BIM Modelling Of Urban Corridors

Akshay Zadap[1] , Harshavardhan Deore[2], Kartik Vichare[3],Sharad Kurhat[4],Aavani P Thampi[5]
[5]Asst.Prof
[1, 2, 3, 4, 5]Dr. D.Y. Patil Institute of Engineering, Management and Research, Pune-411044

Abstract- *Traffic flow can be divided into two primary types. Understanding what type of flow is occurring in a given situation will help you decide which analysis methods and descriptions are the most relevant. The first type is called uninterrupted flow, and is flow regulated by vehicle-vehicle interactions and interactions between vehicles and the roadway. For example, vehicles traveling on an interstate highway are participating in uninterrupted flow. The second type of traffic flow is called interrupted flow. Interrupted flow is flow regulated by an external means, such as a traffic signal. Under interrupted flow conditions, vehicle-vehicle interactions and vehicle-roadway interactions play a secondary role in defining the traffic flow. In this project various case studies are analysed with traffic volume data and effective solutions are made using BIM softwares.*

Keywords- Traffic management, BIM, Traffic flow, Diversion.

I. INTRODUCTION

1.1 Introduction

In recent years popularity of private motor vehicles is getting urban traffic more and more crowded. As result traffic monitoring is becoming one of important problems in big smart-city infrastructure all over the world. Some of these concerns are traffic congestion and accidents that usually cause a significant waste of time, property damage and environmental pollution. Any type of congestion on roads ultimately leads to financial losses. Therefore, there is an urgent need to improve traffic management.Through collected real-time traffic data, the system can recognize current traffic operation, traffic flow conditions and can predict the future traffic flow. The system may issue some latest real-time traffic information that helps drivers choosing optimal routes. Therefore, the system can precisely administrate, monitor and control moving vehicles.

Such traffic IoT must include every element of traffic such as roads, bridges, tunnels, traffic signals, vehicles, and even drivers. All these items will be connected to the internet for convenient identification and management through sensor devices, such as RFID devices, infrared sensors, global positioning systems, laser scanners, etc. Traffic IoT provides traffic information collection and integration, supporting processing and analysis of all categories of traffic information on roads in a large area automatically and intelligently. Thus, modern traffic management is evolving into an intelligent transport system based on IoT. Traffic requires suitable information about services and logistics available on the road and therefore the system can become more self-reliable and intelligent. With a number of WSN and Sensor enabled communications, an IoT of data traffic will be generated.

This traffic monitoring applications need to be protected to prevent any security attack frequent in urban cities. Few such prototypes implementations can be found in and the Smart Santander EU project.

Fig1.1Traffic flow

marine knowing real-time traffic conditions for virtually every highway or arterial roadway in the country and having that information available on multiple platforms, both in-vehicle and out. Imagine driving down an expressway with a telemetric unit that, combining GPS with real-time traffic information, could audibly alert you that you are approaching a blind curve with traffic backed up immediately ahead and that you need to brake immediately. Envision enjoying a mobile device that can display real-time traffic information (while simultaneously helping to generate that information), optimize your route accordingly, and electronically pay tolls when you're on the highway (or fares when you're using mass transit). Imagine a performance-based transportation system that makes capital investment decisions regarding competing transportation projects based on a detailed understanding of their cost-benefit trade-offs enabled by meticulously collected data.

1.2 Development Of An Agent-Based Intelligent Traffic Information System:

There are a large number of heterogonous devices within the traffic monitoring system using IoT. Among challenges of full deployment IoT is making complete interoperability of these heterogeneous interconnected devices which require adaptation and autonomous behavior. The major issue in IoT is the interoperability between different standards, data formats, heterogeneous hardware, protocols, resources types, software and database systems. Another issue is necessity of an intelligent interface and access to various services and applications. It seems that mobile agents are a convenient tool to handle these issues, provide means for communication among such devices and handle the IoT interoperability.

