AUTOMATED SYSTEM DESIGN FOR METRO TRAIN

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ABSTRACT: 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. The paper consists of microcontroller with the RF receiver and the voice recorder chip with speaker .The whole system is attached to the vehicle (BUS or Train). The encoded RFID tags are placed in the BUS stops or the railway stations. The microcontroller in the TRAIN is programmed in such a way that every station name saved in the voice chip which is having a unique code. So whenever the bus or train reaches the station, the reader in the bus or in the train receives the codes, which are transmitted from the tag and the microcontroller receives this code and checks in the look up table, saved in the chip. Whichever matches, the controller will send the command to the voice chip to play that particular voice. At the same time the train stops for about 10-15 seconds in the station and then before leaving the station, it will again start to announce "PLEASE GET INTO THE TRAIN, THE TRAIN WILL LEAVE IN 6 SEC" and the train starts to move to next station. The voice chip will play the voice and this will be heard in the speaker. This voice is repeated till the train leaves the station.

Keywords: BUS, STATION, TRAIN, MICROCONTROLLER, RFID, IC

I. INTRODUCTION

The automated system for a metro rail is an integrated application which makes announcements and displays the relevant station information when the train reaches a particular station. The implementation of the paper is based on Radio Frequency Tags and corresponding readers. Serial communication, non-volatile memory storage, voice chip implementation and others aid in bringing out the desired functionality. This embedded application mainly focuses on overcoming loop holes in the existing system. It is optimized to meet the cost and power consumption requirements.

1.1 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:

- Constant human intervention.
- High cost.
- More Manpower is required.
- Installation and integration is time consuming.

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

- Automated system requiring less manpower.
- It uses a voice chip which records and plays the desired voice.
- Reusability of the recorded message.
- RFID Tags and readers are contact less and do not have range limitations unlike RF receivers and transmitters.
- Databases need not be maintained.
- The model can also be interfaced to provide automatic opening of doors.

1.2 Survey on various Metropolitan Rail networks in the country:

Fig.1.Metro Rail prototype

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

1. Delhi Metro Rail Corporation Ltd. (DMRC)
2. Kolkata metro rail.
3. Mumbai Metropolitan Regional Development Authority (MMRDA).
4. Namma Bangalore Metro Rail Corporation.

1. Delhi Metro Rail Corporation Ltd. (DMRC)

The city of Delhi with a population of round 12 (16.2) million should have had an MRTS network of at least 100 (300) KM by this time, whereas actually it is still (65.10 kms) at the take-off stage. Delhi has all the ideal dress-up for an excellent Mass Rapid Transit System to be brought in. It has wide roads (roads cover 23% of the city area) where road possession for construction is not difficult (except in the old city area). Implementation will also not involve demolition of large scale private properties. Most of the land required is under Government control and hence can be easily acquired.

Government of India and the Government of National Capital Territory of Delhi, in equal partnership have set up a company named Delhi Metro Rail Corporation Ltd. under the Companies Act,1956 which has (already commissioned a 65.10 kms route in Phase-I and is proceeding ahead with another 121 kms in Phase II).

The project update is as follows:

PROJECT UPDATE

Phase I Network | Project Cost | Expected Ridership | Present Status | Training School | Delhi Metro is a world class Metro | Consultancy Project

Phase I Network

Phase I of Delhi Metro Rail project consists of the following three lines:

Line	Length (Kms)	No. of Stations
Line No.1- Shahdara-Tri Nagar-Rithala	22.06	18
Line No.2- Vishwa Vidyalaya-Central Secretariat	10.84	10
Line No.3- Indraprastha-Barakhamba Road-Dwarka Sub City	32.10	31

