ENGINEERING

ISSN (Print): 24490954
ISSN (Online): 26364972

DESIGN ANALYSIS OF SATELLITE- BASED MONITORING AND CONTROL OF ROAD TRAFFIC IN IFAKO-IJAIYE LOCAL GOVERNMENT AREA OF LAGOS IN NIGERIA

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Manuscript Received:14/04/2020 Accepted:12/11/2020 Published: March, 2021

ABSTRACT

Over the years, traffic has always been a major problem in urban cities. Various traffic control methods have been in existence such as odd and even, traffic light deployment; however, these methods have not been effective. Accordingly, this research work considers the design of an efficient and effective traffic control system to ease the flow of vehicles in traffic congested areas in urban cities. Using the satellite based monitoring system, the Traffic Management Centre (TMC) has the ability to view the entire area thereby creating a means by which alternative routes to traffic congested areas can be determined as fast as possible. Results obtained have shown that the use of satellite based monitoring system for controlling road traffic is very reliable with up to about 95% confidence limit. Also, the study revealed that the collection of valid and valuable traffic information by means of satellite is feasible from a technical point of view, even in built-up areas.

Keywords: *Traffic management centre, satellite based monitoring system, road traffic,*

INTRODUCTION.

The everyday experience of traffic congestion on public roads especially in the urban areas has become a problematic issue as road users' swarm through the traffic (Rabbouch, *et. al.,* 2017). On one side, it has been poor transport safety and inefficiency, leading to increase in lateness to work place, loss of lives in traffic, and combustion of fuel (Rabbouch, *et. al.,* 2017). On the other side, traffic congestion has led to an increase in noise pollution, and fatigue due to unpleasant ride. This has been the normal traffic situation in urban areas, while governmental and non-governmental agencies are left to battle with the ideas to manage it, but no remedial strategy has information upon which they rely (Rabbouch, *et. al.,* 2017).

The use of a primitive way of controlling road traffic in a developing country like Nigeria especially in a mega city like Lagos is becoming rampant, where metropolitan police are placed at road junctions to give traffic instructions and control congestion or by giving priority to high occupancy vehicle. This system has no doubt been observed ineffective in a way that a preemption view of road congestion cannot be observed as long as the road user is not at the exact point of congestion.

Congestion on public road networks has become a growing problem in many countries including Nigeria, but authorities such as the Nigeria Federal Road Safety Commission (FRSC), and the Lagos State Road Transport Management Agency (LASTMA) has been combating with likely solutions, but no remedial strategy has been made. Consequently, these agencies need information that is accurate, reliable, timely and complete while road users also need good quality traffic information in order to plan and adjust their routes.

As a result of the dissatisfaction with the present states of traffic congestion on Lagos state roads, this research thoroughly analyzes and quantifies a new approach to quality control of road traffic. Specifically, this work proposes road traffic monitoring by satellite (RTMS). In particular, RTMS is a satellite application which monitors traffic situation with an on-board equipment along with a mobile satellite communication, an in-car unit to report information about its position, speed on the road on which it is traveling. With this technology, traffic preemption can be observed and alternative routes can be made available to the client on request.

RTMS incorporates the use of global navigation satellite system (GNSS) like the GPS and it can be used to manage more effectively, the growing traffic congestion on Lagos roads, where road traffic management, provision of up-to-date, accurate and detailed quantitative information on traffic movement is essential. This construe idea, if adopted, provides coverage over large areas, including regions not covered by GSM, GPRS or UMTS. It can also have cost advantages, provided the system design is optimized for the specific nature of vehicle.

MATERIALS AND METHODS

The scope of this study involves the use of an already launched satellite namely TerraSAR-X along with other related earth devices to analyze, control and reduce road traffic congestion in a local government of Lagos state. The primary source of data involves the actual field survey using a GPS device in Ifako-Ijaiye local government. The data was collected, evaluated, and then analyzed.

The secondary data was obtained from various documentary sources. The Ifako-Ijaiye local government information department, Lagos state transport management agency (LASTMA), Olabisi Onabanjo University library, Covenant University library, International network (internet), also from bibliographical searches on related literature on satellite study. This includes textbooks, published and unpublished materials.

Study Area

Ifako Ijaye local government is a member of the 20-local governments owned by Lagos state. It was established out of old Agege local government in 1996 during General Sanni Abacha's administration, the then military Head of state to Nigeria. Predominantly, the original early settlers of the four major towns (Ojokoro, Obawole, Ifako, and Iju) are direct descendants of the Egbas, where they used as their farm-land. Most of them lived at Agege, Mushin, Ikeja and even Ota in Ogun state. In the advent of rapid development during the oil boom days, when people started looking for land to build their houses, farmlands started giving way to residential and industrial houses. Ifako Ijaiye local government is bounded in the west by Alimosho local government, east by Ikeja, south by Agege and north by Ifo and Ado/Odo Ota (Ogun State).

According to the last census conducted by the federal government in 2006, Ifako-Ijaiye is inhabited with 300,000 inhabitant admist are the old, young, male and female.

With its location in the tropics, Ifako Ijiaye Local government area has tropical climate conditions with two distinct seasons namely the rainy and the dry season. The climate is influenced by two types of winds, the south-west monsoon wind or tropical maritime Air mass. The later wind brings about the dry season from November to March. The area enjoys abundant rainfall almost throughout the year. Rainfall average is about 175cm annually. The temperature and humidity are generally high throughout the year. Figure 1 shows the geographical map of Ifako Ijaiye.

