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RFID-Based Bus Detection System for Visually Impaired

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Abstract: ***A system in bus detection for people with visual impairments using RFID is presented in an effort to make travel easier and hassle-free. The proposed system has two detectors-one at the bus station and the other at the near-by bus-and it has a database and a website. By using the bus detector subsystem, it is easy to detect and announce the names of near-by bus stations through a voice message inside the bus. This bus subsystem senses any blind person within the radius of the station and so informs the driver of a person's presence. The bus station subsystem senses the incoming buses and announces them to the blind people at the station. A full prototype of the system has been constructed and tested to confirm its working. The outcomes show promise in terms of cost-effectiveness, functionality, and safety.***
Keywords: Cost-Effective, Database, RFID, Safety, Voice Message.

I. INTRODUCTION

People who are blind require special services and facilities, above all, accessible public transportation through which they should be given the right and opportunity to move freely and without assistance. The mobility factor is required to have the ability to live or enjoy life on foot, by car, or by metro. Nobody, though, has any option but to depend on others for traveling movements, especially in the case of the other disabled groups; among them is blindness, while its bearer cannot find easy movement. It also restricts the mode of transport and their utilization. Public transportation, which is seen as a necessary mode of transportation in many nations, is the most popular mode of transportation for blind people. For example, according to New York, the percentage of using public transportation is 55% [1].

Unfortunately, public transportation remains inaccessible in most countries to the blind. For example, not being able to distinguish between arrival times of buses at stations and not being able to read bus numbers created difficulties for blind people while trying to board the right bus. Unlike the sighted, the blind need constant direction to avoid accidents and not be severely delayed, which would influence their appointments and fulfillment of some of the tasks that limit their ability to lead a normal life. Such a difficulty would lead to isolation and prevent them from leading a normal life. Systems have been developed, as in [2-4], to help blind and visually impaired people, but present solutions for the mobility assistant in public transportation are rather poor, and this paper is an outcome of this motivation.

A paper proposed a system for visually impaired persons to travel the road smoothly and on their own, especially providing them with all-rounded comprehensive information the bus driver will alert visually impaired passengers when a bus stop is approaching, notify them of upcoming bus stops, and provide them with information about the arrival times and routes of buses at the station.

II. LITERATURE SURVEY

For the blind, countless guiding techniques have been proposed. This section features the most relevant one with our project. Central announcement guiding system via Bluetooth technology is in [5]. This system needs installation of Bluetooth devices at both sides of buses and stations, connected to the processing subsystem. As soon as the bus approaches the station, once Bluetooth devices get attached to it, the bus updates the station's processor subsystem relevant information about the bus. A text-to-speech converter produces an announcement message containing the information of the bus, that is being played on a speaker. There are basically two primary concerns with this system: it is limited to linking two devices at one time, and it occasionally disconnects connections. In [6], RFID-based System Design for assisting the visually impaired is presented. With each bus, there is an RFID tag containing the count and the next stop of the bus. An RFID reader, headset, and control subsystem are all included in a portable gadget that is given to blind people. A reader locates the next bus, reads and extracts data from it, and then sends the information—in the form of an audio message—to the appropriate blind user. Sadly, there is no way to notify the vehicle's operator that someone is a blind person at station, no is there a backup plan in case the user loses track of his gadget.

A WSN-based system described in [7] operates in two phases: detecting blind people and assisting bus-station interaction. The station is separated into areas designated for both visually impaired and regular passengers. Two sticks at the entrance of the blind area can push a switch to sense their presence. When sensed, the station broadcasts this message to the buses around, and, as a forewarning, the bus announces its number by means of a microphone before arrival. The bus also has some light system that indicates if there is a blind passenger inside. Red light signifies that a blind person is waiting, and blue means none. This system also has drawbacks including that it cannot be differentiating whether or not the person within the blind area is indeed blind and cannot sense when a blind passenger leaves, hence calculating futilely and wasting energy. In addition, this system displays only the number of the bus and nothing more about the next stations [7]. Our proposed system does not have any specific region for the blind passengers. Another assistive system is an Android application called OnTheBus [8], which helps passengers with special needs to navigate by receiving voice messages, and it can be used by all passengers. Its primary algorithm leverages the location tracking system and permits the use of the smartphone's compass as well as the 3G network. There are two varieties available: one for typical travelers and another for less fortunate travelers. The application allows blind users to interact with it through voice instructions. It then presents potential routes to a location, letting the user select the best one. The bus's estimated arrival time at the station is provided by the application, along with the location of the closest station. It indicates how many stops it needs to make before arriving at its destination once it is on board. A disadvantage of this method is that it needs to be set up initially in order to be customized to the needs of the blind client. Users who are blind would not be able to reset their applications if this mechanism ever malfunctioned. There is no setup procedure at all with our suggested system. An RFID-based ticket is all that is required of the user.

