System Techniqueforinvestigating and Recovering Stolen Vehicles

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Abstract
This work as complete system is recommended not only for Police Commands in general but also for road safety commission in Nigeria and the model can be implemented elsewhere in the world. The former systems in the previous design uses hardware machines and programmable interface to detect vehicle numbers. The existing works are much more of hardware system and the platforms are much more expensive and consumes space. They also require hidden device installations.
This work will achieve a faster detection and location system of a stolen car. The car details are very logical in nature. The system uses a one-way authentication method toward accessing the system. This is achieved by generating a unique telemedicine code which serves as a password for each user. The platform are easily identified and host some numerous advantages such as: a web based system hosted to be used anywhere in the World, a real time search engine platform using plate number as the search index and an advance car theft detector system to reduce time taken to apprehend a vehicle snatcher. There are many program environments for software program coding but this automated telemedicine and diagnosis software program was developed using HTML, CSS, JAVASCRIPT, Python Flask and SQLite Database.
Keyword: *Vehicle detection, Car Recovery, Stolen Vehicle, Car theft*

I. Introduction

Investigating missing Vehicles are increasing enormously in today's era. In the proportion of population, vehicles increase enormously since last two decades. But, it creates tubule and difficulty for human life. The vehicle investigation system is designed to uniquely identify a car with an encrypted system. Therefore, management and administration of vehicle is very necessary to avoid said problems of society. Install the recognition systems at the target zones [1].

In 1992, Congress passed tougher laws and penalties for auto theft by enacting the Anti-Car Theft Act (Title 18, United States Code, 2119). This legislation was intended to deter the trafficking of stolen vehicles and increase the penalties for carjacking. The primary motivation for this was the large increase in motor vehicle thefts that occurred between 1984 and 1990; they increased from 830,000 to 1,270,000. [2] A summary report prepared for Congress in 1998 to document the effects of the 1992 act notes [3].

There has also been some suspicion that stolen vehicles are being used to fund terrorism and quite possibly used to transport dangerous explosives for acts of terrorism. [4] There is increasing evidence that there are links between organized crime groups and terrorist activities, some of which involves the use of diaspora networks. [5] According to officials at the Federal Bureau of Investigation (FBI), they believe stolen vehicles, bought and sold on the international black market, "help fund criminal operations and can be turned into the terrorist weapon of choice against U.S. troops and Iraqi civilians." [6].

Because there has been a large decrease in the number of stolen vehicle for over 25 years, very little research has focused on the problem and even less on associated crimes, such as illegal motor vehicle exports. With such limited research available, it is difficult to explain how these stolen exported automobiles factor into organized criminal activities. Fortunately, there are two researchers, Brown and Clarke, who have conducted extensive research on the stolen motor vehicle problem, especially the illicit export of stolen vehicles. Brown and Clarke divide their research on vehicle theft for export into three categories, which are helpful for understanding the issues at hand. First, they point out how authorities and all those concerned with the issue should understand the role and involvement of organized criminal elements in exporting stolen vehicles.

Though there are similarities to more common vehicle thefts, the distinctions between them are important and make a substantial difference to impacting the threat. These distinctions are discussed in this research. Secondly, Brown and Clark note that real analysis about why certain countries become popular destinations for stolen vehicles for these organized criminal elements is essential. Finally, they discuss the need to improve the flawed practices among the shipping and freight forwarding businesses that allow stolen vehicles to evade current enforcement measures. [7] Their research provides a baseline for understanding key aspects of the stolen vehicles for export problem.

There are a number of contributing factors why this kind of research is limited. For instance, stolen vehicles are typically investigated at the local law enforcement level, while exports, which involve overseas and domestic businesses, are primarily the responsibility of federal agencies. [8] The aftermath of the 9/11 terror attacks on the United States prompted the U.S. Customs and Border Protection (USCBP) to re-examine and establish antiterrorism programs, including programs regarding imports, to protect the United States. Within several months, the USCBP established the Container Security Initiative (CSI), an effort to protect the homeland from potential maritime shipping container terror threats. [9] However, the CSI program established protocols to address maritime security threats of U.S. imports, not exports. [10] Despite my own intimate engagement with these issues and significant time studying the relevant literature, my research has uncovered no similar container program for exports. This disconnect is problematic at best and potentially inhibits effective homeland security.