Adding to that mobile agent is a perfect choice in cases of disconnection or low bandwidth, passing messages across networks to undefined destination and to handle the interoperability of IoT. All messaging exchanges among agents are established via the TCP/IP Protocol. A software agent is an autonomous executable entity that observes and acts upon an environment and acts to achieve predefined goals. Agents can travel among networked devices carrying their data and execution states, and must be able to communicate with other agents or human users. A multi-agent system is a collection of such entities, collaborating among themselves with some degree of independence or autonomy.

1.3 Traffic Simulation Framework

To justify the proposed system online distributed traffic simulation was conducted. Simulation allows us to observe the properties, characteristics and behaviors of the traffic system. Based on detailed real-time data collected from the distributed online simulations, the IoT traffic system can provide accurate information necessary for near real-time traffic decisions. The whole traffic IoT network is partitioned into dynamic overlapped sections, and a simulation processor is mapped to each section. Each simulation will be supplied with real-time data from nearby RFIDs and sensors and enabled to run continuously. The overall distributed simulation consists of a collection of such segment simulations where each small segment of the overall traffic IoT network is modeled based on local criteria. Each simulation segment is operating in an asynchronous mode, meaning each simulator executes independently of other simulators and the simulation server.

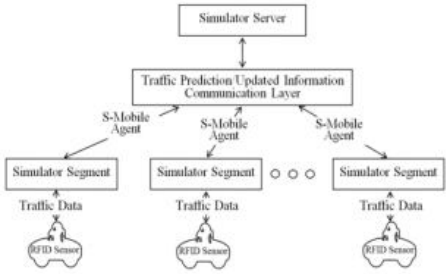

Fig1.1: Distributed online traffic simulation framework

These simulation segments are allowed to exchange information on vehicles moving from one simulation segment to another. Each simulator's segment locally models current traffic conditions and concentrating only on its area of concern. A simulator's segment, for example, might model some set of roads and intersections of that segment, and predict the rates of vehicle flow on links carrying vehicles out of that segment. Each segment shares its predictions with other simulation segments to create an aggregated view of both the individual segment‘s area of interest and the overall of traffic system. Simulators' segments publish their current traffic state information (speed, travel time, flow rate, etc.) and their predictions to the simulation server. An aggregation of all simulation segments provides an accurate estimation of a future state of the system. The general model of distributed traffic simulation framework described in fig1.1 The simulation server disseminates information among the simulator segments, coordinates all simulators' segments and provides a predictive model of traffic conditions in specified traffic areas by analyzing and integrating the results of distributed simulators of those areas. The simulation server maintains state information of current and future operations of the traffic network such as flow rates, average speed, and the time when that information was generated. Running online simulations are integrated with traffic information system infrastructure to receive real-time traffic data and this overall simulation provides detailed information required for prediction of the system future states of the system.

II. METHODOLOGY

2.1 Introduction:

In the ancient times, there was no transportation system. With the passage of time human beings tamed animals and used them as mode of transportation. Invention of wheel marked the turning point in human civilization. Carriages that could carry three-four passengers, driven by animals, came into usage. In the sixteenth century invention of automatic mechanized vehicles helped people travel from one place to another faster. The world’s first car was invented in 1769 by Nicholas Joseph Cugnot. After that there was no turning back,

vehicles of different shapes and sizes began to be developed and introduced. All this brought with them a new threat to human life i.e. roadside accident. Ways and means were introduced for safety and smoothness of traffic on roads. Several rules were introduced to make the road safe and reduce the number of accidents. Even Manusmriti and Kautilya'sArthashastra contain road rules and regulations in great detail.

The rules have been modified from time to time, keeping in view the local/topical needs and requirements. New regulations have been laid down for different categories of road users.

