

An Internet of Things Approach to Crime Reporting System in Nigeria.

Sumayyah Sophie Nandom¹, Samuel Amachundi Adda¹, Wama Adi², Nwaogwugu, Ibeabuchi Benjamin³

1. Computer Science Department, Faculty of Applied Sciences, Federal University Wukari.
2. Computer Science Department, School of Sciences, College of Education, Zing.
3. Computer Science Department, Godfrey Okoye University, Enugu.

Abstract

Criminals and related illegal activities are difficult to predict and far more difficult to deal with once identified. The Nigerian police force (NPF) typically bases its methods solely on internal communication, dismissing (ignoring) the involvement of external parties such as citizens. The lack of timeliness between the occurrence of the criminal event, its identification, and action is due to the investigation chain. In this regard, a system based on Internet of Things technology is proposed to aid in the detection and tracking of criminals. It aims to enable the communication and collaboration between citizens and the NPF in the criminal investigation process embracing the advantages of IoTs technology. Having identified the problem of the existing system, this research used an object oriented methodology; REACTJS for User Interface design, Firebase and MySQL for a distributed database. The resultant application will allow members of the society to anonymously report crime without having to go to the police station thereby reducing crime rate. The system keeps record of wanted criminals and convicted criminals through which people can report wanted criminals when sighted, the designed system tracks reporters IP addresses in order to locate reporter's geo-location to enable NPF or any other law enforcement agencies to locate crime scene in time.

Keywords: *Internet of Things, IoT, crime investigation, crime detection; crime tracking, crime record.*

1. Introduction

The era of Internet of Things has ushered us into a world where there are no more secrets. Things considered to be secrets are dependent on who owns and manages the gadgets we are using and/or

things revolving in our environment. On a daily basis billions of chips, sensors and other electronic devices are produced and are used to monitor people, their activities and their environments. It is estimated that over 46 billion devices are connected to the internet presently [1]. A wide-ranging Internet of Things (IOT) ecosystem has emerged supporting the process of connecting real-world objects like buildings, roads, household appliances, and human bodies to the Internet via sensors and microprocessor chips that record and transmit data such as sound waves, temperature, movement, and other variables [2]. With the use of IOT technology and a proper management of data and variables generated from the technology, these will shape the way we think and live. This technology can also change the mode of approach when dealing with criminal activities in our societies. It will help reduce the high rate of crime perpetrated in our society on a daily basis.

Our society is overwhelmed with criminal activities on a daily basis [3] and these criminals tend to get away with the crimes. In Nigeria for example, security agencies have been overstretched by the increasing level of crime in the country. According to a report by Global Citizen in July 2021, school attacks and kidnapping has been on the increase since the infamous kidnapping of 276 girls from a school in Chibok, Borno state, in 2014 by the terrorist organisation *Boko Haram* terrorist group. A major concern is that eye witnesses in these communities do not trust the security agencies enough to report crime, as sometimes reporting crime to the NPF could turn the witness into a suspect. Sometimes it is the series of interrogation that the witness avoids by not reporting the crime. There is also fear of being accused of perpetrating the offense one reports to the police, reprisal attacks from the person the report is made against, due to the potential leakage of information by the police to the suspects. It is also common for the police to demand that the individual reporting a crime pay for the investigation and make numerous visits to the police station for various reasons, resulting in a significant loss of man-hours. In the quest to curtail the above-mentioned challenges, an Internet of Things approach to crime reporting systems will enable people to report criminal activities to the law enforcement agencies without going to their stations.

The purpose of this research is to create a platform where anyone can report a crime without actually being at a police station, this in turn enable the law enforcement agencies using the IP Geo-location of the reporter to take timely proactive measures to rescue victims and to bring criminals to justice. The system allowed the Nigerian Police Force to keep records of criminals,

thus giving the general public access to reporting crime to reduce crime rate as the law enforcement agencies begin to receive reports of wanted criminals that have been sighted. Leveraging on the IOT technologies, the system was designed to improve information sharing and protection across securities agencies in the country. In addition to leveraging on IOT technologies for information-sharing in general, top priorities including developing a common criminal history record and cataloging scheme that meet officer's dynamic information needs will be embedded into the system.