II. Detection Of Stolen Car

There is an increase in car and vehicle theft and car producers now produce cars with numerous anti-theft devices, such as protected steering wheels, keys with microprocessor chips, and remote control locks.

2.1 CONCEPT OF DETECTING STOLEN CAR

The figure below shows the concept of the new system. The design and implement a web based system that has record of every given car with the pictures. The vehicles has unique identified for each car which is the plate number. The security investigation team once they get hold of a suspected, the plate number is enter into the application and search. Once identified, the vehicle details is verified and if possible, the owner of the car could be call to verify the driver.
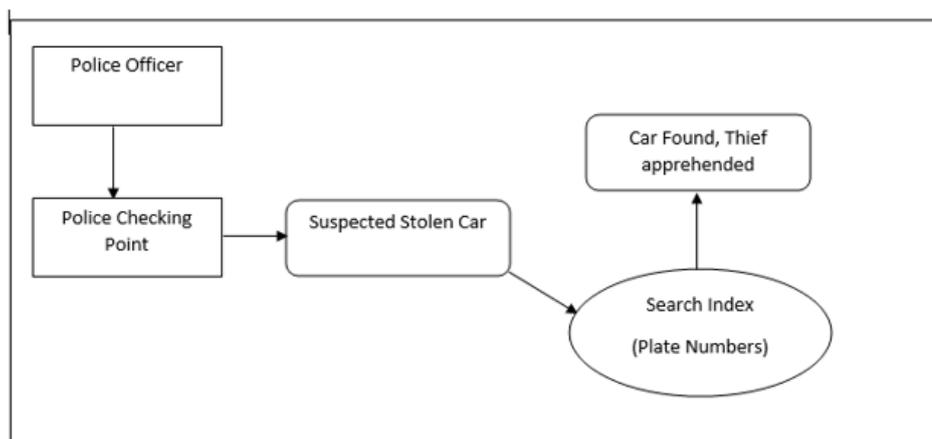

Figure 1.0 Block Diagram of the Proposed System

2.2 REVIEW OF LITERATURE

[11] This a new algorithm for car plate credentials and is proposed to use subdivision method with interconnected constituent. The technique captures the plate details and so on and this should be according to the experimental setup as indicated.

[12] Discussed the green wave system. This is used to provide clearance to any emergency vehicle.

[13] Proposed the use of RFID traffic control to avoid problems of stealing and vehicle theft.

[14] The use of RFID distinguishes between the emergency and non-emergency cases, thus preventing unnecessary traffic congestion. The system is fully automated and requires no human intervention at the traffic junctions. Traffic is a critical issue of transportation system in most of the cities.

[15] Proposed a smart and simple algorithm for vehicles license plate recognition system. Depend on pattern comparison; this algorithm can be applied for real time detection of license plates for collecting data for surveying or for some application specific purposes.

[16] In this images need to be captured first and the image should not be blurred so that system should be able to do necessary processing on image for number identification. Then the license plate needs to be extracted from the whole image. Segmentation is performed on extracted image. Through Segmentation the extracted image is divided into many segments for further processing. Noise needs to be removed from the image for proper number identification. The final phase of Automatic Number Plate Recognition (ANPR) is Number identification.

III Analysis of Existing System

The research work, has studied the existing system that was motivated for improvement. The existing processes are manually operated. In Nigeria, the Abia state police command is the case study of this platform. The existing system is still manually operated in the sense, when the stolen car is detected by the patrol team the document of the car is requested and other personal interrogation is done to proof ownership of the car. This approach are not much effective in this technology era. The theft can forge documents and change a lots car properties. This method requires a highly intelligent police officer that can interrogate and detect wrong owner of a car.