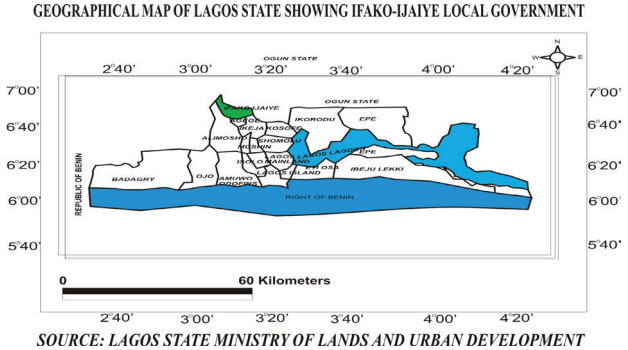
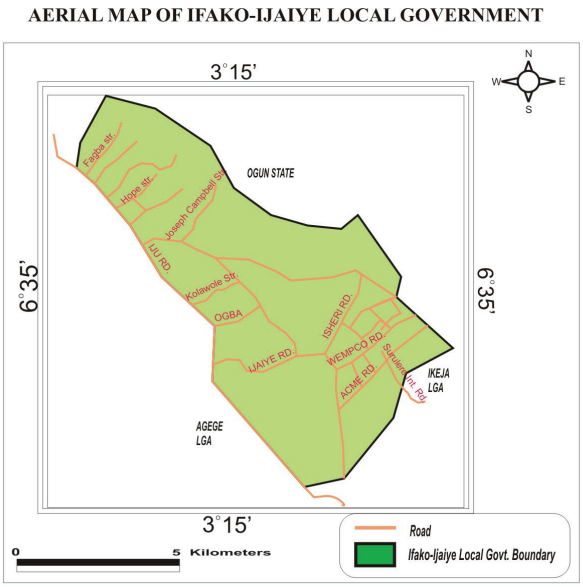


Fig. 1: Geographical Map of Ifako-Ijaiye local government area

Road Network of the Study Area

The development in the socio-economic factors in the study area as led to the discovery of many minor roads linking users' place of work, government establishment amongst others. The present road network as shown in the Lagos state ministry of lands and urban development is shown in Figure 2.



SOURCE: LAGOS STATE MINISTRY OF LANDS AMD URBAN DEVELOPMENT

Fig 2: Map of Ifako-Ijaiye showing road networks

Overview of Road Traffic in the Study Area

As traffic congestion has become an increasing problem in Lagos cities and suburbs like Ifako Ijaiye local government, duelers spend more of their time commuting to work, school, shopping, and social events, as well as dealing with traffic jams and accidents. Driving on roads in this area has been an unpleasant situation for road users. Traffic in areas such as the Acme Ogba road, down to Iju road linking Fagba bus stop has always been chaotic during the day and worse towards the evening period, and any hope of reduced congestion in the suburbs had not been realized; long commutes and traffic jams could be found everywhere.

Since GPS technology can pinpoint any object in the earth from the satellite, it can be used to view moving vehicles on the ground, if this is true, then a user can have a preemption over view of traffic in the study area and in Lagos city at large.

Traffic Congestion

Traffic is the collection of moving vehicles, while Traffic congestion is a condition on road networks that occurs as user increases, and is characterized by slower speeds, longer trip times, and increased queuing. The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, congestion is incurred. As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a traffic jam (Harrou, et. al., 2020)

Design Analysis

This section considers the design analysis of the proposed system. This involves the estimation of traffic flow and traffic volume derived from a fixed sensor (inductive loop vehicle detector). Each of the components that make up the system design is analyzed to ensure a cost-effective solution is adopted. The proposed design consists of only six components performing vital functions in the monitoring and control of road traffic as shown in Figure 3.

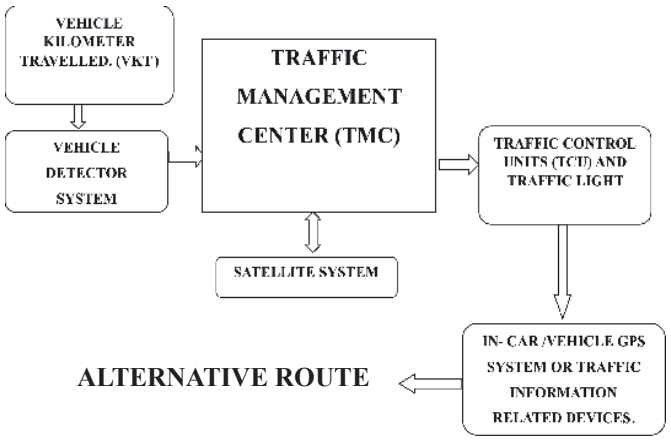


Fig. 3: Design layout of proposed road traffic control system.

Effectively, the vehicle detector (inductive loop type) is buried on the traffic lane to be monitored. The inductive loop is set to trigger with an attached indicator only when it senses any vehicle on such traffic lane whose speed of travel is less than an already set vehicle kilometer travelled (VKT). As the detector is monitored at the traffic management center (TMC), the TMC then sends a request to the RADAR SAT in space to check the road and view alternative routes to such road. As the satellite directive is received in real time, the TMC sends the directive to the traffic control unit (TCU) to direct some vehicles which are GPS or navigational device enabled to an alternative route. For economic viability, either a CCTV or a vehicle detector can be used and not both. With this system and arrangement, a real-time directive must be sent to road users for easy movement and to reduce road travel time (Kurniawan, et. al., 2018). The analysis of each component is discussed below:

The Traffic Volume -Vehicle Kilometer Travelled (VKT)

The vehicle kilometer refers to the distance travelled by the vehicles on roads. It is often defined as an indication of traffic pressure and is generally used to indicate mobility patterns and travel trends. It plays a key role in this study as it helps the sensor in the time

to trigger. For instance, when a vehicle detector is set to trigger at a specified range of vehicle speed, say from 0km/sec to like 40km/sec, this indicate that until our VKT is less than 40km/sec the sensor will not trigger. Also, when triggering occurs, this means that VKT is less than 40km and it's an indication of congestion (Leduc, 2008).

Vehicle Detector (An Inductive Loop Type).

An inductive loop vehicle detector system consists of three components: a loop (a saw tooth) loop extension cable, and a detector. It must be noted that when installing or repairing an inductive loop system the smallest details can mean the difference between reliable detection and an intermittent detection of vehicles. An inductive loop vehicle detector is shown in Figure 4.