2. Literature Review

An overview on Internet of Things (IoTs) and Crime Reporting Systems (CSs) which represent the theoretical key aspects, on which this research work is based, is given in this section.

A. The concept of Crime

Scholars and social scientists have defined crime in a variety of ways. As a result, academics have struggled for years to come up with a clear concept of the term. Crime, according to [4], is a social wrong. Acts or omissions prohibited by law that are punishable by imprisonment or a fine are referred to as crimes. Crimes include murder, robbery, burglary, rape, drunken driving, child abuse, and failure to pay taxes. The word "crime" comes from the Latin word "crimen," which means "offense" as well as "wrongdoer." Crime is regarded as a form of antisocial behavior.

While [5] saw crime as a legal category of all ills, [6] defined it as an act injurious not only to an individual or a group of individuals, but also to a community, society, or the state ("a public wrong"). It refers to actions that are forbidden by law; offence against the state, conducts such as committing murder, stealing property, resisting arrest, driving while under the influence of alcohol and possessing or selling illegal drugs and seen as an act that violates a political or moral rule; an act of a single individual acting from personal motive, or maybe organized activity whereby gangs of mobsters seek to enrich themselves at the expense of the general public and resort to violence and murder in order to achieve their goals.

B. Internet of Things "IOT"

The Internet of Things (IoT) is a concept that connects ordinary physical things such as microwaves, doors, lighting, cars, and computers. The Internet of Things technical concept is to allow these various physical things to sense information via sensors and transfer it to a server [7].

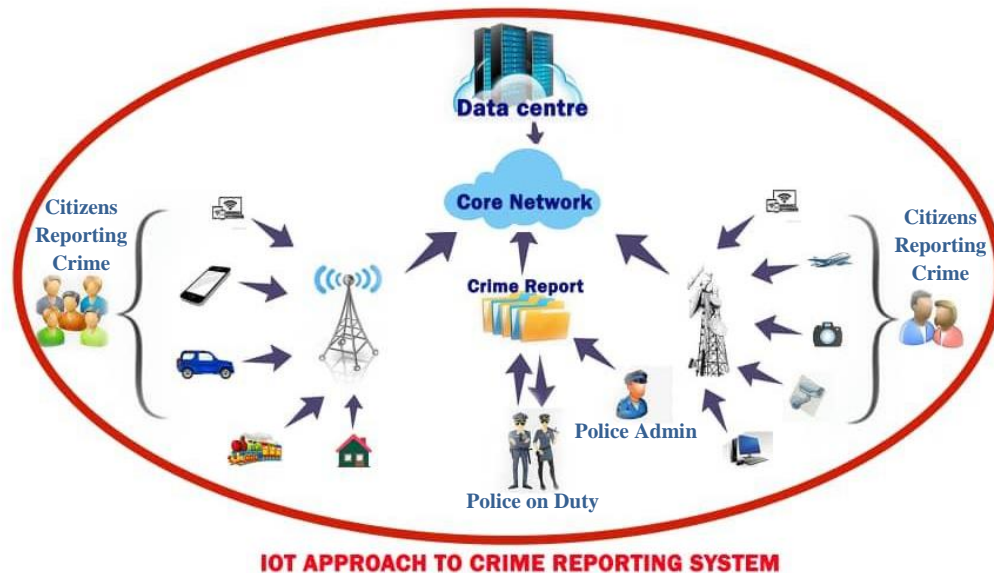
This server analyzes the data in order to gather knowledge and then converts it into specific behaviors or actions. Intelligent surroundings, such as smart houses, smart cars, even smart cities are created as a result of these actions. The Internet of Things' growth has enabled billions of linked devices to connect to the Internet, affecting people's daily lives.

The term IoT “Internet of Things” is the interconnection of things or devices. This term was conceived and birthed by a member of the Radio Frequency Identification (RFID) development community in the year 1999 and since then a series of researches has been carried on it [8]. These interconnected devices and things have the features to regularly collect, analyze and to initiate action, providing a wealth of intelligence for its end users. Imagine a world where billions of objects can sense, communicate and share information and resources, all networked over public or private Internet Protocol (IP). This is the world of the Internet of Things (IOT). This technology is a strong combination of 5G, big data, artificial intelligence, edge computing, FinTech, and cloud computing that uses brute force to communicate with each device. Wireless technologies are used in today's IoT devices in a variety of ways. Short-range technologies, such as WiFi, Bluetooth, ZigBee, and Z-wave, often use unlicensed spectrum, while wide-area cellular technologies, such as GSM, LTE, and 5G, use licensed spectrum [9]. Alternative solutions are also available, such as low-power technologies operating in unlicensed spectrum, including LoRa and Sigfox. Cellular technologies operating in licensed spectrum offer a number of benefits for IoT devices, including enhanced provisioning, device management and service enablement. More significantly, cellular networks offer the global coverage and high levels of reliability, security and performance required by even the most demanding IoT applications.

