



AI Based Motor Vehicles Detection and Tracking System Using Smartphone Application

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ABSTRACT

Information technology (IT) is one of the most emerging field that is a very important role in every field of today's world. Nowadays it is involved almost in every field including medical science, engineering, transportation etc. IT based techniques have enhanced the capabilities of different applications like road optimization, detection, recognition, tracking etc. these techniques have made things smarter and more qualitative. Transportation is one of the most growing and important, that is play a significant role to grow the economy. Today's the most occurring problems or issues are steal of motor vehicles, vehicle smuggling and the use of unauthorized motor vehicles which have a direct effect of the of the growth of economy. Keeping these issues in mind the current developed system has been carried out to overcome these problems. The present system is divided in 3 categories, the desktop application to detect those unauthorized motor vehicles, a smart phone application to track down those motor vehicles using GPS technology and GPS module used to gives us the current position of the motor vehicle and update it on the cloud.

Key words: Detection, Google map API, GPS technology, Smartphone, Recognition

1. INTRODUCTION

Information Technology (IT) is one of most growing fields that plays very important role in today's era. It is involved in most of the fields including, engineering [4], medical science [5], transportation [1], agriculture [3], education [2], etc. [1]. The impact of IT enables, different organizations, to get accessibility in international markets. It also helps government to develop novel and innovative systems or technologies to maximize the firms' or organizations' performance. [9]. Information technology enables us to shape our future in a better way and develops the knowledge of different times including present, past and future with the help of its trending technologies i.e. Artificial Intelligence (AI), Machine Learning (ML) Cloud Computing, Internet of

Things (IoT), etc.[12]. AI is a wide area of information technology which makes machines to mimic like the human [13]. The rapid development in the field of AI have led us to strengthen and enhance the performance of different organizations, transportation and businesses [10]. The transportation has always been a main resource for any nation to grow the economy, [11]. The growing number of populations have led us to failed and inefficient transportation system. If we look around the world, everyone is in a scurry to reach their destinations safely and quickly which have caused number of serious risks like traffic congestions, accidents etc. [12]. IT based techniques have enhanced the capabilities of different applications like road optimization, detection, parking accident prevention etc. These techniques have made things smarter and qualitative. [6] which have ultimately solved many issues and problems that are being faced nowadays in transportation. One of most popular application of IT in transportations includes the modern navigation systems, which facilities the users to navigate from one place to other places using their smart devices with effective and efficient way [7]. Beside these, The E-transport applications facilitates us to do things in much smart way like e ticketing, reservations, payments etc. [8]. Transportations is the one of most important aspects of nowadays which includes number of issues and problems nowadays [1]. The most occurring problems in the transportation includes vehicle theft, illegal vehicle smuggling, use of non-custom paid vehicles which have affected the growing rate of economy many countries [14]. Keeping these problems in mind the present work has been carried to overcome these issues by proposing system which can be implemented to detect and track the motor vehicles by using artificial intelligence and cloud technologies.

2. MATERIAL AND METHODS

AI based motor vehicles detection and tracking system uses the desktop application, GPS technology and smart phone application, as per shown in Figure 1 this system has 3 main parts. In the first part, GPS module which is used for tracking functionality. It will track the unauthorized motor vehicles through GPS and sent its current location to the cloud. In the second part, the desktop application used for detect and

recognized those unauthorized motor vehicles and sent the data in cloud. In the last part, smart phone application used, the main functionality of application is to provide login and signup to users and to show the current location of those unauthorized motor vehicles which were detected. The cloud is working as a central connector for both smart phone application and desktop application, as they both desktop and smart phone application will communicate through cloud only. As shown in the Figure 1. The smart phone application will communicate with cloud and uses the remotely access of the database. The GPS module will transmit its current location through the GPS technology and update it to the cloud.

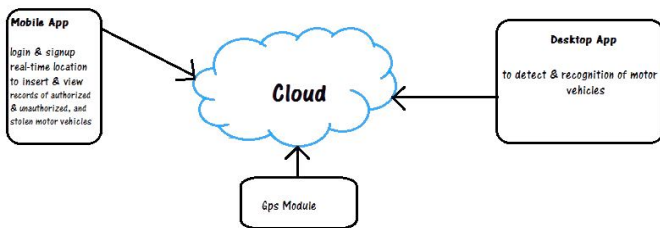


Figure 1: System diagram

2.1 Workflow

The work flow of (MVDT System) is as per shown in Figure 2, Figure 3, Users or client can use this system by performing operations that are mentioned in flowcharts.

