International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 08, August - 2017

"Development of Masterplan for Road using ITS for CBD(Central Business Development Hub) Tumkur Smart City."

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***Abstract*: - One of the major aspects that urbanization was witnessed was the rapid explosion in terms of the number of vehicles that have been on the roads in the recent past. As the financial capacities of man increased, more and more people started owning their own vehicles. This phenomenon when taking place in a massive scale leads to problems as congestion and other traffic related issues. India has also seen a similar trend in the rapid growth of traffic in the past two decades. Intersection or Junction Study was aimed at estimating the current traffic scenario prevailing at the main Junctions like town hall circle, market circle and Shankar mutt circle, Tumkur City. This is facilitated by means of surveys which are conducted for the junction in consideration. Based on the survey conducted, work is done in analysing the performance characteristics of the junction with respect to its present capacity, the maximum limits of capacities and also on possible improvements to the traffic situation prevailing in the Junction.**

Road networks contribution to smart city
City transportation is an important pillar for quality of life of citizens in a city. Currently, in most of the cities, public and private road transportation are the key mode of commuting and logistics. Some large and mega cities have metro and local train network as the backbone transportation mode.
Lack of quality and safe public transportation, inadequate capacity of public transportation, road safety concerns, overcrowded road network, poor traffic management, parking issues, theft, poor road conditions, lack of modal options (including pedestrian walkways) remain the key issues in most of the cities. Most cities also lack the integrated transportation plans leading to huge demand-supply gap and poor transportation network. For transport operators, huge demand-supply gap, under recovery and poor asset management remain the key issues.

Modern vehicles equipped with driver assistance systems can "feel" (by sensors), "see" (by cameras) and – in future – "speak" (by communication systems). The new technology of cooperative Intelligent Transport Systems and Services (C-ITS) enables communication between vehicles and traffic infrastructure. It is based on the principle that cooperative parties (ITS stations, i.e. in vehicles, road side units) exchange information among each other in terms of standardised message sets. The receiving ITS station analyses the incoming data and makes use of them, resulting in a self-organisation principle on local level. Services and applications being subject to competition between companies cover up-to-date traffic information, improved road safety by avoiding accidents and reducing injury severity, increased efficiency by supporting a consistent traffic flow, foresighted driving and enhanced driving comfort. By involving public transport, bicyclists and pedestrians, intermodal and environmental capabilities, autonomous driving and further functions will be addressed in a second step when C-ITS has reached a sufficient market penetration.

Keywords*: *Parking, Commercial vehicles, Traffic signals

I. INTRODUCTION

The rapid transition to a highly urbanized population creates many challenges for the planning, development, and operation of cities that are stimulating new thinking in the responsible professions – architects, urban planners and designers, transportation engineers, utilities, social science, environmental science, public finance and policy, municipal government, and, most recently, information technology. Information systems in particular have many roles to play, not least in being the thread that leads to a closer integration among these communities. During 2010-2011 a professional group, the Urban Systems Collaborative [USC, 2011], has formed to develop this inter-disciplinary collaboration.

The present work is focused on the new roles that can be played in Urban Systems by information technology. This article begins with some examples of Smart Cities and goes on to explain how they work. It then reviews related work on what is driving the current urbanization. This leads to several hypotheses on how the application of information technology can support the goals of cities in both developed and emerging economies.

Smart city: A new concept and a new model, which applies the new generation of information technologies, such as the internet of things, cloud computing, big data and space/geographical information integration, to facilitate the planning, construction, management and smart services of cities. Developing Smart Cities can benefit synchronized development, industrialization, informationization, urbanization and agricultural modernization and sustainability of cities development.

CBD(Central Business Development hub)

A Central Business Development is the commercial and business centre of the city. It is generally known as the heart of the city.

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OBJECTIVES:

• Add value to CBD streets by considering not only the movement of vehicles but also real estate and social values
• Adopt an easy to use, functional on street parking arrangement that maximises on street parking opportunities
• If possible, increase on street parking in the Core CBD's precinct whilst also achieving additional space for tree plantings
• Provide safe pedestrian crossing points across into the core CBD area
• Retain and make better use of the existing laneways and through block pedestrian connections
• Provide visual cues to direct visitor traffic and pedestrians into the core CBD shopping area.

