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Interactive Mobile Based Crime Reporting System Integrated With Map Feature And Exploratory Data Analysis

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Abstract. In India, as per the statistical report of the year 2018, there were around 1.2 million crimes happening every day, out of which only 10% of the crimes were reported. Therefore, it is very difficult and challenging for the police department and intelligence agencies to resolve the crime cases if reported later or with improper and insufficient information. The well designed crime reporting system eases the job of police and investigating agencies to proceed with the rapid action. This paper proposes to design an interactive mobile based crime reporting system(CMS) integrated with map features to facilitate the tracking of location information of the place of crime. The application can be used by the public, police officials, and intelligence officials with different levels of access provisions and functionalities supporting investigation. This will be helpful for the public to report the crime as and when happened and to review the status of reported crime. The cop can use the interactive map to reach the location and can use the reported information for investigation. The higher officials can monitor and keep track of all the cases under their jurisdiction. The paper also provides an exploratory analysis of test data collected from the public using the application and the results were discussed.

Keywords: Crime Reporting System(CMS); Investigation. Location Tracking Map; Mobile App; Police.

1. INTRODUCTION

The major issue that is being faced globally is improper crime reporting and threatening of life. Public security is defacing due to crimes and taking the right actions at the right time is of key significance to solve it. The aim of the project is to create an interactive map application to report the crimes committed by people to police at the right time and also to request support or help from the people around the place of crime if required. This will be done by tracing the location of the victim. Interactive map feature helps to identify the location of the victim easily. In order to increase the number of active users and in parallel to reduce the crime rate, a feature of giving rewards to people who report crimes is proposed. Indicating crime places with suitable icons in map application enables officials to make decisions easily. Analysis of past crime reports and providing the status of crimes enable officials to work effectively.

The average world crime rate is increasing day to day and the technology enhanced solution to report crimes as and when it is witnessed at least to minimize the public crimes is the major motivation behind the proposed interactive crime application. The app is designed and built to realize the following initiatives.

- Crime rate can be reduced in an effectivemanner.
- General public can lead safe and securelives.

- The works of officials can be eased to react and solve the crimewitnessed.
- Awarenessaboutthesystemshouldbecreatedamongpeoplesothatthenumberofuse rscanbe increased.
- Officials need the exact location of the victim to reduce therisks.
- Intimation of messages should beincreased.

2. LITERATURE SURVEY

Prof. Hanmant et al., proposed a design to minimize crime incidents, using data mining, under Police Jurisdiction. There is an enormous void between the number of lawsuits reported and completion of inquiry due to lack of Integrated Mechanism for Investigation, Innovative Practices Training [IPT] [1]. Yoshinori Maeno from Japan patented an idea of monitoring only a given region, which would detect an intruder, then automatically judge instantly and assuredly whether or not the intruder is an illegally trespassing person on the side of its concentrator center and if so, then issues a highly authentic report to such a restraint order as a police station. The crime monitoring invention is not constrained to the surroundings and situations. But it may be renowned to adapt to different conditions with out violating the scope of the innovation.[2]

Robert M Green projected that mobile computers are majorly used for crime detection and security systems like Tablets, Smart Watches, Personal digital assistants [PDA], Mobiles, Carputer, Wearable computers, Ultra-Mobile PC. He patented the use of Instant messaging as an effective way to alert the people during emergencies and User's text can be conveyed over the internet. Advanced methods of alerting include live voice or video calling. In the automation part, Crime images like breaking traffic rules like wearing helmets, obeying traffic signals can be trained using ML models.[3]

Vineet Pande, Viraj Samant, Sindhu Nair (International Journal of Engineering Research & Technology (IJERT) 5 (01), 2016 To predict the variations in crime rate and it's trends, statistical analysis is formulated for type of crimes such as thefts, assault, robbery, murder, traffic violation etc... Time series prediction is used to analyze the frequency rate of crime in a region, month, year and time with respect to crime prevalence of the overall country. Predictive data analysis and visualization techniques are composed to speculate the occurrence of crime as well as to control the crime.[4]

