wanted us to develop a new way to improve the private parking lots. The idea that we developed to achieve this was an effort of all the team members, improving it each time we discuss it.

2.2 Product Function:

The function of the application is basically give the user the information about a parking lot that he/she has selected, giving them the total zones of the parking lot and the number of slots available in each zone.

2.3 User Classes and Characteristics:

The kind of users that will use the application are all of those that work or go to a private parking lot and need to find a slot to park. It doesn't matter if they are looking for a handicap slot or not.

2.4 Operating Environment:

For hardware: It is an edison card with an operative system of *yocto* and libraries of *python*, *nove* and *dweeepy*. In software: It uses *Cordova (phonegap)* that uses *HTML*, *CSS* and *JS*; also it can be used for *Android* and *IOS*. For the design, it uses *CSS* with *Bootstrap* and a Framework of *AngularJS*.

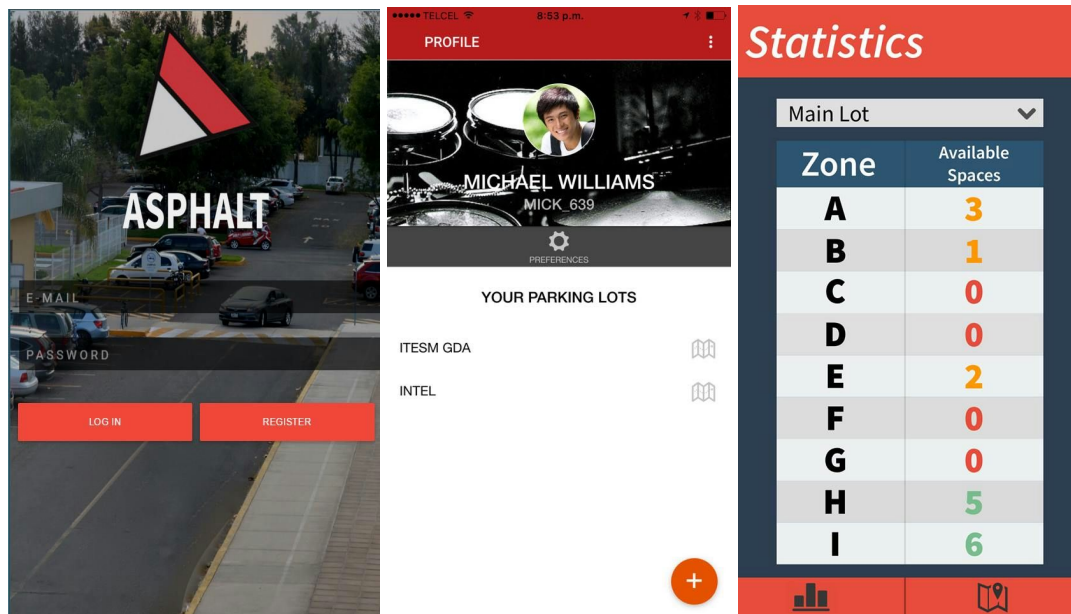
For the database that works together with the hardware and software, it uses *Firebase* that uses *JSON* files and it is a hierarchical database. Some online converters are used to change from *CSV* to *JSON* in order to be imported to the *Firebase*.

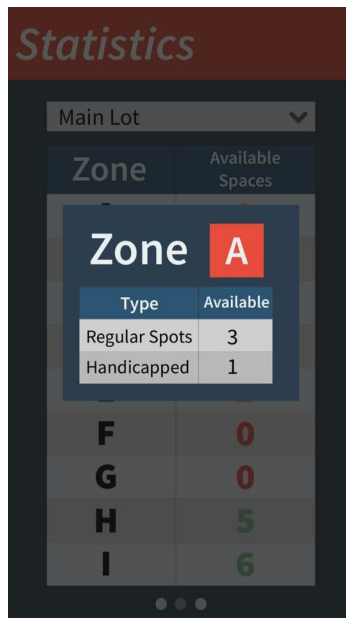
2.5 Design and Implementations Constraints:

It is licensed by *GPLv2* and in terms of hardware, it is limited by *yocto* because it doesn't accept all existing libraries. The memory and battery are limited with an specific capacity and battery life. For the database, it uses *Firebase* which only works with *JSON* files.

3. External Interface Requirements

3.1 User Interfaces:





These are the different screens (the basic idea, some details may change) of the application that the user will see.