Phase II Network*

Phase II of the Delhi Metro Project consist of the following lines:-

Line	Length (Kms)	No. of Stations
Shahdara – Dilshad Garden	3.09	3
Indraprastha – Noida Sector 32 City Centre	15.07	11
Yamuna Bank – Anand Vihar ISBT	6.17	5
Vishwavidyalaya – Jahangir Puri	6.36	5
Inderlok – Kirti Nagar -Mundka	18.46	15
Central Secretariat – Sushant Lok	27.45	19
Dwarka Sector 9 to Dwarka Sector 21	2.76	2
New Delhi – Airport	19.20	4
Anand Vihar – KB Vaishali	2.57	2
Central Secretariat – Badarpur	20.04	15
Total	121.17	81

Table 1.DMRC Project update

Fig.2.Delhi Metro Rail Corporation building unit at Badarpur

2. Kolkata metro rail

The burgeoning transport problem of Kolkata drew the attention of the city planners, the State Government and also the Government of India. It was soon realised that something had to be done and done fast to cope up with the situation. It was Dr. B.C. Roy, the then Chief Minister of West Bengal, who for the first time conceived the idea in 1949 of building an Underground Railway for Kolkata to solve the problems to some extent. A survey was done by a team of French experts but nothing concrete came out. Efforts made to solve the problem by augmenting the existing fleet of public transport vehicles barely touched the fringe of the problem as the roads account for only 4.2% of the surface area in Calcutta as compared to 25% in Delhi and even 30% in other cities

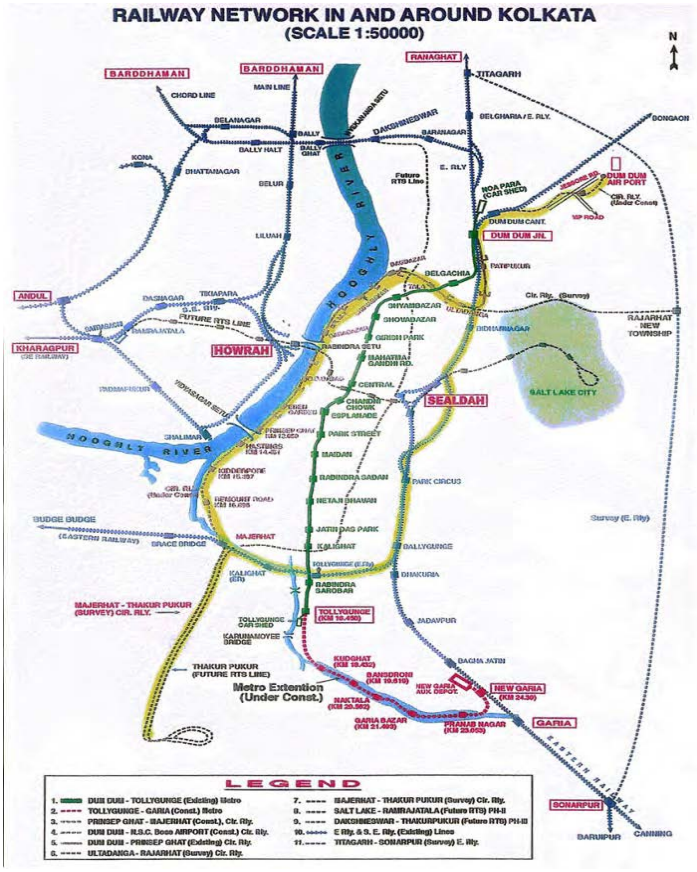

Fig.3.Route Map of Kolkata Metro Rail

The salient features of kolkata metro rail project are:

Total Route Length	16.45 Kilometers
Stations	17(15 Nos. under ground, 1 on Surface and 1 elevated)
Coaches per train	8
Maximum Permissible Speed	55 kmph
Average Speed	30 kmph
Voltage	750 Volt D.C.
Method of current collection	Third Rail
Travel Time: Dum Dum to Tollygunge	33 min
Each coach can carry	278 standing, 48 sitting
Each train carry	2558 passengers (approx.)
Interval between trains	8 minutes in peak hours & 10-15 minutes at other times
Total estimated cost of the project	Rs. 1825 crores (approx.)
Environment control	Forced ventilation with washed and cooled air.

