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An Efficient and Decisive Crowd Management System Based On RFID Technology

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ABSTRACT

Management of crowded events is very challenging and complex task. Many people loss their life and dreams in every year because of the poor organization of crowded events. Radio frequency identification technology can be effectively used for managing crowded events. In this paper aimed to develop a crowd management system using RFID technology. RFID technology provides a wide verity of applications. The localization features of RFID technology is acclimated to classify and track a person in crowded events. As compared with other positioning systems, the RFID technology providing more accurate result in indoor applications. We evaluate the achievements of our proposed crowd management method through a tested environment experiment. The result shows that our proposed method is very suitable for organizing crowded events.

Keywords: RFID Tracking, Crowd Management, Localization Methods.

1. INTRODUCTION

Efficient management of large crowded events is always a challenge. Successful Management of such events largely depends on the use of technologies. There are many business cases where the use of latest technology can vastly improve their management. In recent times, many types of identification and sensor devices, including RFID tags, have been developed. Such technologies, combined with appropriate backend database systems, can be used to improve the crowd and event management. Managing large crowds is a very complex, challenging and costly exercise. Many of the problems encountered in crowd management can be minimized by the use of RFID and other wireless technologies. These technologies are already being used in managing and administering many activities of daily life. However, the effectiveness of these technologies is yet to be tested for managing dense crowds and poses a challenge to the industry. The aim of this paper is to provide a management framework for large dense crowds and identify appropriate technologies which can be used to improve the management of crowded events.

Radio Frequency Identification (RFID) is a popular information exchange technology widely applied in the electronic passport, animal tracking, and supply chains, industrial automation, mining securities, hospital, asset management, and pharmaceuticals. Existing positioning technologies such as GPS are not good for indoors localization applications because the terminal cannot get the signal from satellites. To enhance the availability of the positioning systems for indoors, we used RFID positioning system for locating objects or people in a crowded event. This paper is focused to develop a threshold based human classification system for crowd area and also aimed to locate the missing tags in the group. The RFID readers are placed at fixed positions and each tag can be attached to each person. From the registration counter, a group leader can collect an appropriate number of tags by giving his/her identification details. Group members can collect tags from the group leader. Suppose a person is missing, then they can easily locate the person by using the unique tag identification number.

2. CASE STUDY AND CHALLENGES

The Hajj Case Study: The hajj is Associate in Nursing annual pilgrim's journey by Muslims to Makkah, Asian country and it's one in all the most important annual pilgrimages within the world. The hajj crowd management and navigation system attempt to manage the big crowd by integration totally different mobile technologies with chase and localization primarily based services[3].

The Kumbh Badrinath Yatra Cases: Kumbh is the one of the biggest gatherings anywhere in the world, the Humbh information can be obtained from [3].

Following are some of the common difficulties faced by the crowd and the authorities alike:

- Identification of a person(lost, dead, injured, etc)
- Medical and Emergency services(Police control rooms, waiting rooms, hotels, and lodges)
- Locating important places in surrounding areas.
- Guiding lost persons to their group.
- Reporting in case of emergencies.
- Information exchange between crowd and authorities.
- Controlling the crowd.

This work aimed to solve the above-mentioned problems and propose and develop an efficient and decisive crowd management system based on RFID technology.

3. AN EFFICIENT AND DECISIVE CROWD MANAGEMENT SYSTEM BASED ON RFID TECHNOLOGY

A crowd management system must monitor the capacity, crowd behavior, crowd control, facilities available and stack-holders approach. The proposed method is a framework for crowd management system. This system provides a mechanism to control the crowded area. It provides emergency helps for

- Locate a person in a crowded area.
- Interface to communicate with the people and authority.
- Location of hospitals, police control rooms, waiting rooms and hotels.
- Guiding lost person to reach their group.
- Reporting in case of emergencies.
- Controlling the crowd.

3.1. System Architecture

The objective of this paper is to design an accurate and efficient method for crowd management. The Fig. 1 shows the work flow of our method. From the registration counter, anybody of the member in an exceeding cluster will collect an applicable range of RFID tags by providing the fundamental information (Name, address, contact information, state, the range of cluster members, tag numbers, etc) and then distributed. The RFID readers are capable of tracking each RFID tag separately. The RFID readers are placed at fixed locations and tags are attached to each person. Each person has a unique identification number, the tag identification number is helpful to localization and count the number of the person in a crowded area. After the successful registration, all data are stored in a host computer. At each time slot, the Crowd management system first estimate the number of people in the location (count the number of tags under the reader's range). After the estimation, it decides whether more people are allowed to entering the location. We have a threshold of a number of people for the decision making. If the number of people is large than the threshold (the area is filled with a maximum number of people), the crowd management system restrict the entry; otherwise, it allow people to entering the location. The proposed crowd management system provide several services. Both the management authority and crowd can use the services.