3.1.1   ADVANTAGES OF THE EXISTING SYSTEM
The project work, existing system also has its advantages. As traditional system that does not require much protocol to start operation, just ability to read/written and speak a conversational English. The following are the advantage of the existing system;
1. The Police Officer is not to be computer literate
2. Ability to read/write and speak conversational English either pigeon, broken or polish English
3. Does not require any special training to be operational and functional.

3.1.2   DISADVANTAGES
Car theft, it has been issues of decades. The existing system are actually ineffective to cub the problems of car theft. The system has its shortcoming. The following are the issues;
1.   Hard to Implement the System
The existing system is actually, can detect a stolen car but not immediate effect action to cub the culprit and also as well to implementation of existing system is very expensive, even in the process of installation.
2.   Lack of Security
The security relative to the project work, the existing system are actually not real secured because it is hardware installed that can be vandalized or even hijacked. To this, the information could be null and void i.e. ineffective
3.   Higher Cost
The installation of hardware component in different location, in police command all over Nigeria could be more expensive and at long run not achieve.
3.2   Analysis of the Proposed System
The project work "A System for Detecting a Stolen Car for any State Police Command" is a web based system designed and implementation to have a car registered by the agency. The car owner provide detailed document to the police command. If unfortunately the car is stolen then it will be broadcasted to al patrol team to begin a check. Once a suspected car is found the process of check begin by investigating the color of the car, the driver at the point of theft etc. The phone number attacked to the vehicle registration is instantly called to verify the driver.

3.2.1 ADVANTAGE OF THE PROPOSED SYSTEM
Every newly developed system has it new component features that make it more advance. The newly proposed system is a web based system that runs on a hosted platform. The system is only accessed by the authorized Police officer on patrol field. The search index is the unique identifier, if the car is registered it will display the car detail and verification process is initialized. If any false claim is made the theft is arrested. The following is advantage of the new system;
1.   Real time operation and function. Instant arrest once check and found that the car is stolen.
2.   Accessible and immediate apprehension of thief. The car verification do not waste time and instant recovery of the car is made
3.   The new system is faster in identifying stolen car and much more etc.
The architectural design of the system is designed using the Data Flow Diagram model of the design methodology.See figure below.
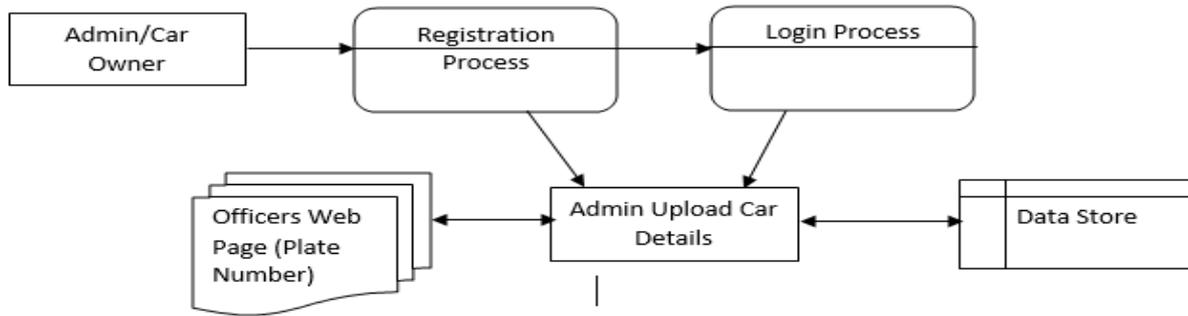
Figure 3.2 Data Flow Diagram of the new system