3.Mumbai Metro by MMRDA

Main objective is to provide a rail based mass transit connectivity to people within an approach distance of 1 to 2 K.m ; to serve the areas not connected by existing Suburban Rail System.

To provide proper interchange facilities for connectivity to neighbouring areas like Thane, Navi Mumbai, and Vasai – Virar etc.

Phase I (2006 – 2011)

Versova - Andheri – Ghatkopar	- 11.07 Km
Colaba - Bandra – Charkop	- 38.24 Km
Bandra - Kurla – Mankhurd	- 13.37 Km
Total	- 62.68 Km
Phase II (2011 – 2016)	
Charkop - Dahisar	- 7.5 Km
Ghatkopar – Mulund	- 12.4 Km
Phase III (2016 – 2021)	
BKC - Kanjur Marg via Airport	- 19.5 Km
Andheri (E) – Dahisar (E)	- 18 Km
Hutatma Chowk – Ghatkopar	- 21.8 Km
Sewri – Prabhadevi	- 3.5Km
Total Length	146.5 km
Total Cost	Rs 19,525 Cr

Its salient features are as follows:

Salient features:

1. Route length -	11.07 km
2. Elevated alignment-	100 %
3. Maximum gradient-	4.0%
4. Minimum curvature -	100 m
5. Minimum Ground Clearance -	5.5 m
6. No. of stations -	12
7. Platform Length -	135 m
8. Car Depot -	D.N Nagar
9. Length of coach -	22 m.
10. Width of coach -	3.2 m.

4. Namma Bangalore Metro Rail Corporation

The Bangalore Metro weaves through the bustling commercial and residential areas of the city. The first phase of Bangalore Metro, consisting of two corridors of double line electrified, will cover a total of 33 km. The East-West corridor will be 18.10 km. long, starting from Byappanahalli and terminating at Mysore Road terminal, going via Old Madras Road, Indiranagar, C.M.H. Road, Ulsoor, Trinity Circle, M.G. Road, Cricket Stadium, Vidhana Soudha, Central College, Majestic, City Railway Station, Magadi Road, Hosahalli, Vijayanagar and Deepanjali Nagar. The 14.90 km. North-South corridor will begin at Yeshwantpur Terminal and terminate at R.V. Road terminal going via Mahalakshmi, Rajajinagar, Kuvempu Road, Malleswaram, Swastik, Majestic, Chikpet, City Market, K.R. Road, Lalbagh, South End Circle and Jayanagar.

Out of the 33 km., 6.76 km. will be underground near City Railway Station, Vidhana Soudha, Majestic and City Market and most of the rest will be elevated.

GAUGE	:	Standard Gauge
TRACTION	:	750V dc Third Rail
NO. OF STATIONS	:	35
TRAVEL TIME	:	33 Mins. (End to end)

