

## Improvement of Traffic in Some Streets in Baghdad City Using GIS Pictures

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### Abstract

Traffic collisions may happen in any location of the street for many reasons, careless drivers, narrow roads, badly designed intersections and traffic signals, are some of the reasons. When the collisions are repeated in a specific location, the case must be studied and solutions must be found to eliminate these collisions.

A GIS is a kind of super map, computer software that links geographic information (where things are) with descriptive information (what things are like). Unlike a flat paper map, where what you see is what you get, a GIS can have many layers of information underneath its surface.

In this paper GIS is used as a tool to examine, analyze, and suggest solutions for areas where traffic collisions have occurred in three selected streets in the city of Baghdad. Al-Kifah Street, Sheikh Omar Street, 14 Ramadan Street (Arbataash Ramadan St.), was chosen for this research. These streets are very busy and old.

Data types that are employed are; firstly and more important accidents by location, cause, date, time of day, type of vehicle, and severity (property damage only, injuries, or fatality).

It was found that most of the collisions are broadsides and the conclusion is that the traffic signals along these streets aren't giving people enough time to clear the intersection. The suggestion is mainly to keep the yellow light on longer so traffic can clear.

### المستخلص

قد تحدث حوادث المرور في اي مكان من الشوارع لاسباب عديده بعض منها اهمال السائقين، الطرق ضيقه للغايه، التصميم الخاطيء للتقاطعات و توزيع اشارات المرور. وعند تكرار الاصطدامات في مكان معين، يجب ان تدرس القضية ولا بد من ايجاد الحلول للحد من هذه الاصطدامات. و GIS عبارة عن برمجيات تربط خارطة المعلومات الجغرافيه مع المعلومات الوصفيه. خلافا للخريطه المرسومة على الورق، باستخدام GIS نستطيع الحصول على انواع عديده من المعلومات.

في هذه البحث يستخدم GIS كاداه بحث وتحليل، واقتراح الحلول علي المناطق التي وقعت فيها حوادث المرور. الشوارع الثلاثة المختاره في مدينه بغداد. شارع الكفاح، شارع الشيخ عمر، شارع 14 رمضان، وقد وقع الاختيار في هذا البحث على هذه الشوارع القديمه والمزدحمه جدا.

انواع البيانات التي ركز عليها في هذا البحث. اولا واهمها الحوادث التي بسبب المكان، تاريخ معين، وقت معين من اليوم، ونوع المركبات، وتحديد (الاضرار بالممتلكات والاصابات والوفيات).

والخلاصه هي ان الحركة والاشارات في هذه الشوارع لا يعطي الناس وقتا كافيا لملاحظه التقاطعات. والاقتراح هو ان يبقي اساسا الضوء الاصفر.

### Introduction

According to the National Highway Traffic Safety Administration, there were over 6 million traffic collisions in which 41,611 people died and

3.2 million people were injured in 1999. About 40 percent of the car-occupant deaths occurred in single-vehicle crashes. Pedestrians constituted

approximately 12 percent, and motorcyclists 6 percent of traffic deaths [1].

Uneven traffic is not something traffic signals of the past were designed to handle. In fact, heavy traffic could be made much worse by signals that plod from green to yellow to red at the same evenly spaced intervals [2].

This study was suggested first by some of engineers of the General Directorate of Traffic. The data that was depended was taken from the files of the General Directorate of Traffic and Amanat Baghdad for the period November, December/ 2002 and January/ 2003 before the war. That was the period of normal political and social conditions rather than the period that followed the war. The data was presenting winter season to include the effect of rains (rainy days are in the season of winter in the city of Baghdad). The study dealt with three main streets in Baghdad, the capital of Iraq. It was done with the aid of GIS software called ArcExplorer2.

Two types of streets were considered. The Streets are Al-Kifah Street, Sheikh Omar Street, 14 Ramadan Street (Arbataash Ramadan St.), the first two are very old located in the old city of Baghdad at the district called Hay Al-Rasafa. The area now is a heavy commercial area. These two streets represent the first type. Arbataash Ramadan St. is newer and located in a newer area called Al-Mansour. This street represents the other type.

