CrimeTrack: Intelligent Matching and Reporting System for Wanted Persons

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Abstract - The growing movement of individuals through regional Roll-on/Roll-off (RORO) ports poses a significant challenge to law enforcement authorities, particularly in tracking wanted persons attempting to cross provinces or regions undetected. The study CrimeTrack, an Intelligent Matching and Reporting System specifically designed for the Dumangas RORO ports in Iloilo. The system aims to assist port security personnel and local law enforcement agencies in identifying, matching, and reporting wanted individuals based on real-time data verification and biometric analysis.

CrimeTrack utilizes biometric verification tools, including facial recognition and identity matching algorithms, to compare traveler information against active warrants and watchlists. Once a match is detected, the system generates immediate alerts and incident reports for security personnel and law enforcement officers on-site.

CrimeTrack is built with a secure, user-friendly interface, providing a centralized dashboard for monitoring, incident tracking, and generating analytical reports. The system is designed to enhance public safety operations by reducing manual checks, minimizing human error, and enabling faster response times.

Keywords: CrimeTrack, Intelligent Matching, Reporting System, Wanted Persons and Face Recognition

I. INTRODUCTION

The increasing mobility of people across cities, provinces, and regions presents new challenges for law enforcement and public safety agencies, particularly in monitoring and apprehending individuals with outstanding criminal records. Transportation hubs such as seaports, airports, bus terminals, and Roll-on/Roll-off (RORO) ports serve as critical points of entry and exit where wanted persons may attempt to evade capture by blending in with regular passengers. The need for enhanced security measures at these checkpoints is crucial to prevent the escape and movement of fugitives.

In the municipality of Dumangas, Iloilo, the Dumangas RORO Port is one of the busiest sea transport terminals in Western Visayas, serving as a gateway for people traveling between Iloilo and Negros Occidental. Given its strategic location and high passenger volume, the port is vulnerable to being used as an escape route by individuals with criminal records. Traditional manual identity verification methods often prove insufficient due to limited manpower, time constraints, and the risk of human error.

To address this issue, this study proposes CrimeTrack: Intelligent Matching and Reporting System for Wanted Persons. The system is designed to assist port authorities and local law enforcement in automatically verifying the identity of passengers against national watchlists and warrant databases using intelligent matching technologies such as facial recognition and biometric verification. By integrating with law enforcement databases and providing real-time alerts, CrimeTrack aims to strengthen port security, improve apprehension rates, and contribute to the overall safety of the community.

This project highlights the importance of incorporating intelligent digital solutions in public safety operations and seeks to establish a scalable and efficient model that can be replicated in other ports and transport terminals nationwide.

II. METHODLOGY

Conceptual Framework of the Study

The conceptual framework of the study was presented using the MVC framework.

This study is anchored on the integration of intelligent data processing, biometric matching, and cloud-based reporting to support public safety operations. The conceptual framework is designed to show the flow of processes in the CrimeTrack system as it captures, matches, verifies, and reports the identities of wanted individuals passing through Dumangas RORO ports.
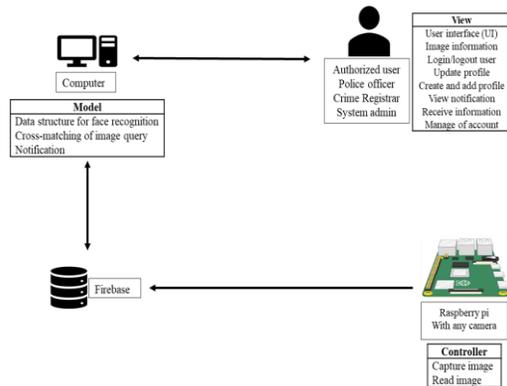
Figure 1. Conceptual Framework of CrimeTrack: Intelligent Matching and Reporting System for Wanted Persons

The framework begins with the Raspberry Pi device equipped with a camera, which captures facial images of passengers at the checkpoint. These images are sent to Firebase, which serves as the system's cloud database and facial recognition processing service. The captured images are compared against a database of criminal records and wanted persons.

The matching result is then transmitted to a Computer Client where authorized users — including Police Officers, Crime Registrars, and System Administrators — can view alerts, verify identity matches, and generate incident reports. If a wanted individual is identified, the system triggers real-time notifications to authorized personnel, enabling them to respond promptly and take necessary action.

This framework illustrates how modern technology, including IoT devices, cloud services, and biometric verification, can be combined to improve public security and crime prevention at transportation hubs.