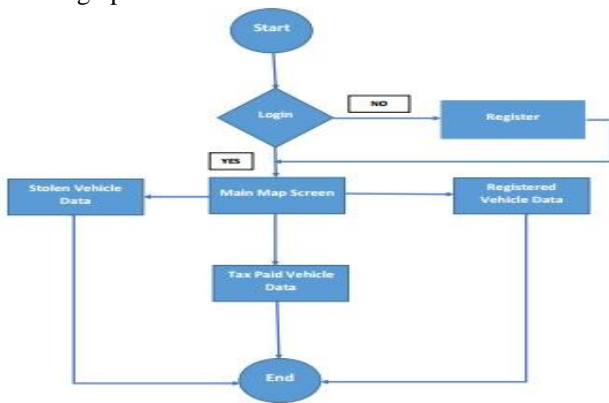


Figure 2: Flowchart of smart phone App



Figure 2: Flowchart of Desktop App

For client or users a smart phone application was developed using Android studio IDE, java programming language and

XML language for designing the interface, the desktop application was developed using python programming language in PyCharm IDE, and Tkinter module used for its user interface. In this application, all the required criteria are defined. For the validation of authorized and unauthorized motor vehicles.

To validate the designed system, a system was developed. Since the designed system was consist of three different parts, as shown inn Figure 1, for the validation of designed system, the different testing was calculated through a Testing, in which different evaluation were performed at small village Tando Qaiser via Tando jam.

2.2 System tools used

There are different tools were used for, to develop this system.

2.2.1 Hardware

Hardware is a physical component that is used mostly in electronic devices, it is something that we can touch or feel [15]. In the developed system there are different hardware component are used for different purposes such as smart phone device [25] , desktop and GPS[26] module for tracking technology.

2.2.2 Software

Software is a set of collection of programs, instructions, procedures and data that are used to perform any specific or multi tasks [16]. A software can be a system software and application software but in our developed system, there are two operating system are utilized, one is android operating system[24] and other one is Microsoft Windows operating system [23].

2.2.3 Integrated Development Environments (IDEs)

The IDE provides the developers a platform, to develop the software with qualitative and efficiently, it is simply a development tool or development kit, that has all the required tools which are used for developing any software or programs [17]. In the developed system, three different IDEs were used i.e. Android Studio[22], and PyCharm[21].

2.2.4 Programming Languages

The programming languages are used by programmers to develop a system or software or program [18]. In developed system, there are different programming languages are used i.e. java programming language[28] and XML language[27] to develop the smart phone application, python programming language[29] was used to develop desktop application.

2.2.5 Application Programming Interface

Application Programming Interface (API) is an intermediary interface between two system or software or application. It defines the interactions of two or multiple application or software [19]. For developed system, to get the current location motor vehicles Google map API[30] was used in

smart phone application.

2.2.6 Cloud

The cloud is database and can be accessed from could platform [20]. In our developed system the Google cloud was used for data storage.

3. RESULTS

The results of currently developed system were evaluated in three different testing performed at village Tando Qaiser via Tando Jam Sindh Pakistan. The results of each evaluated testing are described below. The 1st testing was performed at village Tando Qaiser via Tando Jam in the first week of December 2020. The total of 20 motor vehicles were evaluated, from which 60% of motor vehicles were detected as authorized, 5% were detected as stolen motor vehicles, 10% motor vehicles were detected as non-custom paid and 5% of motor vehicles detected as non-tax paid. As shown in Figure 4. However, 20% of motor vehicles were still not detected because of high speed of those motor vehicles and other issues i.e. night etc. later on these issues were rectified.

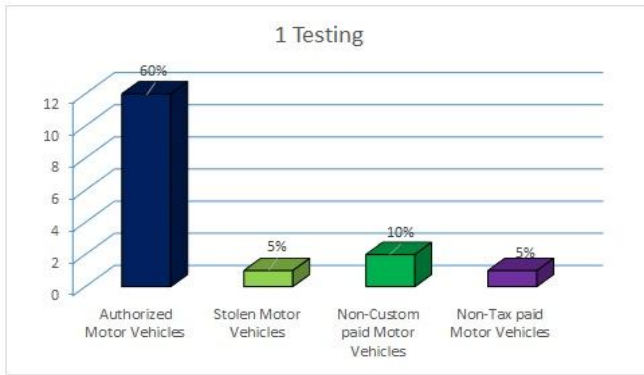


Figure 4 : Results of 1st Testing of motor vehicles in the month of December 2020

The second testing was performed at same place, village Tando Qaiser via Tando Jan in the 2nd week of January 2021. The total of 40 motor vehicles were evaluated, from which 75% of motor vehicles were detected as authorized, 7.5% were detected as stolen motor vehicles, 7.5% motor vehicles were detected as non-custom paid and 5% of motor vehicles detected as non-tax paid. As shown in Figure 5. However, after the rectified of 1st testing issues still 5% of motor vehicles were detected unsatisfactory because of low light and heavy traffic (Figure 5).

