BUS ASSIST

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1st Dr.Rohini V
Proffesor ,dept. of computer science
Christ deemed to be university
Bengaluru, India
rohini.v@mca.christuniversity.in

2nd Rakesh PV
Pg Scholar,dept. of computer science
Christ deemed to be university
Bengaluru, India
rakesh.pv@mca.christuniversity.in

3rd Smith CD
Pg Scholar,dept. of computer science
Christ deemed to be university
Bengaluru, India
smith.cd@mca.christuniversity.in

4th Joshua Stalin S
Pg Scholar,dept. of computer science
Christ deemed to be university
Bengaluru, India
joshua.stalin@mca.christuniversity.in

5th Logesh N
Pg Scholar,dept. of computer science
Christ deemed to be university
Bengaluru, India
logesh.n@mca.christuniversity.in

6thSweta KS
Pg Scholar,dept. of computer science
Christ deemed to be university
Bengaluru, India
sweta.ks@mca.christuniversity.in

7thRajesh Pv
Pg Scholar,dept. of computer science
Christ deemed to be university
Bengaluru, India
rajesh.pv@mca.christuniversity.in

8thNithya S
Pg Scholar,dept. of computer science
Christ deemed to be university
Bengaluru, India
nithya.s@mca.christuniversity.in

***Abstract*—Buses are always crowded, especially in megacities. We will have to wait a long time to board the bus (Public buses) at the bus stops, and often we would not get the seats on the bus, or the buses would be overcrowded, or we had to wait for another bus. We do not know the availability of seats on the public buses and the crowdedness in the buses until they reach the bus stop. Similarly, we do not know the live location of the buses while in service. Think about this, how it would be when we know about the availability of seats in the public buses even before the buses reach the bus stop where we usually board and also the crowdedness stats, the live location of the bus while it is in the service, all in one App.Counting the number of passengers who board/deboard a bus in each station is challenging in the Transportation field. We present a method of automated people counting for a bus based on Ticket Sales Data to solve the problem. An AI camera in the bus door capturing the passenger's flow is set, and the camera can get depth Images and analyze ticket sales data simultaneously. We proposed a method combining sales of ticket data and depth images to detect the head of the passengers. Then a novel tracking strategy is proposed.**

***Index Terms*—component, formatting, style, styling, insert**

I. Introduction

Passenger counting and discovery are essential for business monitoring and utilizing coffers for a public transport system. It's critical to cover general business efficiently for a well-organized and cost-effective public transport system. Public transport companies give information on the connecting routes, which is essential to the business monitoring system. The allocation of public vehicles to the colorful connection routes during regular and busy hours is essential for the operation of a transport system. These connecting routes vary from time to time in different places. Statistical tests may allow a better estimation of the average number of vehicles demanded in a particular way. Business load is more significant during the day as compared to night. Other public vehicles are needed on a route during busy hours. The correct distribution of public coffers or cars in different ways is essential for better optimization and operation of a transport network. This requires constant monitoring of the transport system, similar to counting the passengers during getting off and on public transport. The analysis of this data to measure the passengers can be carried out using a computer vision-grounded approach to avoid mortal trouble. With the development of artificial intelligence and the Internet, the public has an adding demand for intelligent machines as a part of the smart megacity. In an innovative machine system, real-time machine passenger inflow information is essential on the one hand; passengers can optimize their route for going out with the news; Bus companies, on the other hand, can be flexible with machine scheduling. With large quantities of business data, machine companies can optimize their machine line arrangement. Counting the number of people getting in/ eschewal of each machine in every station is essential. Still, there's no mature system to get the data. Currently, videotape image processing technology is used for working the problem with the help of a videotape installed on the ceiling of the machine door. Still, the videotape data is explosively told by light and rainfall due to the stir of the vehicle. Thus, it's still a challenge for accurate counting.

II. Overview of the Proposed System

Firstly, a dedicated camera is mounted on top of bus doors to detect the number of people onboarding / deboarding the bus at each destination along the route. A digital display fitted inside the bus shows the names of the destination as the bus moves, along with a count of the number of people that must be deboarded at that particular stop. This detail about how many peoples have to get down at a specific stop is calculated lively using Ticket sales data from the ticket vending machine used by the conductor. When a passenger comes to the bus stop, use our BUS ASSIST Application while waiting for the bus. This Application will display all details of the number of people who has to get down at that particular stop, live alert of whether the bus is overcrowded or not, alert like whether the passenger can avail seat at the next destination based on ticket sales, and live location of bus as the bus is embedded with the live GPS tracking system, along with these details, we can get to know the reason for the delayed arrival of a bus (Bus driver can send a notification to Application stating the grounds, which all application users can see). The camera detects whether the number of people deboarding the bus matches the number on a digital display that tells the number of people who has to get down at that stop. This information (number of seats available, crowdedness, live GPS, number of people that has to get down) keeps on changing dynamically as it moves through different stops and is updated simultaneously in the Application. Based on insights presented in our Application, passengers waiting at the bus stop can decide whether to board this bur or to wait for the next arrival of the bus