This study studied the problems occurred in the controlled intersections (controlled by traffic signals) in the three streets by collecting data about each of these intersections, analyzing, and finally giving the most proper solutions. Data types are the accidents by location, cause, data, time of day, type of vehicle, and severity (property damage only, injuries or fatality). In Figure 1 the three streets are shown, Kifah and Sheikh Omar Streets are in the

East Bank of Baghdad (Rasafa) south to the Medical City in red color and parallel to the River Tigris shown in blue color. While the third Street Arbataash Ramadan is in the East Bank of the city far from the river near to Al-Khair River in blue and to the left of Al-Rahman Mosque (now still under construction) in green color. Since the old city was first founded near Tigris River East called Al-Rasafa and West called Al-Karkh, we can see that the older Streets of Al-Kifah and Sheikh Omar are near this river. After that the city was extended dramatically to the East and West, some newer Streets like Arbataash Ramadan Street are found. Consequently, the central commercial areas are heavily found in Alkefah and Sheikh Omar Streets rather than Arbataash Ramadan Street. For that we can find heavier traffic volume in the older Streets. These streets were first two-way streets, and in the mid1990's they were converted to one-way but flowing opposite to each other. That was one of the solutions done to solve the problem of heavy traffic volume.

The traffic light phases used were designed to be static not dynamic. That means that the time designed for each phase is fixed and cannot be changed according to variable conditions of the road. For example some traffic light phases need to be shortened at a certain time of the day (at night) or at a certain day of the week (on Friday). This leads to a confusion and need to be solved in either adjusting the design more frequently according to the recent condition or keep the yellow light on longer so traffic can clear or following a new concept for dealing with the problem.

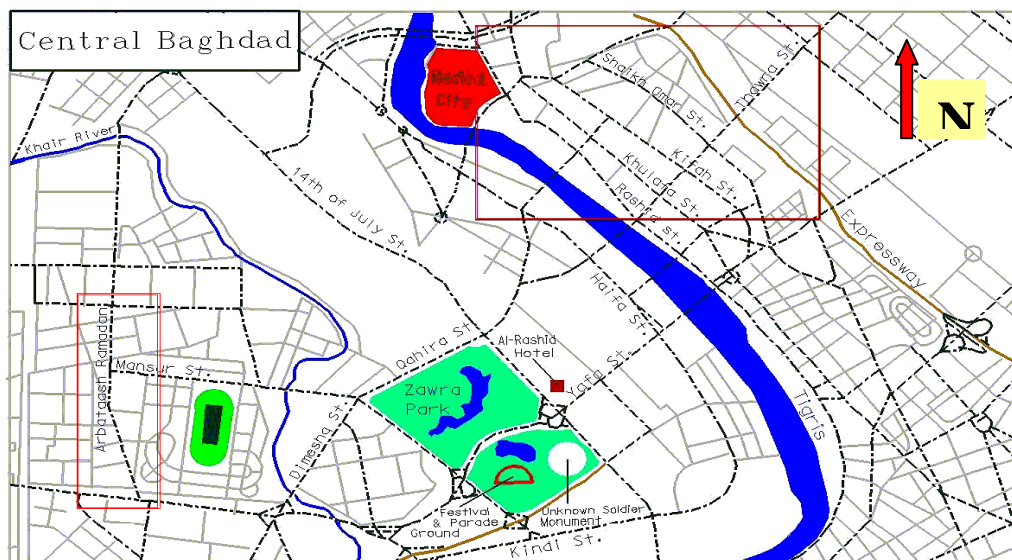


Fig. (1): The Study Area

## The Study Area General Description

### Al-Kefah Street

This street is a one-way road, from Bab AlMuadam in the direction of Sheikh Abdul Qadir Mosque or from Northwest to the Southeast. The accidents here are due to:

The street is too busy for its central location in the capital, especially at the place of the big market of cigarettes where great number of accidents occurs. The lack of traffic signals, the heavy parking of cars along the right side of the street engaging two or three lanes and the weak control of traffic policemen and the bad condition of the street especially at the intersections.

Although the speed does not exceed 50 km/hr many accidents (mostly property damages) occur, these are of two main types; property damage and visible injury. There are four intersections served with traffic lights and these intersections were considered in this study in this street.