The first one, left to right, is the loading screen where the user will enter his/her email and password. After that, it shows the user's profile and the parking lots he/she knows. The user selects one and it shows a list of the zones with the available slots in each one. The final screen is when you select the secondary zone and it shows the user the regular slots and the handicap ones.

3.2 Hardware Interfaces:

Like it was mentioned before, the application works with an edison card that is connected to a battery, a display screen, 2 LEDs, one yellow and one red and has 2 buttons, one physical and the other one is a touch pad. The protocols that uses are *yocto* and has some libraries for implementations like *python*, *nove* and *dweeepy*.

3.3 Software Interfaces:

The application was implemented using PhoneGap and Angular. The code for the application is written in html, css and JavaScript; we used the Bootstrap library and the templates. The code for the database was implemented using Firebase and was coded in Python ;anguage.

3.4 Communications Interfaces:

The applications uses *HTTP* to get access and display the information required from the database to the phone.

4. System Features

4.1 Edison card, sensors and LED lights:

4.1.1 Description and Priority:

This is High priority because the user will be in contact in order to access a zone to park. The edison card that we implemented uses 2 buttons: One physical and a Touch Pad. Also, it uses a small screen RGB that displays the total of slots available in the zone. The LED lights are used to show the user if a zone is full or not.

4.1.2 Stimulus/Response Sequences:

First, to enter a zone that has slots available, the user will press the physical button to enter and when it goes out, it will press the Touch Pad. If the LED is in red, the user will ignore the zone because is full. The screen will display the number of slots available in the zone for the user to decide if goes to or not.

4.1.3 Functional Requirements:

The application shall be available to give free access to users to see the parking lot in a virtual live schema, getting the options programmed to give to the user an easier and comfortable way to operate the system. The system shall be reliable and get the data from the database to deliver the functions of the application.

This system is designed and implemented to assure that the system always meets this requirements in the best trustful way, for this must be maintainable, usable and dependable.

4.2 App lets users know how many places are available in the zones of a parking lot.

4.2.1 Description and priority: We implemented a mobile app available for Android, iOS and Windows Phone, where the users were able to download it, and to see if they found any parking place at the places that they frequently go.

4.2.2 Stimulus/Response Sequences: The user will download the application on its mobile device. The user must log in and request information from one of the possible parking lots. The server must send the information to the app. The user, with the information in hand, will know where to park.

4.2.3 Functional Requirements: The user must have a mobile device with access to the Internet. The app must be connected to the server to be able to get the

information. The server must be able to receive information from the sensors. The sensors must be able to react to them being activated.

4.3 App lets users to have an account on the app.

4.3.1 Description and priority: The application asks the users to create an account for personalization purposes. Thus, the user is able to select its favourite parking lots and zones.

4.3.2 Stimulus/Response Sequences: The user will create its own account by entering its data to the app, and then the app must send it to the database.

4.3.3 Functional Requirements: The user must have access to the Internet and the, if part of the information is wrong, it won't give access to the user's profile.

5. Other Non-functional Requirements.

5.1 Performance Requirements:

The user must have a smartphone with Android, iOS or Windows Phone operating system to be able to run the application, it has to have access to the Internet and the server must be up and running. The sensors must be active and they must be able to send information to the database. The application should receive information from the server and send it to the user in real time.

5.2 Safety Requirements:

For the use of the application, it is recommended that not use while driving because it can distract the driver and may cause accidents.

5.3 Security Requirements:

The user cannot modify directly the information from the database. The application has a secure database with all the information needed from the users to function.

5.4 Key Features:

- The applications will have a list of names of parking lots that are registered in it.
- Each parking lot will be divided in different zones and each zone will have smaller zones represented by letters.
- The letter zones will have a capacity and handicap slots.

- Each time someone park in the zone, the capacity will decrease.
- Each time someone leaves the zone, the capacity will increase.

