

Revolutionizing Financial Operations in Acute Situation: an ECC - Transaction Based System for Security and Swiftness

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Abstract— Floods present significant challenges in various regions, particularly during the November to December period, often resulting in widespread network disruptions and potential outages. Traditional 2G systems may struggle to handle emergency transactions during such critical times. Moreover, there's an increased risk of hackers exploiting vulnerabilities in server systems to misuse frozen funds. To tackle these issues, this study introduces a novel encrypted transaction system utilizing Elliptic Curve Cryptography (ECC) to secure account and receiver details. Additionally, to enhance transaction speed over 2G networks, the system incorporates multi-packet division for money transfers. These enhancements to the Multi-Path Transmission Control Protocol (MPTCP) enable efficient transmission of encrypted data, even in areas with limited coverage. By introducing these innovations, the proposed system aims to bolster the reliability and security of financial transactions during flood emergencies.

Index Terms— Flood emergencies, Network disruptions, 2G systems, Emergency transactions, Elliptic Curve Cryptography (ECC), Multi-Path Transmission Control Protocol (MPTCP), Encrypted transactions, Financial Security, Network Reliability

I. INTRODUCTION

In regions prone to flooding, particularly during the November to December period, network disruptions pose significant challenges, often resulting in complete outages. Traditional 2G systems face difficulties in facilitating emergency transactions during such critical times. Moreover, the risk of hackers exploiting vulnerabilities to misuse frozen amounts on server-side systems exacerbates the situation. In response to these challenges, this paper proposes a novel encrypted transaction system leveraging Elliptic Curve Cryptography (ECC) to secure account and receiver details. Additionally, the system enhances transaction speed over 2G networks by implementing multi-packet division for money transfers, utilizing advancements in the Multi Path Transmission Control Protocol (MPTCP). These innovations aim to enhance the reliability and security of financial transactions during flood emergencies, providing a crucial lifeline in times of crisis.

II. RELATED WORKS

The surge in the cryptocurrency market has captured the attention of investors keen on harnessing its potential for profit. Consequently, there's a growing interest in leveraging historical data analysis methods to assess and forecast future trends within this volatile domain. Blockchain technology has emerged as a cornerstone of cryptocurrencies, driving advancements in data analysis and prediction models. Among these models, Support Vector Regression (SVR) has gained traction for its capacity to analyze and predict cryptocurrency

prices. Yet, research suggests that SVR model accuracy can be further enhanced through integrated learning approaches that amalgamate long-term and short-term historical data. By integrating extensive datasets of historical cryptocurrency prices, researchers aim to validate the efficacy of integrated learning models in bolstering SVR predictive capabilities. Experimental results have shown promising outcomes, emphasizing the potential of integrated learning techniques to deliver more precise cryptocurrency price forecasts. This survey underscores the importance of ongoing research endeavors aimed at refining prediction models to adapt to the ever-evolving landscape of the cryptocurrency market.

Cryptocurrency price prediction has garnered significant attention from investors and researchers due to its profound impact on financial decision-making. However, the volatile and unpredictable nature of the cryptocurrency market poses substantial challenges for traditional prediction methods. As a result, there's a growing interest in leveraging neural networks and deep learning techniques to enhance the accuracy of cryptocurrency price forecasts. Recent studies have explored various neural network architectures, including Long-Short Term Memory (LSTM) and Transformer models, to analyze cryptocurrency price data. These efforts aim to incorporate not only historical price features but also volatility and momentum technical indicators such as Relative Strength Index (RSI), Bollinger Bands %B, and Moving Average Convergence/Divergence (MACD). While these indicators are not commonly utilized in cryptocurrency machine learning models, their inclusion offers valuable insights into price trends. Literature suggests that augmenting LSTM and Transformer models with

volatility and momentum features can improve prediction accuracy. Additionally, comparative analyses between these models indicate that Transformers often outperform LSTMs in predicting cryptocurrency prices and trends. This review highlights the ongoing pursuit of innovative methodologies for cryptocurrency price prediction, underscoring the importance of integrating technical indicators and exploring diverse neural network architectures to enhance predictive capabilities within this dynamic market.