H. Chen et al., suggested enhancing the crime prediction system using data mining algorithms and to identify the pattern among all records using data analysis. Entity extraction method automatically identifies the profile of persons, audio or video evidence from police narrative records. Clustering technique to identify the suspects who committed the crime related to the searching victim. Association rules and sequential pattern mining are used to identify the secrets from users' interaction history through frequently occurring patterns from network intrusion detection. Outlier analysis or deviation detection are used to identify the misbehaved or abnormal activity patterns. Deploying this concept in fraud detection yields effective results. Graphical Mining is used for criminal network analysis. Effective strategy draws the information like subgroups, key members, team members who are related to the crimes and the relational degree(closeness) between them [5].

3. METHODOLOGY

Objectives

- Crime can be reported by any individual without worrying about their identities being revealed.

- People around the area of a crime can be notified about the issue for theirsafety.
- The map application eases the work of officials to locate the areaconcisely.
- General public can lead safe and securelives.
- Crime rate can be reduced in an effectivemanner.
- Transparency among the public to beincreased.

SystemSpecifications

This interactive crime reporting system is developed using an IntelliJ IDEA based new Android Development environment[6]. It is used to build an interactive map interface with java Background. Firebase is used as a Backend-as-a-Service, and it is a real-time database to store information which is basically designed for mobile applications[7]. The application features are implemented using Geo Mapping Application interface, suitable data mining algorithms, Google Colab GPU environment and TPU for processing the data.

ProposedSystem

The application is designed to store information regarding type of crime, description, location, and image which would be entered by the civilian at the nearby place of crime[8]. These reports submitted by civilians are viewed by the responsible official in the police Department. In case of emergency, the person's location is immediately sent to the police[9]. A notification alert is sent to people around a radius of 1 KM about the reported crime, if it is approved by the police. The updates of the crime reported and the action taken on them will be updated to the reported person. During Emergencies, an SOS service has been provided[10]. Architecture for crime network prediction and analysis will beimplemented.

Workflow

- The use case diagram describing the workflow of the interactive mobile based crime reporting system with map feature for location tracking is shown in Fig1.
- Users will sign up in the app with their mobile number and an OTP received to their number on confirmation is shown in Fig 2A and2B.
- An interactive map interface is used to track the user's current location as in Fig2C.
- Users can report a crime with the demographic data and an optional photo image capture of the incident ifpossible.
- Once the report is sent, the police are notified about the crimereport.
- Alert Notification is sent to nearby people around a radius of 1 KM, once the police accept, review and approve thereport.
- The reported user is acknowledged and reward points are added. The reward point feature can be facilitated with the suitable redeemingoption.
- Records and updates about the reports submitted are updated to reported individuals. They will be able to view the status of all the reported crimes from theirend.

