A HOLISTIC FRAMEWORK FOR CRIME PREVENTION, RESPONSE, AND ANALYSIS WITH EMPHASIS ON WOMEN SAFETY USING TECHNOLOGY AND SOCIETAL PARTICIPATION

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ABSTRACT—Ensuring women's safety in smart cities is a need of the hour. Even though several legal and technological steps are adopted worldwide, women's safety continues to be an international concern. Criminal records are maintained by law enforcement agencies and are most often not available to the public in an easily comprehensible form. While some wearable devices and mobile applications are available which are touted to aid in ensuring women's safety, they utilize limited societal intervention and are not very efficient in ensuring the safety of the women as and when required. Most often the crime response, crime analysis, and crime prevention schemes are not integrated, leading to gaps in ensuring women's safety. Our major contribution is in developing a holistic system encompassing the three crucial aspects, i.e crime analysis and mapping, crime prevention, and emergency response by leveraging societal participation for women safety management. This work applies the Geographic Information System (GIS) for the identification of hotspots and patterns of crime. The proposed system uses data generated from the mobile application and/or wearable gadget prototyped as a part of this work along with the criminal history records for crime response, analysis, and prevention. The system for the hotspot identification is demonstrated for the Pilani town in the Jhunjhunu district in the state of Rajasthan, India, and can be easily scaled up geographically and utilized as a safety strategy for smart cities. While the common man is provided a cost-effective solution via the developed mobile application or wearable gadget, the various components are integrated into a website for supervisory management and can be utilized by law enforcement agencies.

Index Terms— Smart cities, geographic information system (GIS), crime analysis, crime response, women safety, mobile application, wearable device.

I. INTRODUCTION Gender-based disparities are one of the major issues of the current century. Even though constitutional rights have vouched for gender equality, it is a reality that gender-based disparity exists in several sections of societies across the world. The 21st-century women have to a certain extent succeeded in contributing to society and working shoulder to shoulder with men in several fields. However, violence The associate editor coordinating the review of this manuscript and approving it for publication was Wenge Rong . against women is being increasingly reported in recent times across the world. According to António Guterres, the ninth Secretary-General of the United Nations, violence and abuse against women are among the world's most horrific human rights violations, affecting 1 in every 3 women in the world [1]. Gender equality is the prerequisite for a better world. Gender-based violence on females limits women's participation in decision making leading to a decline in life quality. Women's equal participation is vital to stability, to prevent conflict, and to promote inclusive and sustainable development. no country has remained unaffected and there is a need to understand the root cause behind the crimes and find solutions. Today, the crime mapping and crime response remain majorly a responsibility of law enforcement agencies. Crime record data is maintained by law enforcement agencies and is

most often not available to the public in an easily comprehensible form to take necessary precautions. Even though crime prevention is a major concern of the police force, since the human resource capacity of the police force is small relative to the population, their services sometimes tend to get limited to crime response than crime prevention. Some wearable devices and mobile applications are developed over the years towards ensuring women's safety. However, most of these applications and wearables either raise an alarm in the form of visual or audio cues or sent messages to the contacts (guardians) or law enforcement agencies. If a woman moves out of the city or away from their guardians these systems do not serve the purpose. These systems utilize limited societal intervention and are not very efficient in ensuring the safety of the women as and when required. Most often the crime response, crime analysis, and crime prevention schemes are not integrated leading to gaps in ensuring women's safety. In this pap

II. LITERATURE SURVEY

1. Athena: A Mobile Based Application for Women's Safety with GPS Tracking and Police Notification for Rizal Province

Ester Dhenise G. Vinarao, Michelle Nicole B. de Guzman, +5 authors Edward N. Cruz Published in Student Conference on… 1 October 2019

The study aims to develop a Mobile Based Application for Woman's Safety to help authorities track criminals through the use of the said application by providing real-time SMS Notification, GPS Tracking, and direct emergency call to nearby police station inside the province. Rizal province was chosen as the beneficiary of this study during this phase. The system will also help authorities prevent crimes before it happens depending on the user response. The study is best suited for individuals commuting to uncomfortable destinations. The study requires users to have an active mobile network load to maximize the potential of the system. It involves host server which accept and process complaints initiated by the users. The development of the "Athena: A Mobile Based Application for Woman's Safety with GPS Tracking and Police Notification for Rizal Province" utilizes Agile methodology in Android platform provide the following functions: sends notification via SMS, video and image capturing, and direct calling the police and GPS tracking in time of distress. The developed system also showed its effectivity in processing the different features stated in the scope and delimitations of the study.

