

Study and solution over parking system and traffic flow at kasarwadi metro station

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ABSTRACT: India is country where development is taking a pace speed. And all of a sudden emergent event happens at a particular place or station which leads to passengers stuck at a place. In Pune the metro transportation is leading key to speed up the transportation for economy purposes, education purposes and also for other purposes. This study focuses on the traffic dispersal, parking availability and area management. The aim of the study is to convert road passenger traffic to the metro traffic also the study is focused on the app which helps the user make travelling easy, efficient and safe. Finally by using these methods efficiently proper traffic flow and parking system can be managed. Care should be taken to develop an integrated transportation system and not favour any one mode of transportation. If the solutions are given and implemented, the problems can be dealt with and the issues which are being faced by other existing metros can be swayed and a faster integrated system can be achieved in a shorter span of time.

KEYWORDS: Sudden emergent events, traffic dispersal, parking availability, area management, faster integrated systems

I. INTRODUCTION

1. Introduction of the Project Work

Pune is well known as the 'Queen of Deccan' due to the scenic beauty it has and rich natural resources. Besides, it is famous for the religious places as well as historical places. Pune city is known in the world map because of its educational institutes, research institutes and IT institutions. It also has an importance as an important military base. Pune is the most industrialised district in Maharashtra and a famous IT hub in the country. Pune is an example of an indigenous Marathi culture and ethos, in which education, arts & crafts and theaters are given more prominence. Pune is the cultural capital of Maharashtra. It is a birth place of the poet-saint Tukaram. It is the home of great freedom fighters like Bal-Gangadhar Tilak, Agarkar and Gopal Krishna Gokhale. Jayant Narlikar, the famous contemporary scientist is from Pune.

2. Location

Pune district is located between 17° 54' and 10° 24' North Latitude 73° 19' and 75° 10' East Longitude. The district of Pune is surrounded by Ahmadnagar district on the north-east, Solapur district on the south-east, Satara district on south, Raigad district on the west and Thane district on the north-west. Pune district forms a part of the tropical monsoon land and hence shows a significant seasonal varia-

tion in temperature as well as rainfall conditions. Climate of western region of Pune is cool whereas the eastern part is somehow hot and dry.

3. Road Network

Pune district is well connected with the state capital and surrounding headquarters through road and rail networks. The road network consists of many Express Highways, National Highways, State Highways and Major District Roads. Pune district has total length of 13,642 km of roads. Following are the National Highways which pass through the district :

1. National Highway No. 4 (Mumbai-Bangalore)
2. National Highway No. 9 (Pune-Solapur-Pune)
3. National Highway No. 50 (Pune-Nashik).

4. Rail Network

The district has total rail network of 311 km. Pune and Daund are two major junction stations. Following are the three main railway routes passing through the district:

1. Mumbai-Pune-Solapur
2. Pune-Miraj
3. Daund-Baramti.

5. Air Route

Pune is well connected through the domestic airlines with the entire country. The airport which is located at Lohgaon has recently acquired status of an international airport. Also it is proposed to develop an international air-cargo hub near Khed-Tahsil of pune district.

6. Study Area

The study area has been taken as the area comprising the present Pune Corporation (PMC), PimpriChinchwad Municipal Corporation (PCMC) and both the cantonment areas named as Khadaki and Pune cantonment. The zoning system of the study area is comprises of 53 zones in the PMC area as well as 38 zones in PCMC area. Pune and Khadki cantonments have been considered as two zones. In addition to that 91 internal zones and 13 external zones are considered.

7. Demographic Profile

35.6 lakhs was the total population of the study area in 2001. The total decadal growth in PCMC area is almost 100% in the past 3 decades. PMC area has registered an average decadal growth of around 35% also the decline in population is observed in both the cantonments.

8. Traffic Demand Forecast

Based on the experience of Delhi Metro the optimistic projections are normally not achieved and it is felt that initially the most likely rider-ship may only materialise. Hence, all the further planning for the Metro infrastructure is done for catering the most likely projections.

9. Objectives

1. To study the map of location.
2. To study the flow of traffic.
3. To provide safe & efficient movement of pedestrian at metro station.
4. To disperse efficient & safe traffic in metro station area.
5. To manage space below metro station efficiently.
6. To provide easy parking near metro station area.
7. To convert maximum road traffic to the metro traffic.

