Project Report

(ECE3501)

Topic: People Counter Over the Cloud

FINAL REVIEW

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ABSTRACT

This project demonstrates how you can use Numpy Python to count the number of persons that come in and out of a mall using a camera and later view the number of available slots.

INTRODUCTION

The camera need to be placed in the entry and exit point of the room for this to work as intended. Basically, you increment the ***count*** every time a car comes in and decrement when it goes out. The LED in the system simply indicates that the vehicle is properly.

PROBLEM STATEMENT WITH ANALYSIS

A **people counter** is an electronic device that is used to measure the number of **people** traversing a certain passage or entrance. Examples include simple manual clickers, smart-flooring technologies, infrared beams, thermal imaging systems, WiFi trackers and video **counters** using advanced machine learning algorithms. Assuming you are not bound by a contract with a shopping center to maintain specific hours, counting people can help you determine the optimal times to open and close the store.

With accurate counts of the people in your store at a given time, you can tweak the store hours, and then determine if the changes are actually bringing in new customers, or just affecting the times existing customers shop.

The focus problem statement comes under

- Safety management in crowded
- Covid control

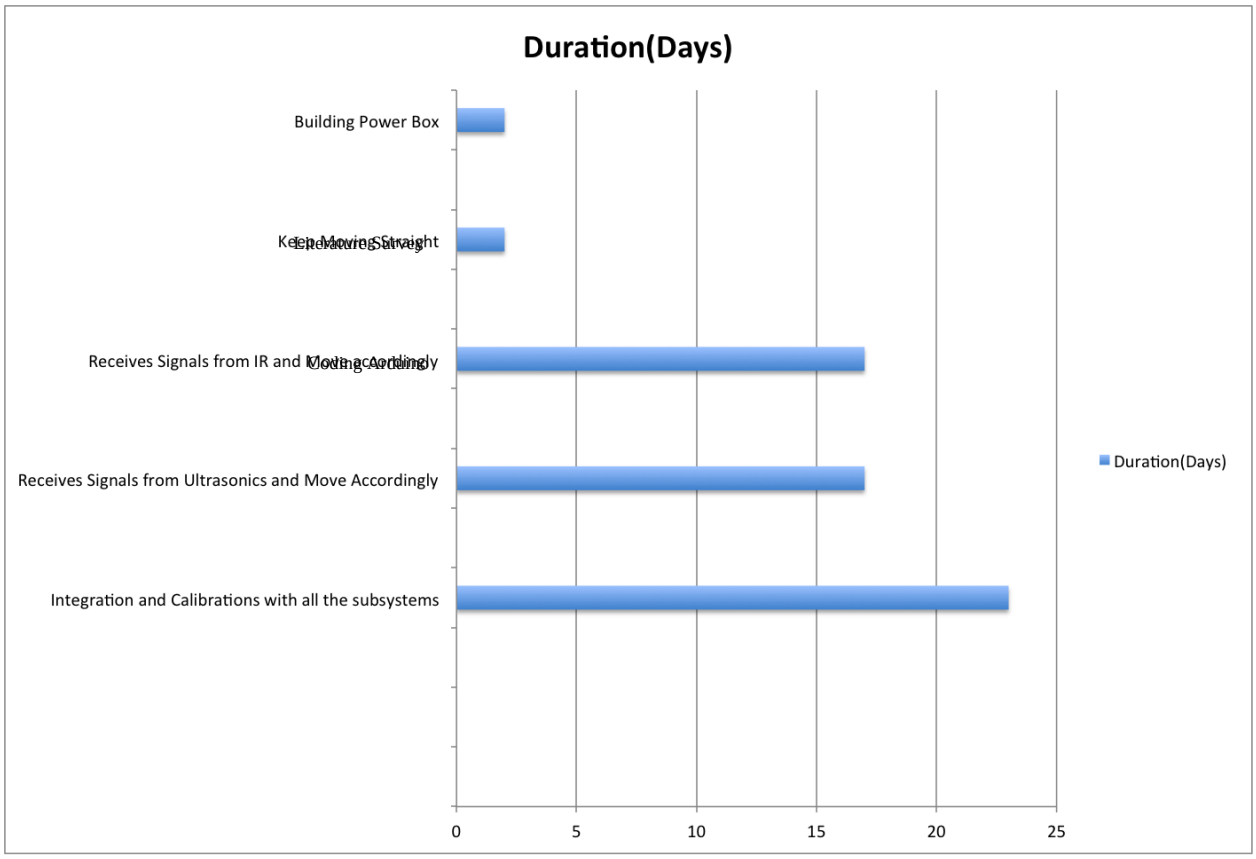
Many states have already set public use guidelines and capacity limits for places like grocery stores, retail stores, and other businesses. To protect employees and customers and comply with local regulations, retailers generally have two ways to control traffic: limiting capacity to a certain number of people per square footage or by percent of occupancy. Setting a limit on the number of people allowed in a store at any given time is just the first step. Enforcing a capacity limit requires a deep analysis to determine what is most feasible for your business.
As retailers navigate COVID-19 limitations, there are two primary tactics for managing traffic flow:

Manual People Counters
Many retailers are assigning the people counting process to their employees. The employee uses their mobile device, a pen and paper, or a manual counter to keep track of the people coming in and out of the building.