2. **Development of an interactive web-based geovisual analytics platform for analysing crime data**

Mohammad Aman Kaif, Sanidhya Samaiya, +3 authors Akula Poojitha Published in IEEE Symposium on Wireless… 15 August 2023

This paper presents the development of an interactive web-based geovisual analytics platform for analyzing crime data. The platform integrates spatial criminology principles and GIS techniques to provide a user-friendly interface for exploring and analyzing crime patterns. District-wise annual crime data from the NCRB reports, with a specific focus on crimes against women between 2017 and 2021, is utilized. The system architecture incorporates React,

JavaScript, Bootstrap, Express, GeoServer, and Node.js, while open-source tools like QGIS and OpenLayers enhance functionality. The platform offers a main dashboard with statistical information presented through doughnut and line charts, along with an interactive map for detailed exploration. It serves as a valuable resource for law enforcement agencies, offering a free and customizable solution for spatial crime data analysis. Future work includes improving the integration between the map-view and graph overview sections and expanding the platform's application to accommodate diverse geospatial datasets.

3. Mapping the Impact: Property Crime Trends in Kuching, Sarawak, During and After the COVID-19 Period (2020-2022)

Azizul Ahmad, Muhammad Haziq Kelana, +4 authors Tarmiji Masron Published in Indonesian Journal of… 30 April 2024

This study aims to explore how COVID-19 and the Movement Control Order (MCO) have influenced the trend of property crimes in Kuching, Sarawak spanning from 2020 until 2022. The lockdown imposed by the government had impacted daily activities in Malaysia, including those in Kuching, Sarawak. The methodology employed in this research involves descriptive analysis and spatial analysis, specifically using the Hot Spot Getis GI* technique, with the support of ArcGIS software. It examines relationships between crime and geography. The trend of property crime cases dropped from 1,144 cases (2020) to 813 cases in 2021 and ended with 683 cases in the year 2022. The value of GiZScore from the lowest of 2.066694 to the highest of 13.365677 is from the year 2021. Property crime in Kuching's urban center was targeted even during MCO beginning March 2020 to November 1, 2021. This indicates a notable decrease in property crime trends during the COVID-19 (2020-2021) pandemic period due to the MCO and lockdown which continue to impact into the subsequent endemic era of 2022. This demonstrates the efficiency of the Royal Malaysia Police, particularly in the context of Kuching, Sarawak.

IMPLEMENTATION

Modules

Service Provider

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Login, Browse Data Sets and Train & Test, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View All Antifraud Model for Internet Loan Prediction, Find Internet Loan Prediction Type Ratio, View Primary Stage Diabetic Prediction Ratio Results, Download Predicted Data Sets, View All Remote Users.

View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

Remote User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like REGISTER AND LOGIN, PREDICT PRIMARY STAGE DIABETIC STATUS, VIEW YOUR PROFILE.

CONCLUSION

Building safer cities for women requires holistic measures for crime prevention, analysis, and response. This will be effective only with the understanding of various socio-economic factors that lead to violence against women so that effective measures for social reforms can be designed. Also, technological interventions will not be effective in providing timely help if only law enforcement agencies or personal contacts are involved in rescue and response. The work presented in this paper describes the holistic framework for crime prevention, response, and analysis with emphasis on women safety using technology and societal participation. The Integrated system offers the components - (1) WebGIS, including the geospatial database storing criminal records and for hotspot generation, analysis, and visualization. (2) Mobile Application for raising alerts and enabling tracking of the person in danger, viewing the crime hotspots in the locality to enable taking precautionary measures. The mobile application is designed to ensure that the registered users receive alerts about the person in danger in the locality. The user can commit to approaching the person in danger after which both the user and person in danger can be recorded and monitored by the system administrator. (3) A cost-effective wearable gadget with GPS/GSM/GPRS for raising alerts and can be used as a standalone device even when the smartphone is not active. (4) Website which acts as an integrator for the various components developed such as 'SpotHer' mobile application, wearable device, and WebGIS system. The website provides visualization for the data collected from the mobile application, wearable device, geospatial server, and criminal records. The administrator can also update the crime data to the geospatial database through the website. The website allows viewing of important information such as the real-time location of the user, safety status of the user, the number of volunteers who responded to an SOS, details of the user such as name, phone number and emergency contacts, etc. It is thus possible to design proactive response measures whereby which the hotspots of crime can be identified, users in danger can be tracked and preventive actions can be planned. The supervisory management of the website will be done by law enforcement agencies.

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