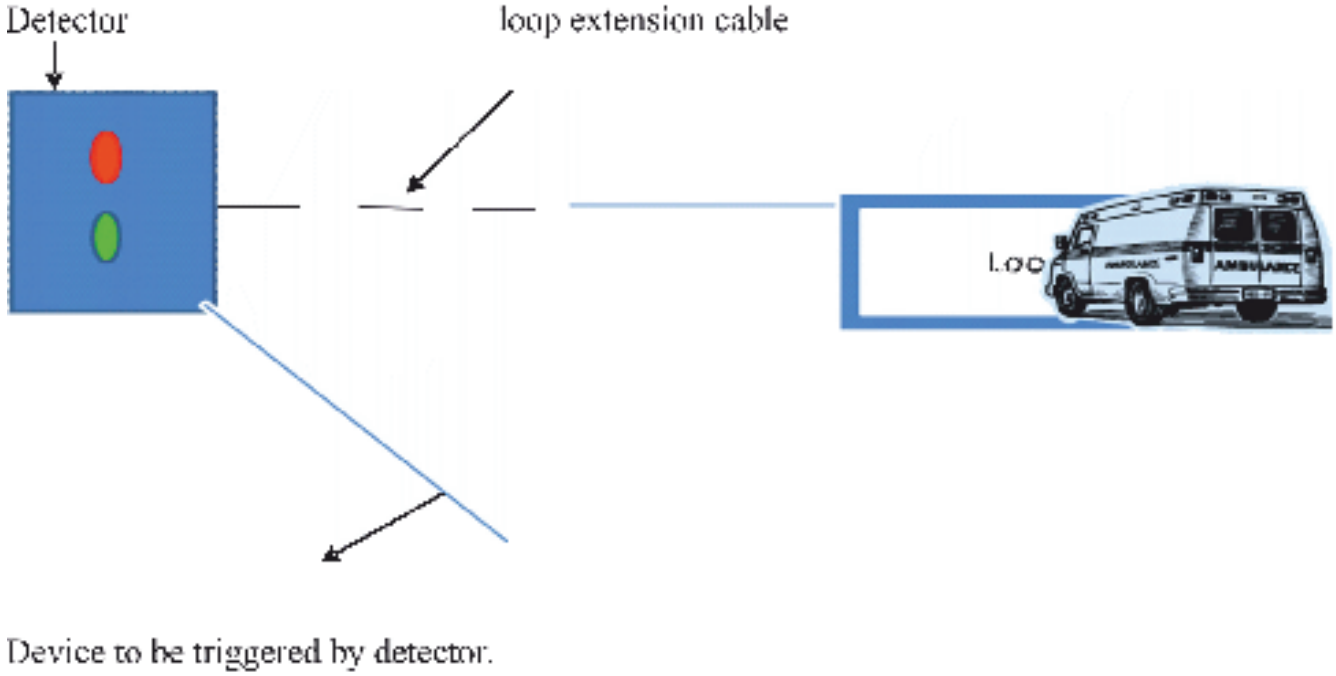
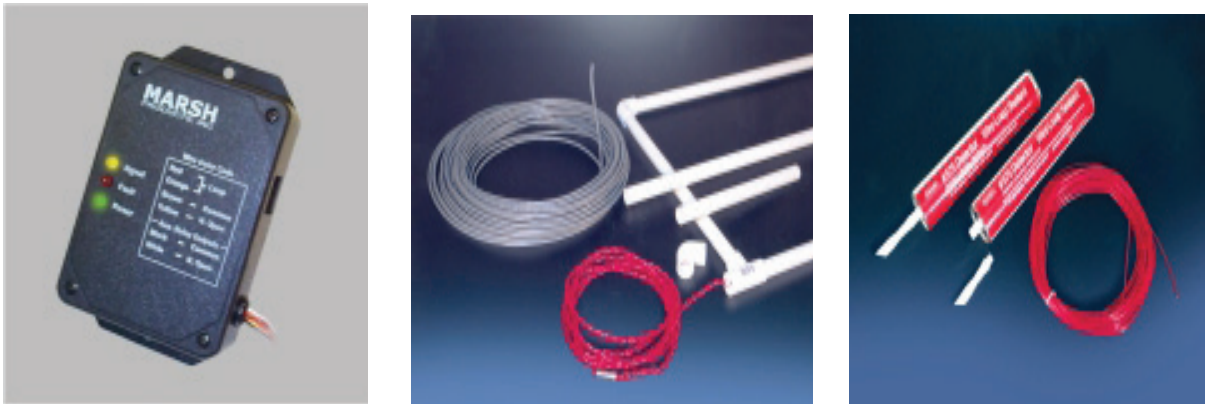


Fig.4: an inductive –loop vehicle detector

The preformed or saw-cut loop is buried in the traffic lane. The loop is a continuous run of wire that enters and exits from the same point. The two ends of the loop wire are connected to the loops extension cable, which in turn connects to the vehicle detector. The detector powers the loops causing a magnetic field in the loop area. The loop resonates at a constant frequency that the detector monitors. A base frequency is established when there is no vehicle over the loop, when a large metal object such as a vehicle, moves over the loop, the resonant frequency increases. The increase in frequency is sensed, and depending on the design of the detector, forces a normally open relay to close. The relay will remain closed until the vehicle leaves the loop and the base frequency is established. The relay can trigger as any number of devices as an audio intercom system, a gate or a traffic light.

In general, a compact car will cause a greater increase in frequency than a full-size car or truck. It must be noted that frequency change is greater with smaller cars. This occur because the metal surface on the under-car carriage of the vehicle are close to the loop. Figure 5 shows the different type of loop detector.



(a) **(b)** **(c)**

Fig. 5: Shows: (a) the inductive loop detector, (b) a preformed loop (c) and saw-cut loop.

Vehicle Detector Sensitivity.

Most vehicle detectors have adjustable settings for sensitivity. If the detector is missing in vehicles, then the sensitivity is set too low. If the detector is jumpy or is creating false detections, it may be set too sensitive. However, all inductive loop detectors are dealing with the same physical characteristics of a magnetic field in a loop. The maximum height of detection is roughly 2/3 the length of the short side of the loop. For example, for a loop that is 18"x 60", the maximum height of detection is 12" from the loop. Most manufacturers have managed to push the height of detection to the full length of the short side; however, it is observed that it is not reliable. An inductor loop vehicle detector connection process is shown in Figure 6.