The first intersection is Bab Al-Muadam Intersection – Alkefah Street. This intersection is the way to Bab Al-Muadam Garage of regional and

local Transport (to the north) and heavy with Buses and Vans. It is also the way to Bab Al-Muadam Bridge and Medical City (west). It connects four main roads; one of them is Al-Kefah Street (one-way) flowing southeast as shown in Figure 2. The other three roads are two-way. The traffic lights used here have three phases, one for each of the two-way roads. The second intersection is Sahat Zubaida Intersection (Figure 3). This intersection connects four one-way roads and has less traffic accidents than the previous one the traffic lights used here have two phases. The third intersection is Sahat Al-Nahda Alkefah Street Intersection (Figure 4). This intersection connects four one-way roads and has more traffic accidents than the previous one because it connects the traffic with Sahat Al-Nahda Garage of regional transports; the traffic lights used here have two phases. The fourth intersection is Sheikh Abdul Qadir Al-Kefah Street Intersection (Figure5). This intersection connects two one-way roads and two two-way roads; the traffic lights used here have two phases.



Fig. (2): Bab Al-Muadam Intersection–Alkefah Street

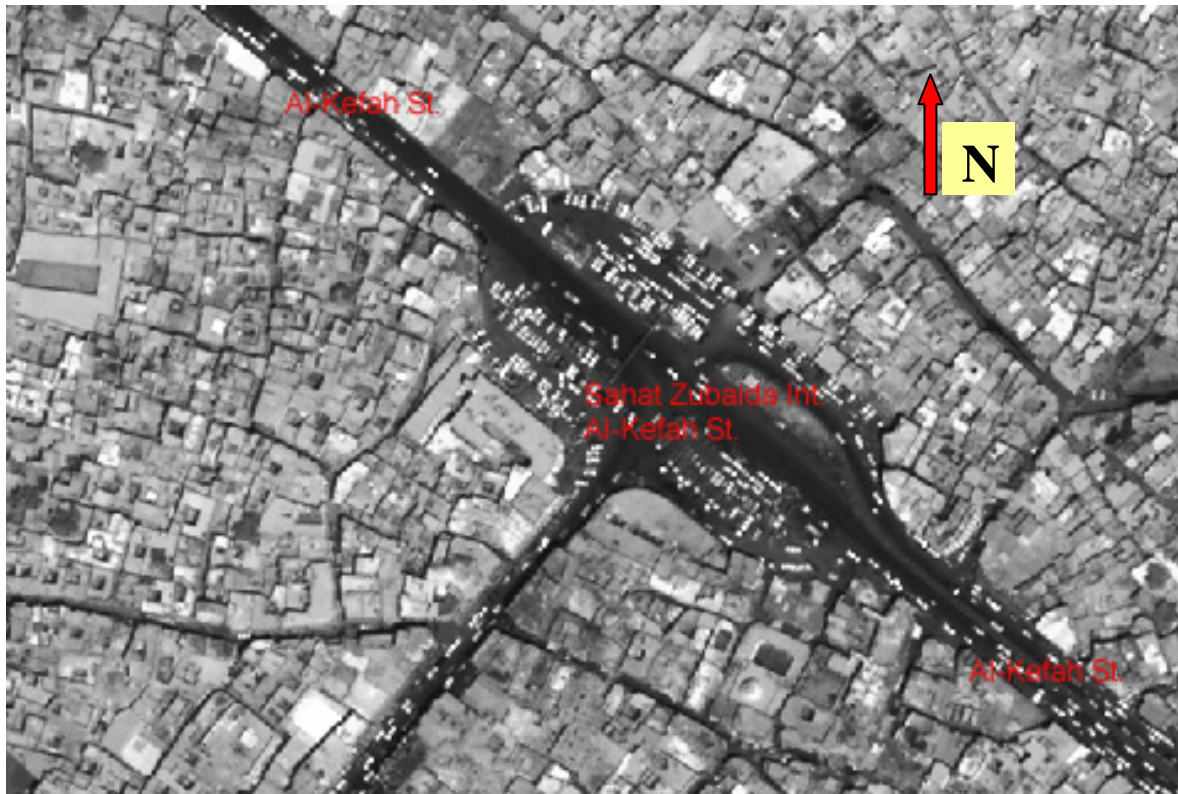


Fig. (3): Sahat Zubaida Intersection – Alkefah Street



Fig. (4): Sahat Al-Nahda Alkefah Street Intersection



**Fig. (5): Sheikh Abdul Qadir Alkefah Street Intersection**

### **Sheikh Omar Street**

This street is parallel to Al-Kefah Street. It is a one-way road also but flowing the opposite direction (Southeast to Northwest). Flowing from Sahat Al-Nahda to Bab Al-Muadam. The central commercial area is concentrated in this street, especially the trade of car and lorry spare parts and some of repairmen and small workshops are found. Delays occur in this street rather than accidents. The road is busy with pedestrians because the walkways are occupied with cars to be repaired. The accidents here are mainly property damage with some pain complaints due to low speed (50 km/hr or less). These accidents are due to pedestrians use the street

as a walkway, lack traffic signals, and the heavy parking of cars and trucks. The two intersections studied are located at the two ends of this street named Sahat Al-Nahda and Bab AlMuadam.