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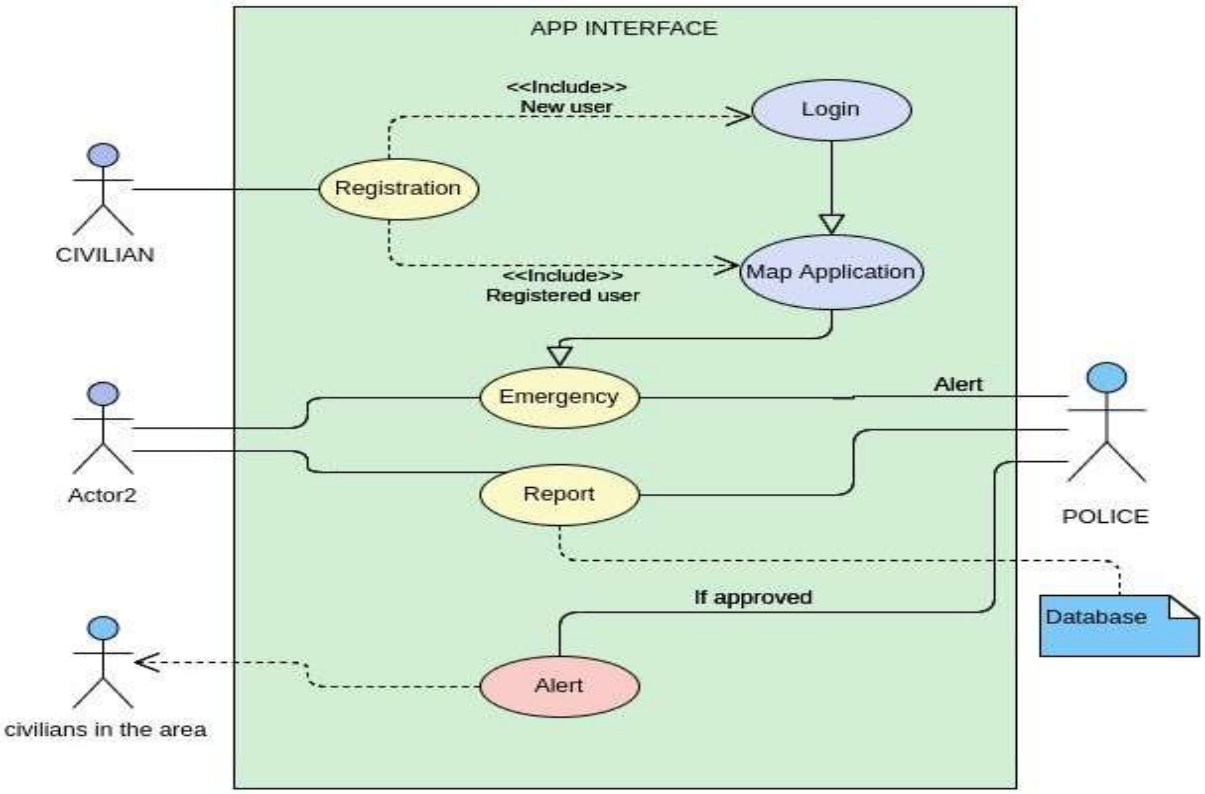

Fig. 1. Use case diagram of Interactive Crime Reporting System

Fig. 2A.UserSignup

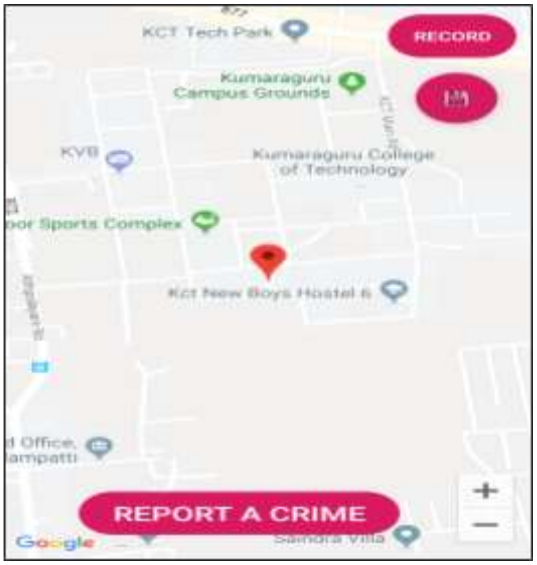

Fig. 2B. Map feature for location tracking

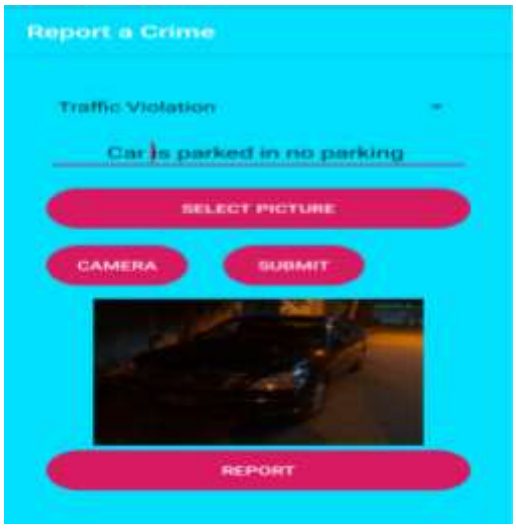

Fig. 2C. Crime Reporting using Photo Image Capture

TargetUsers

- People who are in danger/ requirehelp.
- People who lost any objects can be reported and get information notified fromothers.
- People who seek to report a crime committed byothers.
- Police who will get notification of thecrimes.
- Analysis report to be submitted inCyber-crime.

