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Using Intelligent Transportation Systems the Modern Traffic Safety on the Highway in the Sudan

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ABSTRACT
Today scenario the field of Intelligent Transportation Systems (ITS) has witnessed significantly increased activity in recent years, with the application of modern control, communications, and roadway infrastructure and information technologies to vehicles. The ITS is the application of computer, electronics, and communication technologies and management plan in an integrated manner to endue traveler information to enhance the protection and dexterity of the road transportation systems. Presently many countries place stakes on like technologies as autonomous transportation vehicles and cooperative intelligent transportation systems. Intelligent Transport System (ITS) aims to achieve traffic efficiency by minimizing traffic problems. It improves users with prior information about traffic, local ease of use real-time running information. The paper aims at setting a system for traffic safety on the highway, it focuses mainly on evaluation if their status and determination of their leak points. This was done on the basis of information gathered from the National Corporation for roads and Bridges and traffic police department report for 2016 & 2019 from the Sudan and field surveys are attainable, and applied in geographic information system (GIS).

Keywords — Intelligent Transportation Systems (ITS), Modeling, Traffic Safety, Geospatial, ArcGIS, Sudan Road, Geographical Information Systems (GIS).

I. INTRODUCTION

In the era of Intelligent Transportation Systems (ITS), the technologies supporting communications, sensing & surveillance mechanisms, and Information & control systems are spread via the road infrastructure, the vehicles and the users [1]. The transportation activity is part of our day-to-day life. Each one of us has already experienced some transportation activity, as a train passenger, or as a two wheel bike, as a car driver, as a bus user, and it is quite implausible to imagine our days without people or goods' movement from one place to another place. These movements have the aim of meeting demands for services and activities. Intelligent transportation systems will produce a huge amount of data [2]. In the last few years, the location, communication, information, and sensors Control technologies that characterize the ITS have pervaded the roads, the vehicles, and the users, offering a promising approach to maximize the operational performance of the network, with particular concern with the crowding, safety, user comfort, and environmental aspects [3]. These current developments of ITS can be generally categorized into traffic flow management & control activities, and the provision of traffic information for drivers and users with traffic information services. It is expected that the following advances will underline the decision and operation assistance to drivers for safe driving, [4] possible with fully automated cruising. Since geographical information system appeared as a system depending on computer in keeping, processing and analyzing geographical incident serving this purpose, the interest has clearly increased. That appears via the survey that was done for geographical information system that appeared in the seventh and eighth decades the great progress in computer technology assisted in that and the role of this technique is expected to become greater GIS in the future with the increase in the depending on remote sensing technology as a way of gathering geographical information in its two parts with the increase of swift traffic in cities and on swift roads and highways. It has become a familiar day-to-day on the occurrence of a traffic [5] accident that traffic neck bottles appears and the driver waits for traffic or emergency police and what that needs of time that might be long or short for the control of traffic. For the solution of this issue and minimization of its negative effects progressed countries have organized a modern traffic system, depending on [6] the coordination between organized techniques directly related swift traffic information systems with watching and control traffic systems and contact and computer systems and an information base operated by a especial technical system in this ITS.

The objective of these papers introducing geographical information systems technique and applying them in intelligent transportation systems and again in this paper, putting, ways for fast transportation, [4] roads with the international classifications using geographical information systems and making maps for that and mostly achieves that by typing the trajectory in the map then the geographical information system, and it qualifications of the information base that apply and showing them in the map after connecting the base to the map. Firstly the highways are the only [7] link between most states and represent a fundamental resource to them. Secondly the road is one of the economic indicators of the states and is the key to development in many projects.

Thirdly the huge number of accidents on the highway traffic on existing roads.

II. THE THEORETICAL FRAMEWORK

The Intelligent Transportation Systems largely depend on information and communication technologies (ICTs) and derived knowledge based applications such as traveler information services, traffic monitoring & management services, and navigation. In the last few years, the location, communication, information, [8] and sensors & control technologies that characterize the ITS have pervaded the roads, the vehicles, and the users, offering a promising approach to maximize the operational performance of the network, with particular concern with the crowding, safety, user comfort, and environmental aspects. In this section, we are discussing the theoretical framework of this paper.

2.1. Constructed Roads Problems

The rapid transportation, road and highways represent one of the vital means of transportation in the Sudan as it carries all travelers and goods transferred across the high-speed roads and highways net approximately 80% of the total of those using transportation means generally, so it is the only mean mainly used [9] in the Sudan despite the many issues facing rapid transportation roads and highways most roads existing lack complete or partial services and there is no sign for the entrance of cities or exist, cities are only known by the experience of the driver or road user. Most of the roads are very high above the earth, so it very arduous to enter or get out comfortably. If their damage in any car it repaired on the road which causes a lot of accidents and there are no signs showing cross-roads on roads. The maintenance services and petrol station are at the edges of the cities only.

2.2. The Present State of Built Roads

The general corporation for roads and bridges is considered, on the first level, accountable for measuring roads, as planning building, follow up, maintenance and laying the plans for implementation and agreements with companies [10]. So the corporation is accountable for the measures of road net. Look at table 1, and table 2 showing the specification of built traffic roads [2] most road deficiency international specifications and there is no traffic safety programmer.