10. Scope of the Project Work

- Efficient traffic and commuters dispersal
- Integration with Other Transport Modes
- Parking Provision near Metro Station areas.
- Station Influence Zone for restricting on-street parking, hawking and providing encroachment free footpaths.
- Footpath Railings

II. LITERATURE REVIEW

The purpose of this chapter is to identify the importance of metro, Parking availability near metro station, smart parking methods. The metro is important to convert the road passenger traffic to the metro passenger traffic to avoid the road blockages. Also if the travellers want travel by public transport instead of their own private vehicles then the parking is important. Initially, to understand the problems being faced by the city, visits were made to the assigned offices and a better outlook towards the Pune Metro was achieved. This literature review focuses on the overview and the understanding of the efficient traffic dispersal, automated parking system availability and the impacts of metro on the environment which must be taken into account for this project

1. Jing Teng¹ • Chuanyong He¹ • Xianglong Liu² • Xinzheng Yang “Traffic Management Plan Evaluation Outside the Station in Emergent Events of Urban Rail Transit “ Urban Rail Transit (2016) 2(1):16–27

The objectives of this paper presentation were to analyse Traffic Impact in Emergent Events of urban rail transit, to determine Traffic area outside the station and to give the solution on the traffic management outside the station outside the station. In this research, they studied on traffic management plan evaluation outside the station with simulation, compared the merits of different plans. Then the authors developed the logical model of traffic management simulation and presented transitive relation among different simulation types. At the same

time, they conducted sensitivity analysis for bridging passenger flow demand, they drew a conclusion that when passenger demand is small, they should implement “no emergency traffic management plan”, but when passenger demand is large, they should implement “partial priority plan” or “absolute priority plan”.

2. Harmeet Singh “AUTOMATED PARKING SYSTEM WITH BLUETOOTH ACCESS ” International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 3 Issue 5, May 2014, Page No. 5773-5775

This paper aims at the prospect of developing a fully automated parking system for two wheelers and cars. This proposed system improved version of the existing parking system by enhancing its security features and automating the parking process thus eliminating the need for manual intervention. For authentication and owner identification the parking system has an inbuilt Bluetooth reader by using this the user has to start his/her mobile’s Bluetooth for identification and registration. The Bluetooth reader takes the user’s Bluetooth number and transfers it to database. The owner has to re-start his/her Bluetooth at the time of exit. This eliminates the use of tokens or paper bills. The space management and automation is performed with the help of an ARM micro-controller which controls the mechanical motors to park the vehicle at the appropriate parking location.

3. Ramneet Kaur and Balwinder Singh “DESIGN AND IMPLEMENTATION OF CAR PARKING SYSTEM ON FPGA” International Journal of VLSI design & Communication Systems (VLSICS) Vol.4, No.3, June 2013

This paper focuses on the study of software called FPGA. As the number of vehicles are increasing day by day in rapid manner, it causes the problem of traffic congestion, air as well as noise pollution. To overcome this problem a FPGA based parking system has been proposed by the authors. In this paper, parking system is implemented using Finite State Machine modelling method. The system has two main modules i.e. identification module and slot checking module. Identification module identifies the visitor. Slot checking module checks the slot status. These modules are modeled in HDL and implemented on FPGA. A prototype of parking system is designed with various interfaces like sensor interfacing, stepper motor and LCD.

4. Sejal D’mello “Automated Parking System Using Web Application” IOSR Journal of Engineering (IOSRJEN) ISSN (e): 2250-3021, ISSN (p): 2278-8719 PP 80-82

As we know, now-a-days population has increased; it also caused to increase vehicle population parking system called Automated parking system using Web Application. This System gives us efficiency to find empty slots to park a vehicle in parking area. A user has to book a slot using mobile to park his vehicle. In short, this system helps us to save our time to find vacant place to park our vehicle. The application contains the data of all existing vehicles in parking area, the reserved park area, a vacant place to park vehicle etc. The proposed system is made up of a less human dependent interaction. It helps user to find a parking slot using a short distance algorithm. In our project we use EM 18 module to sense RFID reader, RFID reader to know the status of our parking system. i.e. which car is on which place in parking slot. This system also proposed ewallet method. This system also includes multilevel parking. We will get to know all these features in brief in our paper.

