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CROWD ANALYSIS AND AUTOMATIC DETECTION AND TRACKING OF HUMAN

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ABSTRACT

Crowd management is done in various fields, where bus crowd management has also been one of those area. Where in bus transport the use of IoT sensors are done in the seats which detects the presence of human according to occupancy of seats. Whereas in another public transport service the use of IoT cameras are done which captures the object as human and then send the information captured through it to LCD screen where the people who wants to travel through that particular transport can get the information regarding the crowd density inside the vehicle. Here to know whether the object is human or not, the CNN networks are used, where the machine are trained using different machine learning algorithm to detect the presence of human.

Keywords: Iot; Crowd Management; Raspberry Pi; IEEE 802.15.4; Public Transport.

I. INTRODUCTION

Crowd Management in case of public transports has been of concern, it is usually noticed that some of the buses are overcrowded and at the same time some of them are half-empty although they are heading towards the same destination at the same time. The problem gets even worse if the bus is late. People try to board the bus that comes first as they have no idea about the upcoming buses. The buses coming thereafter aren't fully occupied. This uneven crowd density in the buses is undesirable. Most of the times, this uneven crowd density has caused numerous human deaths along with many casualties. There are also situations where people have had narrow death experiences due to overcrowding. There is a need to develop a system that detects the density inside the bus and displays the crowd density level at the bus stop. Knowing about the crowd density in the upcoming buses, commuters will be in a position to decide whether to board the bus or wait for the next bus. This will help the corporations administering the system to manage the crowd.

Currently, in the present scenario, there is no such existing system. Some of the android applications such as Google maps follow a procedure of obtaining feedback from the passengers after they have travelled on a particular bus. They tend to ask the passengers about the level of crowd density present in the bus. This information obtained is highly unreliable. There can be a situation wherein the information that is fed is incorrect or people might not even provide feedback due to their busy schedules. Our system does not depend on the reviews given by passengers. The installation of a camera along with the dedicated system inside the bus prevents any human interaction with the system thus providing an accurate and reliable output. The camera independently captures the image of the crowd and processes it to the system which detects the crowd level and updates it onto the server. The server then automatically updates the crowd density level at the LCD screen present at the bus stop.

II. LITERATURE SURVEY

The crowding at the beach has always been the main problem, therefore the research has been done on this field and that they have come up with definite solutions. the goal of their work was to style, implement and test a system (BRB-Be Right Beach) that foster beach overcrowding avoidance and allows anyone to settle on the proper beach to travel for having the simplest experience. the main requirement of their system was to possess maximum accuracy (no errors, that's real-time data only are used) within the information provided to the users. The BRB sensor network has control units with attached UV sensor, a thermometer, a humidity sensor and a camera for crowdedness estimation. Data is collected by a cloud platform that gives any user with information about beaches and suggestions where to travel, supported user's preferences like weather, crowdedness, time of travel, and so on. during this paper, they illustrated a system for beach monitoring and preservation, aiming at increasing the event of sustainable tourism. Preliminary results acquired in world scenarios demonstrate the validity of our approach. Future improvements of the system include the fusion with different sensors, like smartphone concentration, and therefore the prediction of beach occupancy supported historical data.

Coastal erosion is one among the problems that has arisen as a result of the degradation of the natural profile of the soil, which is caused partially by overcrowding (e.g. urbanization and tourism). While the primary factor may be a gradual process, the increasing human presence is hastening the ageing of beaches. Research community everywhere the planet indicated Internet of Things (IoT) as a legitimate technology to develop solutions so as to undertake solving or mitigating the coastal erosion problem.

IoT-based techniques are often utilized for coastal environment and population level monitoring to manage heterogeneous and enormous data for real-time monitoring and deciding way consistent with specific rules. the social relationships, the involved devices within the monitoring system (i.e., sensors, cameras, and smartphones) are ready to collect and exchange information. The suggested system may assess the state of a beach's occupation supported environmental and crowding data acquired by devices, also as user comments. The classifier model works better in low and high crowd density scenarios, with accuracy of 94.30 and 87.32 percent, respectively. because of the collected data, time and site preferences are often evaluated helping police and conveyance to raised supervise traffic jam, but also tourists and citizens to pick the simplest option both in terms of travel duration and crowding level of beaches.