- As wheel got invented in the Mesopotamian Civilization, our own civilization was set to motion, for it wheeled our imaginations. In 1645 a sort of cycle was invented by Jean Theson but it had no Brakes, Peddle or Steering and needed feet motion. Lau machine cycle was then created by Karl Von (1817). Soon this was made into the regal Dandy Horse by Dennis Johnson. In 1839 the proper cycle was shaped by K. Macmillan. It had iron wheels and a wooden frame. The manifestation of automobile horse-power was taught in 1769 by Nicolas Joseph Cugnot, who invented the first 'Steam Truck' which the French army thought was useful.
- Then after, automobiles enveloped our life and culture. But the notion called 'accident' endangered our future. The first accident of the Steam Truck in 1771 was the eye opener. During 1899 the first fatal accident took place with the death of a driver. Then onward, the world coined several road safety measures. Still, today12 lakh people are killed and 50 millions get seriously injured all over the world every year.
- This accident menace makes our citizens an endangered species of the future. So let us follow the Road Safety Culture and be cautious about traffic rules today's informed child can only ensure a safe future.

The Firsts in the History of World Traffic:

- The First Accident:- In 1771 the first accident involving a motor vehicle took place in Paris when Cugnot's steam tractor hit a low wall in the grounds of the Paris arsenal.
- The First Act: - The Locomotives and Highway Act was the first piece of British motoring legislation. This was also known as the red Flag act of 1865. The act required three persons in attendance one to steer, one to stoke and one to walk 60 yards ahead with a red flag to warm the oncoming traffic.
- First Man to Be Challenged: - In 1895 John Henry Knight was convicted and fined for using a motor-tricycle on the highway. He was probably the first motorist to appear in court.
- First Fatal Car Accident:- The first motor-car accident in Britain resulting in the death of the driver occurred in Grive Hill, Harrow-on-the Hill, London on 25th February 1899.
- Dusty Road to Tar Surface: - In 1902 Tar was first used on a Macadam surface to prevent dust in Monte Carlo. It was the idea of Dr. Guglieminetti, a Swiss. At first the tar was brushed on cold, but soon it was applied hot.
- The First Number Plate of London: - The Motor car Act of Britain came into force on 1st January 1904. It required that all cars be registered and carry a number plate, and all motorists to have a driving licence. But there was no driving test to pass and the licence was obtained by filling up a form and paying the fee at a post office. The act made dangerous driving an indictable offence.
- The First Petrol Pump: - The first petrol pump was installed in USA in 1906.
- The First Traffic Light of the World: - The World's first traffic lights were installed in Detroit, USA in 1919. The first traffic lights in Britain were installed in Wolverhampton during 1928. However, they did not come to London till 1932.
- Pedestrian Crossing: - The pedestrian crossing was instituted in Britain in 1934. The roads were marked by dotted lines. On the pavement there were striped Belisha beacon light poles named after Britain's Minister of transport L. Hore-Belisha. The Zebra crossing with black and white stripes was developed after the Second World War.
- First Traffic Police Woman: - Police woman were used for traffic control duties for the first time in Paris, in 1964. In Delhi, we introduced woman traffic police, in 1989.
- First Box Junction: - Box junctions, marked with yellow cross-hatching, were introduced in London during 1964. The aim was to prevent traffic blocking junctions when it could not proceed and this was successful.

2.2 Need of Road Safety:

Modern metropolitan living is getting more and more associated with traffic hazards. This can be attributed to complex and complicated road structures as well as increasing human and vehicular population. Enhanced life style and increase in the number of privately owned vehicles especially two-wheelers have made travelling on roads the most dangerous tasks to be undertaken. Globalisation, free market economy and free trade policies have had a direct impact on the increase of automobiles on roads, which in turn have led to

vehicular congestion. Though the number of vehicles increased, the length and breadth of roads remained static. The only way left with the authorities to cope up with problem was to make improvisation on the already existing structures. Hence, construction of flyovers and other road accessories to ease vehicular movement. All such high-tech construction works involved engineering skill of a higher order and traversing on them requires driving skills of the higher order, which only a few road users have. Though this has eased congestion, chances of accidents have increased. And in maximum cases, accidents occurred because of human folly. Free flow of traffic has resulted in increase in speed of vehicles, which in turn has resulted in maximum number of accidents on flyovers because of drivers' inability or incompetence to manipulate the speed properly. Most of the drivers lack intuitive judgment and defensive driving skills, the necessary qualities that a driver must possess

2.3 Types of Signals

2.3 .1 Fixed Time Signals –

Signal timings are fixed for a given time period and predetermined on the basis of traffic volumes

2.3.2 Vehicle Actuated Signals –

The green timings vary for each cycle depending upon the traffic demand at that point of time subject to some minimum and maximum timing.