Table 1. The Road Network the Second Stage (1950 – 1979)

No	Links	Length in klm	Date of Building		Technical spec		Implements company	notes
			Beg	end	Width	side		
1	Khartoum -Medani	187	1967	1970	7 m	2 m	Lawless US + General Organization	Temple
Length		187	The ratio of 33.5					

The general policy department is accountable for traffic safety by coordination with responsible department is ministries. By what was mentioned there is no department or plan. Put for the follow up and for the solving roads issue. If we want to classify the precious roads, according to the American Association of State Highway and Transportation Officials (AASHTO) [11] we are exploring the following:

- Maintained roads with two passes
- Maintained roads with one pass
- Road partly maintained (concrete earth roads)
- National earth roads
- Tapped roads

Table 2. The Road Network Third Stage (1975 – 2000)

No	Links	Length in klm	Date of Building		Technical spec		Implements company	Notes
			Beg	end	Width	side		
1	Fashir/Kubkabia	225	1975	1976				earth
2	Dibaibat/ Kadogli	160	1967					earth
3	Medani/Elgadarif	212	1972	1976	6m-	1.5m	Thegeneral corporation	main
4	Gadarif/Kasala	227	1973	1977	7m/	2m	Chinese company	main
5	Haia/Portsudan	220	1973/	1977	7m/	2m	Yoguslav	
6	Kasala/Haia	206	1974/	1978	7m/	2m	German steerback	main
7	Khartoum/Eldoim	350	1973/	1980	7m/	2m	Italian Rebecca	main
8	Medani/Sinnar	148	1980/	1982	7m/	2m	Waysand fiaty	main
9	Sinnar/Singa	110	/1980	1989	7m/	2m	General corporation	main
10	Niala/Zalingi	70	1980/	1982	7m/	2m	Arab ontractors	main
11	Sinnar/Kosti	210	1980/	1983	7m/	2m	German steer rock	main
12	Atbara/Barbar	110	1979/	1983	7m/	2m	General corporation	main
13	Eldoim/Rabak	36	1982/	1983	7m/	2m	General corporation	main
14	Kosti/Tandalti	110	1983/	1991	7m/	2m	German steerback	main
15	Tandalti/Elobied	119	1988/	1991	7m/	2m	Korian Daiwoo	main
16	Elobied/Eldibaibat	191	1988/	1991	7m/	2m	Volter	main
17	Khartoum/Jaili/Shendi	100	1988/	1991	7m/	2m	Duch ardor	main
18	Senja/Eldamazin	172	1991/	1994	7m/	2m	Hijra	main
19	Medani/Elmanagil	167	1988/	1995	7m/	2m	General corporation	main
20	Rabak/Eljabalain	93	1999		7m/	2m	Iranian company	main
21	Shendi/Atbara	67	1999		7m/	2m	Iranian company	main
22	Hijlij/Elmujlad	140			7m/	2m	Hijra company	main
23	Niala/Elfashir	220	1998		7m/	2m		earth
Length: 3666			Percentage 66%					

2.3. The Density of Traffic

The table number 3 show traffic density in the network from the below table, we find that Khartoum, Medani road is the most dense and its importance is that it links the Gezira with the capital following its Medani, Sinnar road. It is an extension of the previous road.

Table 3. The Road Traffic Density along the Way

Road	Density of Traffic
Medani – Khartoum	17.61
Medani – Gadarif	7.38
Gadarif – Kasala	2.66
Kasala – Haia	2.64
Haia – Port Sudan	0.13
Medani – Sinnar	16.19
Sinnar – Kosti	5.89
Sinnar – Eldamazin	2.45
Kosti – Elobied	1.71
Rabak – Eljabalain	0.94
Khartoum – Eldoim	2.73
Eldoim – Rabak	3.36
Niala – Zalinjai	0.95
Khartoum – Atbara	13.7
Atbara – Barbar	3.27
Elobeid – Kadogli	0.82
Madani – Elmanagil	7.36
Elfashir – Kabkabia	0.3
Niala – Elfashir	1.81
Atbara – Haia	10.21
Elfashir – Kabkabia	0.36

2.4. Density of Traffic Volume

The table number 4 shows traffic densities according to traffic volume also from the previous table Khartoum, Medani road first follow by Medani, Sinnar road.

Table 4. The Road Traffic Density Volume

Road	Density of Traffic
Medani – Khartoum	137.25
Medani – Gadarif	70.12
Gadarif – Kasala	24.45
Kasala – Haia	38.75
Haia – Port Sudan	21.16
Medani – Sinnar	77.95
Sinnar – Kosti	2.68
Sinnar – Eldamazin	25.21
Kosti – Elobied	22
Rabak – Eljabalain	1.7
Khartoum – Eldoim	22.54
Eldoim – Rabak	15.39
Niala – Zalinjai	2.29
Khartoum – Atbara	13.29
Atbara – Barbar	4.92
Elobeid – Kadogli	9.79
Madani – Elmanagil	15.8
Elfashir – Kabkabia	2.04
Niala – Elfashir	16.08

2.5. Traffic Density by Road

The table number 5 show traffic density according to the road from the table above, we find also that Medani, Khartoum road in the first in dense, second comes Medani, Gadarif road which occupied the place of Medani, Sinnar owing to its lengths it also an extension of Medani, Khartoum road.

Table 5. The Rate of Traffic Volume × along the Way

Road	Density of Traffic
Medani – Khartoum	651978
Medani – Gadarif	383724
Gadarif – Kasala	128480
Kasala – Haia	5512
Haia – Port Sudan	316430
Medani – Sinnar	195910
Sinnar – Kosti	70730
Sinnar – Eldamazin	138171
Kosti – Elobied	162096
Rabak – Eljabalain	4485
Khartoum – Eldoim	104544
Eldoim – Rabak	4003
Niala – Zalinjai	42785
Khartoum – Atbara	100170
Atbara – Barbar	4248
Elobeid – Kadogli	67210
Madani – Elmanagil	65048
Elfashir – Kabkabia	17840
Niala – Elfashir	82218
Atbara – Haia	52346

2.6. The International Specifications of Roads

The geometrical design of the road is introduced as finding the geometrical dimensions of each road and the putting in order of the road elements like the trajectory, distances of erceing widths and declines, by this the road must be classified according to its being main, branch or local to determine a design speed ruling decline after balancing come factors like the importance of the road, estimating the volume of characters of the traffic, contour and many at hand.