5. Priyanka Chib” Optimization of Pune Metro Rail” International Journal of Engineering Trends and Technology (IJETT) – Volume17 Number7–Nov2014

The objective of this paper is to present a pre-feasibility study conducted by carrying out household surveys and focus-

ing on the short-comings project of the Pune Maha metro (India) to be faced in near future based on the available data and providing suggestions for the afore-mentioned problems. Construction, geological and the cost factors have also been considered in the paper. The proposals given can serve as a reference to avoid the future infrastructure conflicts also planned development for the Pune metro department.

6. Ravi Bhutania*, Dr.Sewa Rama, Dr.Kayitha Ravinder
“ Impact of metro rail construction work zone on
traffic environment” Transportation Research Procedia
17 (2016) 586 – 595

The objective of this paper is to study different traffic flow, fuel consumption characteristics in a work zone and to simulate various scenario using VisSim software. Also studying the impact of changing work zone conditions on traffic flow characteristics. By doing so the conclusion is made that with such huge economic loss it becomes imperative to have systematic work zone scheduling and traffic management techniques so as to reduce the impact of metro rail construction on work zone. Systematic work zone scheduling and traffic management techniques both are required to be implemented to reduce these impacts of work zone. Development of shockwaves should be checked and can be controlled by altering the traffic signal timings. Since the maximum percentage of economic losses is due to loss in time by bus passengers in the work zone thus public transports should be given priority in work zones. Restricting one or more types of vehicle in peak hours in work zone area could be one of the traffic management schemes which can be adopted in work zones.

III. METHODOLOGY

1. Parking system provided near Pune Metro station.



Fig 01 Parking system provided near Pune Metro station

- Parking lots have been provided at Metro stations to facilitate travellers to park their two wheeler and/or Four Wheelers at station and use metro service.
- These parking lots are outsourced to the contractors who are whole and solely responsible for the security and safety of all the vehicles parked in parking lot and are liable to pay compensation in case of damage of vehicles or theft to vehicles.
- Pune Metro supervises smooth operations and adherence to provisions made in contract by the contractors.
- Keeping a completing approach towards a massive rail network in record time, the Pune Metro stands out today as a shining example of how a mammoth technically complex infrastructure project can be completed within budgeted cost by it's Government agencies.

Will be-



Fig 02 Parking transformation

2. Multi-utility zone (MUZ) design principle Problem-

- Presently this is a wasted area neither needed for thoroughfare traffic nor by pedestrians.
- Left unused it is prone to encroachment silt accumulation etc.

Solution-

- Can be use to accommodate essential street elements like bus stops, auto rickshaw stand , parking and waiting area, utility boxes ETC.
- Where the buffer area is in level with the footpath the difference between the two should be made easily visible to the pedestrian by using different surface treatment.

3. The proposed different elements on the road

- Continuous length and consistent width for foot-path and carriageway
- Wherever available, these should be utilised for provision of bus-stops, parking/waiting area, utility boxes, auto-rickshaw stand, etc

4. No hawking, no parking and no encroachment on footpath

- Main Arterial-** Restrictions of “No hawking and No parking” to be enforced below the metro station and also for a stretch of **100 m** on both sides from edge of the station;
- Connector Roads– 200m** stretch on both sides of the metro alignment shall be kept free for operations of bus routes, IPT (auto/ola pickup/drop off) & cycle/ two wheeler parking.
- Encroachment on foot paths under Metro Station Influence zone should be removed.

5. Bus Route Integration

- Bus Stops to be located within **50m** distance from entry and exit points of the metro station.
- Relocation of bus stops wherever required to optimise the walking distance.
- Maintain sufficient gap between bus stop and auto/ola stands/pickup/drop-off places to avoid conflict of movement.

6. Traffic Signals

- Traffic Signal timings should be synchronised after the Metro implementation.

IPT OPERATIONS: Auto Rickshaw & Taxi

- Auto/Ola Pick up and Drop off Operations mainly on Connector Roads.