ITS (Intelligent Transportation Systems)

Intelligent Transportation Systems (ITS) is the application of computer, electronics, and communication technologies and management strategies in an integrated manner to provide traveller information to increase the safety and efficiency of the surface transportation systems. These systems involve vehicles, drivers, passengers, road operators, and managers all interacting with each other and the environment, and linking with the complex infrastructure systems to improve the safety and capacity of road systems. As reported by Commission for Global Road Safety (June 2006), the global road deaths were between 750,000 to 880,000 in the year 1999 and estimated about 1.25 million deaths per year and the toll is increasing further. World health organization report (1999), showed that in the year 1990 road accidents as a cause of death or disability were the ninth most significant cause of death or disability and predicted that by 2020 this will move to sixth place. Without significant changes to the road transport systems these dreadful figures are likely to increase significantly.

Traditional driver training, infrastructure and safety improvements, may contribute to certain extent to reduce the number of accidents but not enough to combat this menace. Intelligent Transport Systems are the best solution to the problem. Safety is one of the principal driving forces behind the evolution, development, standardization, and implementation of ITS systems. ITS improves transportation safety and mobility and enhances global connectivity by means of productivity improvements achieved through the integration of advanced communications technologies into the transportation infrastructure and in vehicles. Intelligent transportation systems encompass a broad range of wireless and wire line communication based information
and electronics technologies to better manage traffic and maximize the utilization of the existing transportation infrastructure. It improves driving experience, safety and capacity of road systems, reduces risks in transportation, relieves traffic congestion, improves transportation efficiency and reduces pollution.

The following is a list of identified benefits of ITS projects:

- Reduced rush hour congestion and delay
- Increased safety and personal security
- Time savings and operation efficiencies
- Reduced fuel consumption and emissions
- Improved customer service and reduced frustration
- Reduced road accidents and fatalities and
- Enhanced economic productivity.

Traffic Problems

- Traffic congestion and delays.
- Inadequate public transportation facilities, which run behind schedules, causing inconvenience to public.
- Inadequate road facilities, which is not proportional to traffic growth which is due to increase in number of vehicles with little or no space for widening or for any change.
- Prohibitive costs for any new facilities.
- High accident rates due to varying speed of vehicles and lack of discipline among road users.
- Shortage of manpower.
- Increase in air and noise pollution due to increase in number of vehicles.
- Acute parking problem in urban areas.
- Absence of effective monitoring and prevention of traffic violation.

CLASSIFICATION OF ITS

1. Advance Public Transport System
2. Advance Traveller Information System
3. Advance Traffic Management System
4. Automated Highway System
5. Incident Management System
6. Electronic Toll Collection System
7. Advanced Warning System
8. Vehicle Information and Communication System

NECESSITY FOR USING ITS

- Provides novel applications by smart technology.
- Systematically employs advanced technologies in the field of transportation to enhance benefits for road users.
- Improves the existing transportation services through interconnected embedded technologies.
- The mean speed can be increased by efficiently monitoring the vehicle speeds.
- Reduction in road crashes.
- Provides system to avoid collision, accidents, and improves night vision and road alertness.
- Enables the rapid arrival of emergency vehicles during accidents to transfer the victims to trauma care centers within the golden hour through incident management systems.

Parking Methods

The Parking Methods play a major role in controlling traffic and avoid chaotic confusion and traffic jams because of lack of parking facility.

On the basis of the style of Parking Areas, there are two major types of Parking:

i. On Street Parking
ii. Off Street Parking

International Journal of Engineering Research & Technology (IJERT)
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On Street Parking

As the name itself suggests, "On-street Parking" means the area allotted for parking purpose at the sides of the roads. For efficiency in parking system; The On street parking is divided into three types;

- Angular Parking
- Parallel Parking
- Perpendicular Parking
  (efficient parking method)

1)Angular Parking

The vehicles are parked at an angle. It may be a 30 degree angle or 45 degree. The vehicles can be easily reversed if parked at an angle. Hence, proving as an efficient Parking System in case of vehicular circulation.

2) Parallel Parking System

The vehicles are parked one behind the other. The Parking lot is designed as per the area required if Parallel Parking is adopted. It has been surveyed that the area required for Parallel Parking is much lesser that required for Angular Parking. Therefore, more number of vehicles can be parked in this Parking System. For this reason, this Parking system is generally adopted.

3) Perpendicular Parking

The vehicles are parked at right angle to the road.