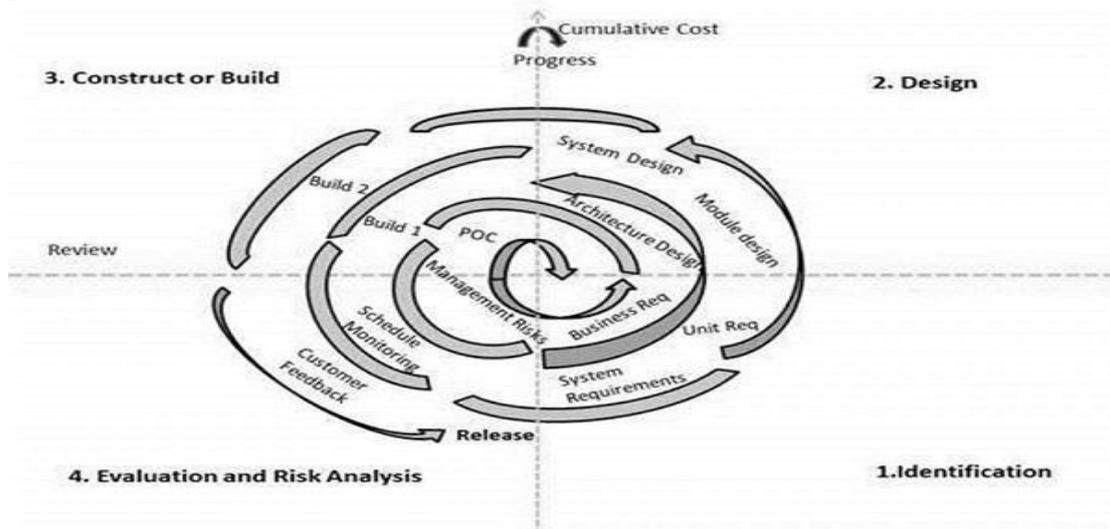## 3.3   RESEARCH MODEL
A. Spiral Model

Figure 3.3: Spiral Model [17]

Figure above suffices, based on the customer evaluation, the software progressprocedure enters the next iteration and subsequently follows the linear approach to implement the feedback suggested by the customer. The process of iterations along the spiral continues throughout the life of the software.

3.4 DESIGN OF PROPOSED SYSTEM
The proposed system is web based application design with python flask and database SQLite. The Police command of in Nigerian States register car owner, this is the work of the administrator. The car owner present the administrator with car detail and the driver license. If unfortunately, the car get missed, if a similar car is caught, the police officer collect the plate number and query the database, once found. The driver is interrogated to identify the true owner of the car. If peradventure they locate the owner of the car.
The project aimed at designing and implementation of a web based application that assist in detecting a stolen car using a unique verifier plate number. We are looking at designing and developing the above system with the following objectives in mind;
1.   Create a web based system for detecting a stolen car
2.   Design a frontend interface for web app using the bootstrapped library
3.   To generate unique identifier i.e. the unique plate number to uniquely identify the car and the owner of the car.
4.   To determine a search algorithm for better search option and implementation of it.
5.   To provide upload option for car images for advance vehicle investigation etc.

IV. Main Menu
The control main menu or main system is the set of interacting component parts working together to accomplish a goal. It is through it that which other submenus could be accessed. The control center main menu of this system include the user's registration interface from which the caridentification (plate number) code is

generated which serves as the tracking id medium for obtaining the details of a suspected vehicle. The tracking id remains the car plat number that was generated during the vehicle and owner documentation. The index page, is found at home.
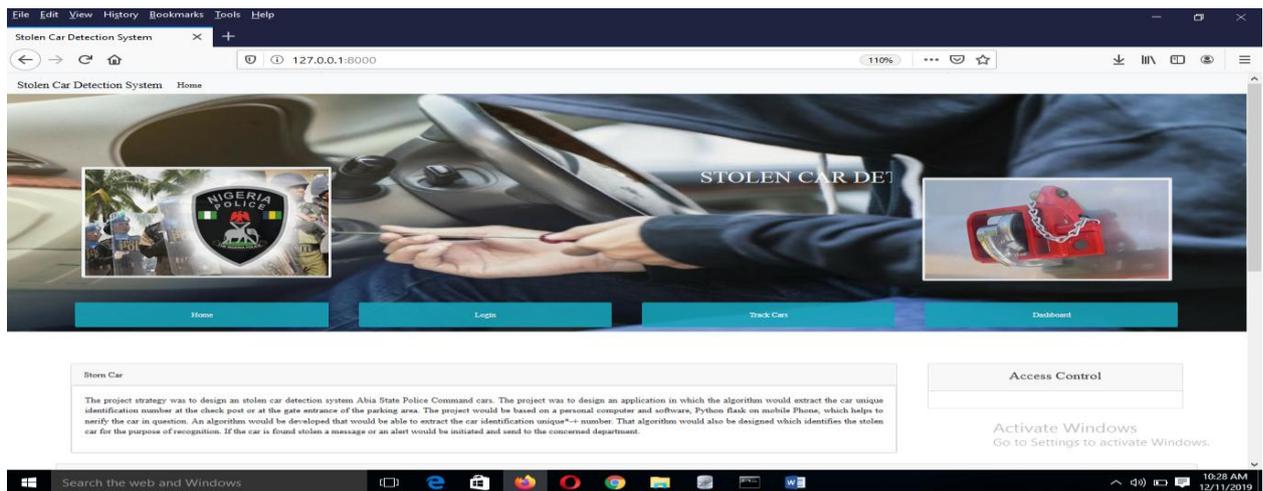