2.7. The Intelligent Transport Systems

The Intelligent transport systems are made of functional groups restarting round traffic and the information about vehicle drivers and the progress in private transport and road network, which compose the integral system of intelligent transport systems, This series of branch systems work in decreasing traffic density, managing roads, supply safety and security and the information concerning the travels and those who do them and the separation between public and private transport it includes the following branch systems.

- Advanced systems of traffic management. (ATMS)
- Information system concerning the driver (ARCS)
- Advanced control systems of the vehicle (ATIS)
- Carrying vehicles operation (CVO)
- Advanced transport systems (APTS)
- Advanced outside transport systems (ARTS)

2.8. The Analysis of Hazard Places

Roads and high ways from a vital factor in the line of communities any defect in roads and highways obviously contributed to the death of people decrease of production and acute economic loss, so those accountable for designing, building and maintaining roads and highways are always needed to make them work scientific efficiency. Despite that accident might not outcome from errors in roads specifications in general, but the concentration of accident in one place might be described by tract, there is an issue in the road system detailed studies of accidents records in sites of high accident occurrence below show (the sites of dangerous places).

2.9. The Photographic Analysis of Road Situation in the Sudan

In the following part we are reviewing the photographic analysis of the road network circumstance in the Sudan and the embodiment of the present circumstance to some of the problems of the present roads.

Figure 1. The narrowness of the road with one trajectory where a travel lorry tries to overtake a tractor in Gezera land south of Khartoum the qualification of a good road are lacking where no separating pavements between directions and there is no light.

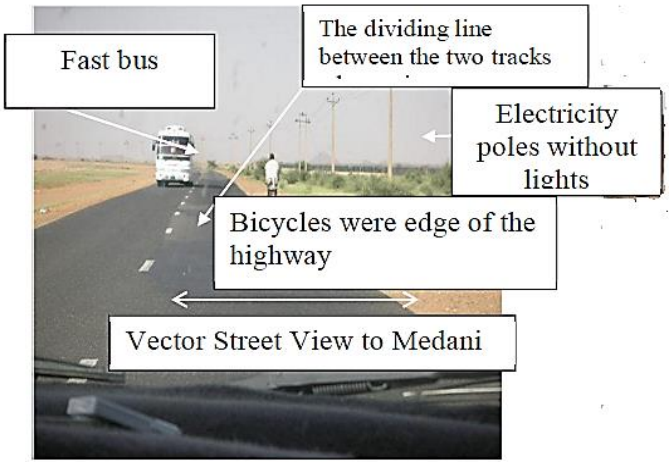

Figure 2. The width of the road and showing the narrowness of the width of the road and shows the separating line without pavements to the trajectories facing each other in direction also it shows that there is no light and no water sewage also the sides of the road are narrow. This picture has been taken from the Khartoum Medani road

Figure 3. The road Khartoum, Atbra suffers also narrowness of the road with on trajectory in each direction also it lack international specifications. (No services, no light, no pavements no mirrors for the curve showing cars coming or going always)

Figure 4. The entry to Elobeid city a road coming from Kosti direction. The road is high above the earth, which causes a lot of accidents and there are no like entries or exits

Figure 5. The problems of Highway that there are no services in the road and that the road is high above the earth for that car is maintained in Highway

Figure 6. There are no lights in Highways and because the car might come upside down it is maintained on the road.

Figure 7. The Accidents in Highway

Figure 8. The issue of sewage in Highway

2.10. The Fast Traffic and Traffic Accidents in the Sudan

Traffic accidents on fast traffic roads have become an issue of dimensions and various features imposing itself via its negative reflections of human and economic reality. It appeared that there is an increase in death rate and in accidents on fast traffic roads and this in return affects people growth in the Sudan table 6 shows that [12]. From the below table we notice that traffic accidents fall in central Sudan Medani, Khartoum road had the highest record of accidents.

Table 6. The Traffic Accidents in the Sudan

Road	Death	Grievously	Slight	Total
Medani - Khartoum	100	129	238	467
Niala – Kass – Zalinje	18	37	20	75
North Artery	13	58	20	89
Jebel Awliaa	26	62	84	172
Elobeid – Kosti	13	6	65	84
Eldoim -	46	63	158	261
Eljaili	26	16	22	64
Kasala – Atbara	63	27	342	432
Medani – Sinnar	17	75	90	182
Challenge Atbara Shendi	10	16	29	55
Medani – Elgadarif	24	62	58	144
WadElnail – Sinja	6	30	25	61
Swakin – Sinkat	15	13	19	47
Elobeid – Eldalanj	7	3	15	25
Doka – Elgadarif	9	2	3	9
Sinkat – Haia – Drdeb	15	13	19	47
Elfula – Elobeid	2	3	12	17
Atbara	49	105	121	275
Total	450	718	1338	2506

2.11. The Traffic Safety in the Sudan Highways

The system lays the speculation of traffic safety to minimize traffic accidents and the fast response to accidents after the occurrence and for the coordination between the departments concerned with traffic safety on [13] quick traffic roads and establishing a geometrical unit for traffic the purpose of which the follow up of roads issue and areas mostly exposed to accidents. The care of traffic education and enlighten from a young age, teaching them low and its application and that there is no person above law also the department for vehicle inspection and complying with technical specifications and the determination of ambulance points on the road and making a special administration for accidents and injuries on roads look at figure 9.