It is an efficient system of Parking.

ii. Off Street Parking

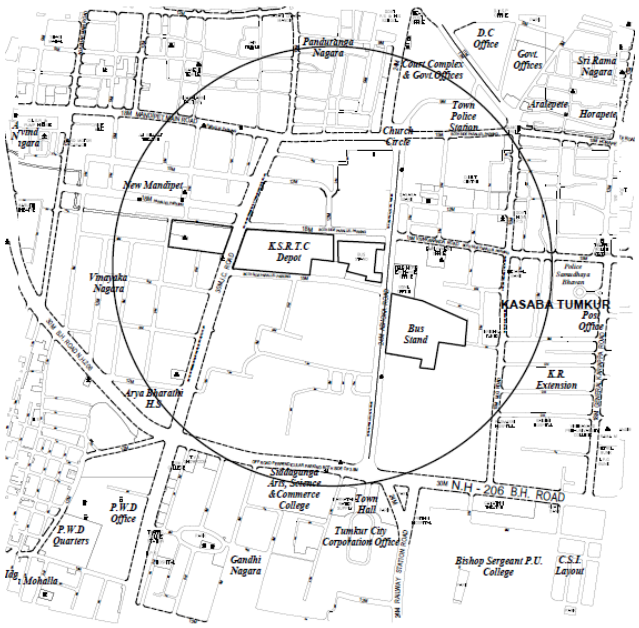
As the name suggests, Off street Parking means a Parking Area is designed adjacent to the Road or in a place or building which is not the part of the road.

Parking lot, Here are some of the examples of Off Street Parking:

- Parking lots
- Bypass road
- Multi-storey Building Garage
- Parking Lanes

II. PRESENT INVESTIGATION

In the present study mainly three circle is considered i.e., Shankar mutt, market circle and tow hall circle. The detail of signal timings in the junction is taken manually and 12 hours classified volume count survey was conducted at the junction.



CBD AREA

Signal Timings of the Aforementioned Circles

1) Town Hall Circle

Towards Market Circle = 90 secs
Towards Town Hall Building = 60 secs
Towards Bus Stand =110 secs
From Shankar Mutt Circle = 90 secs

Figure No.1 Shankar Mutt Junction

2) Shankar Mutt circle

Towards Town Hall Circle = 105 secs
Towards Ammanikere = 126 secs
Towards Upparahalli Gate = 126 secs
From Bangalore = 105 secs

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Figure No.2 Shankar Mutt Junction

3) Market Circle
Towards Gubbi = 120 secs
Towards Old Market = 105 secs
Towards Town Hall Circe = 120 secs
From SSIT college = 105 secs

Figure No.3 Market Circle Junction

Our investigation process is as follows:

1. Collection of accident data from the concerned police station of the junction
2. Visiting the selected junction
3. Traffic volume count per day at each junction
4. Detailed survey
   a) Measurement of all the roads in the junction
   b) Measurements of obstruction, medians, corners
   c) Setback distance from the pavement

Table No.1 Accident Data at Different Junctions

Sl. No.	Name of the spot	No. of accident	Fatal	Non-fatal	Damages	Traffic volume PCU/Hour	Spot speed		
							Minor road	Major road	Minor/ Major
1	Batawadi	94	9	13	72	3070	45	62	0.72
2	S S Circle	64	6	6	52	3478	15	19	0.78
3	KSRTC IN & Out Gate	59	7	13	39	3745	30	33	0.9
4	Kodi Circle	78	9	18	51	3018	30	28	1.07
5	Sira Gate	38	7	11	20	5021	2	27	0.74
6	Town hall	56	4	6	46	3745	60	50	1.2
7	Bhimsandra junction	65	6	13	33	6797	-	-	-
8	Oorukere village limit	155	20	13	122	1969	-	-	-
9	Antharasana halli junction	141	26	11	104	2450	-	-	-
10	Manchalkuppe bus stop junction	99	33	59	7	3802	-	-	-
11	Pandithana halli Gate	72	19	45	8	3802	30	30	0.5
12	Nandhi halli	137	32	85	20	3673	53	53	0.47

Figure No.4 Accident at all Junction Fatal and Killed

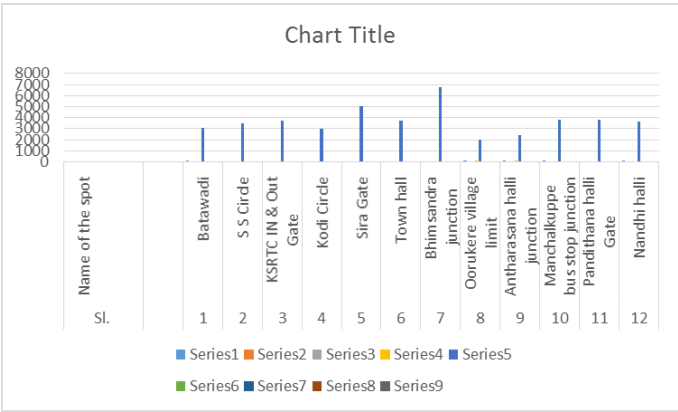

Table No.2 volume Count Data at Town Hall Circle

Town Hall Circle	
Direction Towards	Total/ Cumulative vehicles per day
Market Circle	28372
Town Hall Building	6808
Bus Stand	43368
Shankar Mutt Circle	39952