Fig 4.1 Main Menu of New System

4.2.2   The Submenus

   A subsystem is where work is processed on the system. A subsystem is a single, predefined operating environment through the system coordinates the work flow and resources use. A system can contain several subsystem term used to describe a menu that is contained within another menu. The subsystem of this software where work is processed is the administrator submenu where it have User Login, Car Registration, Register Users and Logout.

The submenu in the administrator dashboard
Administrator: a link to return to Home page
User Login: used for adding users into session
Car Registration: a Link to vehicle registration i.e. through this link registered car are displayed and new car are added.
User Registration: The owners of the cars are registered and link to the registered vehicle.
Logout: through this link student can logout

4.3   Specification
A project specification (or spec) is a comprehensive description of objectives for a development project. It contains all the goals, functionality, and details required for a development team to fulfil the vision of the client. A specification contains information, data and services of a product with the quality requirement. For the purpose of this project, database specification and database design and structure is used for specification.

4.3.1   Database Specification
• Physical design
Below is the entity relationship diagram, which shows the physical design of the database: see figure 4.2
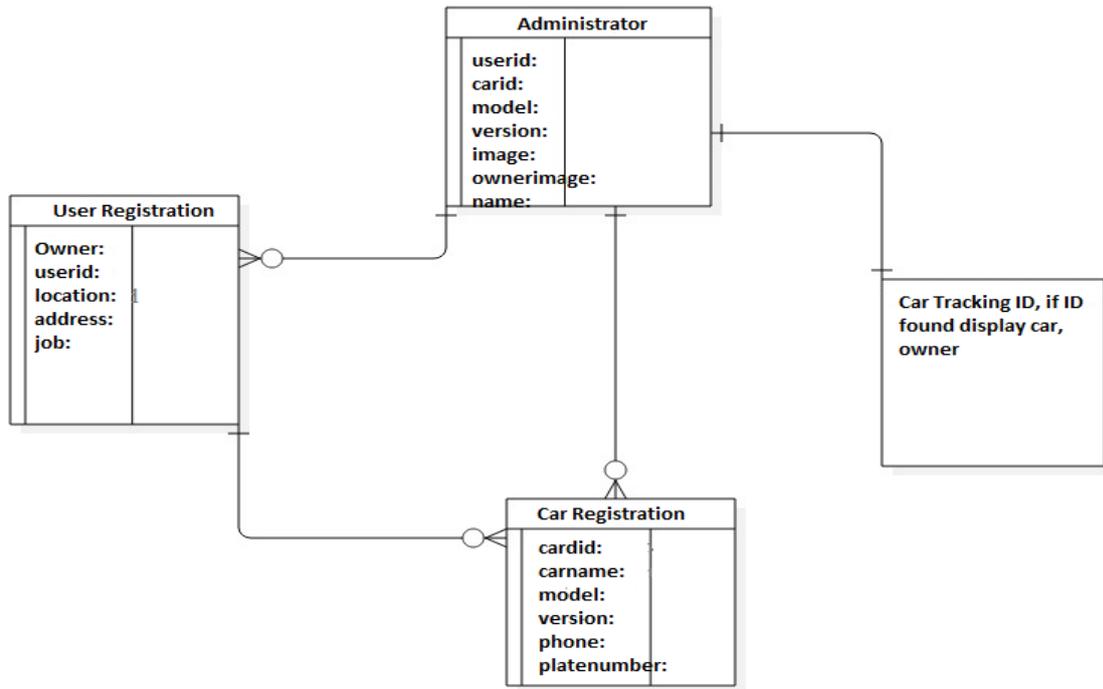
Fig 4.2 Physical Design of the New System Database