The first intersection (Figure 6) connects four roads, three of them are two-way and one (Sheikh Omar St.) is one-way. The traffic light here consists of three phases. The second intersection (Figure 7) connects four roads two of them are two-way, the other two are one-way one of them is flowing towards the intersection so we have here three traffic light phases.

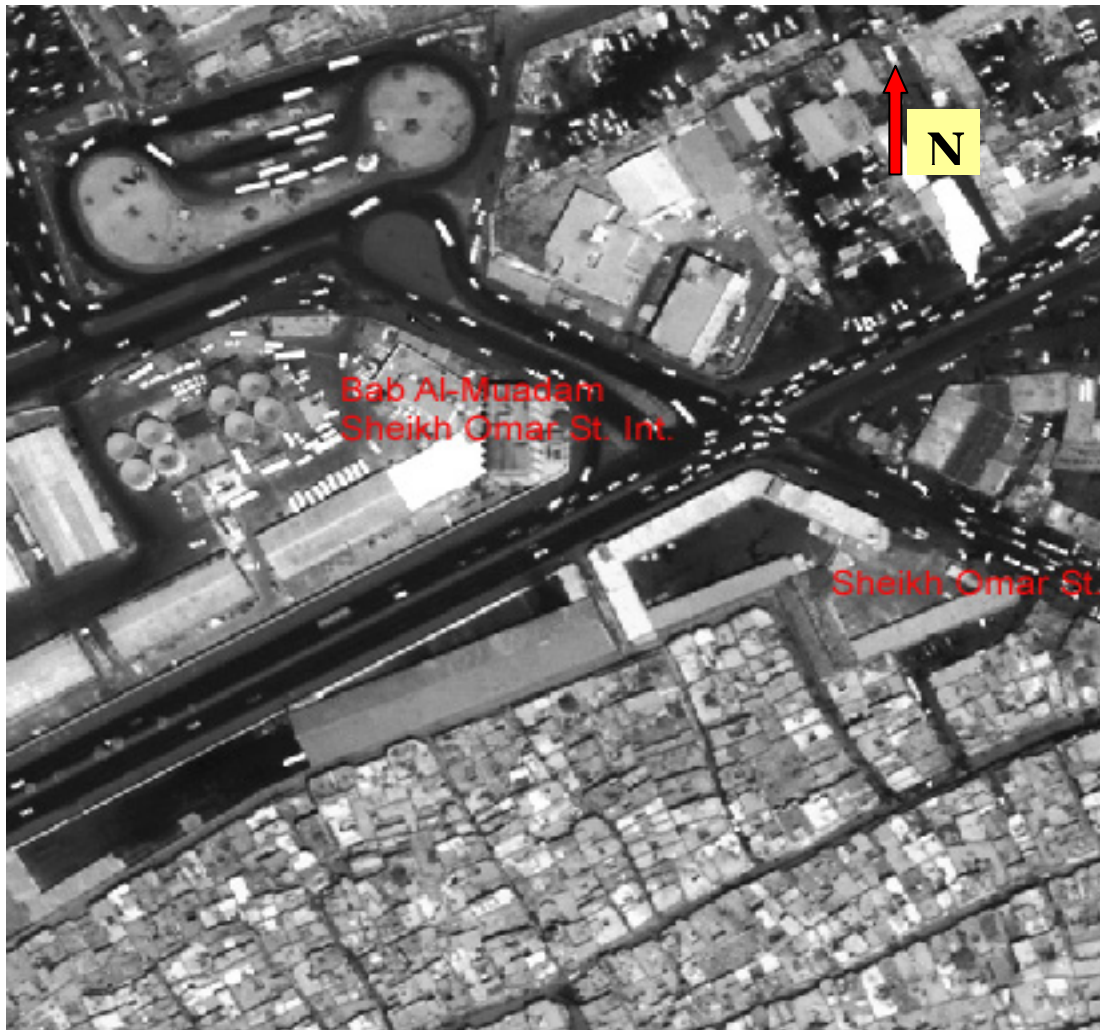


Fig. (6): Bab Al-Muadam Sheikh Omar Street Intersection



Fig. (7): Sahat Al-Nahda Sheikh Omar Street Intersection

**14<sup>th</sup> Ramadan Street (Arbataash Ramadan St.)**

This street is a two way-road. Speed limit is higher than the previous two streets (90 km/hr) and this causes the accidents to be more. Property damages, Visible injuries and Fatalities, rise due to; high speeds that exceeds the limit speed (approaches 110 km/hr or more), the illegal and uncontrolled crossing of street by pedestrians from one side to another, the lack of traffic policemen control, lack of traffic signals, Uncontrolled parking of cars along the street.