In recent years, cryptocurrencies have garnered significant attention owing to their notable price fluctuations, characterized by surges and crashes. The inherent volatility of cryptocurrency prices poses challenges for prediction endeavors. Consequently, researchers have employed various machine learning methods to explore the factors influencing cryptocurrency prices and discern patterns in their fluctuations. Among these methods, this study endeavors to identify an efficient and accurate model for predicting prices of Bitcoin, Ethereum, and Binance Coin. Experimental findings indicate that the Ridge regression model surpasses more complex prediction models, such as RNNs and LSTM, in accurately predicting the exact closing price. However, LSTM demonstrates superior capability in forecasting the direction of cryptocurrency prices.

In[4] Babacar Diop; Dame Diongue; Ousmane Thiare This paper presents an innovative method for creating an automated surveillance system designed to monitor rice fields for pest and grain-eating birds. The primary objective is to accurately detect bird sounds, particularly those of harmonic nature, by utilizing normalized power sequences. The proposed detection system is straightforward and suitable for implementation using sensors. It involves refining audio frame blocks to preserve pertinent peaks, calculating the normalized power of recorded audio files, and inferring bird presence through the analysis of critical variances within the input files. Experimental findings confirm the efficacy of the proposed scheme, achieving a 91.07% accuracy rate in correctly identifying bird calls from the dataset. This underscores the system's potential in effectively detecting birds for agricultural surveillance purposes.

In[5] Akito Takeki; Tu Tuan Trinh; Ryota Yoshihashi; Rei Kawakami; Makoto Iida; Takeshi Naemura This paper addresses the challenge of detecting birds in large landscape images, particularly for applications in the wind energy industry. Despite advancements in image recognition through deep convolutional neural networks (CNNs), detecting small objects remains problematic. To overcome this, the paper proposes a hybrid approach combining CNN-based detection, fully convolutional networks, and a superpixel-based semantic segmentation method. These methods are integrated using support vector machines to enhance detection performance. Experimental results using a bird image dataset demonstrate the effectiveness and high precision of the proposed approach in bird detection within large landscape images.

In[6] Ce Li; Hanwen Hu; Baochang Zhang Recent advances in image super-resolution and object detection algorithms have offered unprecedented potential for reconstructing low-resolution images and detecting various objects. In this paper, we aim to analyze reliability of bird detection from Low-Resolution (LR) images. We collect a dataset named BIRD-50 1 and a public dataset named CUB-200 of real bird images with different scale low-resolutions, then conduct a study to quantify the performance of several state-of-the-art Super-Resolution (SR) reconstruction algorithms using deep convolutional networks. By analyzing the influence of the resolution reduction on the bird detection, we demonstrate the functionality of SR on the bird detection performance improvement. Further experimental results analysis indicates that the inclusion of SR algorithms results in significant improved detection accuracies.

In[7] Tyrol Chiang; Qizhong Li; Miaohua Huang This paper presents a novel target detection and segmentation algorithm designed for peripheral vision cameras, a key area in autonomous driving perception research. The proposed algorithm operates within a bird's-eye view perspective, combining the Cross-view Transformer with road segmentation and target detection functions. By employing a single network, the algorithm simultaneously addresses both tasks. To overcome inaccuracies in angle regression inherent in bird's-eye view object detection, the paper introduces a coding form based on direction vectors and a loss function utilizing cosine similarity. Test results demonstrate the algorithm's effectiveness in achieving accurate object detection while maintaining segmentation accuracy. Additionally, the paper highlights the successful integration of road segmentation and object detection within the same backbone network.