3. Materials and Methods

The new system leveraged on the advantages of IOT technology to enable the investigation and bringing to books the criminal and criminal acts carried out in the Society. The object-oriented analysis and design methodology and the notation symbol of the unified modeling language was used in the analysis of the system and the reaction JS was used to design the user interface while MySQL was used for a distributed database.

The hardware components which described the architectural implementation of the system shows the connection of different devices and the ways in which they are used to report crime or criminal activities to the National Police Force. Below is the architectural implementation of the system:



Information is first generated from the end users' (citizens) point where electronic devices connected to the internet can be used to report criminal activities going on within their locality. Devices such as cars (with embedded sensors), phone, computer system, CCTV cameras, airplane and other sensor-enable devices can be used to snap, record and transmit criminal activities to the National Police Force headquarters. The National Police Force headquarters tracks the record sentin through the use of IP tracker on the application to know the location of the crime and immediately connect to police officers on duty within that area of coverage for further investigation and apprehension of criminals.

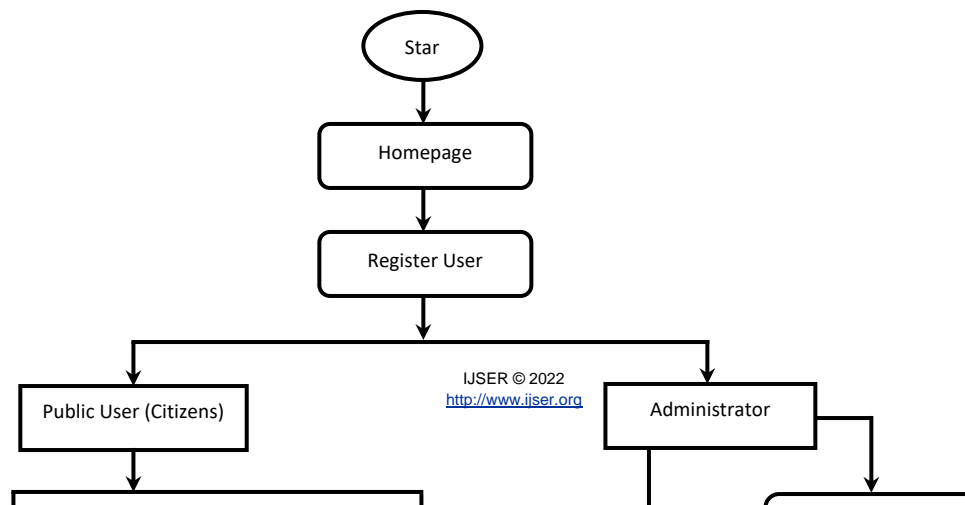


Figure 2: Activity Diagram of the proposed system

The activity diagram of the IOT crime based reporting system describing the behavior of the system in terms of execution of each task.

4. Result

The homepage authenticates every user that logs into the system where every user of the system is expected to be a registered member. The citizens log into the system to report crime, criminal suspects or to view crime records while police officers check the progress of ongoing crime investigations, assign new investigations to other officers on duty and to update crime records. Username and password are required for authentication, after which access to modules of the system are given to users based on their portfolio.