III. METHODOLOGY AND ANALYSIS

Crowd behavior monitoring, also referred to as crowd analysis, is one among the tasks that has got to be completed before travelling or visiting certain locations so as to avoid crowds. Smart video sensors are one among people who aid in crowd surveillance and security, and that they are IOT-based since they use the web for a spread of functions. Crowd and pedestrian behavior analysis may be a critical requirement for smart IoT cameras, particularly video processing. Simulation and tracking methodologies are investigated within the literature so as to supply associated behavioral models. Ground truth is required in both scenarios so as to coach deep models and supply meaningful quantitative evaluation. We present a framework that permits numerous cameras and different targets for crowd simulation, automatic data production, and annotation. This method combines path finding and planning tools with synthetically generated human agents, enhanced frames, and compositing techniques. This unique crowd composition system offered uses the composition process to duplicate annotated data for pedestrian identification. Any crowd or pedestrian simulation model or data annotation system with numerous cameras are often reviewed and compared by creating agent motion to be used within the final visual simulation employing a modular approach. Additionally, any video analysis feature is often utilized to gauge similarity.

With the ever-growing global population, crowding publicly transport is becoming an increasing menace. conveyance systems round the world have remained largely an equivalent over the past several decades although the population they serve has burgeoned. Here it demonstrates about low cost IoT based solution to the crowding problem by using smart seats which will detect and display the seat occupancy status in real time over an online or mobile application. The prototype results are positive and show a totally functional IoT system which will be implemented in buses and trains. this project has demonstrated a strong, cheap and scalable system to manage crowds publicly transport. The software simulation was administered to see feasibility of such a system to figure during a real time environment. The project design was built and tested for various loads and seating profiles to raised estimate the edge. the ultimate results show promise for implementation within the world. Further work is often done to account for standing passengers, implementing addressing schemes to extend scalability and introduce web development to enhance the webpage interface.

CROWD DETECTION

Crowd detection may be a vital application of Crowd Analysis [10], and therefore the most used technique for achieving it are supported computer vision, although it is often through with the assistance of other sensing systems like smartphone concentration [11] or RFID detection [12]. during this paper, we specialize in crowd detection through image analysis, since it's the foremost suitable for our scope. Image analysis and classification has several important features to require under consideration. First of all, the situation is often indoor or outdoor, leading to different sets of issues to be tackled. especially, outdoor analysis results in tougher problems, e.g. the daylight and other noise generating phenomena like rain, shadows or fog. Another distinction lays within the analysis process, which will be wiped out one image or during a sequence. within the case of a sequence, quite one frame is analyzed, so tracking and flow analysis are often applied, like in [10] and [6]. within the frame-by-frame analysis, on the opposite hand, the previous crowd-presence might not be linked with the present one, counting on the interval utilized in image acquisition. In our approach, only a snapshot of the beach situation is taken into account, resulting in simpler and lightweight computations. With this sort of study, crowd density and crowd presence are often easily estimated as in [3]. within the IoT world, crowd analysis is becoming a wise field of research. the most advantage of using IoT is that data are often collected, organized and retrieved using user-friendly interfaces, available from everywhere. In a billboard people counting system is presented and used for statistics about indoor locations occupancy. For both outdoor and indoor use, the prediction of a crowd formation may be a vital application. In the gang is modelled as a feedback system during which the measurement of the present crowd density is employed for preventive correction, i.e. for redirecting people in less crowded places.

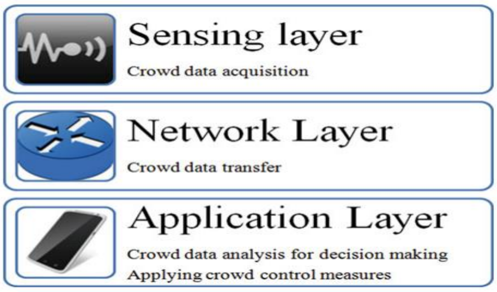

Fig.1.1 IoT architecture for crowd management

IMPLEMENTATION

Installing a webcam on the top corners of the bus along with the dedicated system. The camera is interfaced with the Raspberry Pi. The camera is programmed so that it captures the image at a predefined time interval. The image captured by the camera is fed to our dedicated system. The CNN model processes the image and predicts the crowd density level. The defined output is updated on our real-time server. This real-time server transmits the acquired output to the system present at the bus stop. This system consists of a Raspberry Pi interfaced with the LCD. As soon as the system receives the data it displays it on the bus stop. This crowd density level is updated at regular time intervals so that the commuters get an idea about the crowd density present in the bus at any particular time.