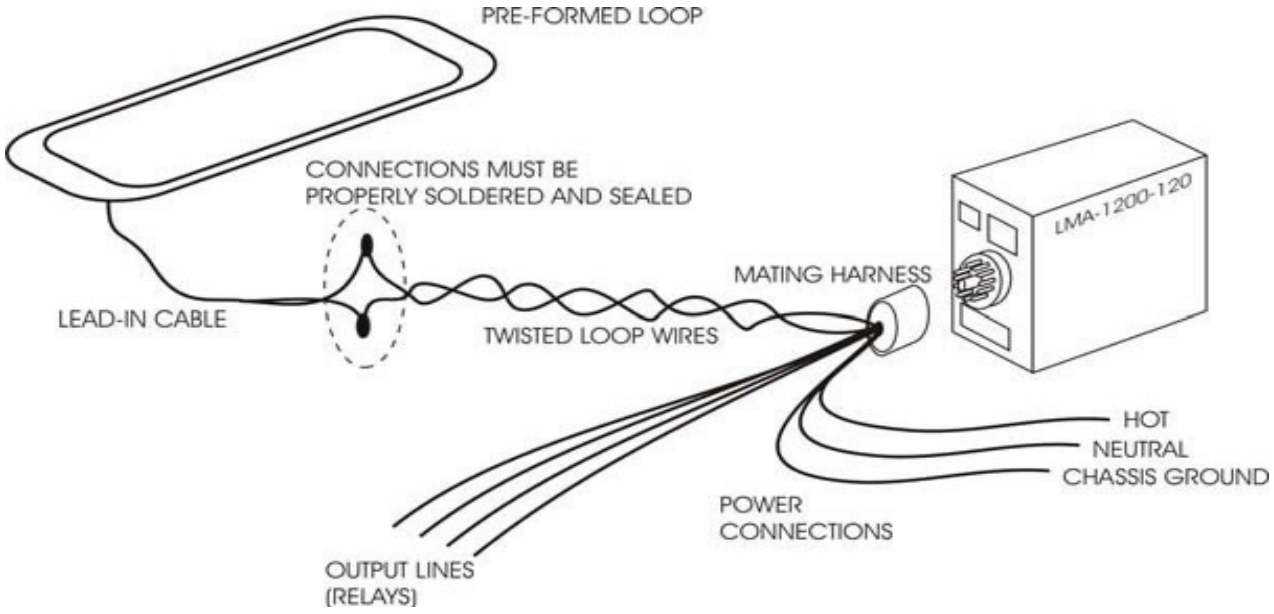


Fig. 6: An inductive loop vehicle detector connection process

To achieve a suitable installation, the following must be noted:

Use a preformed loop before pavement is installed.
Use a saw-cut loop when pavement has already been installed.
The loop should be buried no more than 2" below the asphalt or concrete surface.
Replace any loop wire that has nicks or splices in the insulation
Loop wire should be 14 or 16 AWG machine tool wire with XLPE insulation
Loops should be no less than three turns and no greater than five.
The number of turns increases stability of the signal over long runs between the loop and detector.
The number of turns does not affect sensitivity
Extension cable should be 14, 16, or 18 AWG twisted/shielded 2-conductor cable with Polyethylene jacket.
The wires that lead into the loop must be twisted a minimum of five turns per foot.
The maximum height of detection is roughly 2/3 the length of the short side of the loop
Connections to the detector, the loop and the extension cable should be soldered.
The frequency decreases as the temperature of the loop increases
The frequency increases as the temperature of the detector increases.

The Traffic Management Centre.

This centre is the hub of the transportation management system where information about transportation network is collected with other operations, and manages the network to produce travelers' information.
In this design, this unit receives the triggering sensing of the installed inductive loop vehicle detector embedded on roads, and then accesses a named satellite in space to view the road and search for other alternative route to the road users on such road. The directive from the satellite is then sent to the traffic control unit to carry out the operation. The body concerned with this in Lagos State should be the LASMA, and at the federal level is the FRSC (Federal Road Safety Commission). The following are some other basic functions of traffic management centre:

Records and Manages Traffic Congestion: This involves identifying and responding to recurring congestion, resulting from peak travel periods as well as non-recurring congestion associated with incidents.

Records and Manages Traffic flow: This involves implementing appropriate traffic timing plans to optimize a smooth traffic flow and respond to signal malfunction reports.

Monitoring Emergency: This involves verifying and responding to request for roadside assistance.

Manages Traffic Incidents: This involves detection, verification, response and clearance of events such as accidents, vehicle breakdowns and accident resulting from bad roads, debris or weather condition. Other functions include; recording traffic management failure, and traffic signal systems.

Satellite

Due to increasing traffic congestion, vehicle detection and traffic parameters, estimation has become an important issue; thus, it is important to do a careful study in the selection of satellite to be used for this design. The satellite resolution, its effectiveness and efficiency as it affects its production of images must be considered.

To derive information of the traffic situation on road networks, an observation of large areas, preferably at any time, is necessary. Space borne SAR missions can be a solution for this aim. TerraSAR-X and RADARSAT-2 provide high resolution dual-channel SAR data hence, a possibility to collect traffic measurements of large areas (TerraSAR-X satellite, 2018).

The TerraSAR-X was the first radar satellite equipped with a "Dual Receive Antenna Mode" (DRA-Mode) which allows for the recording of two radar channels with a short time lag. One channel is dedicated to the front antenna and the other one to the rear antenna half. Such multi-channel systems are an important prerequisite for the detection of moving objects in the SAR data (TerraSAR-X satellite, 2018). For this reason,

TerraSAR-X will be specified for this design.

TerraSAR-X is a German earth observation satellite, launched on June 15, 2007 and has been in operation service since January 2008. It has an active array X-band SAR, antenna (wavelength 31mm, frequency 9.6GHz). TerraSAR-X acquires new high quality radar images of the entire planet while circling the Earth in a polar orbit at 514km altitude. This orbit is selected such that the satellite flies in a sun-synchronous which means that it moves along the day-night bounding of the earth conditions and always presents the same face to the sun, ensuring an optimum energy supply via the solar cells (TerraSAR-X satellite, 2018).