III. PROPOSED SYSTEM

The two subsystems that make up the suggested system are the bus subsystem and the station subsystem, both of which are linked to a central database. Together, these subsystems are able to identify approaching stations, bus arrivals, and the existence of blind people at the station. A radio frequency identification device and reader are installed in every bus and station. Furthermore, every blind person using the station is provided with a tag that is connected to their travel information (such as their destination and bus number) via the database of the system; this data is input at the time of ticketing. There are two announcement systems: one on the bus to alert riders of impending stations along the route, and one at the station for informing busses approaching. In addition, the driver of the bus will be informed about any blind passengers who need the bus.

1) Station subsystem description
2) Database Design
3) Website Design

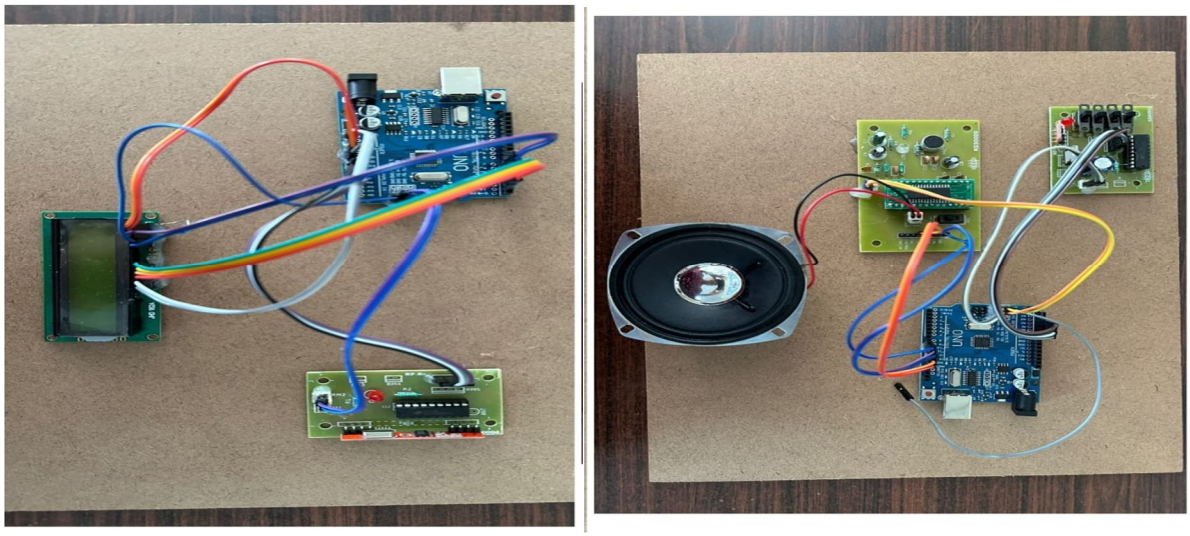

Figure 1: Proposed System

A. *Description of the station subsystem*

An RFID tag, an announcement subsystem, and an identification subsystem (RFID reader) make up the station subsystem. Every blind person we serve is equipped with an RFID tag which has been linked, via the system's database, to his preferred bus number as well as destination details. This information will be stored in the database at the point of issue of the tag to the blind user.

B. *Database Design*

There can be one passenger at a station, zero passengers at a station, or numerous passengers at a station. Similar to this, a bus goes through many stations on its way through a station that has a number of buses traveling through it. The many-to-many connection among the bus and platform tables is managed by the pass table. The bus operator's allocated number, bus no., is a property in the bus table that indicates which bus a passenger should take to reach their destination. BusTagID is the primary key in the bus table. The pass table connects both the bus and terminal tables in a many-to-many fashion, making it a junction table in and of itself. Aside from stop no, which indicates the order of the stations the bus will be traveling through, and departure time, which indicates the time the bus departs a station, it has two main keys, namely stationTag ID and busTagID. A bus number connects each tag bus containing id to the table bus. The busTagID and buses no are the two attributes in this bus table. Four attributes make up the information about the specifics of relevant stations in the table: ticket number, station name, location N and coordinate E (which represent the station's location), and stationTagID, which is the name of the column containing the main key. Table of passengers: this table has information on every traveler. Four table attributes are required: ticket number as the main key, the blindTagID, and two foreign keys, stationTagID and busTagID, which are used to reference the passenger's location and the bus they need to ride.

C. *Website Design*

Such functionalities developed on the site include issuing tickets for visually challenged, managing and updating of a database on buses, tickets, and stations, and general access to web users regarding bus schedules and other system services.