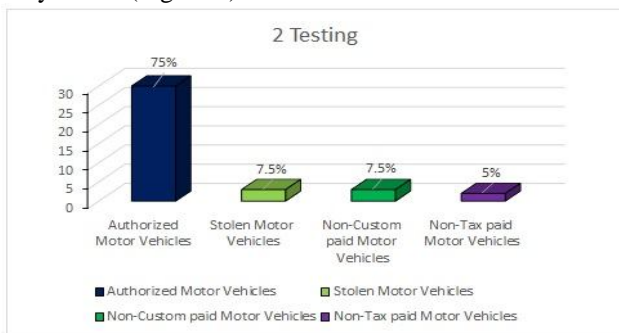


Figure 1 : Result of 2nd Testing of motor vehicles in the month of January 2021

The 3rd testing was performed again at same place, village Tando Qaiser via Tando Jam in the third week of February 2021. In this testing, the total of 50 motor vehicles were evaluated, from which 90% of motor vehicles were detected as authorized, 0 % were detected as stolen motor vehicles, 6% motor vehicles were detected as non-custom paid and 4% of motor vehicles detected as non-tax paid. As shown in Figure 6. However, after the rectified. All the issues, the developed system was working efficiently and effectively. This testing was most critical because after detection of those unauthorized, stolen, non-custom paid and non-tax paid motor vehicles, also tracked using smart phone application as shown in Figure 7.

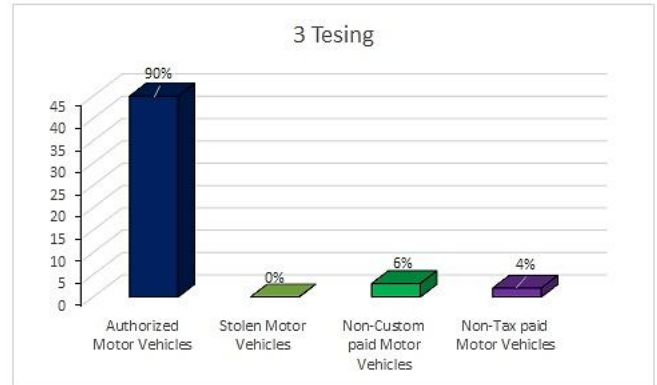


Figure 2: Results of 3rd Testing of motor vehicles in the month of February 2020

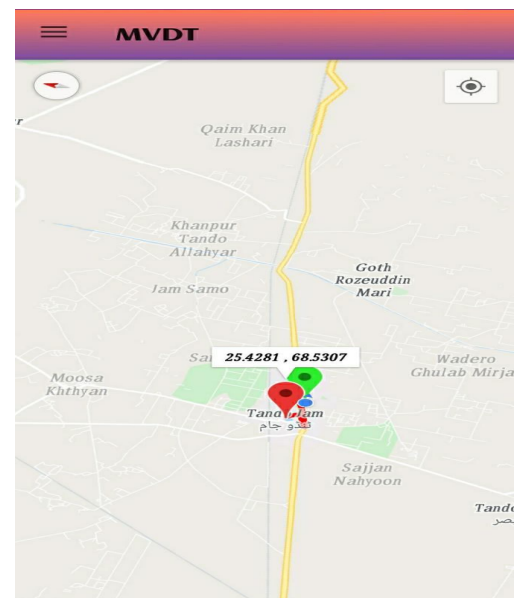


Figure 3: Tracking of Motor vehicles

Besides this, through the smart phone application an authorized person can register motor vehicles, view motor vehicles, add stole motor vehicles data, view stolen motor vehicles and non-tax paid data as well. As shown in Figure 8.

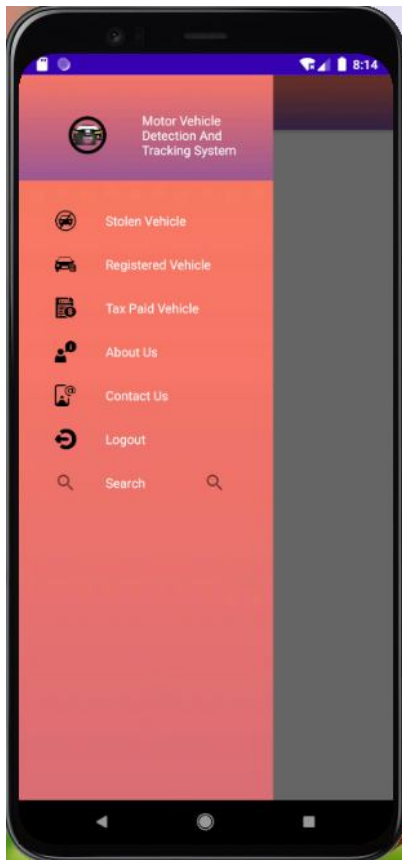


Figure 4: Navigation Drawer

4. CONCLUSION

The unauthorized, non-custom paid, non-tax paid and stealing of motor vehicles led us a significant loss of economy, loss in productivity and also maximized the crime rates in transportation system. To improve the security, reduce the crime rates, safety and efficiency of the transportation system the system was developed to enable new smart phone services and applications in transportation system. The present developed system will help to detect and track down those unauthorized motor vehicles using smart phone application and desktop application.

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