2.4 Causes of Accidents On Highway:

Lack of qualified drivers:

The procedure of issuing driving license is full of lacunaes. The present system of procuring driving license does not lay down any criteria or qualification for a prospective driver. As a result anyone who can move a vehicle is able to acquire a driving license.

Callous attitude of road users:

Certain categories of road users such as pedestrians, cyclists and two-wheeler riders behave in a most reckless manner resulting in their involvement in accidents. Vehicle drivers knowingly indulge in risky situations while on road.

Lack of strict laws:

Stringent punishment is the only deterrent for people to follow traffic rules. The present laws are so flexible and mild that anyone can get away very easily after committing a grave traffic violation. In western countries people abide by traffic rules because the fines are hefty and punishment accompanying traffic offences are strict such as cancellation of license, permit, etc.

Lack of fear of being watched:

There is no fear in the minds of the violators of being watched. Major roads should be covered by advanced electronic gadgets to keep a watch on the violators and violations.

2.5 Rules of Road:

2.5.1 Negotiating an Intersection Judiciously:

- Almost 50% of all city driving collisions occur at intersections.
- Choose the left lane if you want to turn left, the middle lane if you want to go straight, the right lane if turning right, at least 100 m in advance.
- Give proper indication before you turn.
- Slow down while approaching an intersection.
- Stop before stop line at red light.
- Even if the signal allows you to go, proceed slowly and cautiously.
- While approaching an unmanned intersection cover the brake and be prepared to stop..

III. PROBLEM STATEMENTS

Following TheRefrence Case Study

Solution on Case study :

PUNE RING ROAD (PMRDA,Pune connectivity hub)

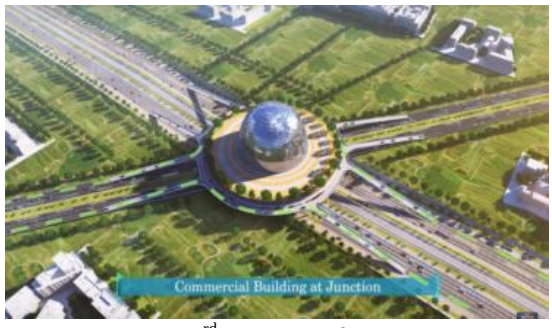

Fig 3.1 : 3rd eye view of actual site

SITE DETAILS

Name of site : PUNE RING ROAD (Pune connectivity hub)
Location Of Site : Pune
A proposed site is taken for case study location is inDeccan,Pune.
Design Team: PMRDA
Builder :PMRDA,Mygov Maharashtra

PMRDA, **Pune connectivity hub**

Pune is a historic city and PimpriChinchwad Township, which was initially considered a satellite town, has gained importance as a twin city owing to rapid industrial growth and IT hubs. The population of Pune Metropolitan Region is ~73 lakhs as per the 2011 Census of India. The proposed Pune Ring Road, as notified in the year 1997, passes through the Pune Metropolitan Region connecting the above mentioned automobile, IT and educational hubs. The total length of the proposed Ring Road is 128.66 km with width of 110 metres. It will have 3 lanes as service roads on both sides for local traffic needs, 4 lanes of access control intercity road for through traffic on both sides and a 33.5 metre-wide Metro corridor for mass transit. Suitable space is kept for beautification and landscaping so that this Ring Road becomes a tourist destination by itself. It is proposed to execute 46 Town Planning Schemes along the Ring Road to ensure planned development of the areas adjoining the road. Truck terminus, developed marketplaces for agricultural products such as fruits, vegetables, flowers, fish and meat, multi-level car parking at all major highway junctions are also proposed. In short, the proposed Ring Road will not merely remain a transport project, but will be an infrastructure-driven development project for Pune Metropolitan Region.