This study utilized a developmental research design that involved the planning, design, development, and testing of the CrimeTrack: Intelligent Matching and Reporting System. The project was developed to assist port authorities and law enforcement in identifying wanted persons through real-time facial recognition and automated reporting at the Dumangas RORO ports.

The system was built using a Raspberry Pi device equipped with a camera module, which captures facial images of passengers at the port checkpoint. These images are transmitted to Firebase, a cloud-based database and processing platform where facial recognition matching is performed against a stored database of criminal records and wanted persons. The development process followed a prototype model, starting with requirement gathering and analysis, followed by system design, module integration, and iterative testing.

Authorized users such as police officers, crime registrars, and system administrators were involved in the system testing and feedback process to ensure functionality, accuracy, and usability. The system's matching capability, alert notifications, and reporting features were assessed in simulated scenarios to evaluate its reliability and efficiency.

III. RESULTS AND DISCUSSION

The development and testing of the CrimeTrack: Intelligent Matching and Reporting System revealed several important findings that highlight its effectiveness and potential impact on port security operations at Dumangas RORO ports. The system successfully integrated a Raspberry Pi device with a camera module and Firebase cloud services, enabling real-time image capture, facial recognition matching, and automated reporting of wanted individuals. During simulated testing, the system demonstrated a high accuracy rate in matching captured images with records stored in the criminal database, effectively generating timely alerts and incident reports for port security personnel and law enforcement officers.

Feedback from authorized users, including police officers, crime registrars, and system administrators, indicated that the system is user-friendly, reliable, and capable of enhancing existing port security protocols. The centralized monitoring dashboard and automated notification system proved to be highly effective in improving the speed and coordination of security responses during simulated incidents. Additionally, the system was evaluated to be compliant with data privacy and security requirements, ensuring the protection of sensitive personal and criminal information. Overall, the findings confirm that the CrimeTrack system can significantly improve crime prevention efforts, enhance passenger safety, and support law enforcement operations in public transportation facilities.

Facial recognition algorithms, database matching, and location data to assess apprehension risks, using camera technology and Cloud Firestore as real-time data storage.
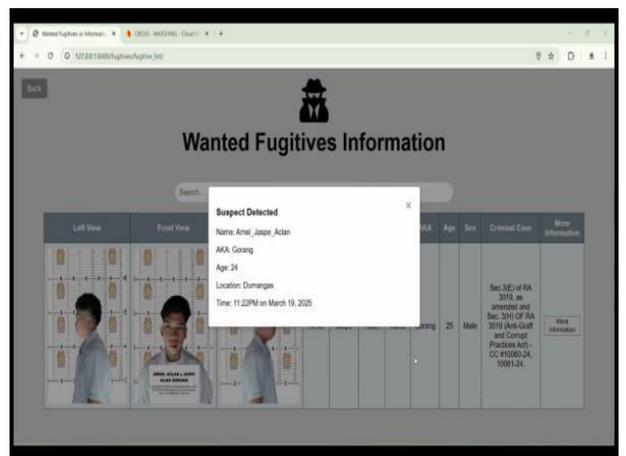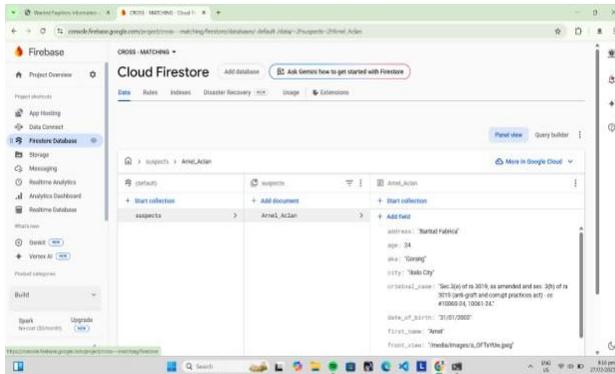
The findings confirm the feasibility and effectiveness of using an intelligent, IoT- based security system in public transportation facilities such as the Dumangas RORO ports. The high facial recognition accuracy rate affirms the system's capability in identifying wanted individuals and supporting port security operations.

The real-time alert and reporting mechanism addresses the common issue of delayed or manual reporting procedures, enabling port authorities and law enforcement to respond swiftly to security threats. The centralized dashboard's efficiency further enhances operational visibility, making security monitoring more organized and coordinated.