IV. CASE STUDY

Pune Metro routes – Phase I

- **Corridor 1** – PimpriChinchwad to Swargate
- Length - 16.589 km
- Elevated 11.570km – PC to Shivajinagar
- Underground 5.019km – Shivajinagar to Swargate
- Capital cost - Rs.7422 crores (with Central taxes only)
- **Corridor 2** – Vanaz to Ramwadi
- Length - 14.925 km – Fully ELEVATED
- Capital cost - Rs.3447 crores (with Central taxes only) Total cost of Phase I – Rs.10869 crores
- Total completion cost – Rs.11802 crores(incl State taxes & interest) Costs revised based on August 2014 prices
- Actual cost of execution could be much higher

Pune Metro routes – Phase II

- 1) Swargate – Katraj
 - 2) Chinchwad – Nigdi (15 km for (1) & (2))
 - 3) Deccan – Tilak road – Swargate – Shankerseth road – Race course – Bund garden (11 km)
 - 4) Pataleshwar – University – Aundh – Hinjewadi (18 km)
- Total Phase II – 44 Km Total **Phase I + II** – 75.5 km

PCMC- Swargate Route

PCMC to Agriculture College – Elevated Agriculture College to Swargate – Underground

(1)PCMC (START) – Old Pune Mumbai highway(service road) -(2) Tukarnanagar – (3) Bhosari – (4) Kasarwadi – (5) Fugewadi – (6) Dapodi – River crossing – (7) Bopodi – (8) Khadki – (9) Range hill – Agriculture college*– (10) Shivajinagar – Police ground – Shivaji road – (11) Pataleshwar – (12) PMC – River crossing – (13) Budhwarpath – (14) Mandai – (15) Swargate (END)

Numbered locations are 15 metro stations (1 to 9 Elevated and 10 to 15 Underground)

*Metro passes through the Agriculture college campus

Vanaz-Ramwadi Route

(1) Vanaz (START) – Paud road – (2) Anandnagar – (3) Ide-al Colony – Paudphata – Karve road – (4) Nal stop – (5) Garware college – (6) Deccan – JM road – (7) Pataleshwar* – Sanchetichowk – (8) Civil court – River crossing – Ambedkar road – (9) Mangalwarpath – (10) Pune Railway station – Railway crossing – Jehangir hospital – (11) Ruby hall clinic – (12) Bund garden – River crossing – Nagar road – (13) Yerawada – (14) Kalyaninagar – (15) Ramwadi (END)

Numbered locations are 15 metro stations

*Pataleshwar is protected ancient archaeological site

- Metro proposed within the 100 mtr 'No construction zone'
- Both corridors cross at Barvechowk but not interconnected as one is underground and the other elevated.

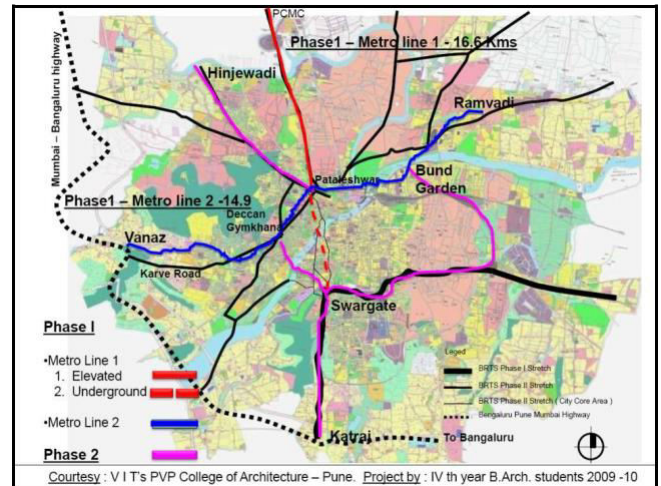


Fig No 03 Pune Metro routes – Phase I and II

Vanaz-Ramwadi Elevated Metro Issues

Project is to be implemented through densely populated areas along highly congested arterial roads – Paud road, Paud

phata, Karve road, Jangli Maharaj road, Sanchetichowk, Sangam bridge, Maldhakka, Railway station, Jehangir hospital, Bund garden road....