Traffic Control Unit

This is either a police unit created primarily for the purpose of overseeing and enforcing traffic safety compliance on roads and highways. Such bodies include the Lagos State Traffic Management Authority ("zone 12" is the closest to this study area) FRSC, VIO (vehicle inspection officer), they also perform the following functions:

Traffic Enforcement: enforcing laws and regulations intended to improve traffic safety such as speed limits. Emergency response: securing the scene of a traffic accident by using cones and flares as well as providing first aid to the injured.

Accident Investigation: pattering evidences to determine the cause of roadside accidents.

General Law enforcement: assisting local police, especially in rural areas and keeping an eye out for non-traffic violations.

Maintenance observing and Report damage to the roadways and conducting hasty road surveys after disasters of the passage of increment weather.

The GPS System (LASER XQL MODEL)

The Global Positioning System (GPS) is a U.S. space-based Global Navigation System. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth which has an unobstructed view of four or more GPS satellites. GPS is made up of three segments: Space, Control and User. The Space Segment is composed of 24 to 32 satellites in Medium Earth Orbit and also includes the boosters required to launch them into orbit. The Control Segment is composed of a Master Control Station, an Alternate Master Control Station, and a host of dedicated and shared Ground Antennas and Monitor Stations. The User Segment is composed of hundreds of thousands of U.S. and allied military users of the secure GPS Precise Positioning Service, and tens of millions of civil, commercial and scientific users of the Standard Positioning Service (see GPS navigation device) GPS satellites broadcast signals from space that GPS receivers use to provide three-dimensional location (latitude, longitude, and altitude) plus precise time.

The GPS system when in operation gives geographical map information of the user's location and the neighboring street names, alternative route to users' location and other necessary navigational information. It must be operated outdoor for proper accuracy.

Many civilian applications benefit from GPS signals, using one or more of three basic components of the GPS: absolute location, relative movement, and time transfer.

The ability to determine the receiver's absolute location allows GPS receivers to perform as a surveying tool or as an aid to navigation. The capacity to determine relative movement enables a receiver to calculate local velocity and orientation, useful in vessels or observations of the Earth. Being able to synchronize clocks to exacting standards enables time transfer, which is critical in large communication and observation systems.

Below is the GPS model system information used.

- ROM version: 7B82C.YF.F.3.25
- Software version: V30.0.9.11
  - ► OEM Info: Custom Information
  - ► Platform ID :5946504E44383243
  - ► Device ID : 2D89DDA2010008BC
  - ► SD card ID : 1930625172

The GPS used in this study is a LASER XQL model for Navigating around the study area to get the latitude, longitude, and altitude of different points in the local government. Figure 7 shows the flow chat algorithm of the proposed design.

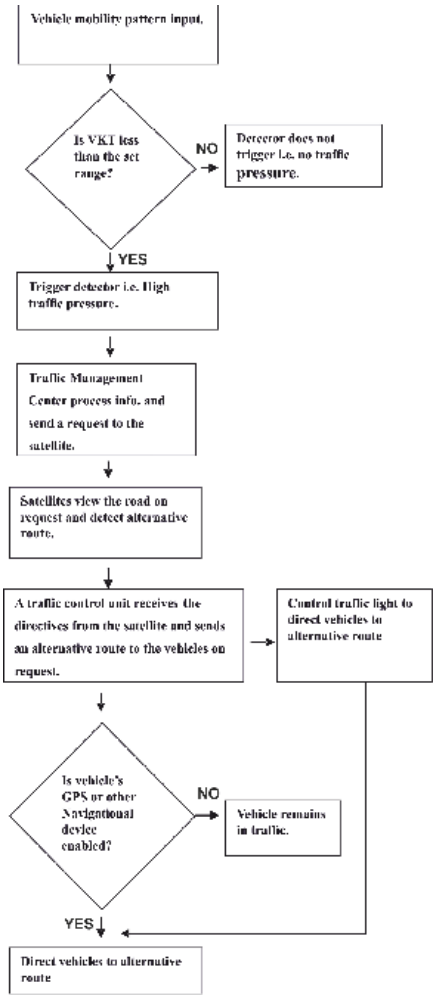


Fig.7: Flow chat Algorithm for the proposed design

RESULTS AND DISCUSSION

This section discusses the results obtained through the testing of the proposed design.Ifako –Ijaiye Road Network with Their Way Points.

The GPS device was used to navigate the study area. The Procedure of GPS operation during the field work includes:

- Press the power button and wait for about 2min for GPS to boot.
- Go to "GPS" (Vehicle Icon)
- Click on "Manage"
- Click on "Track Log"
- Click on "Record" at the lower part of the screen.
- After recording, click on "stop recording".

Table 1 shows the order of the waypoint data that can be found in the appendix. These data are collected on the Ifako-ijaiye roads using the GPS receiver to get the geographical position information of the chosen points especially those susceptible to traffic congestion. These data are shown in the appendix.

Table 1: The study area road names, waypoints and their alternative routes.

ROAD NAMES.	ALTERNATIVE ROUTES.	WAY POINTS.
OLANIYI STREET	Babs Ogunwole Str, Charity Road, Babs Ladipo Olanrokun Str. Olayiwola Str.	001-150
FAGBA JUNCTION	Jonathan Coker Road.	151-300
IJU ROAD	Ogba Ijaiye Road, College Road.	301-450
CHARITY ROAD	Social club Road, Agege Motor Way, Abule Egba.	451-600
OLAYIWOLA STREET	Charity Road, Babs Ogunwole Str. Olaniyi Str.	601-750
ABIODUN KUYE ROAD	Olayiwola, Jonathan Coker, Charity road.	751-900
JONATHAN COKER ROAD	Mofolashayo Drive, Fagba Ajoke Str.	901-1050
AGBE ROAD	Olaniyi Str, Owode Str, Social club Road.	1051-1200
SANTOS AVENUE	Babs Ladipo, Social club, Abule Egba.	1201-1350
MOFOLASHAYO DRIVE.	Fagba, Jonathan Coker Str.	1351-1500
BABS LADIPO.	Olaniyi, Charity road, Social club Road, Ileogbo Str.	1501-1650
SHODAMOLA STREET.	Molashayo Drive, Pipeline Road, Amateur.	1651-1700
SOCIAL CLUB ROAD.	Owode Str, Santos Avenue.	1701-1850
COLLEGE ROAD	Iju Road, Fagba Junction.	1851-2000

Traffic Pressure with Different Time Range in the Study Area.