The website provides staff section and general passenger section. However, only with the help of a valid username and password, a staff member can login in order to authenticate the user to access various features offered by the website. After getting logged in, station employee is able to add and retrieve data in the database of the system. They can also handle the ticketing procedure, locate pertinent ticket information, or update bus-related data like destinations and departure times. Passengers can use the website to find out when buses are available and when their destination is departing.

IV. CONCLUSION

We created our database and website using the XAMPP software as our development environment. As was previously noted, XAMPP is a complete package that includes both the web server, Apache, and the database server, MySQL. Apache will deliver the website's content, and MySQL is going to be used to create and manage database tables. Via a database connection, our website retrieves information that is helpful to its visitors. Both regular users and staff are intended to benefit from its features. Employees have access to the ticketing system to search for specific tickets, view all tickets, and create new ones for both regular users and visually impaired users. Bus station staff: it can show precise details of a single bus, show details of all buses, or alter bus details (to add a new bus, modify the tag id, or add terminals to a bus network).

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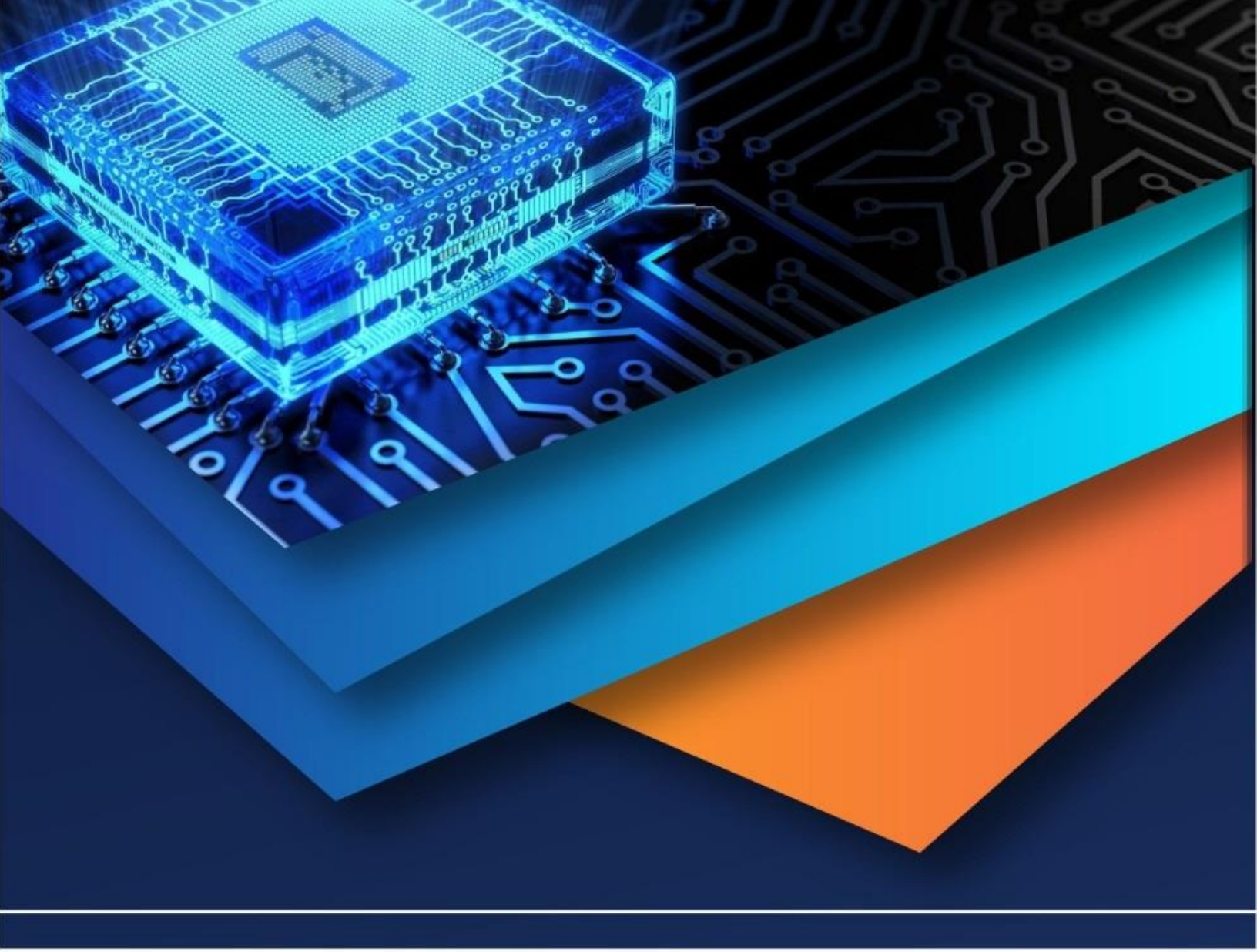

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