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Automatic Station Announcement and Fire Prevention System in Railways

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Abstract - This paper focuses on developing an intelligent system which senses every location with the help of GPS receiver and intimates each passenger to know their own destination through phone call. The system also announces each and every station to all passengers through speaker. The proposed system facilitates the passenger to identify their particular destination very easily. The system would alert the passenger when the train reaches before the particular station by sending audio voice to their mobile phone. The system also detects the smoke and if it is detected, the system activates the alarm in each and every compartment. In the recent days, occurrence of hazards due to fire and resulting fire accidents is more possible. So, the proposed solution is to detect the fire and then sprays the dry chemicals when temperature reaches the high range which is identified by temperature sensor.

Index Terms – Location identification, GPS receiver, Smoke detection, Temperature sensor.

I.INTRODUCTION

Unpredictable railway schedules which are made practically impossible to find the specific destination on where we have to reach. To overcome this problem, the paper made the concept of making calls to the passengers when their destination is reached by the train. When the station location is received it automatically activates the voice circuit to announce predefined station name. Nowadays people travelling from one place to another place have become a part of our day to day life and the people who depends on the public transports. Due to presence of this system, the passengers are easily to know their destination.

This paper focuses on developing an advanced railway control systems in which a GPS receiver is used for tracking the location of the train. Initially GPS tracking is developed for military purposes, but now it is mostly used for various applications [1][2]. These devices allow people to track others as well as valuables through internet from anywhere else. By using GPS, location identification has seen a sharp rise owing to its simplicity and increasing affordability of GPS based devices [3].

It is highly intelligent monitoring system in which the GPS (Global positioning system) receiver is capable of identifying the location in which it is present in the form of latitude and longitudes. The GPS gives the data received from the satellites. In this paper, the microcontroller is used which is interfaced with a GPS receiver so that it can receive the information about the location in which the train is present. When the station location is received it automatically intimates the passengers.

GPS receivers are used to provide three dimensional locations such as latitude, longitude and altitude with precise time. These receivers provide reliable positioning, navigational and timing services to worldwide users in any climatic conditions whether day or night anywhere in the world and around the earth.

This system also detects the smoke and if it is detected, alarm will produce within in train. If the temperature increases above threshold value it assumes fire accident and it is prevented by spraying dry chemicals.

Embedded system is a computing device that has computer hardware with software embedded in it. Embedded system is mainly used for its size and cost benefits and it improves performance and reliability. Embedded system is used in variety of applications and it controls many devices in common use today. Embedded system are generally based on the microcontrollers and designed to do some specific task, rather than be a general purpose computer for multiple tasks.

Objective of the paper is to create an application that is able to estimate destination station and alert the passengers through phone call and also to offer a convenient mobile information service, this ensures the passengers to get the alert of destination station before train reaches the destination. The mobile is portable thing; it is the best way of communication. So, we have chosen the phone call as the best service to intimate the passenger as even the basic mobile will support this application. Hence better way to alert all class people and is cost effective.

II.EXISTING METHOD

The existing system involves announcing the arrival and departure information manually in a particular station while the proposed one is an automated system with very limited human intervention. The proposed system uses relatively less expensive sensors which reduce the cost parameter of the system.

Few disadvantages of the existing system are
• 	Constant human intervention.
• 	More manpower is required.
• 	It produces an alarm when train reaches the station, so passengers are disturbed.

The existing system displays the number of railway stations on TFT display and also this system produces alarm when the train reached less than 10km from destination. So, it generates unwanted disturbance to the passengers.