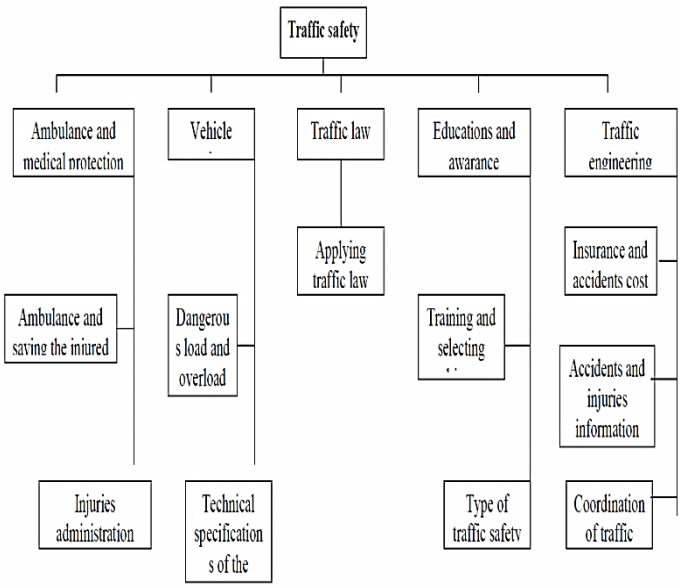

Figure 9. The Traffic Safety System

III. THE APPLICATION FRAMEWORK

In this section, we are discussing the application framework of this paper. The proposed application framework using ARCGis 9.3. The ArcGIS is a geographic information system (GIS) for working with maps and geographic information. It is used for creating and using maps, compiling geographic data, analyzing mapped information, sharing and [14] discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database. In this segment, we are identifying the method and its terms and the topics for using these terms and on this base the first step begins with keeping places information meaning the introduction of computer maps and using light survey researcher. The map is kept as a picture first inside the computer, then it is transform to a number picture the number picture means transform the symbols of the map to a group of coordinate point every point has its vertical and horizontal coordinate [15] it should be noticed when transform the map is a digital map that it's supported by astronomical coordinates original points called judgment points to which the coordinates of the points of all the map are attributed after that begins the first stage, the stage of preparation in which layer are prepared and information base in a branch programmer called are catalog in which georeferencing is done and the layers reprinting cartographic symbols. The Georeferencing [16] is done depending on geographical system used known as UTM which depends on the last coordinates taken known as WGS 84. The basic map includes many symbols of various geographical phenomena points linear and areal. But does not accept keeping place data in this complex form so every separate phenomenon goes into detail and is called a layer and the main purpose of separating every phenomenon in a separate layer is that the establishes a special table for every point including its basic data is the layer should not include more than one phenomenon because areal phenomena differ from inter and point phenomena figure 10 georeferencing of the basic map grants. Firstly, all the points of the digital map are attributed to the proper points in the Sudan. Secondly the symbols of map phenomena are placed properly to each other. Thirdly, there are fixed points depended on overlaying between layers.

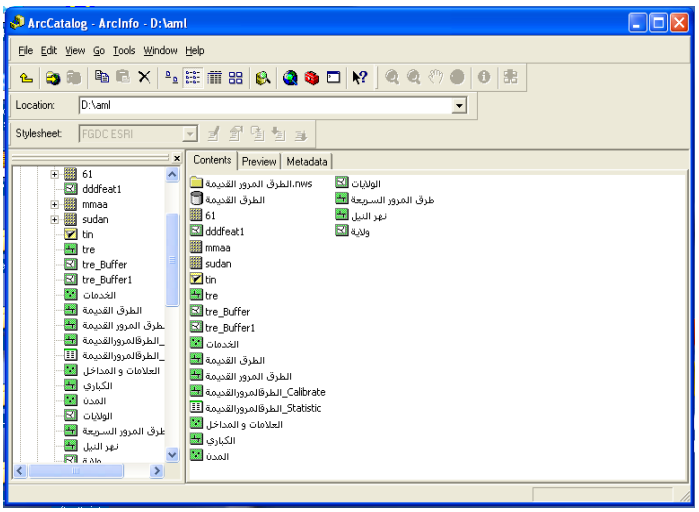

Figure 10. The Preparation in Arc Catalog

The second step in preparing a data base attached to every layer is prepared and we mentioned in the first step. When preparing the layers a table, including the basic data is established it is place data for every layer (place and form of the phenomenon) and this does not happen alone the characters of the geographical phenomenon, but it should be completed by the data concerning the phenomenon fields are added according to the data special to every layer devoid of records. The second stage begins with transformation all layers with the data base connected with every layer and the basic map to the (arc map) to open all these layers in all their forms (symbols) with the first step inside. The (arc map) to do in this context first step, making the engineering correction, then the second step begins concerning enumerating which is changing the map to digital form enabling the system to work with it. In this stage previous should be made and that is for accrediting place analysis process on it. Afterwards, the third step in putting down the description data of every layer in this from the map becomes processed with the description on it look at figure 11 concerning it down.