While this is a quick solution, it's not without its downfalls. For one, this requires an employee to be at the entrance of the store at all times, instead of inside stocking the shelves or running a register. There is also always the chance for human error, as it can be easy to get distracted and lose count of people on a busy Saturday.

Automated People Counters
The most advanced solution is to deploy automated people counters for 24/7, real-time traffic and occupancy monitoring. These counters utilize IoT solutions like sensors, thermal devices, and video technology to keep track of and control the flow of people throughout brick-and-mortar operations, thus complying with CDC recommendations on occupancy limits.

GANTT CHART SCHEDULE



THE PROPOSED SYSTEM

Achieving the benefits of an automated people counting system begins by implementing a robust IoT platform. The right technology driven solution will serve as a foundation for all data collection and analyses, in addition to facilitating workflows and communicating with your other integral business systems.

Our solutions helps businesses design, implement, and manage their IoT platforms to ensure that data is accessible and ready for analysis. With the insights gained from constant data collection and routine evaluation, retailers can strategize competitive ways to offer personalized shopping experiences while remaining compliant with COVID-19 regulations

We used Numpy code which detects facial and bodily features of a human body and hence gives us a count of the number of people appearing in front of the camera. This is good and better than any other possible alternatives (for us) because it considers bodily features and face structure both. (Hence good for ranged counting too)

WORKING

We planned on making a people counter using Numpy, Python , OpenCv. We would then send the data (number of people at a given time point) to the server using an HTTP GET request and then send it over to a website using WebSockets and thus showing the change in real time.

COMPONENTS/SOFTWARES INVOLVED IN THE SYSTEM

A. Camera

This camera module can perform image processing such as AWB (auto white balance), AE (automatic exposure) and AGC (automatic gain control), for the video signal coming from CMOS sensor. What's more, in fusion of other advanced technology such as image enhancement processing under low illumination, and image noise intelligent forecast and suppress, this module would output high quality digital video signals by standard CCIR656 interface. OV7670 built-in JPEG decoder supported reatime encoding for collected image, and external controller can easily read the M – JPEG video streams, achieving the camera design of double stream. OV7670 supported motion detection and OSD display function of screen characters and pattern overlay, capable of self-defining detection area and sensitivity

B. The Server

We made a server using Node.js with Express framework to create simple get request to increment the number of people in front of the camera at a time frame. This data would then be sent over to a website made using React.js which is already connected with the server using a WebSocket connection.

C. The Website

The website is made using React.js and the graph in the website is made using HTML5 Canvas API. The graph increments and shows a relative (to the previous number of people in front of the camera) line chart.

We chose to used React because it's a widely used technology and we felt it'd be a good idea to learn it.

D. Numpy

NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.

We would be using numpy and opencv for face recognition

E. React

React is an open-source, front end, JavaScript library for building user interfaces or UI components. It is maintained by Facebook and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications.

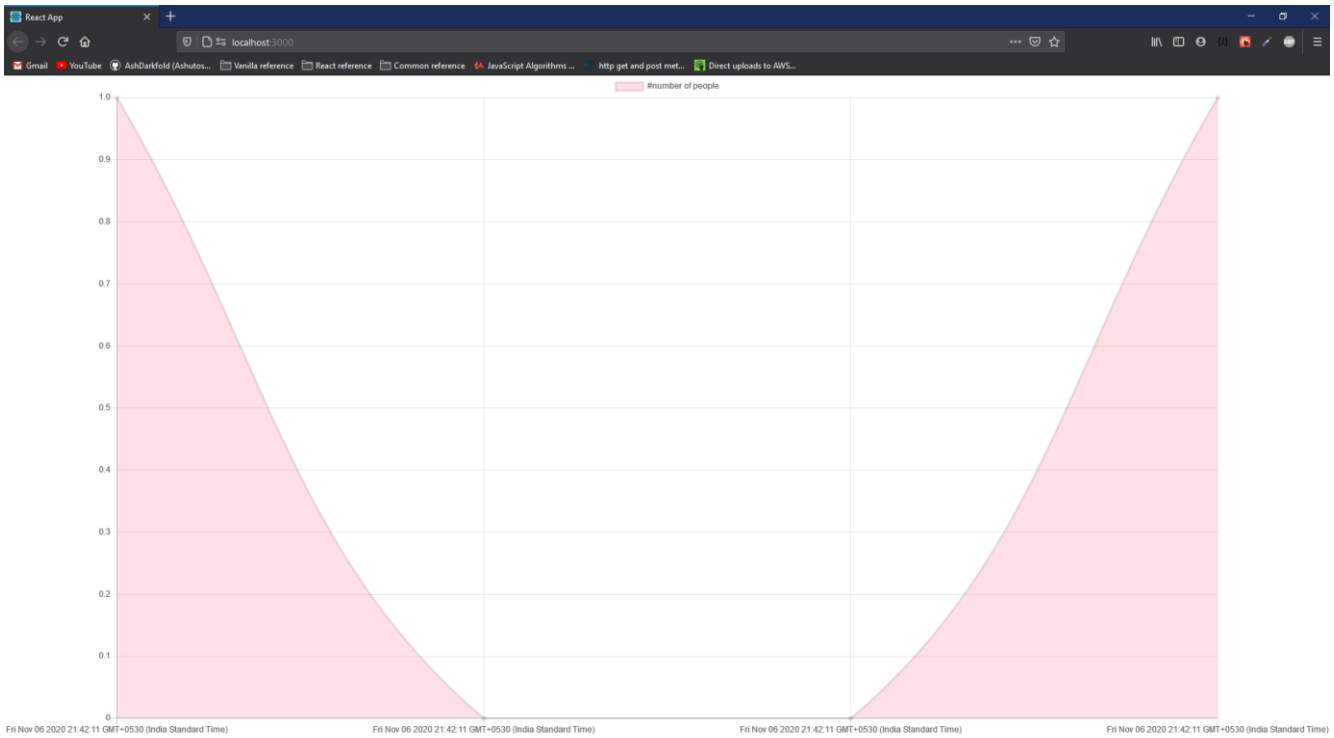
We use react in frontend to show the updated graph on each update