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In existing method, the device displays list of railway stations and an input is get from the passenger by invoking the touch screen and pointer context application programming interfaces. The received input is processed for identifying the user's selection. If the distance is lesser than 10 kilometers, the alarm system is generated. The position and speed related information is updated, displayed continuously and distance is recalculated at the refresh rate supported by the GPS receiver [4].
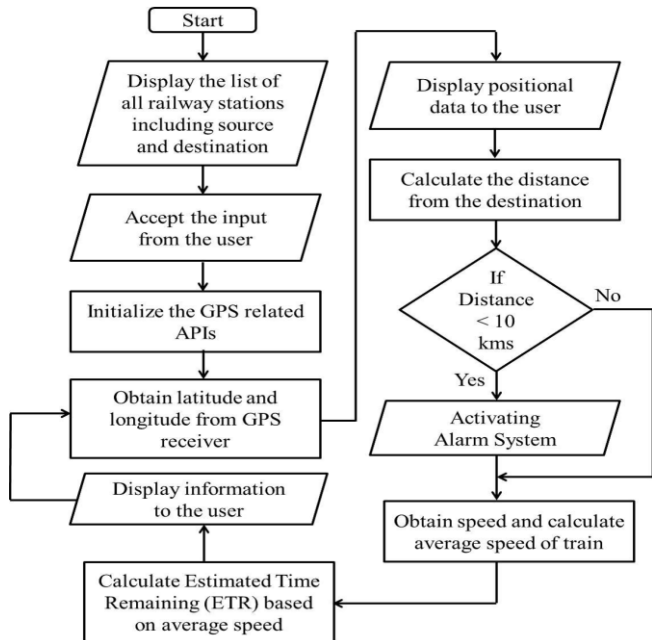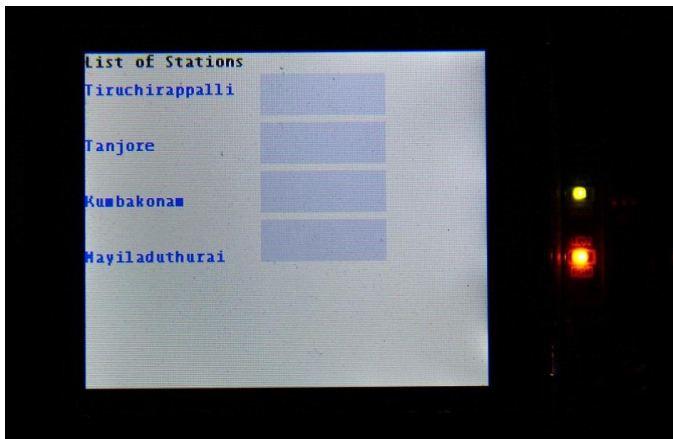

Fig.1 Flow chart of existing method

Fig.2 List of Railway Stations on TFT Display

III.PROPOSED SYSTEM

Security in travel is primary concern for everyone. Now a day fire accidents are more often occurring in trains. When these accidents are occurring in remote areas or during night times the loss or damage being caused is at higher rates. The damage is heavier due to improper reach of service at right time due to improper communication. This time delay is causing heavier damage. Thus, eliminating the time between when an accident occurs and when first responders are dispatched to the scene decreases the damage. One approach to eliminate the delay is by identifying the fire accident and

notifying the concerned authorities, loco pilot and passenger with in no time. Passengers will be notified by ringing the buzzer and loco pilot will be notified showing the message in the LCD display fitted in the engine along with alarm. In the same time the railway authorities and emergency services are notified by calling through GSM service. The GPSA related APIs are called to initiate the receipt of information from the GPS receiver. If any smoke detected inside the train, then warning SMS send to the control room and also in case of fire sensing, the SMS send to the control room and dry chemicals will spray in the fixed compartment automatically.

During night time, passenger not identifies their destination accurately and even sometimes they slept well during night times. Many passengers are affected by this problem. To avoid this mistake, the proposed system senses GPS location and the system which is capable of announcing the station name when the train reaches before the station which will be helpful for passengers travelling in AC coaches as well as for non-local passengers who may not have idea about the local areas. The passenger's mobile is ringing when the passenger reaches before their destination and also announces each station name through speaker. So, the passengers easily know their destination.