1) Metro columns on road

- Elevated Metro has to run on road at a height of about 10 mtr. There will be a flyover like structure called **viaduct** on piers at road median
- Reduction in road carriageway width by about 3 mtr.

2) Metro alignment on road

- Metro will deviate from road centre where obstructions, sharp turns on road which Metro cannot take, example Paudphata, Deccan corner....

3) Metro station on road

- 35 mtr.wide, 140mtr. long and 23 mtr. (6-7 storey) high Metro station
- road widths inadequate
- parking space not possible due to congested locations

4) Building demolitions, land acquisition required for (2) & (3) above

Vanaz-Ramwadi Elevated Metro Issues

5) Violation of fire safety norms and DC rules in Metro construction

- Insufficient space for Metro stations - part / full demolition of buildings
- Metro construction could be very close to existing buildings
- Rescue in case of emergencies could be severely hampered

6) Shifting of surface and under ground utilities required

- Serious problems in physical shifting, coordination between agencies

7) Road blockage / Traffic management during construction

- 9 mtr of central road portion will be barricaded during construction
- Suitable roads for traffic diversion not available
- Severe traffic bottlenecks and mobility will be seriously affected

8) Large number of trees on the corridor will be cut (example JM road)

9) Visual impact

- Metro track will be like a continuous flyover on road with huge metro stations across entire road width