4.3.2 Algorithm for the new System
  i.   Enter the domain name in any browser such as Chrome, Firefox etc.
 ii.   Run application:
    a. Navigate on command prompt to application directory
    b. Type: python run.py
iii.   Car and Owner registration, submit by clicking 'add users, car'.
 iv.   View users by clicking registered users and View car by clicking registered Cars.
  v.   On home page click track car; enter the car id and click track
 vi.   End.

4.3.3 Data Dictionary
This a set of information describing the contents, format, structure of a database and the relationship between its elements, used to control access to and manipulation of the database. The data dictionary of this system covers the fieldname, the data types of the fieldname, its constraint and description of the fieldname.

Table 4.1 Data Dictionary of New System

S/N	FIELDNAME	DATA TYPE	CONSTRAINT	DESCRIPTION OF FIELD
1	Id	Int	non null auto increment	This field is assigned a unique number for each patient's data entry.
2	CarName	Varchar	non null	This field describe the name of the car.
3	Email	Varchar	non null	This field describe the owner's email. It could be yahoo mail, goggle mail etc.
4	carid	Varchar	non null	This field contains the of the car id.
5	userid	varchar	non null	Description of the car owner id
6	Phone	Varchar	non null	This field contains the phone number of user/car owner.
7	Car version	Varchar	non null	It describe the version of the car
8	Car model	Varchar	Non null	It describe the model of the car

4.4 Flowchart Structures

For the effective functionality of the system, it requires both hardware and software requirements, see figure below
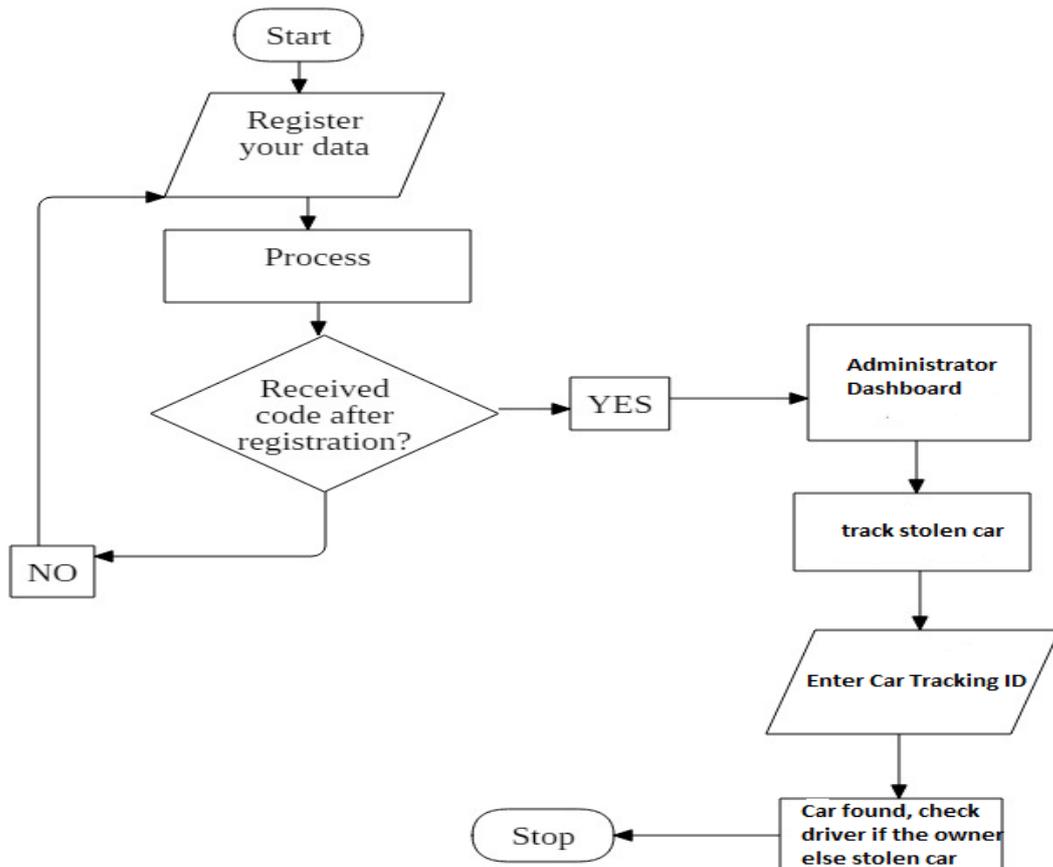
- **Program Flowchart**