III. DETECTION Of PASSANGERS

An IP camera gathers and transmits video data over an IP network. IP cameras do not require local recording hardware and only need a local network. IP cameras connect to a network using the same technology as smartphones and PCs. the IP cameras are fixed at the entrance of each bus So that it captures the images of passengers boarding in and out of the bus. Then a WiFi connection is used by an IP camera to connect to a network. A manufactured Ethernet switch, also known as a power over ethernet(PoE) switch, delivers electrical power and data transmission capability to connected network bias. Finally, IP cameras are connected to the onboard embedded computer and the PoE switch and are mounted on the overhead compartment above the driver's seat. The box mounted on the bus automatically powers the computer. It transmits a signal to activate the PoE (Power over Ethernet) switch to power on the IP cameras within around 30 seconds after beginning the bus. Ethernet cable is utilized for power and data connectivity since the IP cameras receive power directly from the PoE switch. The embedded PC box records the video feeds received from the IP cameras. The system uses wireless transmission to transfer video data to the control center as the bus is docking at the station. More than just providing live camera viewing and video recording for monitoring and backup purposes, an intelligent vehicle surveillance system equipped with GPS, WLAN, and advanced computing technology can do anything like vehicle tracking and route navigation, passenger counting, bus fare reading, as well as sending alerts to drivers and first responders based on roadside and vehicle conditions. We can access video images and remotely monitor the bus from a control center once the IP cameras transmit video to the onboard embedded computer, sending the live video over a secure cellular connection. When the bus arrives at the destination terminal stop, the computer wirelessly uploads any previously recorded video to the database at the control center using WiFi, 3G/4G LTE, or any other available communication networks.

IV. Future prediction based on the ticket sales Data

Accurate short-term soothsaying of public transport demand is essential for the operation of on-demand public transport. Knowing where and when unborn requests for the trip are anticipated allows drivers to acclimate calendars snappily, which helps alleviate service quality and trustability and attract further passengers to public transport. We address this need by developing AI-based deep learning models for predicting bus passenger demands based on actual data obtained from the ticketing system camera data.The origin-destination of bus passengers plays a significant role in the planning and operation of buses. However, in most places, only boarding information is recorded, with no destination of each passenger information available.We proposed a method for estimating bus passengers' destinations based on a global positioning system (GPS) and smartcard/ticket sales data that has been collected.We will maintain a dataset of all routes available for a bus traveling on its designated path from its source and destination.We will have an Electronic Display that will show the current destination name and next destination stop along with the exact number of passengers that must get down at that particular stop based on / her ticket.

A. Working Of This Module

As soon as a passenger is aboard the bus, he/she will be asked to buy a ticket. The conductor will issue a ticket with details of the destination and fare. So when the bus starts to move, the destination will be displayed on the screen, and the exact number of passengers to get down at that stop will be displayed. The Camera, which is AI Enabled t is embedded on the door panel and will monitor whether or not the number of passengers deboarded the bus. The count of the number of passengers will be decremented when the People count matches the number of passengers deboarded at that particular destination. The count of passengers at that particular instance of time and at that specific destination can be calculated based on a ticket, and this data can be used to calculate the number of passengers who will be getting down to the next station and based on that number we can predict the number of seats that will be free or available.

B. USE CASE

Suppose there are 30 seats available on the bus for sitting, Twenty people can stand on the bus, which equals 50, which

means that it is considered that the bus is full. Suppose more than 50 people are on that bus at any time. It is considered 'OVERCROWDED,' which will be displayed on the digital display and as an alert on the user application. This data about how many seats are occupied, how many people will deboard at the next immediate destination stop, and after their deboarding, how many hearts will be available now, and how many people who are standing can occupy those seats will be analyzed and will be calculated in real-time and sent to all people using the BUS ASSIST application so that users will get to know if they can get a seat, and prediction of occupying those seats early, or how crowded the bus is. So now the user waiting at the bus stop gets to know whether he gets a chance to occupy seats or how soon he can get a seat once he boards the bus and how crowded the bus is using these ticket sales data and cameras. Now he can choose whether he can board or wait for the subsequent arrival of the bus on the same route by tracking the bus using our application.

V. Fraud Detection of Bus Ticket Sales

Cheating in the sale of bus tickets is common among transportation service providers who still use the conductor as a bus ticket seller. The high cost of supervision, lack of honesty, and unification of the conductor's sales and ticket control functions make this fraudulent practice a problem that businesses must deal with.