10) Inordinate delays and cost escalation due to various reasons

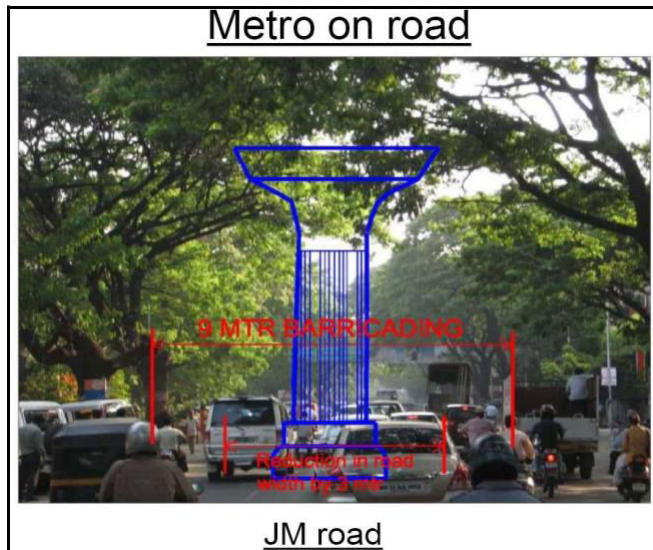


Fig. 04 JM metro road

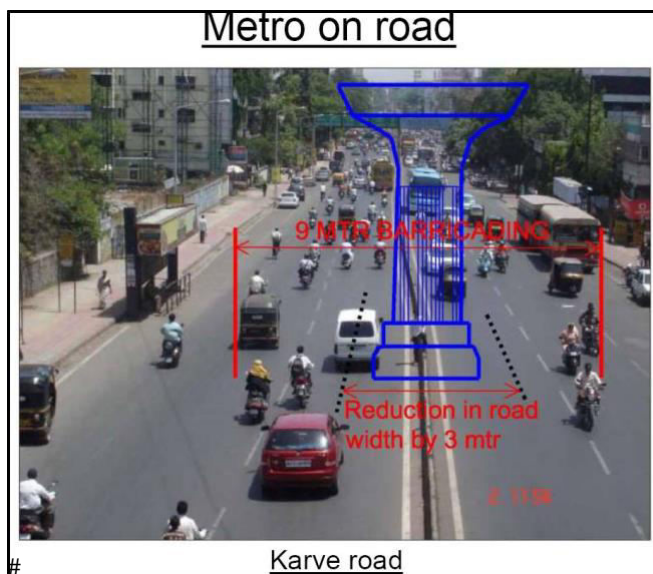


Fig. 05 Karve metro road

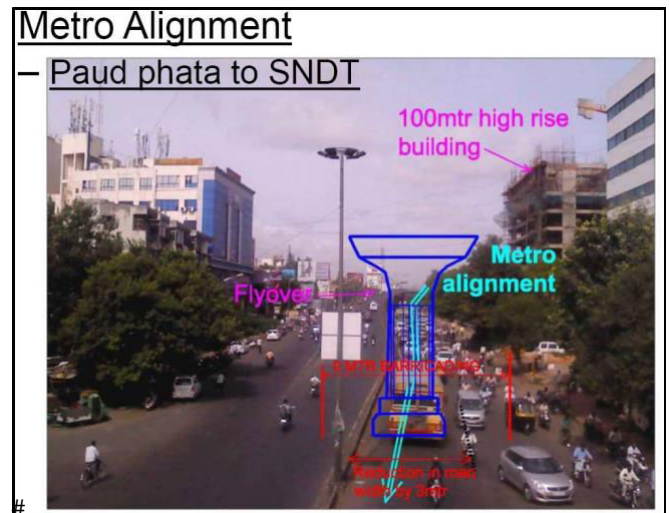


Fig. 7 Paudmetro road

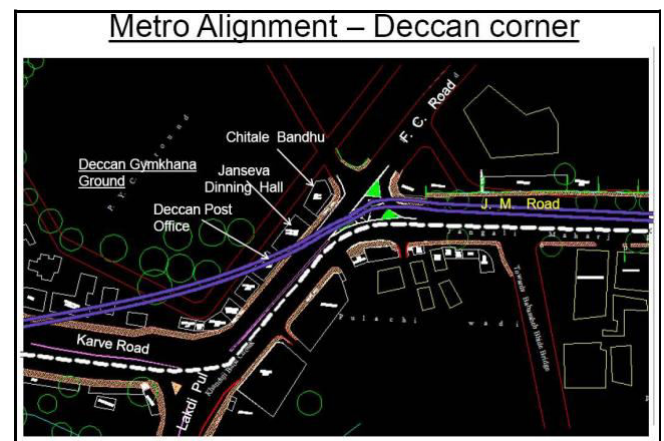


Fig. 8 Metro Alignment metro road

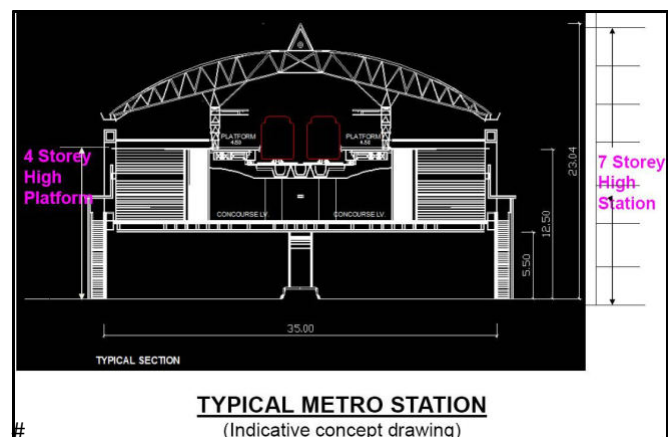


Fig.9 Typical metro station

Some other important issues

Land for Metro depots not available ??

- Corridor 1 - PCMC to Swargate

Metro depot proposed within the Agriculture college

- Area required 11.5 hectares
- Metro to run inside the college premises for length of about 1 km
- Reported that Agriculture college unwilling to provide land

- Corridor 2 – Vanaz to Ramwadi
- Metro depot proposed at old kachra depot site
 - Another project ‘Shivrishti’ already approved at same site
 - Area beyond site hilly and under BDP
- Issue not yet sorted out Overlapping of Transport options
 - Local train route, BRT corridors, grade separated highway, rapid transit riverside road overlap with Metro corridors
 - will impact metro ridership, also wastage of public money

Utility for citizens?

Low ridership

- Metro capacity is up to **30000 phpdt**(peak hour peak direction traffic) Break-even point between bus transport and Metro is **15,000 phpdt** Most likely maximum phpdt for Vanaz- Ramwadi route will be

6203 in 2018, 8519 in 2021 and 10982 in 2031 --- indicates very low ridership.

