

Overview

Problem:

When searching for a parking spot across several parking lots (or a big parking lot) it may be hard to find a parking spot quickly as one has to search row by row to find an open spot.

Solution:

The solution is to map the parking lot into open / closed spaces and relay this data to a mobile or web application such that the user can find the open parking spots without having to do an exhaustive search of the parking lot(s).



Intended Use / Users:

The solution is proposed to anyone with internet connectivity who is looking for a parking spot in a large or multiple parking spot location. The product is intended to be used when not driving to find parking spots and lots that are open before the trip to the parking lot.

Technical Details

Hardware:

- Pre-Processing: IP68 rated IP camera
- Raspberry Pi 2
- Post-Processing: Server with x2 GTX 680

Software/Languages:

- Pre/Post Processing: Python, Bash
- Mobile: React-native
- Web: Angular

APIs/Services:

- Firebase, Tensorflow, Opencv, CUDA
- Google-Firebase

Design

Testing:

- Multiple test Raspberry Pis to test code before deploying to production Pi.
- Source is thoroughly reviewed and tested before merging into production.
- GUI and functional testing to ensure mobile application is performing as expected

Mobile Application



Requirements

Functional:

- A Raspberry Pi will maintain activity states of all paired cameras.
- Each processing device will report to firebase once an hour.
- Information is given to the user in a way that enables easy and quick consumption.

Non Functional:

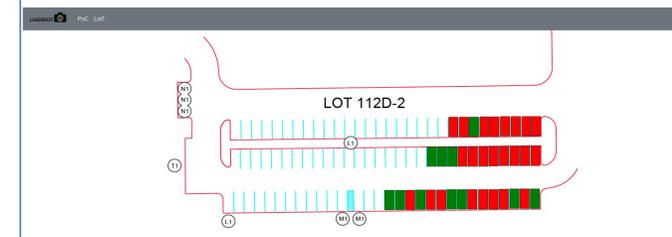
- Spot detection takes place in under 2 seconds and with an accuracy of 70%.
- Updates on mobile applications will take place within one second of changes happening in firebase.

Standards

- IEEE Std 2755-2017: Concepts in Intelligent Process Automation
- IEEE Std 730-2014: Software Quality Assurance Processes
- IEEE Std 982.1-2005: Software Aspects of Dependability

The Team

- Derrick Lockwood : Team Lead
- Donavan Brooks : Backend Lead
- Joseph Krajcir : Quality Assurance
- John Ingwersen : Mobile Master
- Riley Snyder : Webmaster
- Mason Schreck : Communications Lead
- Ahmed E. Kamal : Advisor & Client



Constraints

Safety:

Our user interface provides a way for users to get their information in a way that does not lead to distracted driving.

Economic:

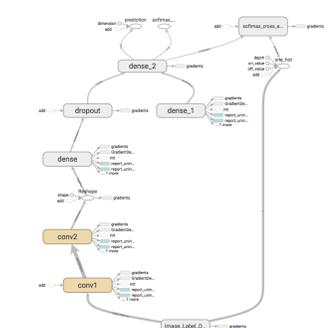
The final design is cost effective to enable a vast deployment over a large area where multiple instances of the system are needed.

Operation:

The system is able to function in all types of environments and stand up to the weather conditions in the deployed area.

Documentation

Full wiki on github with instructions for setting up the system and deploying pre/post processing devices. Scripts to enable quick setup of multiple environments.



Design Approach