Advantages of the proposed system are,

- Identify the destination station very easily
- This can be used for buses also
- Basic mobile can also be used
- Automated system requires less manpower.
- It uses a voice chip which records and plays the desired voice.
- Smoke detection is available.
- It prevents the fire accidents.
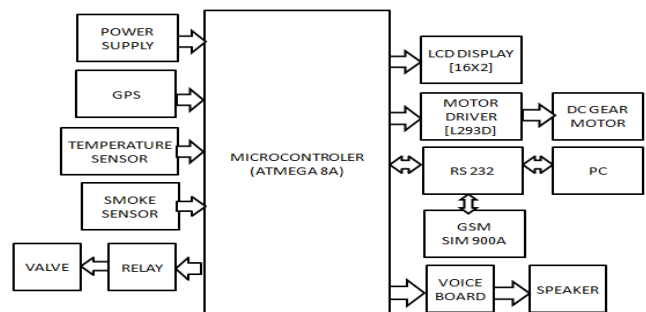
BLOCK DIAGRAM

Fig.3 Block diagram

In this paper, microcontroller ATMEGA8A is used, this microcontroller has high performance, advanced RISC Architecture and operating voltage is -2.7 to 5.5V. Compare to other controllers, it has reduced instruction.

LCD display is a thin, flat display device. In this paper, it is used to display the list of station name.

GSM represents Global System for Mobile Communication. GSM Modem RS232 is built with dual band GSM engine SIM 900A, works on frequency 900/1800MHz. The modem is coming with RS232 interface, which allows connect PC as well as microcontroller with RS232 chip.

GPS represents Global Positioning System. GPS Receiver is used to identify the location of the station.

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Smoke sensor senses the smoke within the train.

Temperature sensor is used to sense the temperature. If the temperature goes above threshold value, it assumes fire accidents, and then it sprays dry chemicals.

The function of motor driver is to take a low current control signal and then turn into higher current signal that can drive a motor.

Relay is an electrically operated switch. Many relay use an electromagnet to operate switching mechanism mechanically, but other operating principles are also used. A relay that can handle the high power required to directly drive an electric motor is called Contactor. Solenoid Valve is an electromagnetically valve.
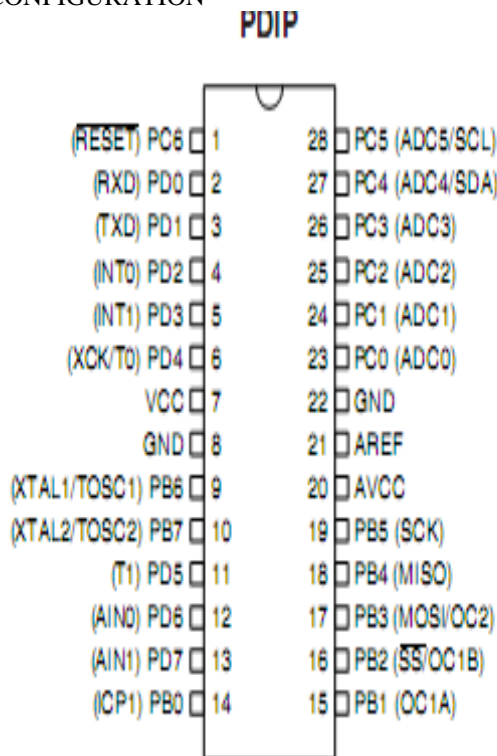
PIN CONFIGURATION