Fig 4.3 System flowchart of New System

For the effective functionality of the system, it requires both hardware and software requirements, see figure below
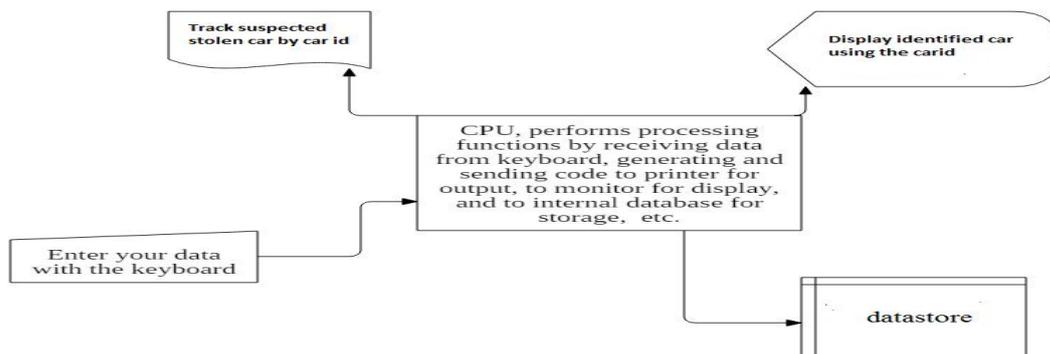

Figure 4.4The Complete System Architecture

V. Result and Documentation

The project work is focused at design and implementation of a web based system. The frontend application is designed using the bootstrap library for better fitting to device. The backend is implemented using flask framework. The administrator is responsible to registering car owner etc. The administrator update user data and post to database. The search index is identified the plate number once found but will check detail for the arrested.

Program documentation is a method of recording and communicating the activities of the system development and the outcome of each stage in the entire process. It generates important and indispensable information, and maintains the system. It is vital for proper implementation and maintenance. The program documentation of the system contained installation and procedures in order to get the best performance of the system.

5.1 CONCLUSION

In conclusion, there has been enormous research done in this field of stolen car detection and recognition for car owner in Nigeria. Various researches provide various techniques and approaches of it. Most of the countries have developed the system for this purpose but for their own countries. Since every country has its own License plate numbering system that differs from others in fonts, color of number plate, and size of number plate. Though, all of those systems have their pros and cons. The main disadvantage is that they all need a human being for the processing while our proposed project is an automatic system that does not require any human being. If the query found any car with its registration will be apprehended and if the car is found stolen a message would be sent to the security personals.

Reference

[1]. Christos Nikolaos E. VassiliLoumos, Anagnostopoulos, Ioannis E. Anagnostopoulos, and EleftheriosKayafas- A License Plate Recognition. Algorithm for Intelligent Trans-portation System Applications IEEE transaction on Intelligent Transportation System, Vol. 8, No. 3, Sept 2006.

[2]. Adger, Katherine. (2007) "An Analysis of Location and Offender Characteristics for Motor Vehicle Theft in Texas from 2001 to 2005." Master's thesis, University of North Texas, 2007.