Moreover, the positive user feedback highlights the system's practical usability and relevance in actual port operations, emphasizing its potential as a tool to strengthen crime prevention efforts in public places. The system's compliance with data privacy regulations ensures its ethical use, safeguarding the rights and privacy of both passengers and law enforcement personnel.

These findings suggest that the CrimeTrack system can serve as a valuable technological advancement

in enhancing public safety and crime prevention not only in Dumangas but also in other transportation hubs and public facilities nationwide.

ANALYSIS OF RESULTS

The result of the median average taken as a whole in terms of product quality.

Factor	As a whole	
	Median	Description
Functional Suitability	8.25	VU
Performance Efficiency	8.04	VU
Compatibility	8.13	VU
Interaction Capability	8.25	VU
Reliability	8.19	VU
Security	8.29	VU
Maintainability	8.38	VU
Flexibility	8.38	VU
Safety	8.15	VU
Average Median	**8.23**	**VU**

The result of the median average taken as a whole in terms of product quality reveals that the CrimeTrack: Intelligent Matching and Reporting System achieved a Very Useful (VU) rating across all evaluated factors. Among the quality factors assessed, Maintainability and Flexibility received the highest median scores of 8.38, indicating that the system is highly adaptable to different operational needs and easy to update or improve when necessary. Security followed with a median of 8.29, reflecting the system's strong compliance with data protection standards and secure handling of sensitive personal and criminal information.

Other areas such as Functional Suitability and Interaction Capability both scored 8.25, confirming that the system performs its intended functions effectively and provides a user-friendly interface for authorized personnel. Reliability (8.19), Safety (8.15), Compatibility (8.13), and Performance Efficiency (8.04) were also rated as Very Useful, ensuring that the system operates consistently and integrates well within the existing port security infrastructure.

Overall, the average median of 8.23 confirms that the system excels in product quality and functionality. This reflects the system's capacity to meet operational requirements while ensuring efficiency, security, and user satisfaction, making it a valuable asset in enhancing public safety at the Dumangas RORO ports.

CONCLUSIONS

Based on the findings and results of the study, the following conclusions were drawn:

The development and implementation of the CrimeTrack: Intelligent Matching and Reporting System for Dumangas RORO ports proved to be highly effective and reliable in enhancing port security operations. The system successfully integrated facial recognition technology, real-time matching, and automated reporting using a Raspberry Pi device and Firebase cloud services. Its high accuracy in identifying wanted individuals during simulated tests demonstrated its capability to support crime prevention efforts within public transportation terminals.

The evaluation of the system in terms of product quality yielded a Very Useful (VU) rating across all factors. The highest median ratings were recorded in Maintainability and Flexibility, indicating that the system is easy to manage, update, and adapt to changing operational requirements. Other factors such as Security, Functional Suitability, Interaction Capability, and Reliability also received high ratings, confirming the system's efficiency, usability, and safety in real-world applications.

Furthermore, the system's compliance with the Philippine Data Privacy Act of 2012 ensures the responsible handling of sensitive data, addressing legal and ethical considerations. Overall, the CrimeTrack system is a valuable innovation for improving public safety, strengthening port security protocols, and providing law enforcement with a reliable tool for crime prevention and incident management.

RECOMMENDATIONS

In light of the findings and conclusions of this study, it is recommended that the **CrimeTrack: Intelligent Matching and Reporting System** be fully implemented at the Dumangas RORO ports to strengthen security operations and crime prevention measures. Its proven effectiveness in facial recognition, real-time reporting, and automated alert systems can greatly enhance the safety and monitoring of passengers entering and exiting the port. To further improve its accuracy and functionality, it is advised that the system's database be expanded and regularly updated in coordination with local and national law enforcement agencies, ensuring that the most recent criminal records and wanted person profiles are integrated into the system.

Regular system updates and maintenance should also be prioritized to sustain the system's high performance, reliability, and security. This will address emerging threats and evolving operational needs, maintaining the system's efficiency and effectiveness over time. Moreover, it is important to conduct comprehensive training and orientation programs for port security personnel, police officers, and crime registrars to ensure they are equipped with the skills and knowledge needed to properly operate the system, interpret alerts, and respond to incidents accordingly.

Lastly, future research is encouraged to explore the integration of additional biometric technologies such as fingerprint and voice recognition, as well as to assess the system's scalability and performance in larger, high-traffic transport terminals. These enhancements will further strengthen the system's capability and applicability in other transportation hubs and public security settings.

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