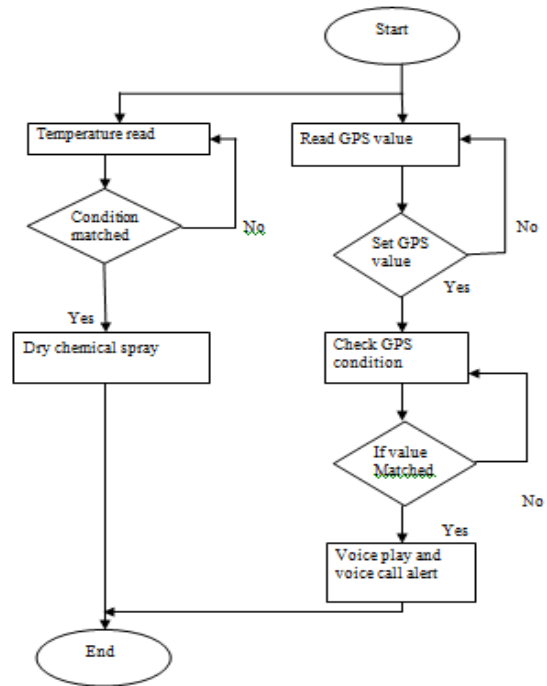Fig.4 Pin diagram of ATMEGA

FLOW CHART

Fig.5 Flow chart of proposed method

Algorithm

Initially, the system read the GPS value and if GPS value is set, then checks GPS condition. If this value is matched, then speaker announces the station name and phone call come to the passenger's mobile. At that time, temperature sensor senses the temperature value. If it is matched, dry chemical will spray. This could be useful for preventing the fire accident occurring in train.

Approach And Methodology

In this paper, a GPS receiver is used to continually track the location of the train. The receiver spots as many satellites as possible and collects positional (x, y, z coordinates) and time data from all the satellites spotted. For example, assuming that four satellites are spotted, the pseudo ranges are calculated as:

$$R^1 = CT-CT^1 = \sqrt{[(x1^-x)^2 + (y^1-y)^2 + (z^1-z)^2]}$$
$$R^2 = CT-CT^2 = \sqrt{[(x2^-x)^2 + (y^2-y)^2 + (z^2-z)^2]}$$
$$R^3 = CT-CT^3 = \sqrt{[(x3^-x)^2 + (y^3-y)^2 + (z^3-z)^2]}$$
$$R^4 = CT-CT^4 = \sqrt{[(x4^-x)^2 + (y^4-y)^2 + (z^4-z)^2]}$$

Where,

R_k = Pseudo range of kth satellite

x_k, y_k, z_k = Position of kth satellite
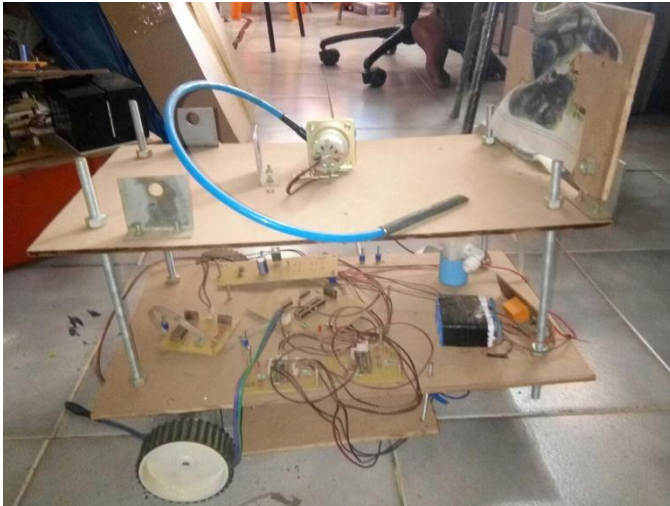
T = Clock bias of receiver

T_k = Clock bias of kth satellite

C = Speed of light

The location of the receiver is obtained by solving these equations and the position is obtained in terms of the Cartesian coordinates and time. The coordinates are resolved into latitude, longitude, altitude and speed etc.

Distance is calculated as

Distance = Speed * Time

IV.CONCLUSION

This paper aims at an automated system to make announcements and display at stations codes. The main aim of this paper is to make an automated place announcement system for train using voice IC and the radio frequency wireless card for tracking the station data. Avoidance of missing the destination can be overcome by implementation of phone alert system within the train. The practical implementation and concept of this work could be useful for a lot of passengers' especially handicapped people and aged people to know their destination by themselves. When the train reaches before destination, station name is announced via mobile and also announces each station name publicly through speaker within the train. Finally, it also detects smoke and prevents all the passengers from fire accidents. The future work of this paper will create a mobile application.

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