Fig.4.Bangalore Metro train

2. Basic Block diagram of the Metro Train Project.

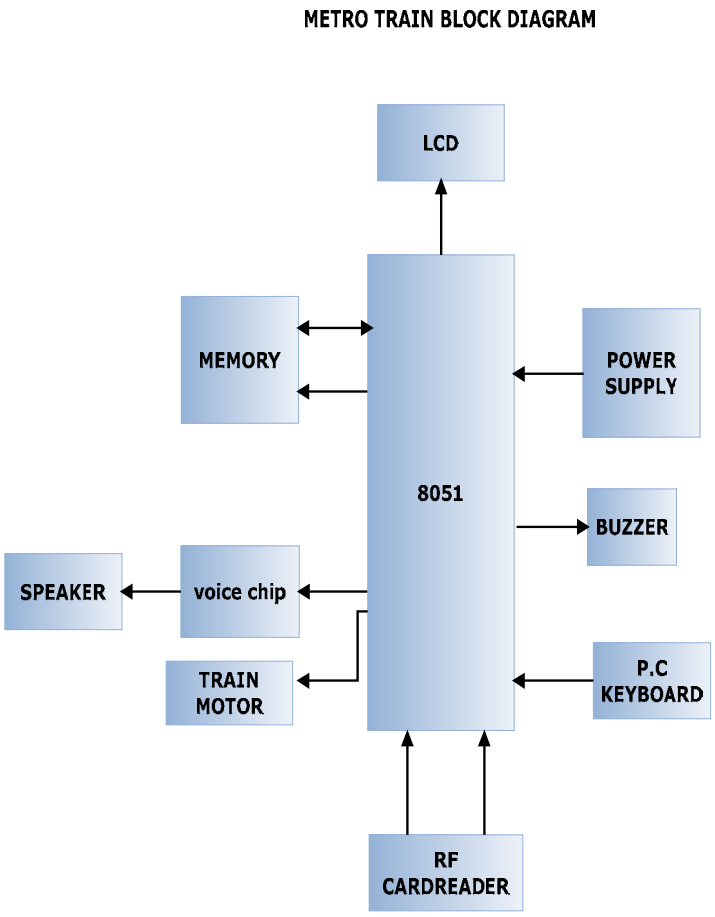

Fig 5: Basic Block diagram of the Metro Train Project.

3. The Circuit Diagram

The final circuit diagram showing various pin connections and the components interfacing to the microcontroller is shown below.