Table 2 shows the observation of road traffic congestion at different time of the day within the study area.

Table 2: The observation of Road traffic congestion at different time of the day within a study period.

ROAD NAMES	7:30 -11:30 am	12 noon -2pm	2pm :5pm	5pm-9pm
OLANIYI STREET	Light	Light	Moderate	Heavy
FAGBA JUNCTION	Heavy	Light	Moderate	Heavy
IJU ROAD	Heavy	Moderate	Moderate	Heavy
CHARITY ROAD	Heavy	Light	Light	Heavy
OLAYIWOLA STREET	Light	Light	Moderate	Moderate
ABIODUN KUYE ROAD	Moderate	Light	Moderate	Moderate
JONATHAN COKER ROAD	Moderate	Light	Heavy	Heavy
AGBE ROAD	Light	Moderate	Light	Moderate
SANTOS AVENUE	Moderate	Light	Light	Moderate
MOFOLASHAYO DRIVE.	Heavy	Moderate	Light	Heavy
BABS LADIPO.	Light	Moderate	Light	Heavy
SHODAMOLA STREET.	Light	light	Heavy	Heavy
SOCIAL CLUB ROAD.	Moderate	Light	Moderate	Heavy
COLLEGE ROAD	Heavy	Moderate	Moderate	Heavy

Prediction of Traffic Volume on Few Roads in the Study Area.

Average width of a vehicle = 3.5m

Traffic density = Volume / time.

Volume of traffic = No of Vehicle/distance

Table 3 shows the prediction of traffic volume on selected rods in the study area.

Table 3: Prediction of Traffic Volume on Few roads in the study area.

Roads	Time of the Day	No of Vehicles	No of Lane	Distance covered (m)	Traffic Volume(/m)
Iju road	7:15am – 9:12am	184	2	1000	0.368
	12:01pm - 2:pm	107	1	"	0.107
	5:00 pm -7:00pm	156	1	"	0.156
	8.00pm-9.00pm	21	1	"	0.012
Jonathan Coker Road	7:00am 9:10am	107	2	"	0.214
	12:04pm -1:30pm	66	2	"	0.132
	6:15pm- 8:20pm	196	2	"	0.196
Abiodun Kuye Road	7:30am- 8:15pm	103	1	"	0.103
	11:40am- 1:pm	61	1	"	0.061
	5:30pm-6:45pm	94	2	"	0.188
Mofolashayo drive	7:17am 8:30am	137	1	"	0.410
	11:20am- 1:30pm	84	1	"	0.084
	6:40pm- 8:18pm	103	1	"	0.103
Fagba	6:40am-8:00am	127	2	"	0.254
	12:24mp-2:10pm	52	2	"	0.104
	7:05pm- 8.30pm	200	2	"	0.400

CONCLUSION.

Several traffic management schemes have been adopted in order to improve transportation and flow of traffic on major roads in Lagos city. Example includes the use of LASMA (traffic wardens), use of LAGBUS adopted by Lagos metropolitan area transport authority (LAMATA) to convey people in masses to their destination. However, these methods have not been effective considering the large rural to urban migration of people to the area. In this study, it was observed that the use of satellite based monitoring system for controlling road traffic is very reliable up to about 95% confidence limit. Also, it was shown that the collection of valid and valuable traffic information by means of satellite is feasible from a technical point of view, even in built-up areas. Although, the startup cost could be high, it leads to better information dissemination due to the feasible collection of valid and valuable traffic information by means of satellite which in effect reduces travel time and combustion of fuel by road users especially the commercial drivers in this city.

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APPENDIX

SN	ROAD NAME	WAYPOINT RANGES
1	Akinsegun str	1 to 317
2	Arikemibi lane	318 to 813
3	College ogba ijaiye rd	814 to 1407
4	Mofolashayo drive	1408 to 1557
5	Oyelakin str	1558 to 1708
6	Santo Avenue	1709 to 1906
7	Social club rd	1907 to 1997