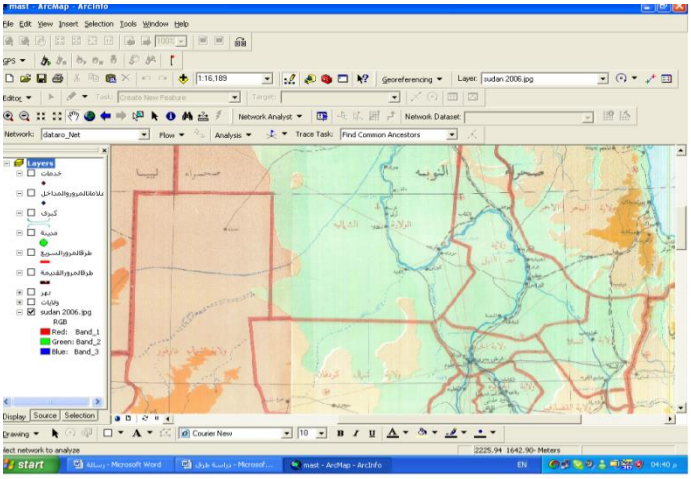

Figure 11. The Base Map and Layer in Arc Map

3.1. The Proposed System

The system uses geographical data technology in reflecting the present status of roads and the capacity of these roads for traffic and the design of quick roads and increasing roads in this country and the connection to the national network. The system will show services place on the roads and the strategy of services, distribution and the follow up on the first stage of planning. Afterwards preparing the data and layers base depending on scientific criteria put to be base in designing quick traffic roads. This stage begins with fixing the layers of the base map and the first step is putting down the control points. We are chosen four points consecutively (25,20), (30,20),(30,10), (35, 10) appearing in figure 12 the figure shows the value of vertical coordinate (y map) and the horizontal coordinate (x map) all points are considered as exacting points to all digital linear and a real phenomenon so it separators phenomenon from each other.

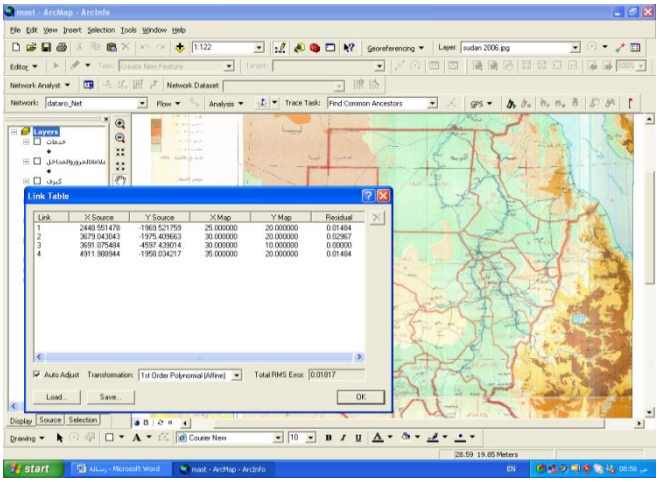

Figure 12. The Control Points

After that begins the work of a number of all layers and writing the data concerning it in the data base figure number 13 shows the layers prepared.

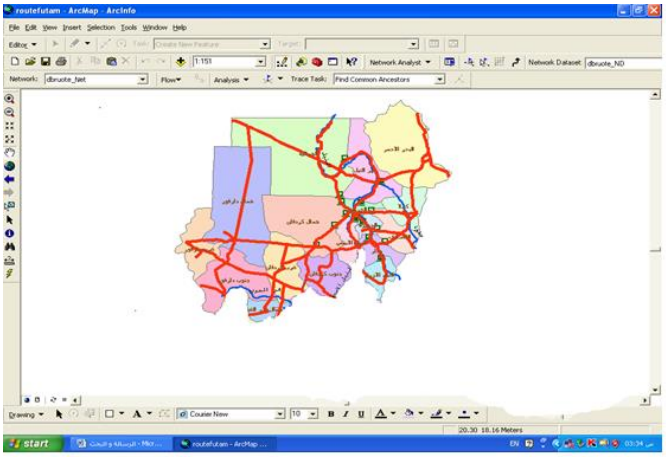

Figure 13. The Layers Preparation

The first stage is finished after finishing the data of all layers and the second stage begins it the stage of layers integration with each other or putting them together according to the type of layer example what are bad roads.

3.2. The Procedure for Traffic Safety System

The traffic safety system is one of the important systems for its direct relation to the life and safety of the citizen during transfer him on the road, whether walking or riding the system puts the stipulations and the band that kind vehicle owners and their drivers minimizing [17]. The losses and the damage outcome from driving cars on high-speed roads to the minims rate. The more the system is binding the more bodily and material injury, which occurs to another, is minimized as a result of careless driving or not complying with controls on driving on high-speed roads.

As we mentioned the main objective of the system of minimizing accidents and making traffic on roads easier and more secure at all times so it was a must to establish a computer system linked to watching cameras on quick roads. Every road is covered by 15 cameras, ten of which are fixed 15 are mobile (entering and getting cars) all vehicles entering and getting out are recorded. All data is recorded (speed, signs, load, and control of driving). By means of the fixed cameras. The vehicle making the accidents is picked the following data is recorded vehicle number, name of the owner place of the accident type of car, type of accidents value by accident. The number of the cameras photographing the accident, the condition of the ace vehicle, name of the road in the central unit directing the car making the accidents by police rounds found on the road through VMS to warn the driver also RDF is used to warn and direct drivers. When an accident occurs first its place is located on the map and locating the place co-ordinates via the cameras photographing the accidents and reporting to the nearest police rounds and the nearest ambulance to save the injured and transferring

them to the nearest medical unit. The police round records the data of the accident which license number, type of accident, type of injury. The causes of injury, insurance number, type of insurance place of the accident, vehicle number [18]. These data are introduced in the central unit through the screen prepared shown in figure 14 for cameras on high-speed roads and figure number 15 shows accident screen.