4. DATA ANALYSIS, OUTCOMES AND VISUALIZATION

The data is collected through the developed interactive mobile based crime reporting application involving the usage of app and a crime report survey from students, faculty, workers and people around Coimbatore in the year 2020 and an exploratory analysis on the gathered data entries is performed [11]. The result and outcome of a set of data analyzed are displayed anddiscussed.

Analysis1:

Analysis has been done on crime type to determine the most frequently happening crime shown in Fig 3. Based on that, traffic violation is determined as a commonly occurring crime. Officials and department authorities can be focused more based on the hierarchy of crime rate.

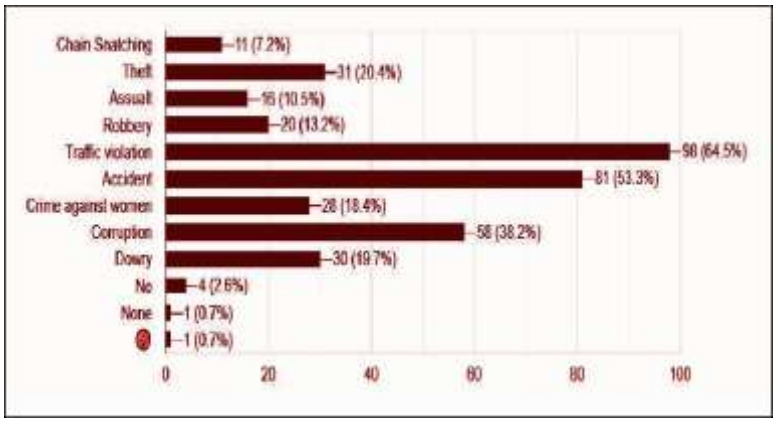

Fig. 3. Analysis Chart of most frequently occurring crime

Analysis2:
Fig 4. The chart shows the frequency of crime that the civilians witnessed. Additional Forces and security can be enforced based on crime occurring rate.

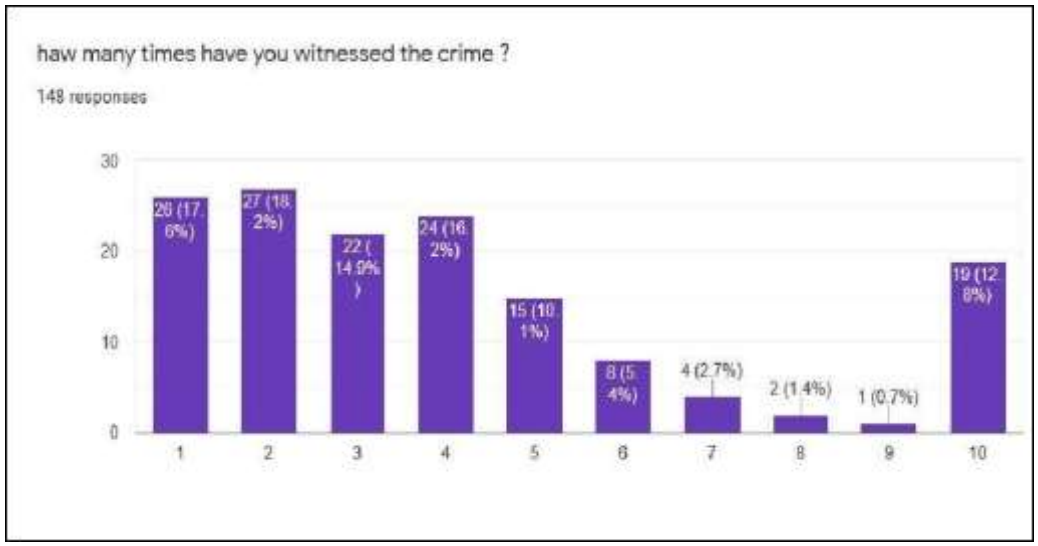

Fig. 4. Analysis Chart of frequency of crime witnessed

Analysis3:
Reporting rate of people is analyzed and shown in Fig 5. According to this graph, 68.4 percent of people didn't report the crime even though they have witnessed the crime. Awaren