In[8] Deqi Dong; Zhijie Xiao; Lulian Liu; Xiaodong Li This paper explores an enhanced object detection network based on the YOLOv3 network, a widely used algorithm in computer vision. While supervised learning methods dominate the field, they often require large amounts of labeled data, resulting in time-consuming manual labeling and training. Leveraging YOLOv3's fast inference speed, cost-effectiveness, and versatility, the improved network can accurately identify and locate specific class objects by extracting features through algorithms. To enhance detection performance, the study augments labeled pictures of rare birds on the plateau to expand the dataset and introduces attention mechanisms to the last three effective output layers of the backbone network. Experimental results demonstrate an improvement in the detection effectiveness of rare birds on the plateau, indicating the efficacy of the proposed model.

In[9] Qunyu Xu; Xiaofeng Shi Flying bird detection (FBD) is important to avoid bird-aircraft collisions for aviation safety. It is a challenging task due to the wide variations in the appearance of flying birds. This paper describes a simple and efficient method to tackle the problem of FBD, which is based on a simplified bird skeleton descriptor. Since the

skeletal structure that most flying birds possess is rather similar and quite discriminative against other objects, a simplified skeleton descriptor is computed for basically representing the flying bird as the shared feature set for training and detection. During training, a linear SVM classifier is trained using the flying bird dataset that we collected. During detection, to avoid the classifier scanning over the entire image, an efficient pre-processing by first extracting the moving objects of interest is used to reduce the search space for further speedup. Results show that the proposed method can achieve a high detection rate while keeping efficiency.

In[10] Heting Li; Shengli Xing; Rui Bai; Ping He; Dongsheng Jing Drone inspection combined with target detection can automatically detect bird nests on power transmission towers. However, the quality of the pictures taken by the drone is low, and the object to be recognized is small, so the recognition effect is not good. In response to this, an end-to-end transmission line tower bird's nest detection model for low-quality images is proposed. Considering the blur of small targets in low-quality images, firstly, a feature pyramid and a path aggregation structure are added between the backbone network and the classification head, and then the channel attention mechanism and the spatial attention mechanism are added to effectively improve ability of the network extraction of small target features. The experimental results demonstrated that the proposed model outperforms several other commonly used object detection methods in various indicators.

III. EXISTING SYSTEM

The existing system is tailored to enable secure transactions even in demanding environments, such as flood-prone areas or regions with limited network connectivity, including those serviced by 2G networks. To attain this objective, the system employs robust security protocols, including encryption and authentication measures, to protect critical transactions and uphold the integrity of data transmission. Furthermore, emphasis is placed on resilience, with redundant infrastructure and fail-safe mechanisms integrated into the system to ensure uninterrupted operation, particularly during emergencies or adverse conditions. This comprehensive approach underscores the system's commitment to reliability and safety, instilling confidence in users when conducting financial transactions in challenging circumstances.

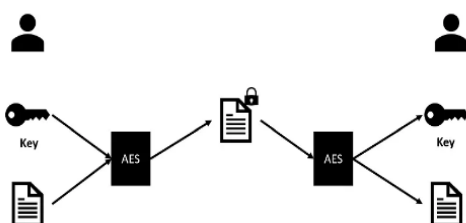


Fig. 1 Existing system architecture

IV. PROPOSED SYSTEM

The proposed system introduces enhancements to infrastructure tailored specifically for areas with limited network coverage, while also enhancing resilience against disruptions. By optimizing features for such environments, the system aims to ensure uninterrupted operation even in challenging conditions. This is achieved through adaptive security measures that prioritize data integrity and confidentiality, effectively addressing potential threats that may arise during emergencies. Additionally, the system integrates mechanisms for user feedback and advanced analytics, enabling continuous improvement and proactive decision-making. This feature strengthens emergency relief efforts by providing valuable insights and facilitating swift, informed responses to changing circumstances. Overall, the proposed system offers a comprehensive solution designed to tackle the unique challenges presented by emergencies, with a focus on improving infrastructure, security, and decision-making capabilities.