Here we have three intersections; the first one is Arbataash Ramadan Intersection (Figure 8), which connects four roads of two-way each. The traffic light phases are four phases. The second one is Almansur Arbataash Ramadan Intersection (Figure 9) which is a tee intersection connects three roads of two-way. We have three phases. And finally the third intersection is Al-Mamoon Arbataash Ramadan Intersection (Figure 10) which is exactly the same as the previous one.



**Fig. (8): Arbataash Ramadan Intersection**



**Fig. (9): Almansur Arbataash Ramadan Intersection**



**Fig. (10): Al-Mamoon Arbataash Ramadan Intersection**

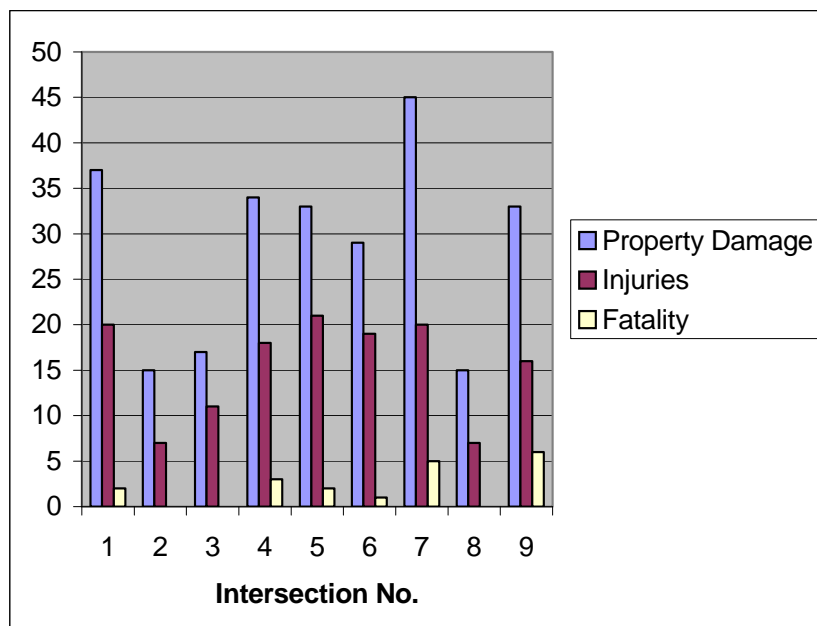
**Summary of collected data**

Following are two charts presenting the number of accidents, first by severity (bar chart Figure 11) the second by the day of the week (line chart Figure 12). In these Figures the intersections are presented as numbers from 1 to 9:

- 3=Al-Nahda Alkefah St. Int. (Figure4)
- 4=Sheikh Abdul Qadir Alkefah St. Int. (Figure5)
- 5= Bab Al-Muadam Sheikh Omar St. Int. (Figure6)
- 6=Sahat Al-Nahda Sheikh Omar St. Int. (Figure7)
- 7=Arbataash Ramadan Int. (Figure8)
- 8=Almansur Arbataash Ramadan St. Int. (Figure9)
- 9= Al-Mamoon Arbataash Ramadan Intersection (Figure10)