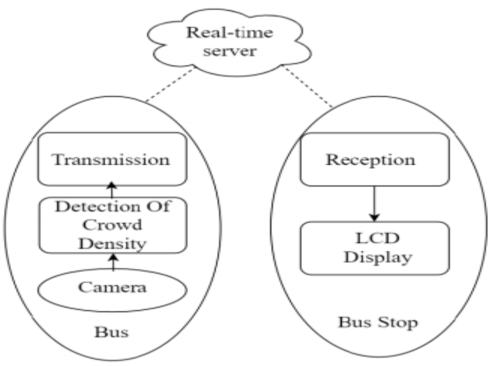

Fig 1.2 Proposed design

EXAMPLE OF TRACKING OF PILGRIM IN HAJJ

The solution will track the movement of pilgrims primarily via RFID technology. A location aware mobile solution also will be available to pilgrims with smartphones to reinforce the accuracy and tracking time of the pilgrims. The mobile solution is secondary because not all pilgrims are going to be expected to

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possess smartphones. RFID tags are one among the foremost cost-effective solution which will be distributed and given to all or any pilgrims easily. Pilgrims will each tend an RFID tag. RFID readers are going to be placed in strategic locations round the Hajj area dividing it into different zones. Data from the RFID readers are going to be sent to a knowledge processing control center, which can store, collect, process and display real-time data on the pilgrim's location. This control center will include an internet-based interface and can function the core central application. Pilgrims with RFID tags having mobile smartphones are going to be ready to install and use a mobile app to require advantage of location-based services. These services would come with finding the situation of family and friends within the Hajj area, sending emergency requests, receiving alerts/notifications from the system and a searchable mapped Hajj area with all important locations and facilities. The mobile user would even be transmitting his/her location while the mobile app is running. this is able to increase the real-time tracking and position accuracy of a mobile user pilgrim. All data of transmission and receiving from a mobile user is again dealt by the control center.

A Pilgrim's location are going to be tracked within the following manner: Once the pilgrim comes into the proximity of an RFID reader his/her tag are going to be read and sent to a knowledge processing center, which can store and update the Pilgrims location. Since the world are going to be divided into zones with RFID readers in each zone, the extent of detail of a pilgrim's location are going to be at a zone level. The pilgrims with the mobile app are going to be sending their location whenever the info connection of their mobile is in commission. So, for a mobile app user the extent of detail of the situation might start at a zone level when the RFID reader reads his/her RFID tag but be later updated to an in-depth GPS coordinate once the mobile app transmits the situation.

IV. RESULTS AND DISCUSSION

The developed system works as expected and interacts with all the components properly. Our system has been tested in real-life situations and it predicts the output accurately. The system is now capable of predicting one of the density levels amongst five with an accuracy of approximately 90%. Below are some of the sample test images for different density levels.

Fig 1.3 shows Very Low Density and Very High Density

Fig 1.4. Moderate Density and High Density

Fig. 1.5. Very Low Density and Very High Density

Fig. 1.6. Moderate Density and High Density

V. CONCLUSION

A crowd management paradigm is presented for spreading visitors across a busy space. Sensors, management, and interface are the three layers that make up the framework. The sensors layer's goal is to track visitors and collect data about crowds. After administrative approval, the management layer will analyze the collected data and extract the required information about the visitors. The interface layer provides an application that informs administrators and visitors about current opening roads and doors, how to discover non-crowded regions, and how to identify their groups and friends in order to help them escape crowd disasters. The suggested architecture will save time and effort for administrators by allowing them to control and distribute visits using low-cost sensors. manipulated by smartphone.

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