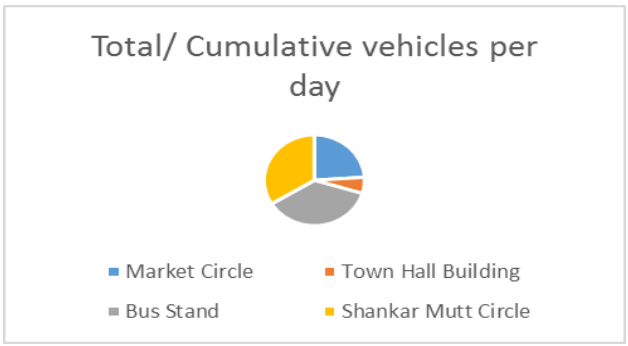

Figure No.5 Traffic data at town hall circle

Table No.3 volume Count Data at Shankar Mutt Circle

Shankar Mutt Circle	
Direction Towards	Total/ Cumulative vehicles per day
Town Hall Circle	8544
Ammanikere	22272

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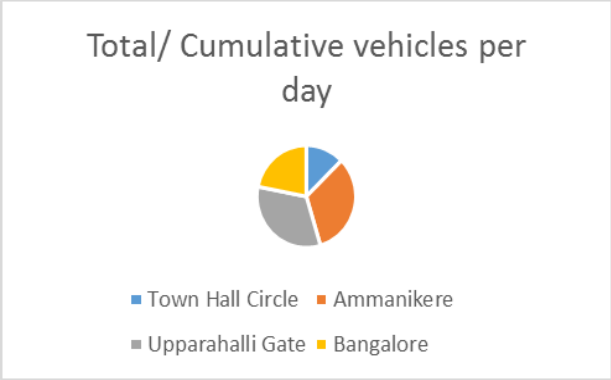

Fig 6 shankar mutt

Table No.4 volume Count Data at Market Circle

Market Circle	
Direction Towards	Total/ Cumulative vehicles per day
Gubbi	22260
Old Market	17220
Town Hall Circe	23820
SSIT college	24840

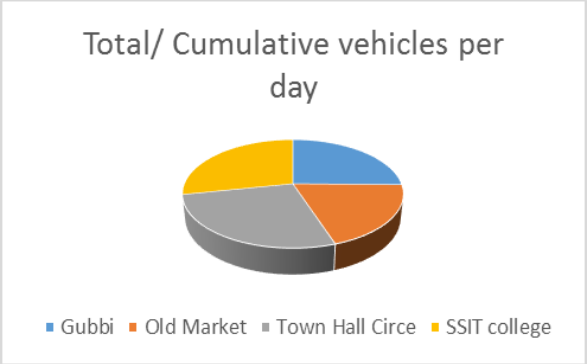

Figure No.7 Traffic data at town hall circle

Density based Automatic Signal Control system

- This system is used in all the three signals that includes the proposed signal too for better traffic movements .
- Nowadays, controlling the traffic becomes major issue because of rapid increase in automobiles and also because of large time delays between traffic lights . So, in order to rectify this problem, we will go for density based traffic light system.
- In this system , we will use Infrared (IR) sensors for each roads;these sensors always sense the traffic on that particular road.
- All these sensors are interfaced to the micro controller.
- Based on these sensors, controller detects the traffic and controls the traffic system

III. DISCUSSIONS & REMEDIAL MEASURES

To provide new signals to the existing traffic scenario at gumchi Junction. The existing traffic movement is analyzed and the adequacies of the current unsignalized intersections are also analyzed.

The following are some of the remedial measures

- For an economic development of tumkur city proper Transportation planning is a must.
- It is also possible to locate underground buildings and structures that practically do not require daylight such as cinema halls, shopping establishments, cultural and service facilities where people come for only a short time.
- Since there is lot of conjestions on doing ON road perpendicular parking we have proposed inclined ON road parking on major roads.
- In the main commercial area (M.G.Road) behind tumkur bus stand to reduce on road parking problem and traffic conjestion we have proposed off road parking on govt. land.
- Density based Automatic Signal Control system is used in all the three signals that includes the proposed signal too for better traffic movements.

IV. AKNOWLEDGEMENT

The success associated with the accomplishment of any task would be incomplete without acknowledging the people who made it possible. I am immensely and sincerely thankful to our prof., SUDHA P S head of the Department, Dr. SM PRAKASH our Principal, and Dr.JAFER SHARIFF Management of KNS Institute of Technology, Bangalore. under whose constant support and encouragement this paper has been accomplished flawlessly.

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