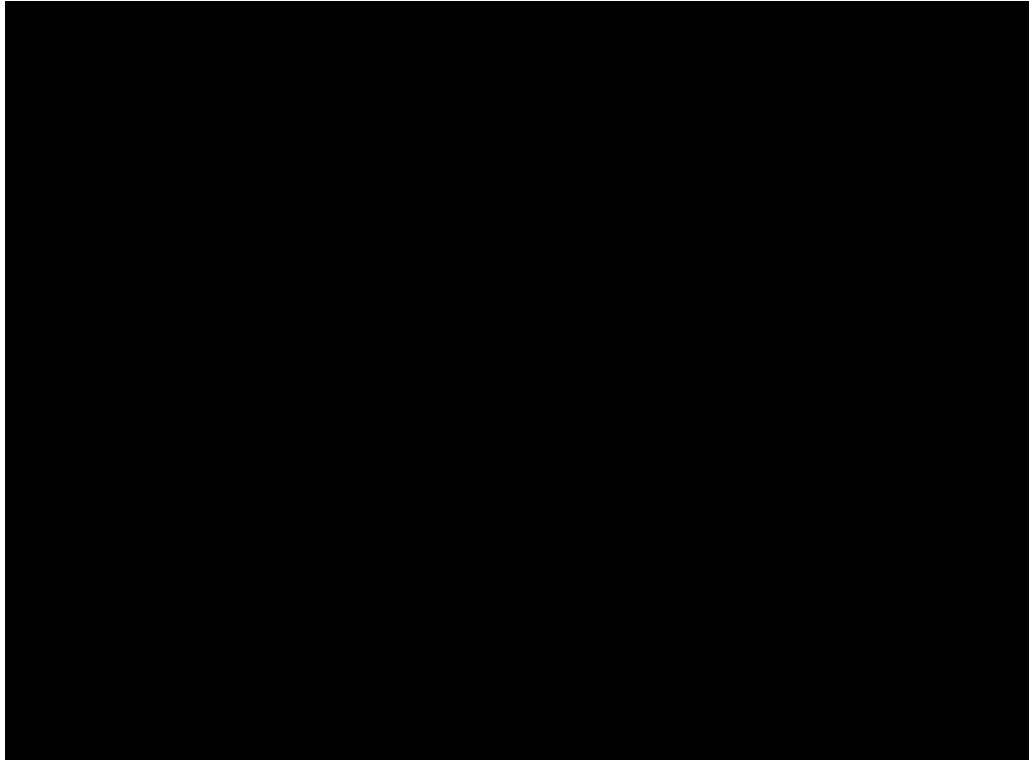
Intersection no.

- 1= Bab Al-Muadam Alkefah St. Int. (Figure2)
- 2=Sahat Zubaida Int. (Figure3)



**Fig. (11): Number of Accidents due to location**





**Fig.(12): Number of Accidents for each intersection due to day of the week**

### Conclusions

In this study several conclusions were noticed, and these conclusions may be generalized for all other streets in the Cities of high traffic volume. These conclusions are:

1. In old cities the streets are commercially busy in nature like Al-Kefah and Sheikh Omar streets while newer ones are less like Arbataash Ramadan Street.
2. In the streets of Al-Kefah and Sheikh Omar intersections the most accidents severity is property damage, fatalities are rare, due to the low speed and not the traffic police control. Whilst fatalities rise in the intersections of higher speed street of Arbataash Ramadan.
3. The lack in proper and multistory parking areas in general especially in the busy and commercial streets has led to an additional load on the streets and intersection, and consequently to more accidents.
4. Improper distribution of cars and lorries repairing workshops in the center of the city has led these cars and lorries to stop improperly on the walkways forcing pedestrians to use the main streets as walkways, which results in more accidents.
5. The traffic signal phases are fixed in one or two modes only, i.e. they are static not dynamic in design.

### Recommendations

1. The main point to be recommended in this study is to depend dynamic traffic control through the installation of cameras in each location, one for each road connected by that intersection. These cameras are then connected to a main control room and a special expert system adjusts the traffic light phases each 15 minutes for example. At this control room we have some special personnel watching what's going on at the intersections and solve any possible problem. This method is applied in certain cities in the United States and Australia.
2. A good solution is to utilize the GPS system with a suitable software and a connection with each of the cars to show the driver in real time the locations of traffic jams or accidents so that he may use an alternative way.
3. Suitable parking in a form of multistory building for cars to park especially in commercial districts.
4. To convert intersections to interchanges of suitable kind though this will be quit costly.
5. Installation of traffic lines on the road to help the driver take the right lane for him.

6. The construction of underground passages for pedestrians to cross the street and forcing people to cross through them, like for example construction of barriers along the sides of the streets to isolate the walkways from the body of the street.

**References**

1. Robert, E., (2001), "*Human Factors in Traffic Safety*". Lawyers & Judges Publishing Company.
2. Lang, L., (1999), "Transportation GIS". ESRI Press 380 New York St. Redlands, California.