



# International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: [www.ijirccce.com](http://www.ijirccce.com)

Vol. 7, Issue 2, February 2019

## Bi-Directional People Counting and Ticket Validation

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**ABSTRACT:** Nowadays, people in metropolitan cities use fastest and cheapest mode of transport. Trains in metropolitan cities are easily available but due to peak hours in these cities these trains are over-crowded arising the problem of more footboard passengers. Therefore, it is necessary to know the train timings and the number of peoples available in each compartment for safe and comfort journey. In this project, an application is developed to display the number of persons in each compartment of train and to display the best compartment for safer journey to minimize the number of footboard travelers and ticket forging.

**KEYWORDS:** Infrared sensor, Arduino board, LCD, Radio Frequency ID, Radio Frequency ID reader, Cloud, Website.

### I. INTRODUCTION

In this system, we use Infrared sensor. Infrared sensor is used to detect the humans and object by emitting ultrasonic rays. This sensor is placed in train door to count the incoming and outgoing of the passengers. Finally, the count value will be displayed which is the number of passengers inside the train compartment. The sensor is attached with Arduino board and the number of passengers is displayed in the LCD display. The count value is stored in the cloud and the data can be viewed in the website. This website provides the number of passengers inside the train compartment which will only be shown to the Railway Administrator and to passengers who wait to board the train, This Website also provides the least crowded compartment, which is the first module. Data will stored in the cloud and data can be retrieved from the cloud .

Ticket validation is the second module and this is done by using Radio Frequency Identification tag and reader. Radio Frequency ID tag stores the passengers data such as name, age, balance and the RFID reader is used to read the RFID tag. Each time the tag is read by the reader, the reader detects whether the tag is valid or invalid and deducts a ticket fare amount in case of valid tag and in case of invalid tag an alert is passed to Railway Administrator. It also provides the passengers if they have low balance and a popup showing that they should recharge to use this railway services. They will be allowed to use the services if they have low balance and the services will be stopped if they deny to recharge the balance.

This system will be useful for the passengers who use the train services regularly. They can avoid the crowded ticket counter and can save their time. Train pass can also be taken in this system (monthly pass). Each Passenger can provide their own username and password.

### II. PROPOSED SYSTEM

In our proposed system, we are going to provide a people counting mechanism in Train to determine the number of passengers in the compartment. The various applications of counting mechanism includes determining the Retail shop customers, shopping mall visitors, people inside the lift and so on. This process can be done using Ultrasonic sensors which detects the passengers entering the train compartment. Number of passengers in the compartment are calculated in the station and the current count value is updated and displayed in the next coming station. Also, the count value is

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displayed and updated frequently in the website. So, the passengers can plan accordingly. Entire project is developed in Arduino IDE and Embedded C language is used.

Also, a ticket validation technique is used to determine the only the valid passengers can board the train. Manual ticket validation takes more time and also consumes more Man power. This ticket validation is implemented by using RFID tag and reader.

### III. METHODOLOGY

#### A) PEOPLE COUNTING

This methodology deals with the crowd analysis of each compartment in the train. Crowd analysis in the sense, counting the people who are entraining and detraining in a compartment using IR Sensor. InfraRed sensor counts the people in a particular doorway where it is installed. An active IR sensor keeps emitting the infrared radiation and when it doesn't get back the amount of rays it has reflected, it detects a person. Two IR Sensors are used in the same board. When a person entrains, the person crosses the first IR Sensor and then the second IR Sensor. This increments the count of the people in the train. Similarly when a person detrains he crosses the second IR Sensor first and then the first IR sensor next. This decrements the count of the people in the train.

#### B) TICKET VALIDATION

Instead of Ticket generated in paper, every person is given a card which has an RFID tag and can be recharged. Whenever a person gets a ticket the amount in the card is deducted. This card can also be used to take monthly passes.



(a). People Counting (source: beainc.com)

### IV. LITERATURE SURVEY

S.NO	TITLE	AUTHOR	CONCEPT
1	Bi-Directional Passing People Counting System based on IR-UWB Radar Sensors	Jeong Woo Choi, Xuanjun Quan, Sung Ho Cho	<p>MODULE:</p> <ul style="list-style-type: none"> <li>➤ Two IR-UWB sensors</li> </ul> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Multiple people counting passing through a wide door</li> <li>➤ Sensing and direction recognition through a path</li> <li>➤ Mutual information between</li> </ul>