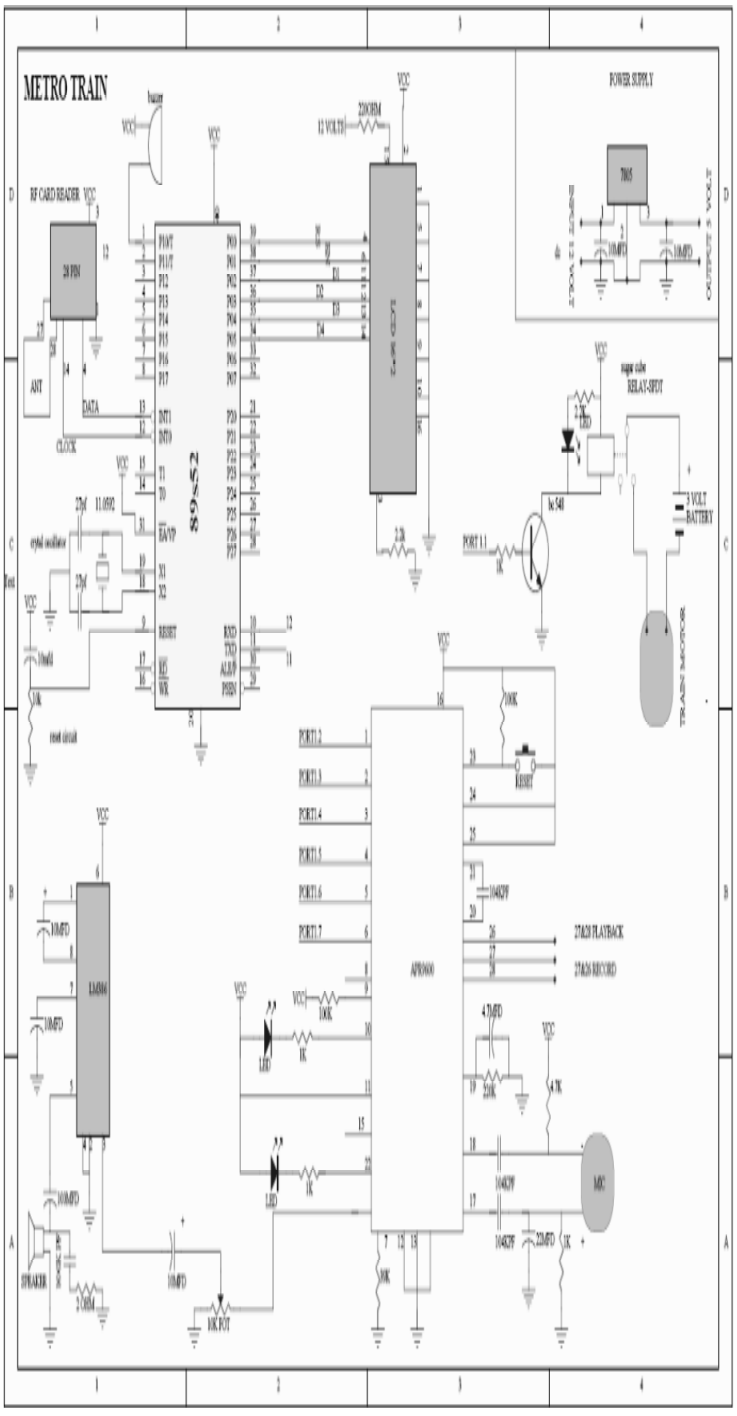

Fig.6.Ciruit diagram of the Metro Train Project

4. Snapshots:

The following are few snapshots of the working model at our workplace, United Telecom Ltd., Hyderabad.

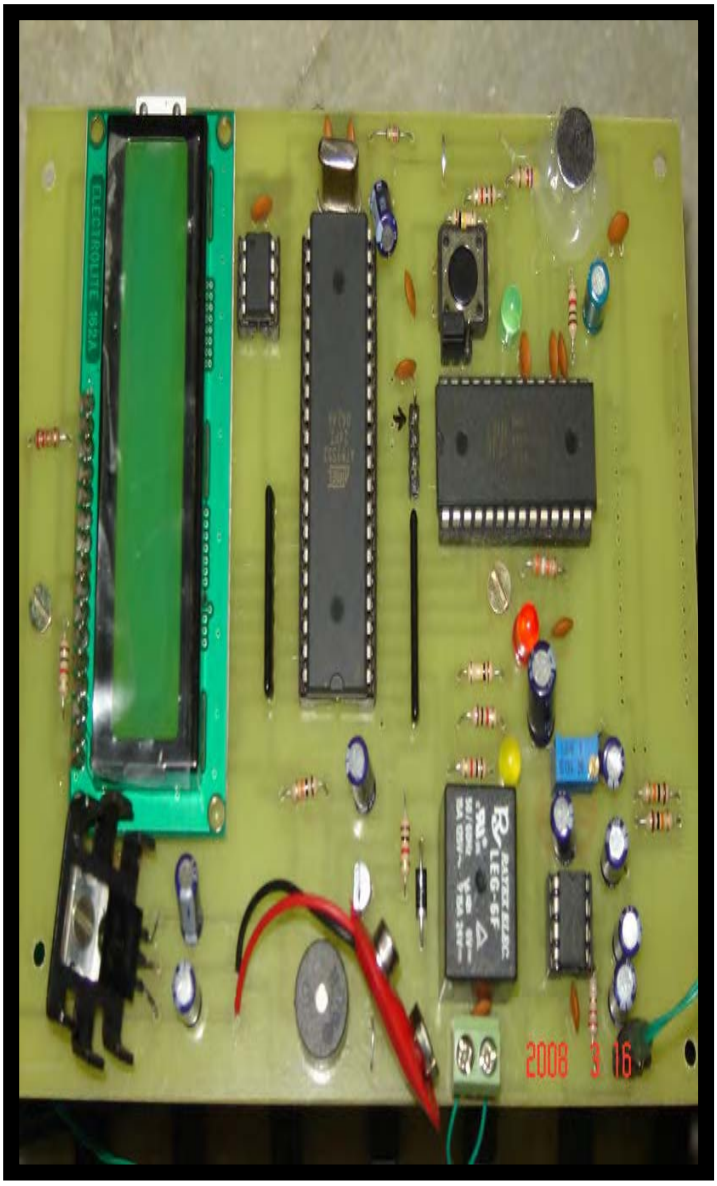

Fig 7. PCB showing controller and interfaced components

Fig.8. PCB mounted on the engine of the train.