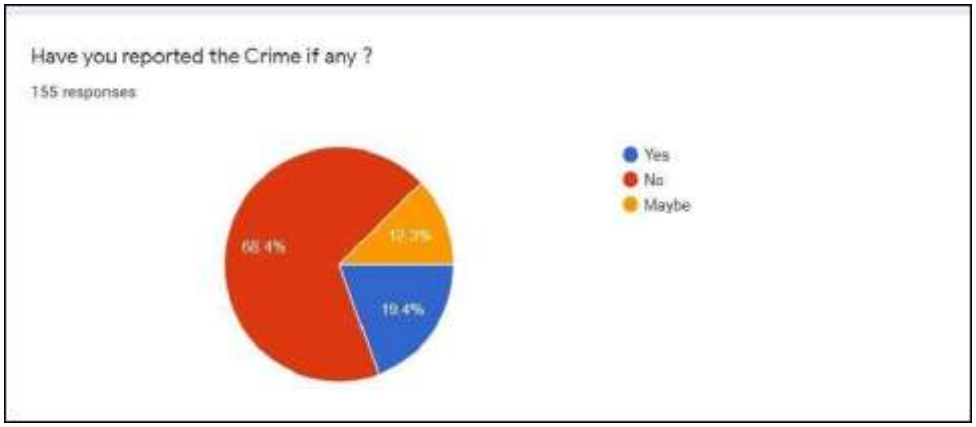

Fig. 5. Analysis Chart of reporting rate of people

Analysis4:
Fig 6. shows the acknowledgement rate of crimes previously reported without app. Insights that have been drawn from the graph is "If acknowledgement rate rises then reporting cases will also be increased". Meanwhile, the crime rate will bereduced.

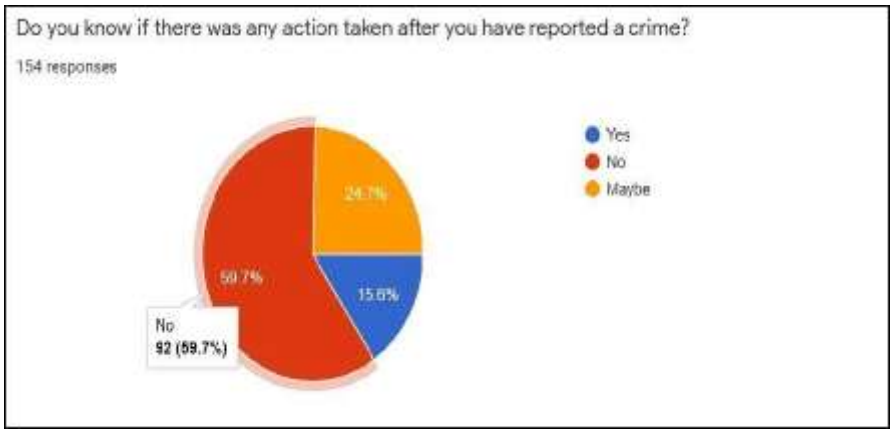

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Fig. 6. Analysis Chart of acknowledgement rate of crimes

5. CONCLUSION

The paper proposed an interactive mobile based crime reporting system integrated with map features for location tracking and the exploratory analysis on the crime reporting data gathered. The key advantages of the system designed includes Interactive map feature to identify the location of the victim easily. The feature of giving rewards to people who report crimes will increase the number of active users and in parallel reduces the crime rate. Indicating crime places with suitable icons in map application that enables officials to make decisions easily. Analysis of past crime reports and providing the status of crimes enable officials to work effectively. Data mining routines like sequential pattern mining and association rule mining that can be used to recognize the regularly occurring patterns from users' interaction history using crime data reported, which would help the investigations and future crime predictions.

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