Fig 3.2: Pune traffic condition

Fig 3.3: connectivity hub (128.66km with 10 junctions)

Fig 3.4: metro with solar street light


Fig 3.5


Fig 3.6: elevated metro design

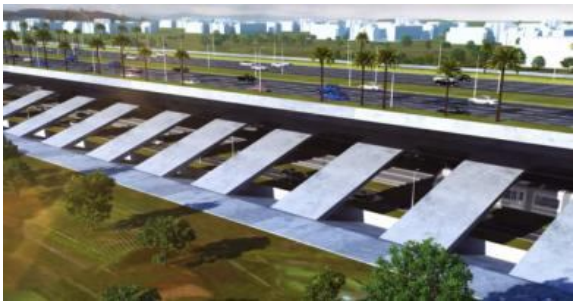

Fig 3.7

Fig 3.8: river bank

Fig 3.9: traffic free junction

Fig 3.10: Tunnel

1. Solution on Case study :

Automated Vertical Car Parking Station

Fig3.12 : 3rdEye View Of Actual Site

4.1 Revit model:

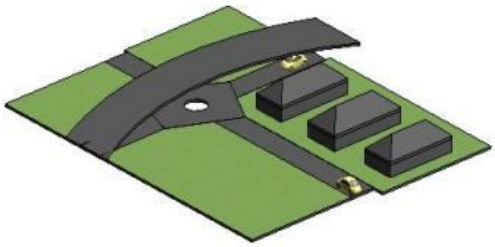

Fig 4.1 Revit Model

Revit model

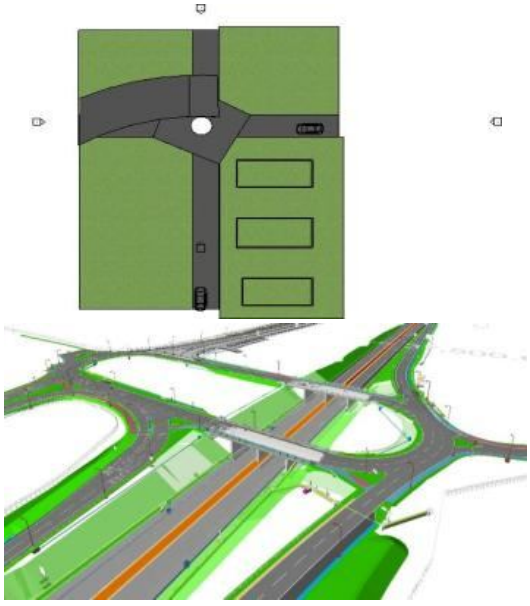

Fig 4.2 Top View Of Model

4.2 . Ring road introduction:

A ringroad (also known as beltline, beltway, circumferential (high)way, loop or orbital) is a road or a series of connected roads encircling a town, city, or country. The most common purpose of a ring road is to assist in reducing traffic volumes in the urban

centre, such as by offering an alternate route around the city for drivers who do not need to stop in the city core.he name "ring road" is used for the majority of metropolitan circumferential routes in the European Union, such as the Berliner Ring, the Brussels Ring, the Amsterdam Ring, the BoulevarPériphérique around Paris andthe Leeds Inner and Outer ring roads. Australia, Pakistan and India also use the term ring road, as in Melbourne's Western Ring Road, Lahore's Lahore Ring Road and Hyderabad's Outer Ring Road. In Canada the term is the most commonly used, with "orbital" also used, but to a much lesser extent.

In Europe, some ring roads, particularly those of motorway standard which are longer in length, are often known as "orbital motorways". Examples include the London Orbital (188 km) and Rome Orbital (68 km).