A. BASED ON TICKET SALES AND DISTANCE BETWEEN TWO STOP OF THE BUS.

PASSENGER FRAUD DETECTION There will be a display to show the count of the exact number of people that have to get down at a particular stop. So the bus conductor has a handheld RFID ticket generator device which is a cloud-edge computer integrated. As soon as the ticket is generated, its destination and the count of an exact number of people who have the same destination stop are calculated. This detailed data is displayed in digital, which is inside the bus. This Digital display is placed so that it is easily visible to all the passages and conductors inside the bus. Our AI and ML-enabled Camera embedded in the top of bus door tracts analyzes whether the exact number of people who have the same destination gets down or not. Whenever there is a match between the display counter and the Track count of the camera, we can say that there is no fraud. Else system detects and predicts the scam. As a result, it gives a scam alert by alarming the bus speaker and notifying the conductor by providing a heavy haptic vibration in the ticket device. The conductor must also scrutinize and monitor; it's the job camera to track the number of people getting down and alert likewise.

VI. Crowd and Bus management

We are automating the allocation and de-allocation of buses by calculating the crowd from the past data received from the camera and ticket module for a particular route at a specific time. Time is taken from the tracking module.

A. Scenario-1 Buses getting overcrowded at specific stops along the route at peak times.

Consider buses A and B with a crowd capacity of 40 allocated to a particular route. Buses A and B arrive at the specific bus stop along the way at 9:00 and 9:30, and Both busses arriving at that stop get overcrowded. Bus A gets overcrowded with 12 people, that is, the total number of people inside the bus will be 52 and bus B gets overcrowded with 10 people, that is, the total number of people inside the bus will be 50, here we see that between 9:00 to 9:30 22 people are overcrowding the bus, by looking at the issue we can assign a new bus to that route such that the bus added will reach that particular stop at 9:15 timing which manages the crowding of the bus at that stop, identifying the above-described problem and providing an optimum solution is completely automated by our software, the software analyses the data from ticket and tracking module, alerts the admin if this problem anomaly found, that is, buses getting overcrowded at specific stops along the route at peak times and also provides the solution by predicting an optimal time and number of buses to allocate to solve the problem.

B. Scenario-2 Buses getting undercrowded, which leads to resource wastage.

The problem statement is vice versa of scenario one. Consider buses A and B with a crowd capacity of 40 allocated to a particular route. Buses A and B arrive at the specific bus stop along the way at 9:00 and 9:30, and Both busses arriving at that stop get undercrowded, which leads to resource wastage. Let us consider that bus A has 20 vacant seats and bus B has 22 vacant seats on leaving that particular bus stop. Looking at this issue carefully, we can determine that there are 42 vacant seats and just 38 seats occupied considering both buses. Therefore, we can remove one of the buses along the route and adjust the other bus's timing so that undercrowded ness and overcrowding are optimized. This process of identifying such problem anomaly, that is, Buses getting undercrowded, and providing an optimal solution is automated by our software, as mentioned the same in scenario one, the software considers the data from ticket and tracking module analysis and alerts the admin if mentioned problem found and also predicts optimum solution, that is, it tells to reduce the buses allocated and adjust the other buses with respect to time to optimize the resources, which in turn reduces carbon footprints.

C. Scenario-3 Buses getting overcrowded or undercrowded at specific stops arriving from the different routes..

We consider buses getting overcrowded and undercrowded at specific bus stops along the same route, and we saw how our software was providing an optimized solution. Now we might think about the buses arriving from different routes and getting overcrowded and undercrowded at particular stops. Our software also optimizes this scenario; the software considers the data and analyses it, takes the average crowding or undercrowded ness along both routes, and predicts which route

to take into consideration to remove or add busses to optimize resources and decrease carbon footprint.

BUS ASSIST APPLICATION FEATURES

The Bus Assist application was initiated in response to the inconvenience of traditional transportation alternatives and the difficulty in finding the bus availability between the routes and to efficiently track the status of the bus. The insanity of a 20-minute wait for a 10-minute travel on the a bus, as well as the difficulties of predicting the crowd in a bus and tracking the live location of the vehicle served as the foundation of the Bus Assist application

Bus Assist is on a mission to be the pioneer of a smart, cashless commute by: Providing actionable information on the best available public transport options. Offering easy and flexible contactless ticketing options. Integrating all MaaS (Mobility as a Service) providers to render a centralized and intelligent application Creating employment opportunities for last-mile partners while ensuring the healthy growth of the organization and investors alike

Features of the application are follows:

1. User Registration and Login: a new user can register themselves with the application and can login into the application using their credentials.

3.Real time tracking: user can track the track the live location of the buses that are deployed along a desired route. Alongside, user can also view vehicle fleet information as well as the status of the bus whether the vehicle is over-crowded or partially crowded.

4.Passes and tickets: users can buy bus passes and tickets on the go providing contactless and cashless ticketing.

5.Support and Assist: user can report any queries and issues regarding the vehicle, driver, and co-passenger.

6.Redeem coins: The app provides for the redemption of the coins to avail offers and discounts on their Tickets or Pass purchases.

7. User Summary: users can view the entire summary of their travel history such as last visited bus station, most visited bus stations, the overall expenses on tickets and pass purchases, total coins redeemed and spent.

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