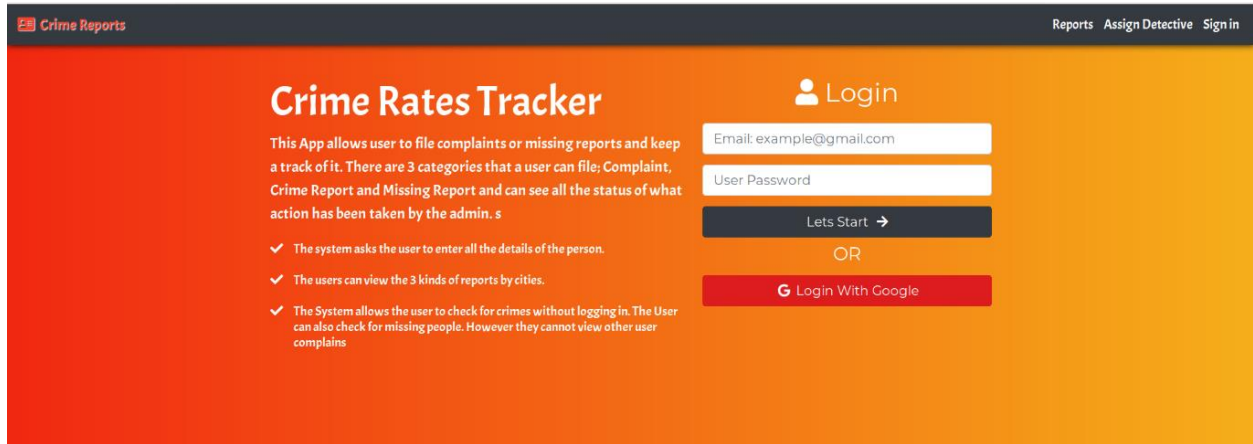


Figure 5: System Homepage

Report Crime

This module of the system gives the citizens an opportunity to report crime of any category where they can choose from the three options either to report a crime, complaint of and/or missing person.

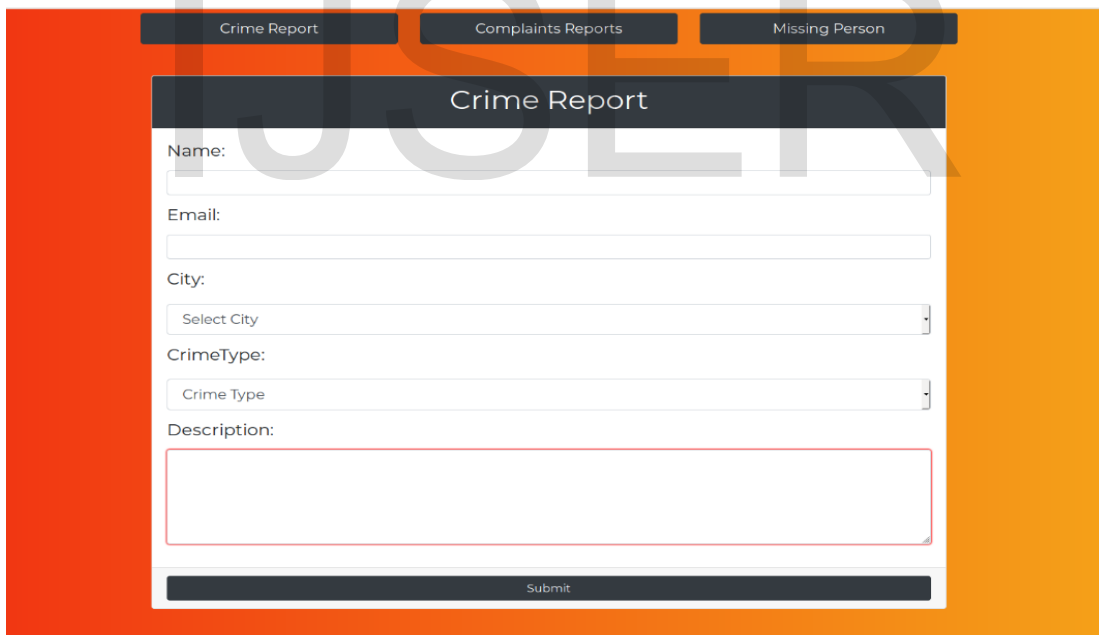


Figure 6: Report Crime Module

Crime Tracker

This module is only accessible to the Nigerian Police Officers who use it to track all crimes reported by the good citizens within their neighborhood. The use of IP geo-location is implemented on this module for easy tracking of crime.