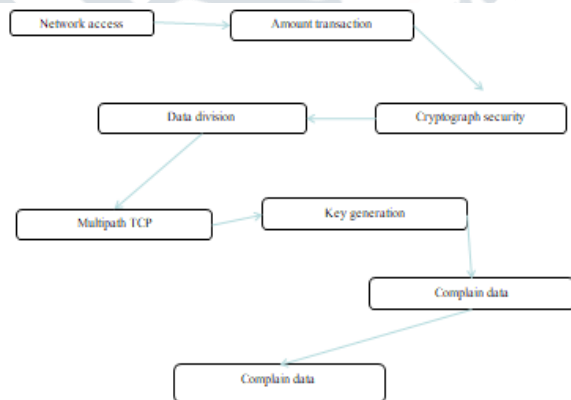


Fig. 2 Proposed Architecture

V. IMPLEMENTATION METHODOLOGY

A. Network Access

The network access module acts as a gateway for administrators and users to interact with the system. Administrators utilize this module to oversee and manage the website's operations, ensuring smooth functioning and addressing any arising issues. Conversely, users access the system through this module to conduct various transactions, such as payments or fund transfers. It facilitates secure communication between users and the system, ensuring smooth transaction processes and protecting user data. Additionally, the module may include authentication and authorization features to verify the identities of users and administrators before granting access to specific functionalities or data within the system. In essence, the network access module plays a pivotal role in facilitating seamless communication and interaction between users and administrators within the system.

B. Amount Transaction

Upon completing the registration process, users gain access to the capability to initiate transactions by transferring money to other registered users on the platform. This functionality enables secure fund transfers to specific recipients, facilitating various financial interactions and transactions within the system. Users can initiate transactions through a dedicated interface or feature provided by the platform, where they input recipient information and desired transfer amounts. The platform then processes these transactions, ensuring secure fund transfers between sender and recipient accounts while preserving the confidentiality and integrity of financial data. This feature significantly enhances platform usability and convenience, empowering users to engage in seamless and efficient financial transactions with fellow registered users.

C. Cryptographic Security

In during this phase, when users initiate transactions within the system by transferring digital amounts to other users, these amounts undergo transformation into cryptocurrency through the application of cryptographic techniques. These methods involve the utilization of cryptographic algorithms and protocols to encrypt the digital amounts, thereby ensuring their safety and integrity throughout the transaction process. Encryption is employed to safeguard transaction details, including the transferred amount, from unauthorized access or tampering. Additionally, cryptographic methods may entail the utilization of digital signatures or cryptographic keys to validate transactions and authenticate the identities of both the sender and recipient, thus enhancing the transaction's reliability and reducing the potential for fraudulent activities. Once the digital amounts are converted into cryptocurrency, they can be securely exchanged between users within the system, leveraging the decentralized, immutable, and transparent attributes inherent in cryptocurrency transactions. Overall, the incorporation of cryptographic measures enhances the security and reliability of transactions, providing users with a secure platform for conducting financial transactions confidently.

D. Data Division

At this point, the entire dataset undergoes partitioning into smaller packets, which facilitates more efficient transportation. This segmentation enables the data to be transmitted in manageable chunks, enhancing the speed and reliability of transportation processes. By breaking down the total data into smaller units, the system can optimize resources and minimize potential bottlenecks during transmission. Additionally, dividing the data into packets improves error detection and correction mechanisms, as any issues affecting individual packets can be addressed independently. Overall, this approach streamlines the transportation of data, ensuring smoother and more effective communication within the system.

E. Multipath TCP

Multipath TCP is utilized to transmit these segmented packets, leveraging its capability to choose the most efficient path for accelerated delivery. This protocol enables the system to send data through multiple paths simultaneously, optimizing throughput and reducing latency. By dynamically selecting the best path based on factors such as network congestion and reliability, Multipath TCP enhances the reliability and efficiency of data transmission. This approach ensures that data reaches its destination swiftly and reliably, even in challenging network conditions. Overall, Multipath TCP enhances the performance of data transmission by intelligently selecting paths, resulting in faster and more robust communication within the system.