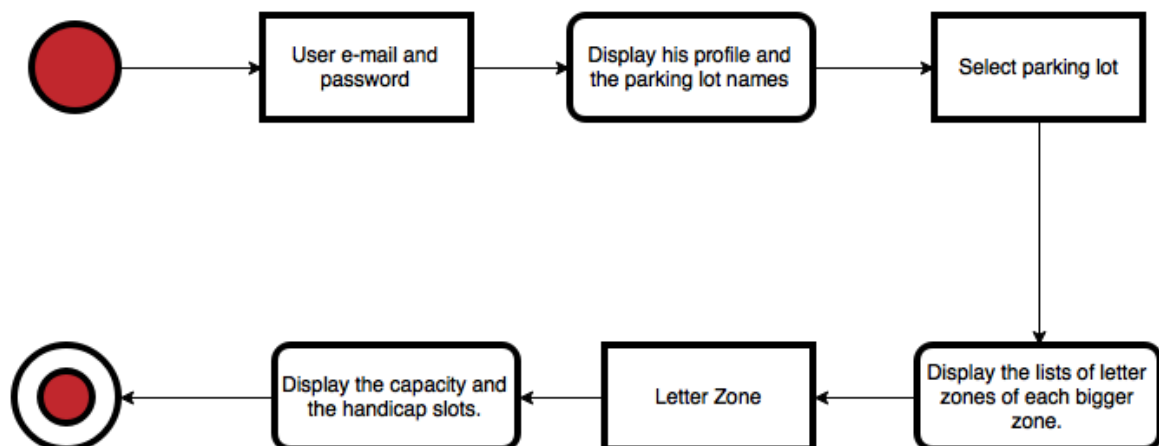
5.5 Concerns:

- It is important that the applications gives the correct number of slots available in each letter zone.
- It is important that the zones correspond to the correct parking lots.
- It is important that the edison card and the application are synchronized correctly and they don't crash between them.

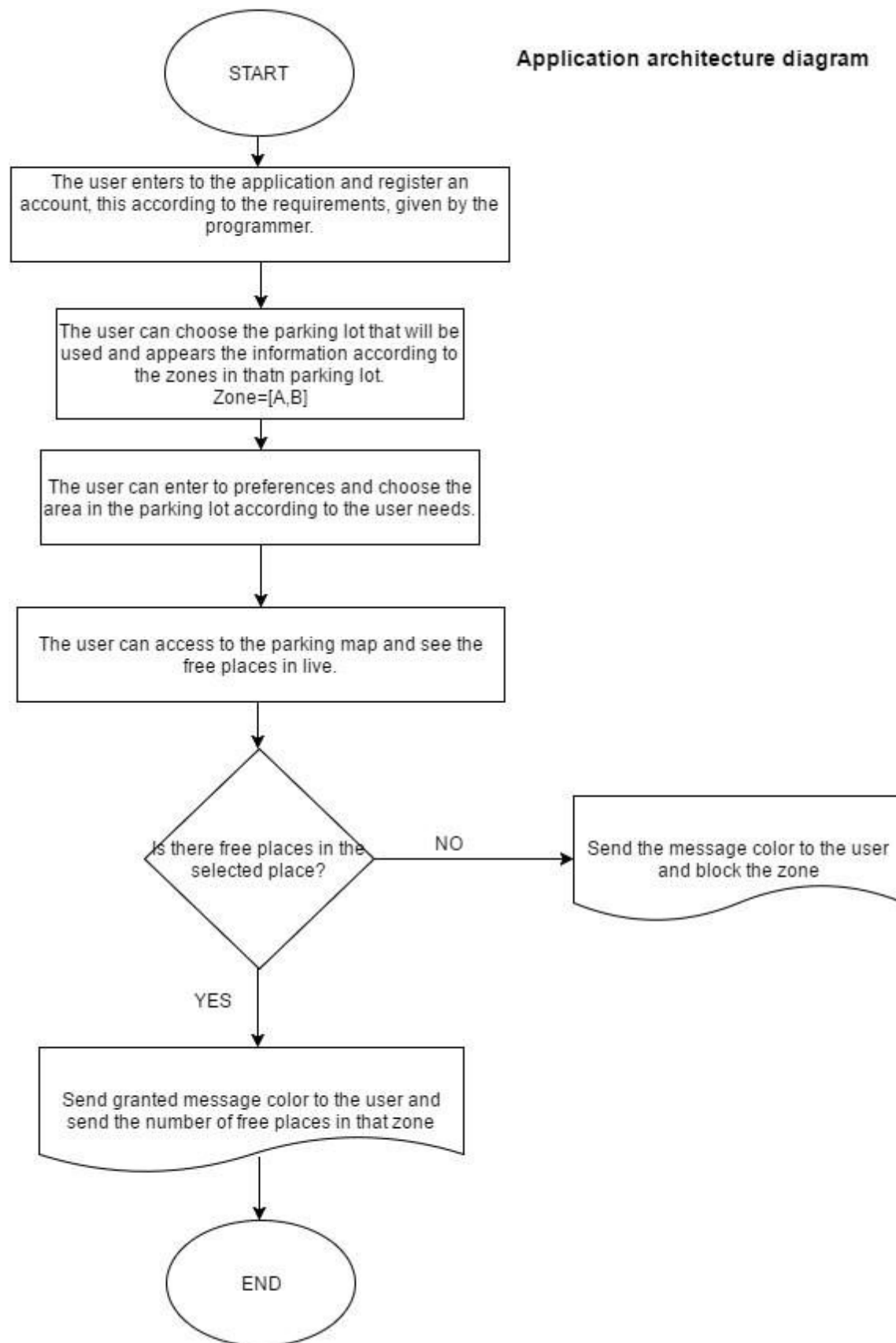
5.6 High-Level requirements:

- Must specify and be accurate with the slots available in each letter zone.
- The edison card and the application should work correctly according to the database.
- There must exist a correct communication between the server that collect data and the database.
-

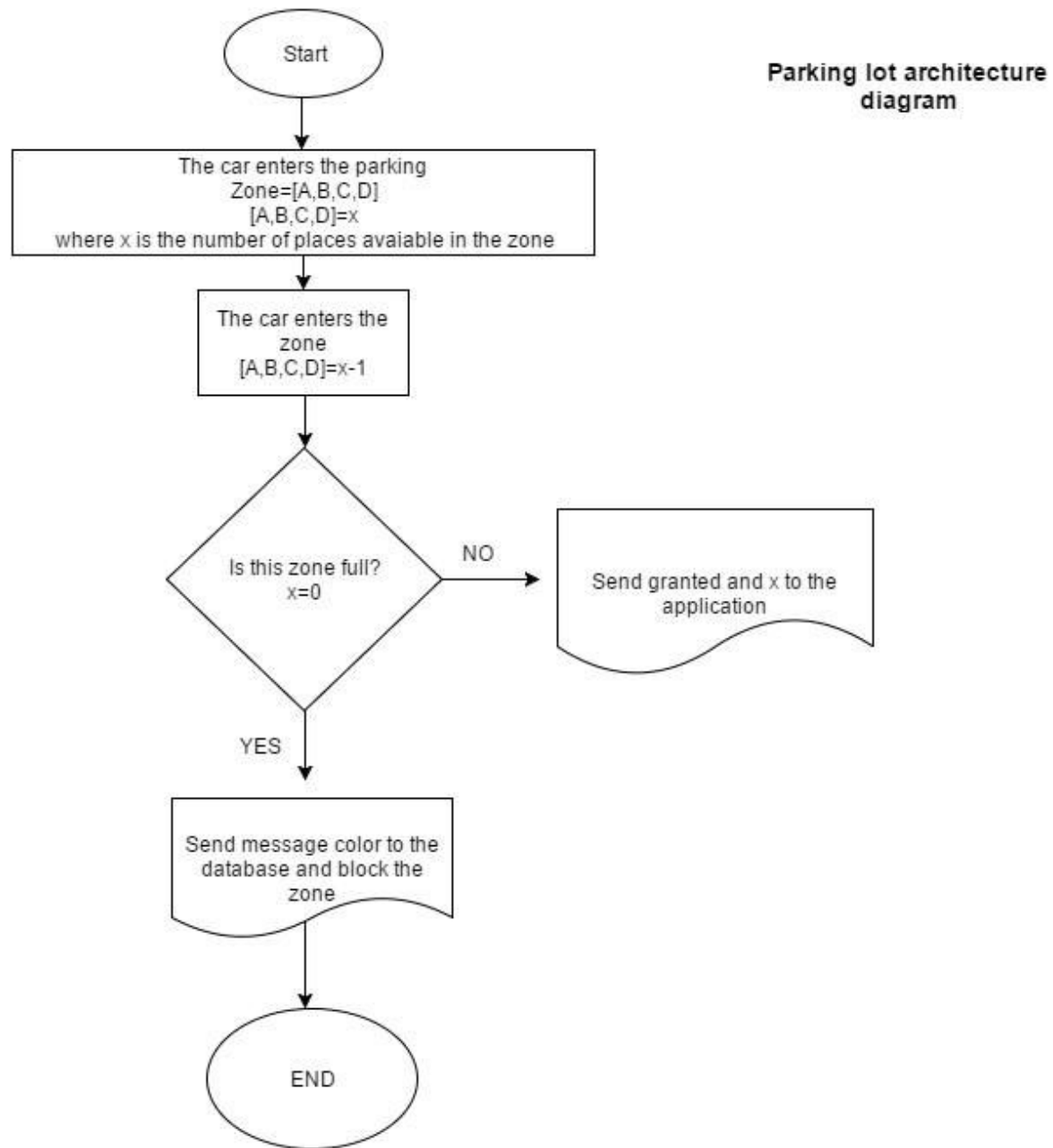
5.7 Activity Model:



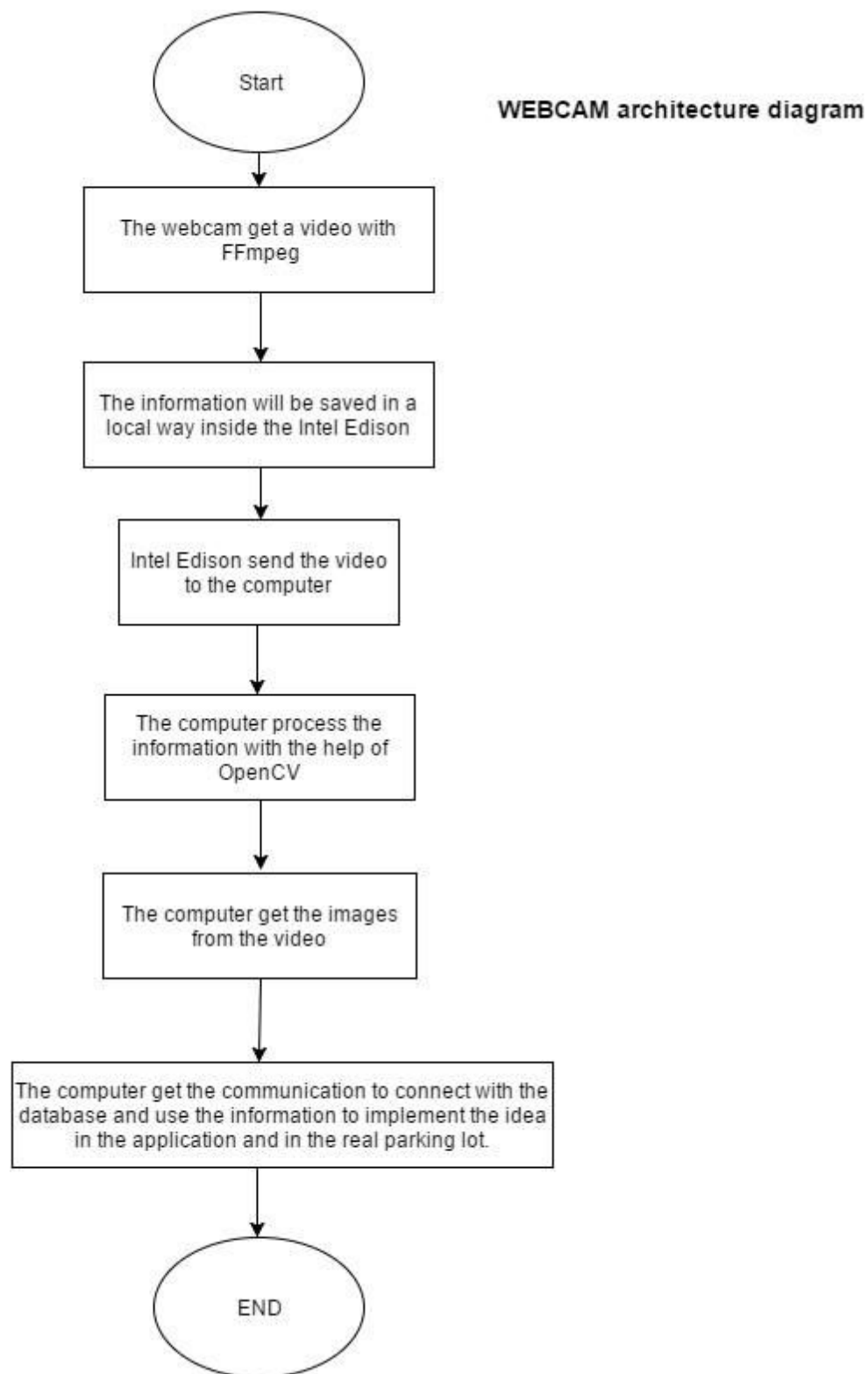
5.8 Software architecture: Application diagram



5.9 Software architecture: Parking Lot



5.10 Software architecture: Webcam diagram



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