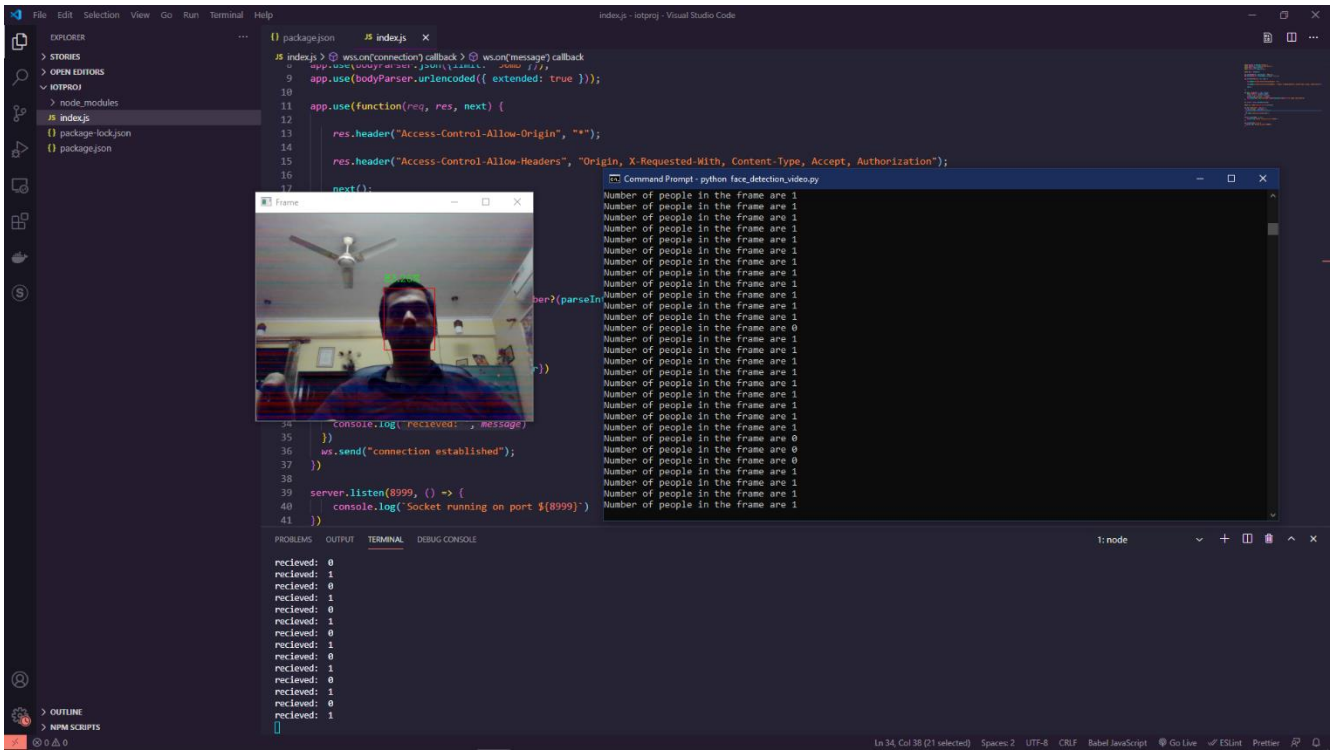
F. WebSocket

It is a computer communications protocol, providing full-duplex communication channels over a single TCP connection. The WebSocket protocol was standardized by the IETF as RFC 6455 in 2011, and the WebSocket API in Web IDL is being standardized by the W3C.

We should be using sockets for sending message to server

Screenshots





Result:

Hence, we implemented a people counter demo using numpy, opencv, node js and react js. This concept can be used in scenarios where there is a possibility of a huge crowd.

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