

IOT Based Crowd Management And Monitoring In Public Transport Systems

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Introduction

A smart city is a municipality that uses information and communication technologies to increase operational efficiency, share information with the public and improve both the quality of government services and citizen welfare. It adopts techniques such as machine learning and IOT (Internet of Things). In our project we plan to explore IOT by making systems which will help to make better crowd management/ monitoring in public transport systems.

Problem Statement

The major cities in the world have altogether been facing the same problem of overcrowding of their city. The most affected part can be seen in the public transport systems such as buses and trains where overcrowding is a common affair during the peak hours. This also means that the commuters have to risk their lives in order to reach their respective workplace on time. The population of a megacity like Mumbai is 1.73 crores, where almost about 7 million commute daily by its most popular mode of transport, the local train. That is about 45% of the population of the city. It's no surprise that commuters falling to death off trains is about 500-700 per year.

Moreover there had been an instance where overcrowding on the railway station had led to an stampede situation leading to loss of lives. Such incidents could've been avoided if the crowd is monitored/ managed. If the commuter gets to decide if the risk of travelling in overcrowded public transport is worth taking, it would be a better situation than present, though not a complete solution of such a major problem.

Methodology

The commuters will get a live feed / information regarding how crowded the train/ bus is, along with its live location. Even the places where overcrowding is common, the authorities would get the information regarding the relative crowd capacity in that part of the place. All the information will be sent via the Internet using an IOT device which will be responsible for finding the amount of crowding. The IOT device will include sensors which will count the number of people and a wifi module will send this information via the internet. This information will then be assessed along with other device's information and will help to determine the exact amount of crowding in that particular area. Thus this will be a smart step towards making a smart city.

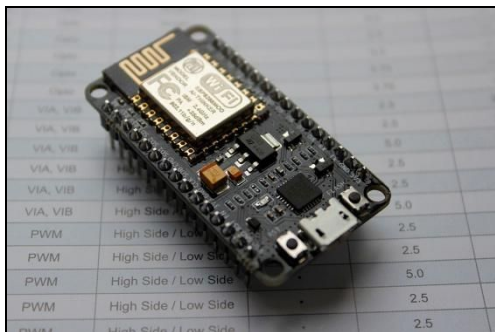
Components used:

Gps module neo 6m:



- This module has an external antenna and built-in EEPROM.
- Interface: RS232 TTL
- Power supply: 3V to 5V
- Default baudrate: 9600 bps
- Works with standard NMEA sentences

NodeMCU:



It is an open source IoT platform. It includes firmware which runs on the ESP8266 WiFi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on

the eLua project, and built on the Espressif Non-OS SDK for ESP8266.

IR Sensors-receiver (using opamp 358):



IR (INFRA-RED) sensor is based on LM 358 IC which is an Operational amplifier acting as a comparator. The comparator compares the analog voltages of potentiometer and the voltage generated by the photodiode. The two voltages are applied on the two terminals of the IC and correspondingly it generates a digital output on the output pin that is indicated by a Red Led.

Working:

Firstly when the device is powered up, it connects to the WiFi network assigned to connect to the internet. The GPS module powers up and also starts searching for satellites to obtain the GPS data. There are 3 IR sensors, i.e 2 for entering and 1 for exit. Whenever these sensors detect people entering or leaving, it will accordingly update the count value. This data is uploaded to Thingspeak and Blynk server instantaneously and can be visualized on a

webpage and mobile application. The data is presented along with the device's GPS location. Thus you can get real time crowd data along with location details via the Internet.

Conclusion:

Although the idea is difficult to implement on overcrowded public transport of ours, Further improvements like using probably a Crowd monitoring cameras which use an algorithm for giving an estimate of the crowd or even using piezo sensors on pathway of the crowd to estimate the crowd can be seen suitable.

Our project can be summarised for a Public Transport system where:

- Commuters will get exact location of the transport (bus/train).
- Commuters will get to know the exact arrival time of the train/bus.
- As the app will give an insight on how crowded the train/bus is, commuters will be able to decide which train/bus to board on.

More Applications:

- Event Management
- Malls
- Diverting traffic jam
- Diverting crowd in tourist spots
- With the help of data science techniques companies can find out which places are overcrowded and can accelerate their business.
- Further Machine Learning algorithms can be used to predict crowd.
- If this app is connected with m-indicator it will give precise information on the public transport.

Link for Code:

<https://github.com/gp499/IOT-based-crowd-monitoring.git>