[3]. Bender, Bryan. (2005) "Stolen U.S. Vehicles End up as Bombs in Iraq, FBI Says." NewYorkTimes, July16, 2007. tp://www.nytimes.com/2007/07/16/world/americas/16iht-16cars.6683928.html?pagewanted=all. "US Car Theft Rings Probed for Ties to Iraq Bombings." The Boston Globe, October 2, 2005. http://archive.boston.com/news/world/articles/2005/10/02/us_car_theft_rings_probed_for_ties_to_iraq_bombings/.

[4]. Block, Robert. (2006) "An L.A. Police Bust Shows New Tactics for Fighting Terror. Officers Use Local Laws to Arrest Small Offenders with High-Risk Potential." Wall Street Journal, December 29, 2006. https://www.wsj.com/articles/SB116736247579862262.

[5]. Block, Steven. (2012) An Analysis of Internationally Exported Vehicle Thefts in Two High-Risk Cities. Newark, NJ: Rutgers University, 2012.

[6]. Boon Jr, John E., John S. Hollywood, Kenneth N. McKay, and Diane Snyder. (2005) "Connecting the Dots" in Intelligence: Detecting Terrorist Threats in the Out-of the Ordinary. Santa Monica, CA: Rand, 2005. https://www.rand.org/pubs/research_briefs/RB9079.html.

[7]. Clarke, Ronald V., and Michael, G. Maxfield. (2004) Understanding and Preventing Car Theft. Crime Prevention Studies, Vol. 17. Monsey, NY: Criminal Justice Press, 2004.

[8]. Clarke, Ronald V., and GoharPetrossian. (2012) Export of Stolen Vehicles across Land Borders, Problem-Specific Guides Series, no. 63. Washington, DC: U.S.

[9]. Cummings, Sally J., and David P. Stewart, eds. (2002) Digest of United States Practice in International Law. Washington, DC: U.S. Department of State, Office of the Legal Advisor, 2002. https://www.state.gov/documents/organization/139638.pdf.

[10]. DeMarco, Jerry. (2014) "New Jersey State Police 'Operation Jacked' Takes down International Stolen Car Trafficking Ring." South Passaic Daily Voice, February 27, 2014. http://southpassaic.dailyvoice.com/police-fire/new-jersey-state-police-operationjacked-takes-down-international-stolen-car-trafficking-ring/630128/.

[11]. Christos Nikolaos E. VassiliLoumos ,Anagnostopoulos, Ioannis E. Anagnostopoulos,, and EleftheriosKayafas- (2006) A License Plate Recognition. Algorithm for Intelligent Trans-portation System Applications IEEE transaction on Intelligent Transportation System, Vol. 8, No. 3, Sept 2006.

[12]. A. K. Mittal and D. Bhandari, (2013) "A novel approach to implement greenwave system and detection of stolen vehicles," in Proc. IEEE 3rd Int.Adv. Comput., Feb. 2013, pp. 1055–1059.

[13]. S. Sharma, A. Pithora, G. Gupta, M. Goel, and M. Sinha, (2013) "Traffic lightpriority control for emergency vehicle using RFID," Int. J. Innov. Eng.Technol., vol. 2, no. 2, pp. 363–366, 2013.

[14]. R. Hegde, R. R. Sali, and M. S. Indira, (2013) "RFID and GPS based automaticLane clearance system for ambulance," Int. J. Adv. Elect. Electron. Eng.,vol. 2, no. 3, pp. 102–107, 2013.

[15]. Choudhury A. Rahman, WaelBadawy,Ahmad Rad-manesh A Real Time Vehicle.s License Plate Recognition System Proceedings of the IEEE Conference on Advanced Video and Signal Based Surveillance,0- 7695-1971.June 2010.

[16]. BanshidharMajhi Heuristics for license plate localization and hardware implementation of Automatic License Plate Recognition (ALPR) systemDepartment of Computer Science and Engg, National Institute of Technology Rourkela, 2012.

[17]. Boehm, B. W. (1988). A spiral model of software development and enhancement. Computer, 21(5), 61–72. doi:10.1109/2.59