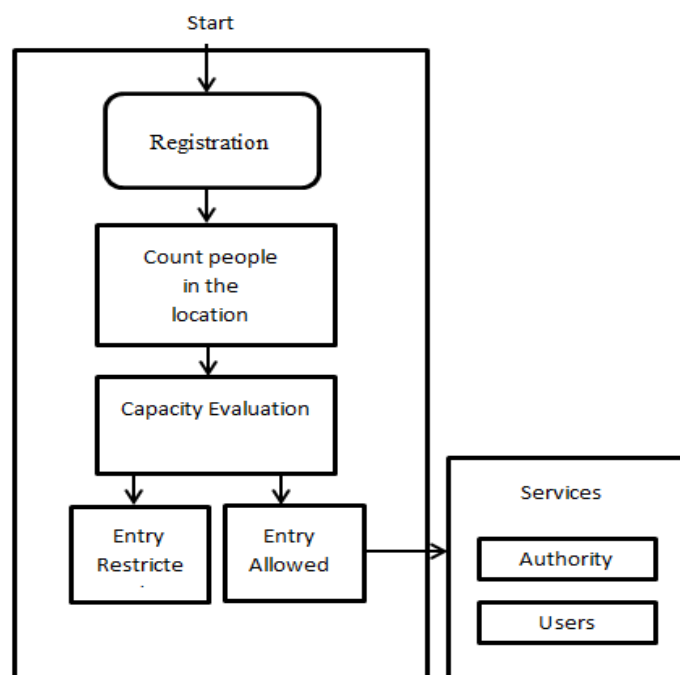


Fig 1: System Architecture

3.2. Radio Frequency Identification Module

An emerging application of RFID is indoor and outdoor Real-Time Localization System (RTLS). The Radio Frequency Identification Module help to localize each person in the event. RFID readers are placed at the different location and RFID tags are provided with each person. Each RFID tag has a unique identification number, the RFID reader is capable of reading the unique number. There for we can localize every person in a crowded area by using the RFID module.

3.3. User Interface Module

The user can interact with the crowd management system via a desktop computer. There is two type of users, admin, and crowd. The admin has all access privilege. The admin can register a new group of people, communicate with panel members crowd, searching for find a person in the crowded location, controlling the exit process and also analysis the crowd details. The crowd can access the website with their own tag identification number. They can use the crowd management website for finding the location of missing person, finding the location of hospitals, police control rooms and waiting rooms etc.

The user interface module of the crowd management system will consist of the following features:

- It helps to the registration process.
- Being able to show the location of every person in a crowded event.
- Being able to provide emergency services for police control rooms and hospitals.
- Being able to send notifications and news to users.
- A history of the location of the pilgrims will be stored for the entire event. This can be used later on by the management team for analysis and research.
- Being able to find free waiting rooms and rest places.
- Being able to communicate with crowd and panel members.

4. EXPERIMENTAL EVALUATION

In order to validate our proposed design, we carried out a series of experiments using the sample crowd management system. The main components of a crowd management system are an RFID reader, nine RFID tags, PCB, transformer, ATmega 32, MAX232, LCD, keyboard switch etc. The keyboard switch is used to represent different locations. After the successful registration, the crowd can enter into the event. The keyboard switches and corresponding locations are listed in Table 1.

Table-1: Keys-Locations

| Keys | Locations |
|------|--------------------------------------|
| A | Entrance to platform 1 |
| B | Men's police station at platform 2 |
| C | Woman's police station at platform 3 |
| D | Waiting room at platform 3 |
| E | Waiting room at platform 4 |
| F | Waiting room at platform 2 |
| G | Hospital at platform 2 |
| H | Hospital at platform 3 |
| I | Location 1 at platform 4 |
| J | Location 2 at platform 2 |
| K | Location 3 t platform 1 |
| L | Location 4 at platform 2 |
| M | Location 5 |
| N | Location 6 |
| O | Exit at platform 1 |
| P | Exit at platform 2 |

Table 2: Sample Registration Details

| id | Name | Address | State | No. Person | Related id's |
|-----|--------|------------|------------|------------|--------------|
| 101 | Athira | Iykkarettu | Kerala | 3 | 102, 103 |
| 104 | Anna | Aymanathil | Karnadaka | 2 | 105 |
| 106 | Mittu | Pulical | Thamilnadu | 3 | 107, 106 |

The sample registration details are shown in Table 2. After the successful registration, each one gets an RFID tag. Each RFID tag has a unique identification number. The RFID reader is placed at different locations and it is capable of identifying each tag separately. Therefore the location of each person in a crowd can obtain. Man missing is the major issues in a crowed event. It is difficult to find a person in a large crowded area. The proposed system helps to find the missing person by using the RFID tag identification number. The searching result is shown on the web page, this page is visible to both admin and crowd. We can find the location of each member in a group by entering only one group tag identification number. For example, tag number 107 is missing, any one of the members of the group can find the location by entering his own tag number the result is shown in Table 3.

Table 3: Result of Localization

| ID | Location |
|-----|--------------------------------|
| 106 | Location 1 at platform 4 |
| 107 | The waiting room at platform 3 |
| 108 | Location 1 at platform 4 |

The panel members can also analyze the crowd by using date and state. This information is helpful to managing and monitoring the crowd.

5. CONCLUSION

The organizations of crowded events are a very difficult task. Many people lose their life due to the unorganized crowded events. The proposed system is used for handling the crowded events. It can be implemented very easily and the service does not require any other technology. We can effectively track a person by using this method. RFID technology does not require any line of site so it is better to indoor localization. This method is very helpful to apply in the mobile banned areas.

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