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SMART METRO TRAIN SYSTEM

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ABSTRACT

Now a days technology is going so vast and everything is becoming as smart as human is but not totally as is, in the sequence of this technology flow, there is a need of controlling of train traffic system in a smart way, by feeling the requirements of this system, we are designing a model (prototype) based smart metro train system, which is giving a smart sense to control the flow of trains. In this model research based project we are using some of electronics components such as The Arduino Uno with microcontroller board based on the ATmega328P. As a controller of this system and we use C as a language platform and NI Multisim for circuit design and IC's and also using Gates.

Keywords : Circuits, Catcher, Transmitter & receiver, Track changing, Trains.

INTRODUCTION

This MCU based system is following these three steps:

- First Microcontroller active the system sensors.
- Analysis the sensors data for train.
- On the bases of sensors data microcontroller operate the trains.

The working of this controlling system as follows in details. The train control system has three basic parts (sensors, microcontroller, transmitter & receiver for train controlling) first microcontroller active the system sensors and analysis the sensors data for train, if any sensor goes ON then identify the train by checking identify sensor. After identifying the train it will check other

sensors for 2nd train. If 2nd train comes the microcontroller send the signal to the 2nd train and stop it, until 1st train passes through central part or crossed the junction. After passing the central part of track by 1st train microcontroller then send the signal to the 2nd train and it will start to move. There is a special case in which if 2nd train accidentally or due to any other cause stopped on the central path at any point or anywhere of the track. If during this time 1st train coming near the central part then microcontroller performs special case option and 1st train will receive the signal to stop before entering in central part. Now When 2nd train gets ON then microcontroller send it to that track where 1st train is not present. When 2nd train passes the central part then microcontroller will start the 1st train and this system will follow the same pattern. Here is another thing in this research base project is THE SIGNAL SYSTEM in which when a train passes through any sensor then signal goes RED and when that train approaches to next sensor then previous signal goes GREEN and next will be RED. As train goes on this pattern follows.

MATERIALS AND METHOD

The things for manufacturing our research base project is given below:

IC's : 74LS74N which is a D type flip flop.

74LS02P & 74LS27P NOR GATES.

74LS08P & 74LS11P AND GATES.

IR sensor (Tx, Rx) : to sense the train.

Two trains engine : for model stimulation.

Magnetic catchers : to change the track for trains.

Arduino board : to control the trains.

Rail car track : to support the trains.

LED's. : for indication of signal system.

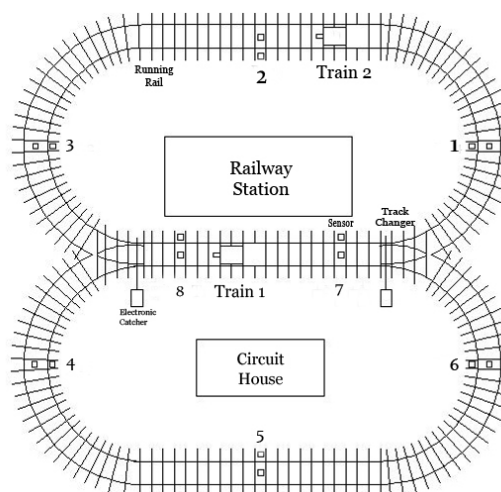
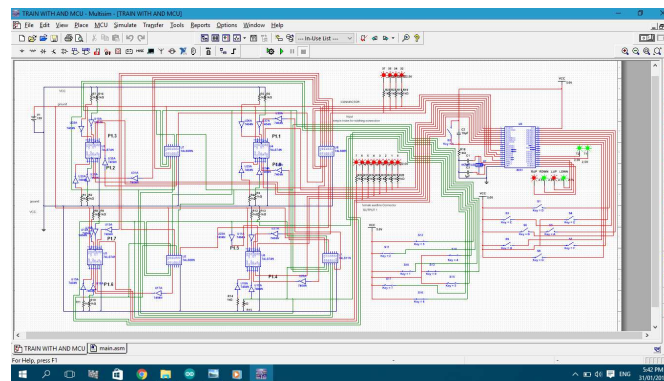
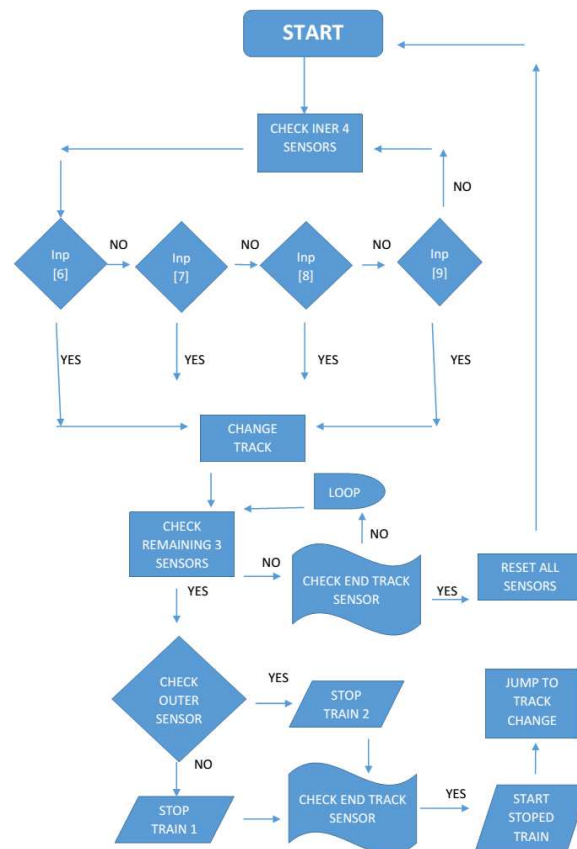