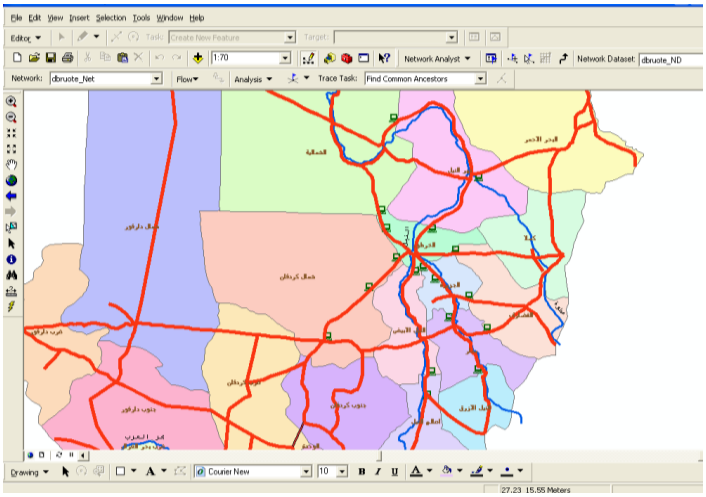

Figure 14. The Distribution of Cameras in Traffic Safety System in Highways

Figure 15. The Accidents Screen

In this scenario, accidents are entered in the central unit connected to the cameras on quick roads to report accidents and to alarm and direct users. The general police department puts the laws that protect road user and grant traffic safety in quick rods on some of the authorized and the factors affecting travel. The lenience inspector responsible for the follow up licenses in traffic general department. Truck inspector and traffic inspector to determine truck places on quick roads and the times of trunks entry to high-speed roads. In the examine the public department employs him to examine the vehicles on the road and their fitness according to the law and rules. The police round trip and they are the round working on high-speed roads.

Figure 15. The Cameras Screens

Thereafter traffic inspector has to determine travel lines and the public vehicles in and outside towns and villages and the number traveling each line (types and travel lines) the number of stations their places and time to work on them the travel fair, number of travelers allowed to be transferred to watching system. Using the cameras help in exacting traffic on quick roads watching are entered through camera screens connected to the central unit. The cameras are distributed in the road, according to the road's importance and the volume of traffic in it. Every road is covered by 10 to 15 cameras some fixed and some mobile to grant continual which on all quick roads, directing and alarming drivers on high speed roads.

Figure 16. The Accidents Camera

As the law has put special articles, concerning road accidents in the case of accidents occurrence like helping the injured and accompanying him to the nearest hospital accidents data are enacted through accidents screens connected to the data central unit. A data system of injuries is useful in going information about traffic accidents and the victims participating in the accident. There data information has an important value on which traffic safety strategy is built and the quick response to the occurrence of an accident is important for saving the injured. Time to reach the accidents place should be from 8 to 10 minutes compared to a time of response of three hours now to reach the place of the accident. The response of the saving of the injured accidents is an unsatisfactory level so there is a need for improvement, determining priorities and control of injuries closing the suitable hospital are important in traffic safety. But the observation which should be cared for is the difficulty of finding a hospital suitable for the injured where medical services should be granted including emergency treatment through public and private hospitals. And there is a problem in selecting the hospital, especially those whom their work place chooses the medical service place for them either through medical insurance or shoamak insurance, which specify certain hospitals for treatment as they have to go to the nearest hospital then they are transferred after being received in the and specifying the extent of injury danger.

The strategy plans of traffic it has appeared that there are no comprehensive strategic plans for controlling safety on quick roads, but there are continual plans subject to amending and review in the periodical meetings and that there is no data base available about accidents and injuries that enables creating a system built upon an database. So an engineering unit for traffic should be established to follow up road problems and the places most exposed to accidents and the care for traffic education and awareness from a young age and teaching the law and applying it and that there is no one above the law rule. The department of traffic engineering inspects vehicles and they're complying with technical specifications and determining ambulance points on the road and establish a specialized department for accidents and injuries in Highways. Traffic safety can be summed up as follows

1) Making double roads
2) Making new roads
3) Making free roads
4) Ensuring traffic safety
5) Establishing accidents data base
6) Information awareness

IV. MODELS OF HIGH-SPEED ROADS DESIGNING PLAN

In this section, we are reviewing plans for designs various services which are as follows.
It's possible to use the tool of analysis (Hyperlink) by tapping the map to give a view of the shape of quick traffic roads inside and outside towns, the shape of the signs [19] the limiting of speed, entrance to states [20] which would be shown in the below figure.