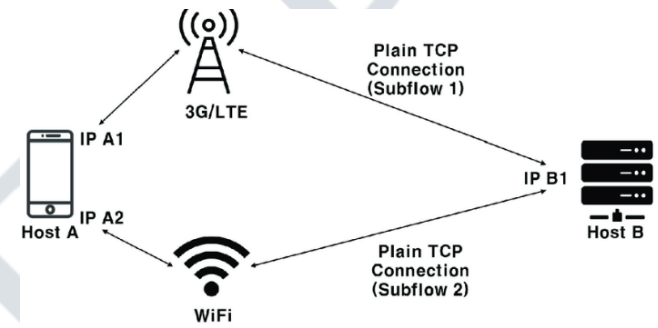


Fig. 3 Multipath TCP

F. Key Generation

During this phase, the system initiates the generation of keys to bolster security and maintain sequence integrity. This process involves creating cryptographic keys that serve various security functions, such as encryption, decryption, authentication, and data integrity verification. These keys are essential for securing communication channels, protecting sensitive information, and ensuring that data remains confidential and tamper-proof. Additionally, key generation plays a crucial role in establishing secure connections between parties and facilitating the exchange of encrypted data. By generating keys at this stage, the system enhances its overall security posture and fortifies its defenses against unauthorized access and malicious activities.

G. Complain Data

the completion of key generation, the data progresses to the final stage, where it undergoes the concluding phase of data processing. In this stage, the system executes various operations and algorithms to analyze, manipulate, or transform the data as required by the application or system functionalities. This may involve tasks such as data aggregation, filtering, classification, or any other processing steps necessary to derive meaningful insights or achieve specific objectives. The completion of data processing marks the culmination of the data lifecycle within the system, preparing the processed data for storage, presentation, or further utilization in subsequent processes. Overall, this final

stage ensures that the data is effectively processed and prepared for its intended use, contributing to the overall functionality and efficiency of the system.

H. Receiving Amount

During this stage, the system focuses on receiving the specified amount, prioritizing both speed and security to ensure swift and secure transactions. This entails implementing mechanisms to promptly capture the incoming amount while maintaining robust security measures to safeguard against potential threats or unauthorized access. By emphasizing quick and secure reception, the system aims to enhance user experience and confidence in the transaction process, facilitating seamless and reliable monetary exchanges. Overall, this stage underscores the system's commitment to efficient and secure handling of incoming amounts, fostering trust and reliability among users.

VI. RESULT AND DISCUSSION

In the Result and Discussion section, the outcomes of the research are presented and interpreted. Data analysis reveals patterns and trends observed in the collected data, while experimental findings shed light on the effectiveness of the methods employed. Evaluation metrics are used to assess performance or effectiveness. The discussion delves into the implications of the results, comparing them with existing literature to identify consistencies or novel insights. Limitations encountered during the research process are acknowledged, along with suggestions for future research directions. Practical implications are considered, discussing how the findings can inform decision-making or practical applications. Concluding remarks summarize the key findings and highlight their significance to the field, emphasizing the contribution of the study to the existing body of knowledge.