INDEX	DATE	TIME	LATITUDE	LONGITUDE	HEIGHT	DISTANCE (m)
1	9/22/2010	11:00:49	6.660825	3.313185	-1E+08	0
2	9/22/2010	11:00:51	6.660757	3.313188	-1E+08	0.007612
3	9/22/2010	11:00:53	6.660663	3.313215	-1E+08	0.018411
4	9/22/2010	11:00:55	6.66057	3.31321	-1E+08	0.028816
5	9/22/2010	11:00:57	6.660533	3.31321	-1E+08	0.03289
6	9/22/2010	11:00:59	6.66051	3.313213	-1E+08	0.035518
7	9/22/2010	11:01:01	6.66051	3.313213	-1E+08	0.035518
8	9/22/2010	11:01:03	6.660483	3.313222	-1E+08	0.03863
9	9/22/2010	11:01:05	6.660483	3.313222	-1E+08	0.03863
10	9/22/2010	11:01:07	6.66045	3.313217	-1E+08	0.042373
11	9/22/2010	11:01:09	6.660367	3.313212	-1E+08	0.051666
12	9/22/2010	11:01:11	6.660332	3.313208	-1E+08	0.055584
13	9/22/2010	11:01:13	6.66026	3.313208	-1E+08	0.06356
14	9/22/2010	11:01:15	6.660227	3.31321	-1E+08	0.067281
15	9/22/2010	11:01:17	6.660143	3.31322	-1E+08	0.076622
16	9/22/2010	11:01:19	6.66006	3.313227	-1E+08	0.085927
17	9/22/2010	11:01:21	6.659977	3.313245	-1E+08	0.095423
18	9/22/2010	11:01:23	6.659893	3.313255	-1E+08	0.104765
19	9/22/2010	11:01:25	6.659823	3.313248	-1E+08	0.112589
20	9/22/2010	11:01:27	6.659743	3.313243	-1E+08	0.121511
21	9/22/2010	11:01:29	6.659673	3.313242	-1E+08	0.129303
22	9/22/2010	11:01:31	6.659618	3.313243	-1E+08	0.135436
23	9/22/2010	11:01:33	6.659557	3.313245	-1E+08	0.142299
24	9/22/2010	11:01:35	6.659497	3.313243	-1E+08	0.148976
25	9/22/2010	11:01:37	6.65943	3.31324	-1E+08	0.156417
26	9/22/2010	11:01:39	6.659367	3.313237	-1E+08	0.163473
27	9/22/2010	11:01:41	6.659275	3.313223	-1E+08	0.173784
28	9/22/2010	11:01:43	6.659185	3.313215	-1E+08	0.183846
29	9/22/2010	11:01:45	6.659098	3.31321	-1E+08	0.193509
30	9/22/2010	11:01:47	6.659018	3.313203	-1E+08	0.202444
31	9/22/2010	11:01:49	6.658957	3.313195	-1E+08	0.209365
32	9/22/2010	11:01:51	6.658905	3.31319	-1E+08	0.215151
33	9/22/2010	11:01:53	6.658857	3.313188	-1E+08	0.220529
34	9/22/2010	11:01:55	6.65881	3.313188	-1E+08	0.225731
35	9/22/2010	11:01:57	6.658763	3.313188	-1E+08	0.230919
36	9/22/2010	11:01:59	6.658713	3.313188	-1E+08	0.236493
37	9/22/2010	11:02:01	6.658665	3.313188	-1E+08	0.241868
38	9/22/2010	11:02:03	6.658618	3.31318	-1E+08	0.247138
39	9/22/2010	11:02:05	6.658575	3.31317	-1E+08	0.252093
40	9/22/2010	11:02:07	6.658563	3.313168	-1E+08	0.253406
41	9/22/2010	11:02:09	6.65853	3.313162	-1E+08	0.257182
42	9/22/2010	11:02:11	6.658488	3.313158	-1E+08	0.261842
43	9/22/2010	11:02:13	6.65841	3.313148	-1E+08	0.27063
44	9/22/2010	11:02:15	6.65833	3.31315	-1E+08	0.279537
45	9/22/2010	11:02:17	6.658222	3.313182	-1E+08	0.292098
46	9/22/2010	11:02:19	6.658132	3.313207	-1E+08	0.302489
47	9/22/2010	11:02:21	6.65807	3.313212	-1E+08	0.309372
48	9/22/2010	11:02:23	6.65804	3.313217	-1E+08	0.312761
49	9/22/2010	11:02:25	6.65799	3.31322	-1E+08	0.318334
50	9/22/2010	11:02:27	6.657937	3.313227	-1E+08	0.324325
51	9/22/2010	11:02:29	6.65789	3.313227	-1E+08	0.329514
52	9/22/2010	11:02:31	6.657845	3.313227	-1E+08	0.33453
53	9/22/2010	11:02:33	6.657798	3.313228	-1E+08	0.339722
54	9/22/2010	11:02:35	6.657755	3.313225	-1E+08	0.344566
55	9/22/2010	11:02:37	6.65772	3.313222	-1E+08	0.348472
56	9/22/2010	11:02:39	6.657708	3.313223	-1E+08	0.349785
57	9/22/2010	11:02:41	6.657678	3.313228	-1E+08	0.353175
58	9/22/2010	11:02:43	6.657645	3.313225	-1E+08	0.356896
59	9/22/2010	11:02:45	6.657612	3.313222	-1E+08	0.36063
60	9/22/2010	11:02:47	6.65758	3.31322	-1E+08	0.364165
61	9/22/2010	11:02:49	6.65755	3.313217	-1E+08	0.367516
62	9/22/2010	11:02:51	6.657527	3.313202	-1E+08	0.370595
63	9/22/2010	11:02:53	6.657503	3.313185	-1E+08	0.373783
64	9/22/2010	11:02:55	6.657483	3.313183	-1E+08	0.376021
65	9/22/2010	11:02:57	6.657472	3.313185	-1E+08	0.377321
66	9/22/2010	11:02:59	6.657472	3.313185	-1E+08	0.377321
67	9/22/2010	11:03:01	6.657458	3.313193	-1E+08	0.37907
68	9/22/2010	11:03:03	6.657448	3.313197	-1E+08	0.380245
69	9/22/2010	11:03:05	6.657417	3.313213	-1E+08	0.384222
70	9/22/2010	11:03:07	6.657378	3.313223	-1E+08	0.388622
71	9/22/2010	11:03:09	6.657378	3.313223	-1E+08	0.388622
72	9/22/2010	11:03:11	6.657368	3.313228	-1E+08	0.389868
73	9/22/2010	11:03:13	6.657355	3.313237	-1E+08	0.391617
74	9/22/2010	11:03:15	6.657345	3.313243	-1E+08	0.392954
75	9/22/2010	11:03:17	6.65732	3.31326	-1E+08	0.396297
76	9/22/2010	11:03:19	6.657293	3.313268	-1E+08	0.399396
77	9/22/2010	11:03:21	6.657265	3.313282	-1E+08	0.402882
78	9/22/2010	11:03:23	6.657237	3.313292	-1E+08	0.406225
79	9/22/2010	11:03:25	6.6572	3.313302	-1E+08	0.410446
80	9/22/2010	11:03:27	6.657153	3.313302	-1E+08	0.415648
81	9/22/2010	11:03:29	6.657108	3.313303	-1E+08	0.420655
82	9/22/2010	11:03:31	6.657077	3.313308	-1E+08	0.424228
83	9/22/2010	11:03:33	6.657047	3.313307	-1E+08	0.427577
84	9/22/2010	11:03:35	6.657018	3.313305	-1E+08	0.430728
85	9/22/2010	11:03:37	6.656992	3.313305	-1E+08	0.4337
86	9/22/2010	11:03:39	6.656957	3.313305	-1E+08	0.437602
87	9/22/2010	11:03:41	6.656922	3.313303	-1E+08	0.441494
88	9/22/2010	11:03:43	6.656898	3.3133	-1E+08	0.444121
89	9/22/2010	11:03:45	6.65687	3.313302	-1E+08	0.447285
90	9/22/2010	11:03:47	6.656843	3.3133	-1E+08	0.450251
91	9/22/2010	11:03:49	6.656817	3.313295	-1E+08	0.453274
92	9/22/2010	11:03:51	6.65679	3.31329	-1E+08	0.456295
93	9/22/2010	11:03:53	6.656767	3.313283	-1E+08	0.458986