Fig 4.3 Ring Road Model

In the United States, many ring roads are called beltlines, beltways, or loops, such as the Capital Beltway around Washington, D.C. Some ring roads, such as Washington's Capital Beltway, use "Inner Loop" and "Outer Loop" terminology for directions of travel, since cardinal (compass) directions cannot be signed uniformly around the entire loop. The term 'ring road' is occasionally – and inaccurately – used interchangeably with the term 'bypass'

Fig 4.4 road model

4.3 Pune ring road:

Pune Ring Road is a proposed circular road for Pune city. This decision was taken on 12 June 2007 by the then Chief Minister of Maharashtra Shri VilasraoDeshmukh. The Pimpri-Chinchwad Municipal Corporation, Pune Municipal Corporation and the Pune Metropolitan Region.

Development Authority are responsible to make necessary provisions for this plan. The total length of road is 161.73 kilometers. The total cost will be ₹ 104.08 billion.

The passenger and freight traffic in and around the city has been increasing at a rapid pace due to increase in the number of industries, IT hubs and other socio-economic development. Vehicular traffic from highways such as Mumbai-Pune-Solapur highway pass through the city, causing traffic congestion. The purpose of the ring road is to divert the passing-by traffic from outside towards other cities, without letting them enter Pune. It will also provide connectivity to important areas of the city. It is predicted that nearly 10 lakh vehicles will use the ring road to enter, leave or pass through the twin city.

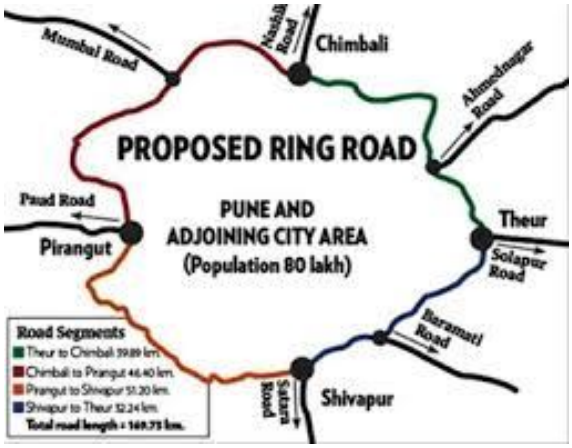

Fig 9 Pune Ring Road

	Name of the Road	Length in m	Flyovers		Major bridges length in m	Minor bridges length in m	Viaducts bridges length in m	Under pass length		Tunnels length in m	Elevated road	Land Acquisition	
			Road Length in m	Railway length in m								100 m width area in hectares	300m width road area in hectares
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	**Part I** – Theurphata, NH9, Kesnand, Wagholi, Bhavdi, Tulapur, Alandi, Kelgaon, Chimbli, NH50	39.89	650	300	490	450		1280			2750	355	132
2	**Part II** – Chimbolliphata to Nighoje to Sangurde, Shelarwadi, NH4, Shirgaon, Chandkhed, Rihe, Ghotawde, Pirangut.	46.400	160	200	850	300		830	120	650	3490	242.6	695.8
3	**Part III** – Pirangut, Urwade, Mutha Bahuli, Sangrun, Nigde, Khamgaon, Ghera Sinhgad, Kalyan, Kondanpur, Shriramnagar.	51.200	1850		1520	300	3070	90		2928		425	255.00
4	**Part IV** – NH4, Gogatwadi, Patharwadi, Bhivri, Kanifnath, New Mula – Mutha canal, Theurphata, NH9	32.240	500	150		150	2250	980		8050	1200	203.00 55.70	45.00
		169.940	**3160**	**650**	**2860**	**1200**	**5320**	**2960**	**120**	**11628**	**7440**	**1281.4**	**1116.8**

Expressways, Public Housing and Renewal

During World War 11, Russell Van Nest Black, the author of the 1931 Philadelphia Tri-State Regional Plan, characterized the Quaker City as either a “growing child in late adolescence,” or “an ailing adult . . . rotting at the core.”’ Black’s despairing sentiment, expressed in a letter of mid-1943, soon faded as the scintillating vision of postwar urban renaissance captured the imagination of planners, political reformers and businessmen alike. In many American cities, not only Philadelphia, once moribund city planning commissions were resurrected and their powers and staffs enlarged and professionalized. By war’s end a diverse body of urban actors rallied behind redevelopment, housing construction and highway buildings. Planners, housing reformers, mayors, labor leaders, bankers, home builders, developers, and the heads of major universities, hospitals and other city institutions, seemed to agree with this three-part approach as the best way to rescue the city from decay and decline.2 In order to carry out the postwar vision of urban renaissance, organizations positioned in the van of what political scientist John Mollenkopf labels the “pro-growth coalition” touted urban redevelopment, housing, and highway building as the solution for urban problems, especially for the deteriorating downtown economy.