Fig. 1. Layout of smart metro train system

MODELLING SIMULATION



FLOW DIAGRAM OF SYSTEM



SURVEY ON VARIOUS METROPOLITAN RAIL NETWORKS IN THE COUNTRY

Few of the metro train networks in the country are as follows.

- A. Rawalpindi_Islamabad Metro Train system.
- B. Lahore Metro Train system.
- C. Karachi Green line Metro Bus system.

A. Rawalpindi-Islamabad Metro Train System –

Ten stations in the Rawalpindi Part and fourteen in the Islamabad Part are provided along the corridor.

Functional elements at the stations include ticketing booths, concourse level nearside transfer, stairways, platform screen doors turnstiles for automatic fare collection and all other amenities for passenger convenience.



Fig. 2. Rawalpindi Stations (10 Stations)



Fig. 3. Islamabad Stations (14 Stations)

1. Future Requirements of Islamabad-Rawalpindi

Metropolitan Area

The greater Islamabad – Rawalpindi Metropolitan Area is the third largest conurbation in Pakistan with a population of over 4.5 million inhabitants. The Twin cities of Islamabad and Rawalpindi are growing at a rate of more than 4 percent per annum, indicating a higher than national growth due to significant migration. With present growth tendencies it is expected that the population would

increase to 7.0 million in twenty years' time. Since both cities have grown into each other, significant quantity of commuting takes place between the twin cities.

B. Lahore Metro Train System –



The **Lahore Metro Train System** is a rapid transit train system being built in the city of Lahore, Pakistan. The Turkish firm Ulasim and NESPAK are mentors on the project. The construction work is being managed by the HUD & PHE Department through TEPA. When completed, it will consist of 27-kilometres long road track for the Metro Bus Service, from Gajumata to Shahadra, out of this track 8.5 km is elevated .Travel time for the 27 km will be one hour. It has 29 stations and e-ticketing and Intellectual Transportation System are part of the MBS. Whereas all IT part is being carried out in coordination with Punjab IT Board.

1. Bus Rapid Transit (BRT) system

What is Bus Rapid Transit System (BRTS) ?

- A public transport system which uses buses to provide faster, more efficient and comfortable service than the ordinary bus service.
- Buses generally run on segregated lanes with no interference from mixed traffic and with some priority at traffic signals.

China

China

India

Turkey

facebook.com/MBSLahore

• A system with emphasis on *moving people rather than vehicles.*

Lahore Transport Company (LTC) has defined two corridors, on which the Bus Transit will run: Ferozepur Road line extending 28 km and Multan Road Line extending 12 km. The project will be implemented on Build-Operate-Transfer basis. Approximate cost of this project is Rs.25 Billion. Work on the project is in full swing.

The Metro Bus System is being inaugurated on February 10, 2013. It is the 1st Rapid transit system in Pakistan. A test run of the articulated trains was conducted on 25th December 2012 from Gajumata to Kalma Chowk Fly Over. The Chief Minister of Punjab Shahbaz Sharif drove the bus from Chungi Amar Sidhu to Gajumata. Six of the 45 buses, each having a capacity of 150 passengers, have reached Lahore. An independent security has been established for this project.