- This means that the Metro route is not suitable or convenient for people in the area considering their origin and destinations
 - Bus connectivity to proposed Metro stations not good
 - With no parking space at Metro stations, commuters will not be able to use own vehicle to travel up to the station.
 - High passenger density areas not covered example Shivajinagar railway station and ST bus stand, Pune railway station and ST bus stand. Though Metro route passes through nearby areas, Metro stations are not directly accessible from within the premises.
 - Due to such reasons utility of Vanaz-Ramwadi Metro will be low and also expected reduction in traffic on road may hence not take place – which means increased congestion on roads with reduced carriageway width
- **This defeats the very purpose of having Metro !**

V. MODEL APPLICATIONS, RESULTS AND DISCUSSIONS

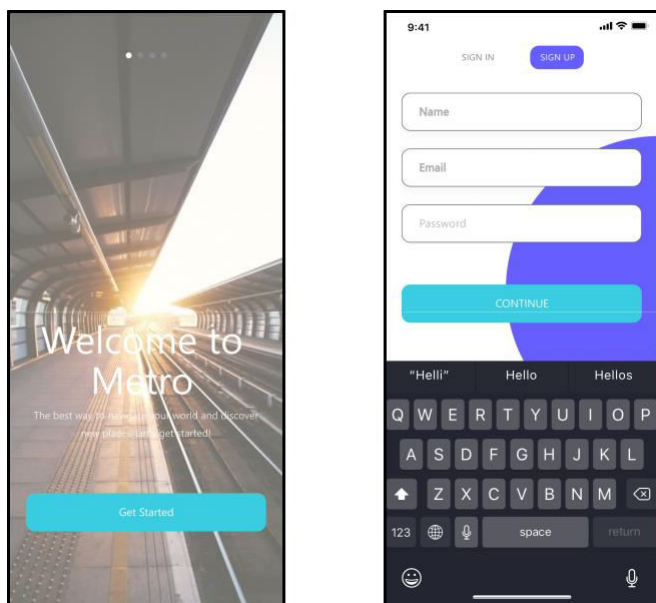


Fig 4.2.1 Login Options

After surveying at the location on working days as well as on weekends the above average information of the travelers is on daily basis in the city through the area around kasarwadi metro station. To tackle this situation of slow traffic movement following traffic dispersion techniques are supposed to use so that the traffic is moved continuously and smoothly. The idea has been proposed to develop an app for the main purposes of this project, that is to make travelling easy for passengers, to make availability of parking easy nearby metro station and to make travelling easy by private vehicles of owner itself. The app interface will start with the login details where user has to enter his name, email address and password. After the successful login by user the app takes the user in the option menu where the user has to select what requirement the user needs.