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			radar signals
2	People Counting System by Using Kinect Sensor	Osman Parlaktuna, Aylin Co kun, Anil Kara, Mustafa Parlaktuna, Metin Ozkan	<p>MODULE:</p> <ul style="list-style-type: none"> <li>➤ Low cost Kinect sensor</li> <li>➤ Depth Camera</li> </ul> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Perpendicular placement of sensor</li> <li>➤ Depth and Vision Data capture</li> <li>➤ Water Filling Method</li> </ul>
3	Measuring People-Flow Through Doorways using Easy-to-Install IR Array Sensors	Hessam Mohammadmoradi, Sirajum Munir, Omprakash Gnawali, Charles Shelton	<p>MODULE:</p> <ul style="list-style-type: none"> <li>➤ HVAC Systems</li> <li>➤ 8x8 IR array sensors</li> </ul> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Combination of Otsu's thresholding and modelling thermal noise distribution</li> <li>➤ 93% Accuracy</li> </ul>
4	People Count System Using Multi-Sensing Application	Kazuhiko Hashimoto, Katsuya Morinaka, Nobuyuki Yoshiike, Chjihiro Kawaguchi and Satoshi Matsueda	<p>MODULE:</p> <ul style="list-style-type: none"> <li>➤ Sensor Head module</li> <li>➤ Pyroelectric PbTiO ceramics</li> <li>➤ IR-Transparent lens</li> </ul> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Background Mean Method-to binarize output</li> <li>➤ Pattern Recognition Algorithm-Recognition of moving directions</li> <li>➤ 95% Accuracy</li> </ul>
5	A New Method for People-Counting Based on Support Vector Machine	Ruixia Yang, Fang Zhu, Junhua Gu, Xinwei Yang	<p>MODULE:</p> <p>Infra-red sensors</p> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Pattern Recognition-Data processing</li> <li>➤ Feature Extraction</li> <li>➤ Adaptive Data segmentation</li> <li>➤ Support Vector Machines</li> </ul>
6	A low-power people counting system based on a vision	L. Rizzon, N. Massari, M. Gottardi, L. Gasparini	<p>MODULE:</p> <ul style="list-style-type: none"> <li>➤ Single overhead sensor</li> <li>➤ Low power vision sensor+FGPA</li> </ul>



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	sensor working on contrast		<p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Address-driven Data Representation</li> <li>➤ Virtual loop</li> <li>➤ Lightweight counting people algorithm</li> </ul>
7	People counting in Smart Buildings	Jana Kalikova, JanKreal	<p>MODULE:</p> <p>Wi-fi Scanner Optical sensor</p> <p>METHODOLOGY :</p> <ul style="list-style-type: none"> <li>➤ 802.11 protocol</li> <li>➤ Face Recognition Software</li> <li>➤ 'Hot' Head Detection</li> </ul>
8	An RFID-Based Technique for Train Localization with Passive Tags	Alice Buffi and Paolo Nepa	<p>MODULE :</p> <ul style="list-style-type: none"> <li>➤ Passive UHF-RFID Technology</li> <li>➤ UHF-RFID Reader and RFID tag</li> </ul> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Tag Localization</li> <li>➤ Phase based Localization</li> <li>➤ Train Localization</li> </ul>
9	Code based-Chipless RFID System	G. SriHarsha Vardhan, Naveen Sivadasan, Ashudeb Dutta	<p>MODULE :</p> <ul style="list-style-type: none"> <li>➤ Chipless RFID</li> <li>➤ QR code Resonator</li> <li>➤ Passive RFID tag</li> </ul> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ Secure identification</li> <li>➤ Domain Reflectometry Method</li> </ul>
10	Personal Navigator for a Public Transport System using RFID Ticketing	Ana Aguiar and Francisco Nunes, Manuel Silva and Dirk Elias	<p>MODULE:</p> <ul style="list-style-type: none"> <li>➤ RFID Readers</li> <li>➤ RFID Cards</li> </ul> <p>METHODOLOGY:</p> <ul style="list-style-type: none"> <li>➤ RFID based location information</li> <li>➤ User navigation indication</li> <li>➤ Current location</li> </ul>



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## V. PSEUDOCODE

### 1. Basic Declaration

- 1.1 include LiquidCrystal and SoftwareSerial Header files
- 1.2 define WaitTime equal to 3
- 1.3 Set pins that sensors are attached to.
- 1.4 Set Pins that LCD's are connected to.
- 1.5 Initialize count value to Zero

### 2. void setup()

- 2.1 Initialize sensors as input
- 2.2 Initialize LCD as Output
- 2.3 Initialize the serial connection

### 3. void loop()

- 3.1 Read input from sensor input pin
- 3.2 If sensors read True Value count gets incremented
- 3.3 If sensors read False value count gets decremented
- 3.4 Check for WaitTime period and update current count value.
- 3.5 Print count value on LCD and serially

### 4. void readData()

- 4.1 Read sensors value:
  - 4.1.1 digitalRead(sensor 1 input);
  - 4.1.2 digitalRead(Sensor 2 input);

## VI. CONCLUSION AND FUTURE WORK

This system is a low cost highly effective system. This system can reduce paperwork which saves time as well as money. Performance is good. The passengers using the train can avail this service from their house for free. The balance should be recharged by them. Passengers can save the time in buying ticket at the ticket counter. Generally, most of the people go to the station just before the train arrival and also if passengers waste their time in ticket counter then the train will leave them. To avoid this situation this system provides a website can be used. Generally, we have manual counting method and this manual counting method is not an easy process and also wastes man power and time. By using this system people can be counted automatically without man power.

This system can be further developed in the future by using more sensors to detect the smoke and alcohol. This can be useful for passengers to travel safely in the train and the detection of smoke and alcohol will be provided to the Railway Administrators and they will take the necessary action against the smokers and drinkers. This can be useful for the ladies and children travelling in the train.

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ISSN(Online): 2320-9801  
ISSN (Print) : 2320-9798

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