94	9/22/2010	11:03:55	6.656738	3.31328	-1E+08	0.462166
95	9/22/2010	11:03:57	6.656713	3.313277	-1E+08	0.464977
96	9/22/2010	11:03:59	6.656687	3.313275	-1E+08	0.467942
97	9/22/2010	11:04:01	6.656665	3.313272	-1E+08	0.470385
98	9/22/2010	11:04:03	6.65664	3.313268	-1E+08	0.473197
99	9/22/2010	11:04:05	6.656613	3.313262	-1E+08	0.476259
100	9/22/2010	11:04:07	6.656587	3.313253	-1E+08	0.479359
101	9/22/2010	11:04:09	6.656562	3.313253	-1E+08	0.482146
102	9/22/2010	11:04:11	6.656535	3.31325	-1E+08	0.485141
103	9/22/2010	11:04:13	6.65651	3.313243	-1E+08	0.488011
104	9/22/2010	11:04:15	6.65648	3.313232	-1E+08	0.491596
105	9/22/2010	11:04:17	6.656453	3.313223	-1E+08	0.494709
106	9/22/2010	11:04:19	6.656432	3.313223	-1E+08	0.497123
107	9/22/2010	11:04:21	6.656408	3.31322	-1E+08	0.499738
108	9/22/2010	11:04:23	6.656382	3.313218	-1E+08	0.502716
109	9/22/2010	11:04:25	6.65636	3.313217	-1E+08	0.505138
110	9/22/2010	11:04:27	6.656337	3.313215	-1E+08	0.507732
111	9/22/2010	11:04:29	6.656313	3.313212	-1E+08	0.51036
112	9/22/2010	11:04:31	6.656292	3.313208	-1E+08	0.512803
113	9/22/2010	11:04:33	6.656272	3.313207	-1E+08	0.515039
114	9/22/2010	11:04:35	6.656247	3.313198	-1E+08	0.517959
115	9/22/2010	11:04:37	6.656223	3.3132	-1E+08	0.520566
116	9/22/2010	11:04:39	6.656202	3.313198	-1E+08	0.522988
117	9/22/2010	11:04:41	6.656182	3.313188	-1E+08	0.525478
118	9/22/2010	11:04:43	6.656162	3.313182	-1E+08	0.527813
119	9/22/2010	11:04:45	6.656137	3.313177	-1E+08	0.530655
120	9/22/2010	11:04:47	6.656113	3.313175	-1E+08	0.533262
121	9/22/2010	11:04:49	6.656093	3.313172	-1E+08	0.535522
122	9/22/2010	11:04:51	6.656075	3.313165	-1E+08	0.537695
123	9/22/2010	11:04:53	6.656055	3.313158	-1E+08	0.540031
124	9/22/2010	11:04:55	6.656038	3.313153	-1E+08	0.54197
125	9/22/2010	11:04:57	6.65601	3.313148	-1E+08	0.545176
126	9/22/2010	11:04:59	6.655987	3.313142	-1E+08	0.547879
127	9/22/2010	11:05:01	6.655963	3.31314	-1E+08	0.550474
128	9/22/2010	11:05:03	6.655935	3.313137	-1E+08	0.553654
129	9/22/2010	11:05:05	6.655905	3.31313	-1E+08	0.557078
130	9/22/2010	11:05:07	6.655882	3.313132	-1E+08	0.559673
131	9/22/2010	11:05:09	6.655857	3.313133	-1E+08	0.562465
132	9/22/2010	11:05:11	6.655833	3.313128	-1E+08	0.565125
133	9/22/2010	11:05:13	6.655813	3.31312	-1E+08	0.567537
134	9/22/2010	11:05:15	6.655787	3.313117	-1E+08	0.57052
135	9/22/2010	11:05:17	6.65576	3.313122	-1E+08	0.573543
136	9/22/2010	11:05:19	6.655737	3.313115	-1E+08	0.576247
137	9/22/2010	11:05:21	6.655722	3.313113	-1E+08	0.577915
138	9/22/2010	11:05:23	6.655705	3.313117	-1E+08	0.579806
139	9/22/2010	11:05:25	6.655683	3.313115	-1E+08	0.582229
140	9/22/2010	11:05:27	6.655658	3.313113	-1E+08	0.58502
141	9/22/2010	11:05:29	6.655633	3.313107	-1E+08	0.587891
142	9/22/2010	11:05:31	6.655608	3.313097	-1E+08	0.590889
143	9/22/2010	11:05:33	6.655583	3.31309	-1E+08	0.593773
144	9/22/2010	11:05:35	6.655572	3.313087	-1E+08	0.595124
145	9/22/2010	11:05:37	6.655553	3.313077	-1E+08	0.597448
146	9/22/2010	11:05:39	6.655535	3.313065	-1E+08	0.599855
147	9/22/2010	11:05:41	6.655512	3.313058	-1E+08	0.602558
148	9/22/2010	11:05:43	6.655493	3.313053	-1E+08	0.604676
149	9/22/2010	11:05:45	6.655488	3.31305	-1E+08	0.605345
150	9/22/2010	11:05:47	6.655472	3.313037	-1E+08	0.607718
151	9/22/2010	11:05:49	6.655457	3.313017	-1E+08	0.610474
152	9/22/2010	11:05:51	6.655438	3.312997	-1E+08	0.613487
153	9/22/2010	11:05:53	6.655433	3.31299	-1E+08	0.614412
154	9/22/2010	11:05:55	6.655433	3.31299	-1E+08	0.614412
155	9/22/2010	11:05:57	6.655432	3.312983	-1E+08	0.615173
156	9/22/2010	11:05:59	6.655415	3.31297	-1E+08	0.617546
157	9/22/2010	11:06:01	6.655408	3.312963	-1E+08	0.618594