Mobile and cyber-physical systems project specification

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Team 8

Abstract

The document presents the problem we wish to address, a possible use case with the specifications necessary for the implementation of the project; there will also be a short paragraph in which we will talk about how we intend to carry out our idea.

1 Problem description

The advent of the COVID-19 pandemic has set limits regarding crowding in public places where a minimum social distance must be maintained to prevent the spread of the infection. This event has increased the amount of time (wait) required to carry out normal daily habits, such as shopping in stores, interacting with public offices, etc.

Knowing in advance the amount of people in a given place could, without a doubt, helps in containing the virus and in optimizing the time lost in unnecessary waiting.

2 Use case(s)

As we mentioned in 1, a possible application of our project could take place through the use of a bot, to which it is possible to ask directly the level of crowding of a particular place. The latter must be equipped with cameras positioned in strategic places, like entrances and exits. For this purpose it is also possible to use the surveillance cameras already present in the shops/offices.

A further use case could be meeting the merchant's or public body's need to know the number of customers over a given period of time.

3 Requirements

We'll use the following software/hardware platforms:

- **Hardware** side:
  - **IP camera** with Wi-Fi module for video streaming;
  - **computer** to run the software.
- **Software** side:
  - **telegram bot**, built on Python by using python-telegram-bot;
  - **software for people detection** with the use of OpenCV and for sending data towards the ThingSpeak platform;
  - **Heroku** for bot hosting;
  - **Thingspeak** for the online data storing and visualization;
  - **MongoDB** for the storing of data regarding the affluence of people inside a building.

4 Solution description

The goal of our project is to produce a bot that, at the request of the user, indicates the number of people in a room. At this point we will use IP cameras with the Wi-Fi module in order to simulate the behavior of a real camera. When the camera is turned on, the software starts counting in real time, through the OpenCV library, the number of people who are currently inside the room.

The software also, at each time slot decided on the basis of the local (arbitrarily in this project, for simplicity), saves on the database the data on the turnout that will be recoverable by the bot, which will provide this information at the user's request.

5 Planned demo and future work

We will present a demonstration video of our work, in which we will show how people are detected (and how the affluence value on the cloud is updated), and then show a possible use of the bot.

In the future we intend to expand our work through the possibility of creating a real app in which it will be possible to make a possible reservation to a shop/office. We are also interested in expanding our project by collecting further data for statistical purposes to better understand the flow of people in a certain area and/or at a certain time.