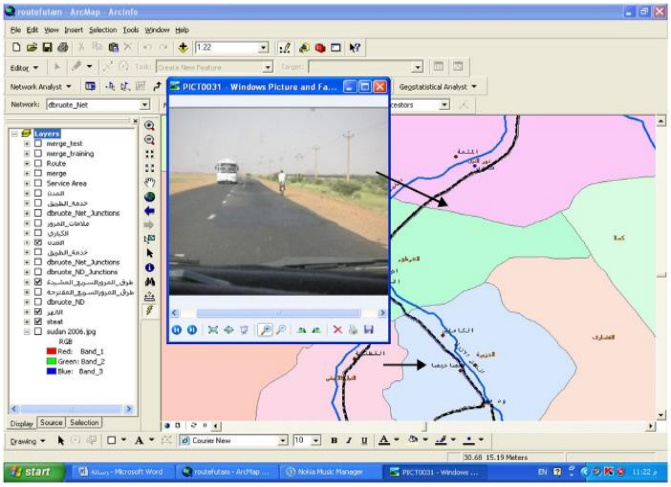

Figure 17. Entering the Present Status of the Road

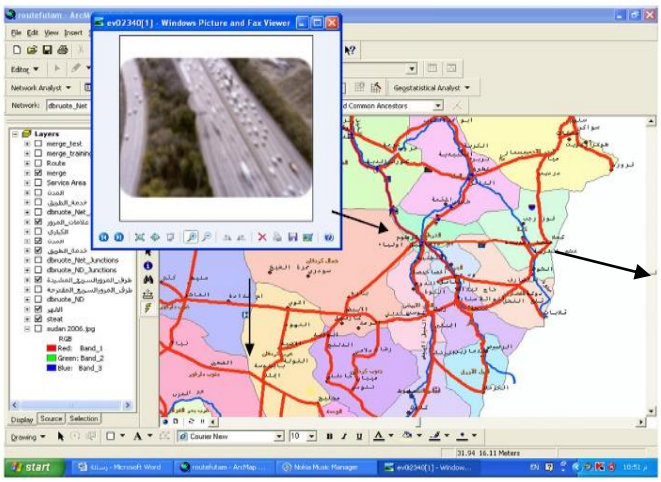

Figure 18. The Proposed System of High-Speed Roads in Eastern area

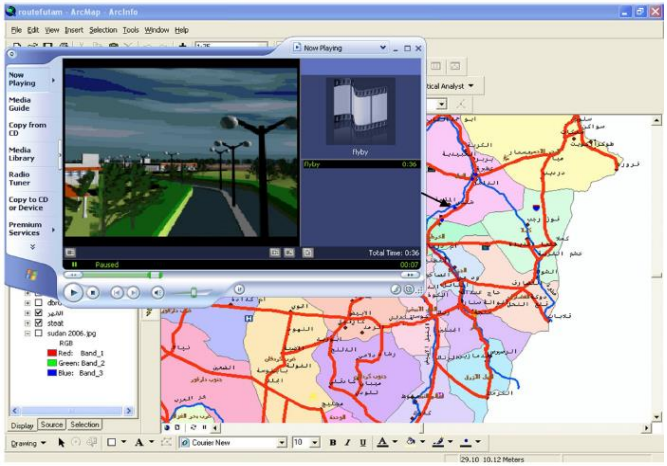

Figure 19. The Proposed System for Linking Central Sudan

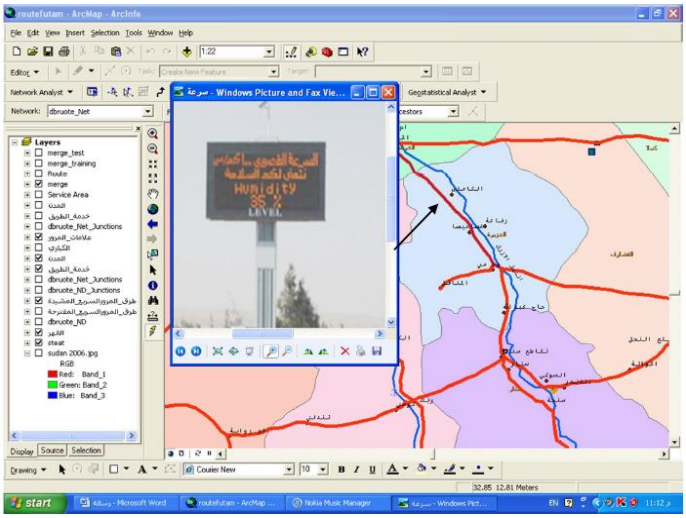

Figure 22. The Limits of Speed on High-Speed Traffic Road

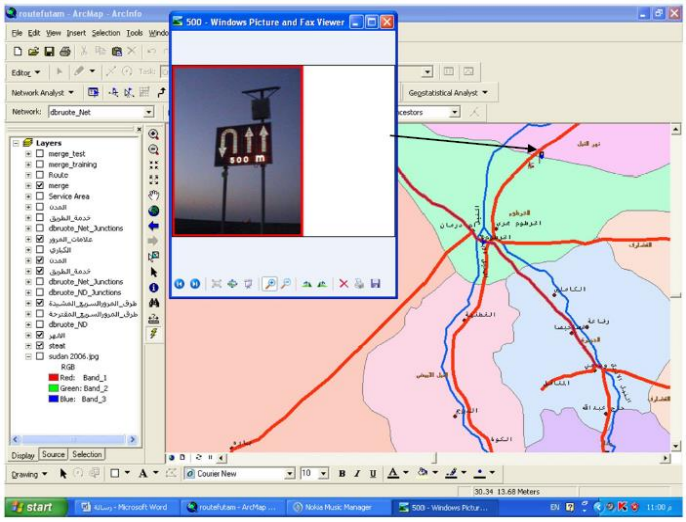

Figure 20. Designing Traffic Signs in Northern Area Tahini Road

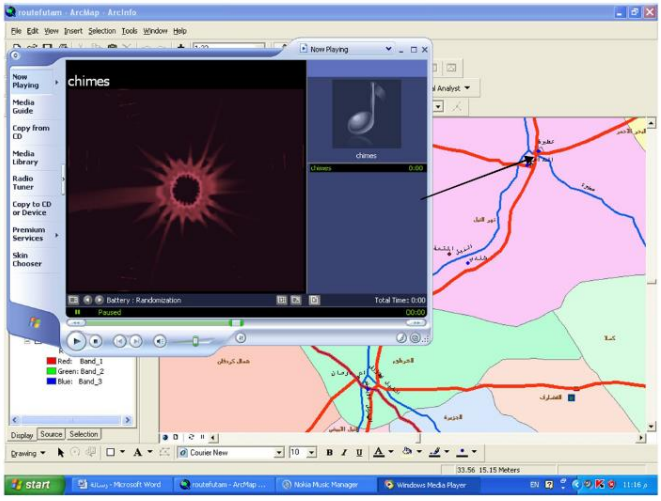

Figure 23. The Sound Alarm when there is Danger on the Road

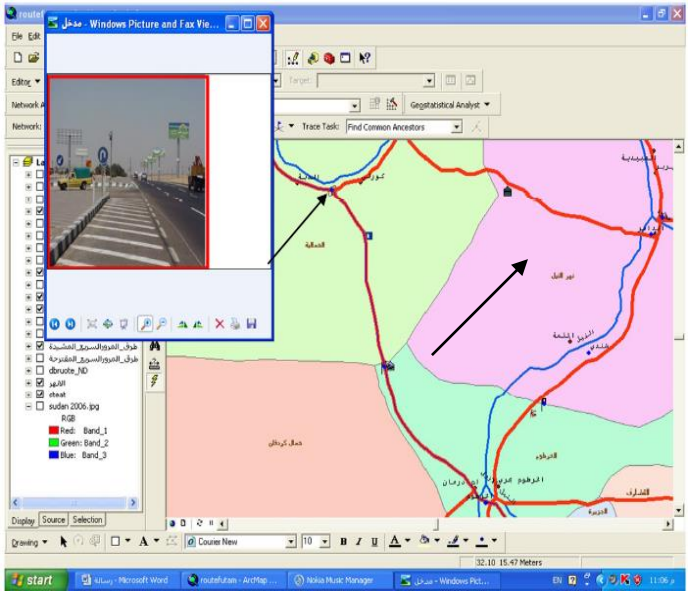

Figure 21. The Traffic Signs on High-Speed Traffic Road

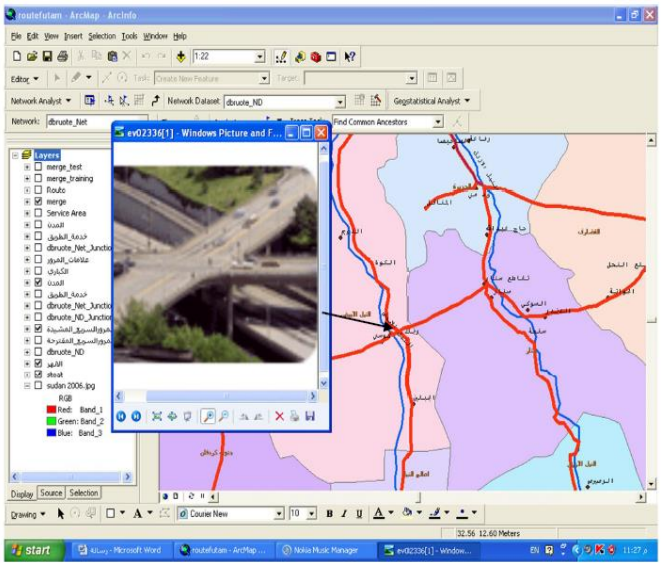

Figure 24. The Cross Roads on High-Speed Traffic Road

Figure 25. The Report about the Condition and Place of the Affected

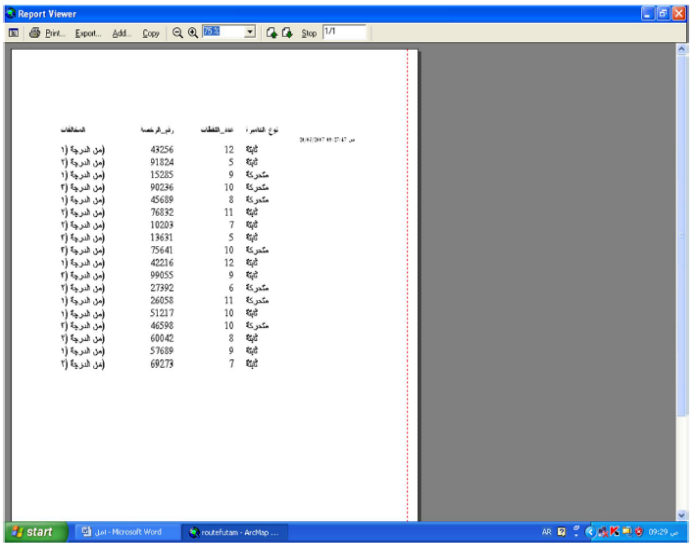

Figure 26. The Report about the Camera Photographing the Accident

V. CONCLUSION

For the last several decades, many of these intelligent transport systems, programs have been targeted at making better safety and reducing congestion. The Intelligent transportation systems are applications of advanced sensor, computer electronics and communication technologies which, without embodying intelligence as like, purpose to provide innovative services relating to various modes of transport and enable different users to be better informed and make safer, more coordinated, and smarter use of transport networks. The ITS applications include telematics and all types of communications in vehicles, between vehicles, for example vehicle-to-vehicle, and between vehicles and fixed locations for example vehicle-to-infrastructure. The area of roads forms the backbone of traffic and transport in the world which need it complying with the international specifications in the area and passes separation establishing circular roads avoiding cross roads which helps make traffic convenient and decreasing accidents. Road lighting contributes in minimizing accidents and driver does need to use the bridge lights. On establishing a road engineering side should be noticed by coordination with specialized department international traffic signs should be fixed which helps the driver road the road which minimizes the rate of accidents. Eventually, this paper describes the modern context or the urban transportation systems and the present day aspect of Intelligent Transportation Systems, highlighting the Sudan case.

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