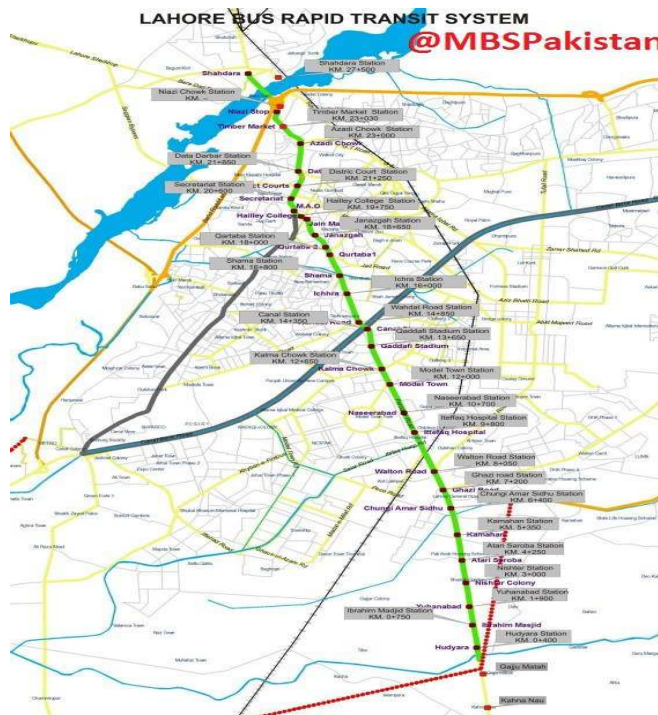


Fig. 4. Lahore Metro Train System Route Map

C. Karachi Green line Metro Train system –

This project will constructed a bus-way (dedicated for BRT vehicles) in the median of the roads along the corridor with stations in the center of the median in both at grade and elevated sections which all provide high speed (25 Km/h) and high capacity (29,400 passengers per hour per direction) service. The design capacity of the proposed BRT system with passing lanes provision will increase based on the number of direct / express services run between stations in the future, as required. It is consist of 22.2-kilometres long road track for the Metro Bus Service, from Surjani to Jama Cloth, out of this track 11.7 km is elevated. It has 22 Bus Stations and 14 billion cost is reserved for this project.



Fig. 5. Karachi Green Line Metro Train System Route Map

Existing vs. proposed systems

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 tags which reduces the cost parameter of the system.

Few disadvantages of the existing system are :

High cost.

Constant human interference.

More Manpower is required.

Installation and integration is time consuming.

The proposed system overcomes the above disadvantages and has the below mentioned merits :

Databases need not be maintained.

Reusability of the recorded message.

Automated system requiring less manpower.

Readers are contact less and do not have range limitations.

It uses a voice chip which records and plays the desired voice.

The model can also be interfaced to provide automatic opening of doors.

PURPOSE OF THIS PAPER

To improve the quality of life of travelers in Pakistan.

To vastly improve the quality of public transport organization in Pakistan.

To provide reliable, safe, inexpensive, high quality and fast BRT Bus Service.

To provide substructure that allows buses to ply in an efficient manner with exclusive right-of-way for a significant portion of their route distance, and reduce travel time.

FUTURE WORK (GPS)

In future, this system can be implemented by using GPS. Since GPS plays a major role in developed countries. So this system can be more advance and fast response by using GPS. GPS is the most advanced communication. GPS plays a vital role in fast transmission as well as clear response by using spectrum analysis.

CONCLUSION

This research comprises the design of an Automatic Train/Bus system. **Smart metro train system** is an operational safety enhancement device used to help automate operations of trains. Mainly, it is used on automated guide way transits and rapid transit systems which are easier to ensure safety of humans. Most systems elect to maintain a driver (train operator) to mitigate risks associated with failures or emergencies. Compared to ATP, which only controls braking, smart metro train system controls all phases of train operation from acceleration to precise stopping, smart metro train system helps the train operators to realize driverless operation. Driverless trains have the potential to

remove human error and transform mass transit in modern cities. As London debates whether to go ahead with full train automation for its underground network, Chris Lo takes a closer look at the technology's benefits and potential pitfalls.

Driverless train technology might not be a new concept for the world's metro systems, but it's still something of a contentious issue in public transport circles. On one side, driverless trains are being championed as a way of avoiding human error and reaching new levels of efficiency at a time when many metro systems are operating at the very limits of their capacity. On the other, critics are concerned about entrusting public safety to a driverless system, as well as the spectre of mass job losses. One of the main objections to fully driverless smart metro train system is a perception that handing total control over to an automated system poses a threat to public safety. This is partly driven by the natural comfort derived from having a qualified human driver on the train to react to unusual situations and provide a friendly face to the public.

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