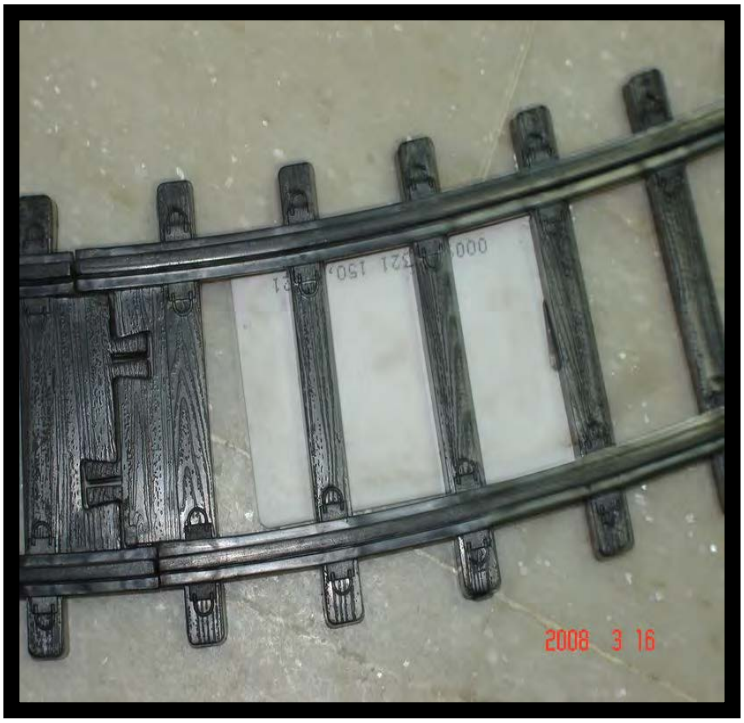

Fig.9.5X5 feet circumference track with the train prototype

Fig.10. RFID Tag placed under the tracks

Fig.11. the train stopped at one of the stations

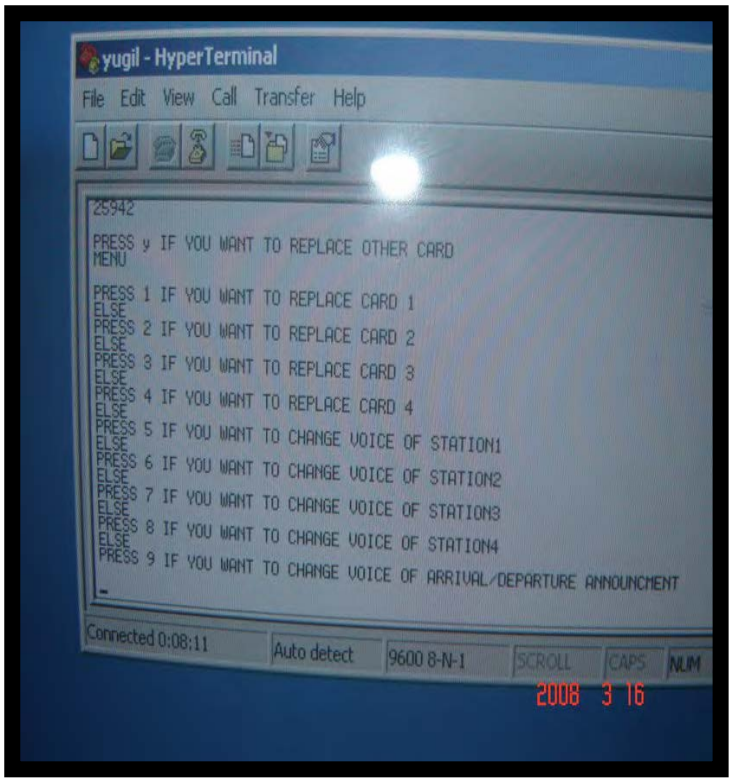

Fig.12. Hyper-terminal showing the menu options in serial communication module

4. CONCLUSION:

This paper aims at an automated system to make announcements and display at stations codes. Finally as a part of a project we can implement an automatic door opening system in feature by interfacing a dc motor to the micro controller. The main aim of this project is to make an automated place announcement system for Train using voice IC and the radio frequency wireless card for tracking the station data. It can be extended to any number of stations

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