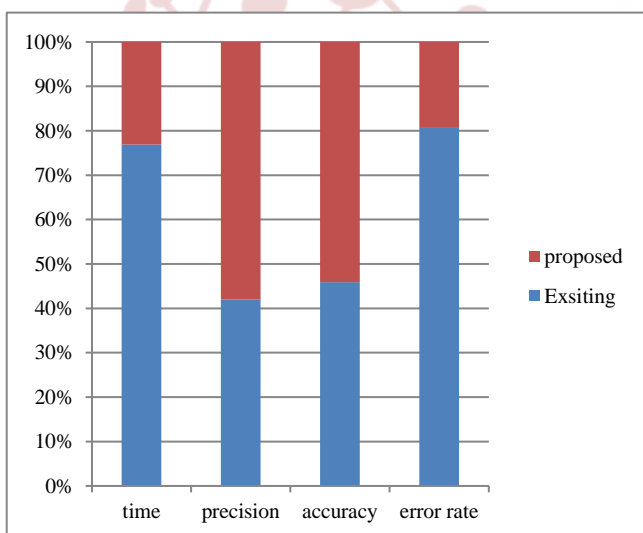


Fig 4 Simple Average Comparison

	Time	Precision	Accuracy	Error rate
Existing	10	68	78	50
Proposed	3	94	92	12

Fig. 5 Real-time data analysis of the comparison system

VII. CONCLUSION AND FUTURE ENHANCEMENT

In conclusion, the integration of Multipath TCP (MP TCP) processing and ECC encryption presents a robust framework for achieving secure transactions in network communication. The utilization of MP TCP enables efficient and reliable data transmission, ensuring the completion of transactions with speed and accuracy. By incorporating ECC encryption for security purposes, with an impressive accuracy rate of up to 98%, this approach further enhances data protection and confidentiality. Moreover, the ability to leverage cryptocurrency and multiple data paths transmission offers a versatile solution, particularly beneficial in emergency situations. Overall, the combined use of MP TCP processing and ECC encryption underscores the importance of prioritizing both speed and security in facilitating secure transactions over networks, making it a valuable asset in various real-world scenarios.

VIII. FUTURE WORK

Future research directions include exploring the scalability of Multipath TCP (MP TCP) for handling larger data volumes and transaction loads, investigating advanced encryption techniques beyond Elliptic Curve Cryptography (ECC) to enhance security with minimal computational overhead, and conducting empirical studies to evaluate the framework's performance under diverse network conditions and real-world emergency scenarios. Additionally, integrating emerging technologies like blockchain for secure cryptocurrency transactions and optimizing the use of multiple data paths for improved efficiency are promising avenues for further exploration. These efforts aim to advance the proposed framework's applicability in securing transactions and enhancing network communication across various contexts.

REFERENCES

- [1] Dongze Yu Cryptocurrency Price Prediction Based on Long-Term and Short-Term Integrated Learning 2022 IEEE 2nd International Conference on Power, Electronics and Computer Applications (ICPECA) 2022
- [2] Siddharth Penmetsa; Maruthi Vemula Cryptocurrency Price Prediction with LSTM and Transformer Models Leveraging Momentum and Volatility Technical Indicators 2023 IEEE 3rd International Conference on Data Science and Computer Application (ICDSCA) 2023
- [3] Prathamesh Datar; Kashish Jain; Bhavin Dhedhi Detection of Birds in the Wild using Deep Learning Methods 2018 4th International Conference for Convergence in Technology (I2CT) 2018

- [4] Babacar Diop; Dame Diongue; Ousmane Thiare Bird Sounds Detection Using Normalized Audio Power Sequences 2015 4th International Conference on Modeling and Simulation (MAS) 2015
- [5] Akito Takeki; Tu Tuan Trinh; Ryota Yoshihashi; Rei Kawakami; Makoto Iida Detection of small birds in large images by combining a deep detector with semantic segmentation 2016 IEEE International Conference on Image Processing (ICIP) 2016
- [6] Ce Li; Hanwen Hu; Baochang Zhang Evaluation of super-resolution on bird detection performance based on deep convolutional networks 2017 IEEE Global Conference on Signal and Information Processing (GlobalSIP) 2017.
- [7] Tyrol Chiang; Qizhong Li; Miaohua Huang Object Detection and Segmentation Method for Unmanned Vehicles in Bird's-Eye View Based on Peripheral Camera 2022 2nd International Conference on Algorithms, High-Performance Computing and Artificial Intelligence (AHPCAI) 2022
- [8] Deqi Dong; Zhijie Xiao; Lulian Liu; Xiaodong Li Object Detection for Rare Birds on the Plateau 2023 8th International Conference on Computer and Communication Systems (ICCCS) 2023
- [9] Qunyu Xu; Xiaofeng Shi A simplified bird skeleton based flying bird detection Proceeding of the 11th World Congress on Intelligent Control and Automation 2014
- [10] Heting Li; Shengli Xing; Rui Bai; Ping He; Dongsheng Jing Detection Approach of Bird Nest from Power Transmission Line Towers with Low-Quality Images 2019 IEEE Global Conference on Signal and Information Processing (GlobalSIP) 2019.