4.4. ‘Link’ and ‘Place’

As a Link, a street provides a conduit for through movement; it forms an integral part of the whole urban street network and other, more specialised, urban transport networks (e.g. on-street light rail network, or cycle network). Link users may travel by a variety of modes, from private car or truck to bus, bicycle or on foot.

4.5. smart glowing highway tech:

Fig 10 glowing highway

rom the country that gave the world wooden shoes comes a much slicker way to travel: A Dutch design firm is creating a "smart highway" that glows in the dark, charges electric vehicles and displays weather and road conditions on its illuminated surface.

As eco-friendly as it is innovative, the first stretch of this experimental highway will be built in mid-2013 in the Netherlands.DaanRoosegaarde, founder of design lab Studio Roosegaarde, expects the road to be "the Route 66 of the future," according to Popular Science.

The highway will feature lane dividers made from photoluminescent paint that recharges during daylight, then glows throughout the night. And temperature-sensitive paints on the roadway will display ice crystals in below-freezing weather to warn drivers of possible icy conditions, according to Wired.

Some of the designers' other ideas remain in the conceptual stage, however, and will be implemented over the next five years as more "smart highways" are constructed, according to Wired.

In one example of the roadway's innovations, the designers will save energy by creating lights that shine only when cars are on the road and switch off when there's no traffic, according to the Telegraph. Other electricity-saving ideas include roadside "pinwheel lights" that are powered by the wind created when a fast-moving car drives past them.
Perhaps the most futuristic concept devised by Studio Roosegaarde is the "induction priority lane," reserved exclusively for the use of electric cars. Magnetic fields under the road's surface would charge an electric car "the same as charging your electric toothbrush," EminaSendijarevic of Studio Roosegaarde told Popular Science.

The road design, which has attracted inquiries from India, the United Kingdom and other countries, was born partly out of frustration with the slow pace of infrastructure improvements.

"Research on smart transportation systems and smart roads has existed for over 30 years," Sendijarevic told Wired, and designers "are not going to wait any longer for innovations to find their way through the political system, but will start building this highway now."

V. INNOVATIVE HIGHWAY SAFETY TECHNOLOGY

5.1 . Variable Message Signs

Fig 5.1 message sign

This is something that is already being rolled out in India in places like Bengaluru and Hyderabad. Delhi, too, soon plans to install these. Variable Message Signs are LED boards which can display important information that needs to be communicated to commuters. These can be used to update road users on the real-time road and traffic conditions in the case of major breakdowns, congestions, and so on.

5.2 Speed Governors

The union government recently made the installation of speed governors mandatory in all commercial vehicles in India from January 31, 2017. So what exactly is this device? Speed governors are essentially devices which put a cap on the speed that can be achieved that is below the vehicle's natural maximum speed.

Fig 5.2 speed governors

The device has a series of sensors that can detect how fast a vehicle is going and if this crosses the limit set by it, it restricts the flow of air and fuel to the engine. This automatically slows down and stops the vehicle from crossing this pre-determined speed. Speed governors are one of the most effective solutions to ensure that vehicles remain within the speed limit.

VI. CONCLUSION

In our project we have study traffic pattern and also carry out traffic analysis of area of Pune at different period of time to provide best traffic solution to that areas. We also used infrawork 360 and naviswork for our project. Infrawork 360 use existing data to create the model of project by using infrawork 360 we can design the model and also make the visualized videos of structure.

The traffic studies shows most traffic occurs due to insuffient space and heavy traffic at peak time the solutions are given for different cases, for wagholi model ring road is proposed.

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