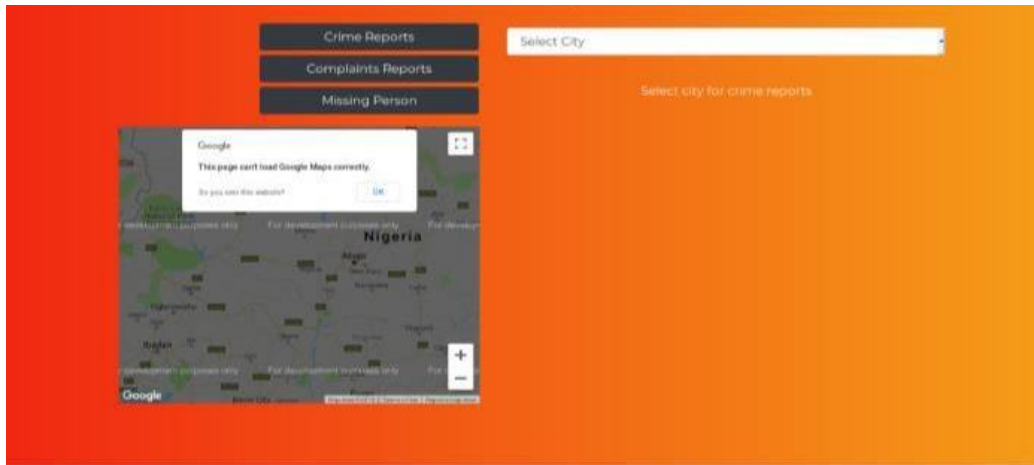


Figure 7: Crime Tracking Module

5. Conclusion

Considering the level of crime in our society today, it will be impossible for the government alone to effectively reduce criminal activities having known that of recent times the Government through the Law Enforcement Agency has invested so much towards security with average success to show for it. Leveraging on the technology of IOTs, access to criminal records gives the general public the opportunity to report crime within their neighborhood and also the required information to be on the lookout for criminals in their neighborhood thereby helping to curtail the level of criminality. In this study, the test implementation results of an IOT approach to crime reporting system which allows the general public to report crime to the National Police Force headquarters, the National Police Force track the location of the crime and assign officers on duty within that location for further investigation. This system will solve most of the problems in the manual crime reporting system.

References

- [1] Julie S., (2021), 'Internet of Things' Connected Devices to Triple by 2021, Reaching Over 46 Billion Units. An Online Article Retrieve 22/9/2021 from

<https://www.comparethecloud.net/news/internet-of-things-connected-devices-to-triple-by-2021-reaching-over-46-billion-units/>

- [3] David Canter & Donna Youngs (2016) Crime and society, Contemporary Social Science, 11:4, 283-288, DOI: 10.1080/21582041.2016.1259495
- [4] Sowmyya T. (2014), Crime: A Conceptual Understanding. Indian Journal Of Applied Research, Volume: 4(3). ISSN - 2249-555X
- [5] Lindsay Farmer (2008), Criminal Law, Tradition and Legal Order. Crime and the Genius of Scots Law 1747 to the Present, Cambridge, Cambridge University Press, 1997, xi + 207 p., ISBN 0-521-55320-2.
- [6] Martin, S.S., Butzin C. A., & Inciardi J. (1995). "Assessment of a Multi-Stage Therapeutic Community for Drug-Involved Offenders." Journal of Psychoactive Drugs 27:109–116.
- [7] Melanie Swan (2012), Sensor Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0, Journal of Sensor and Actuator Networks ISSN 2224-2708 www.mdpi.com/journal/jsan/. doi:10.3390/jsan1030217
- [8] Luigi A., Antonio I. & Giacomo M. (2016), Understanding the Internet of Things: definition, potentials, and societal role of a fast evolving paradigm. A publication of Ad Hoc Networks , Elsevier, 2016. DOI: <http://dx.doi.org/10.1016/j.adhoc.2016.12.004>
- [9] Keyur K. P. & Sunil M. P. (2016), Internet of Things-IOT: Definition, Characteristics, Architecture, Enabling Technologies, Application & Future Challenges. International Journal of Engineering Science and Computing, vol. 6(5), doi:10.4010/2016.1482, ISSN 2321 3361
- [10] Jaiswal, A., Gunjal, N., Londhe, P., Singh, S. & Solanki, R. (2013). Crime Automation & Reporting System. International Journal of Science and Modern Engineering (IJISME) (11), 5–6.

IJSER