4.2.2 Public transports, Parking and E-guider

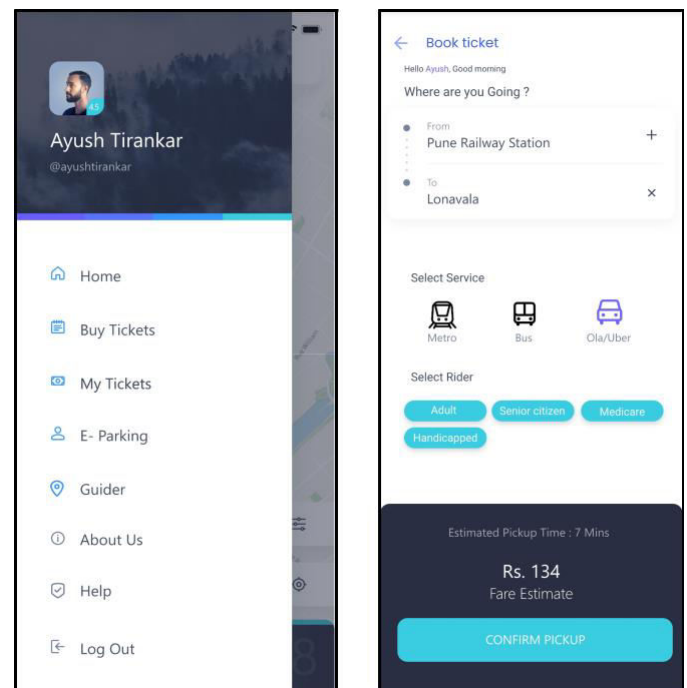


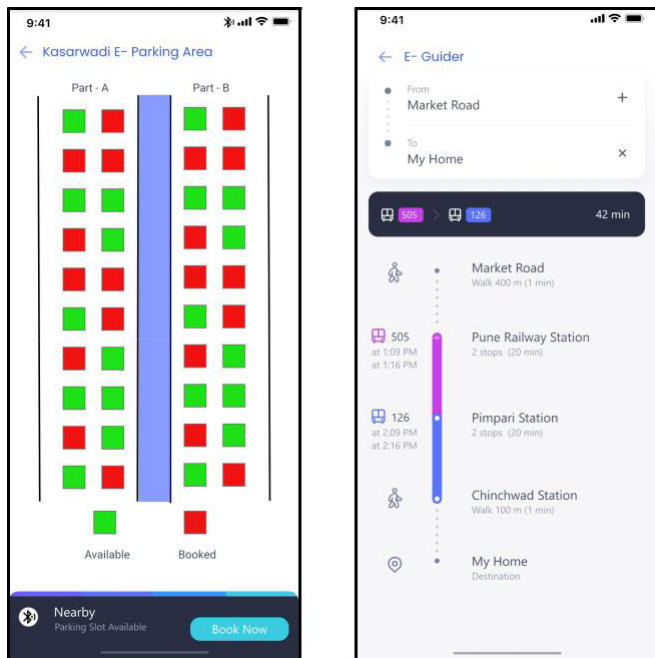
Fig 4.2.2 Booking

As shown in above pictures user in the first option will the public Transports option as,

- Metro
- Bus
- Ola/Uber

For this if the user is travelling by public transports then the user only has to put the destination in the search bar and after that user will get all the information about metro, bus and Ola/uber with the estimated travel time, time table of metro and bus, So that user can decide on his/her own which public transport to choose from above. It makes easy as there is availability of time table, approximate travel time by each public transport and estimated fare of every public transport.

The second option is shown in the second picture of fig 4.2 as E-parking available near metro station. This type of parking is useful when the user needs to use public transport and requires the parking for its own vehicles. As the traffic in the



4.2.3 Fig E-Parking and E-Guider

city is more users will automatically tend to choose public transport over private vehicles. This is the main idea of providing parking near kasarwadi metro station and to convert the road passenger traffic to metro passenger traffic. The parking system will be automated bluetooth parking system and FPGA software so that it will be able to provide fast, secure and efficient parking for the vehicles. For the parking if the space is not available then the space below metro station between two pillars can be used for making this kind of 2 storied parking for efficient space management.

The third option is shown in the third picture of fig 4.2.3 This option will be useful for the users travelling by their own private vehicle. This E-guider will show the least traffic way to user so that travelling be easy without getting stuck in traffic. The idea is that, this app will compile the data available on Google maps like it is already used in ola or uber apps and then will show the least traffic congested route. This will make travelling easy for the user of this app.

VI. CONCLUSION

Indian cities, with the help of DMRC, are planning to invest about Rs 2 trillion in metro rail systems. But our analysis Shows that the DPR prepared by DMRC for Pune has many serious analytical and methodological flaws, making the proposal highly questionable. Therefore, there is an urgent need to solve the problems that we face during the metro construction to tackle the problem such as various transportation facilities, parking system near metro area, overcrowding to overcome these problem new techniques and ideas developed to solve these problems so after overseeing these ideas we have come up with idea to use these ideas and implement in our way .so as a result we developed the Metro App in which we have tried to eliminate these problem by providing multiple transportation services such as bus & cab service along with metro.

E-parking system to show the efficient way of parking to avoid overcrowding, option guider which provide the best option of travel for your convenience . So this becomes the best way to eliminate the flaws and solve the problems we

might face after metro construction and bring ease to people.

The above given solutions which are given, can be put to use to implement and eradicate some of the issues the metro is facing in the market. Care should be taken to develop an integrated transportation system and not favour any one mode of transportation. If the solutions are given and implemented, the problems can be dealt with and the issues which are being faced by other existing metros can be swayed and a faster integrated system can be achieved in a shorter span of time. An environmental impact assessment with socio economic surveys for both the corridors in detail can help keep the demands and the supplies under control and these above solutions can be implemented to achieve optimization and efficiency of the Pune metro rail in the following years

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