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SecureAid Bot

Krupa K. S.[1]; B. Riya Shetty[2]; Bijay Adhikari[2]; Sanchit Singla[2]; Surya Chandra Regmi[2]

[1]Assistant Professor Department of CSE (IoT & Cyber Security with Blockchain Technology)
[2]Students, Department of CSE (IoT & Cyber Security with Blockchain Technology)
[1,2]BMS College of Engineering, Bengaluru, India

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Abstract: Natural and artificial disasters are one of the ma- jor threats to human lives, infrastructures, and socio-economic stability across the world. Despite the advances in disaster management systems, existing systems still have limitations due to slow information dissemination and a lack of personalization, and inefficiency in open relief operations [1], [3]. The proposed deficiencies shall be minimized with SecureAid Bot, a novel intelligent and decentralized framework integrating generative AI and blockchain technology that enables quick and apt disaster communication and relief coordination.

The platform uses an AI-driven chatbot that will give real-time emergency alerts and instructions in context for better accuracy and timeliness of responses during disasters [4], [5], [10]. Given its integration with data from various sensors in near real-time, like weather and seismographic monitoring systems, SecureAid Bot creates situational awareness in real time and provides efficient engagement with its users [7], [18]. For its part, upon detection of disasters, a blockchain-powered fundraising module is automatically activated that will ensure donation transactions are transparent, traceable, and tamper-proof through smart contracts [24]–[27].

The platform also hosts an admin dashboard through which government agencies and NGOs can monitor donations in real time, manage withdrawals, and optimize the use of resources with ease [12], [16]. In addition, integrating innovative technologies into SecureAid Bot has not only brought reliability to communi- cation but also innovation in the area of transparency of relief funds-a landmark toward a secured, decentralized, and inclusive disaster management [8], [23].

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I. INTRODUCTION

➢ *Overview*

Effective communication in the least possible time, along with open relief systems, is the need of the hour for disaster management in this ever-more uncertain world with a high incidence of natural disasters and emergencies. SecureAid Bot is an innovative solution that integrates the best of generative AI and blockchain technology onto one platform to provide real-time communication along with safe fundraising during crisis situations.

It is based on an AI-driven chatbot, which can be enabled to distribute live, hyper-local emergency alerts and converse through situation-sensitive natural conversation [4], [5]. The system integrates with real-time data feeds from weather APIs, seismic sensors, and emergency databases. Consequently, this supports appropriate, situationally tuned information delivery as required [7], [10].

SecureAid Bot is designed with a core of blockchain-based fundraising, which automatically gets triggered on the detection of any disaster to allow secured, transparent, and traceable transactions via smart contracts categorical [24]–[27]. It allows interaction with the chatbot to get important updates or make optionally tamper-proof donations through crypto wallets like MetaMask, where all the transactions would immutably be stored on the blockchain ledger itself categorical [25], [26].

Furthermore, government agencies, first responders, and NGOs will be able to track fundraising in real-time via an admin dashboard to enable quick deployment of resources, hence better coordination [12], [18]. In other words, SecureAid Bot bridges gaps in disaster communication and relief trans- parency: decentralized smart steps toward inclusive disaster management [8], [23].

In addition, government agencies, first responders, and NGOs are able to track fundraising efforts in real time through an admin dashboard, facilitating quicker resource deployment and more effective coordination [12], [18]. In summary, Se- cureAid Bot closes essential gaps in disaster communication and relief transparency, a decentralized and smart step towards inclusive disaster management [8], [23].

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➢ *Motivation*

Despite early warning systems and plans for disaster management in place, disasters-both natural and man-made-continue to kill people and wreck infrastructure and unsettle communities. Traditional communications media deployed un- der such conditions, such as SMS notifications, radio, and so- cial media, are usually non-interactive, nonlocalized, and non- inclusive and hence often place at risk marginalized groups facing language difficulties or constraints in connectivity or technical illiteracy. Similarly, traditional fundraising platforms tend to be prone to delays, opacity, and centralized control and thus end up constraining timely delivery of relief and undermining the trust of donors [24], [27].

SecureAid Bot is driven to address these challenges through offering conversational, empathetic, and real-time AI com- munication in the event of emergencies, decentralizing and automating the fundraising process to guarantee fast, secure, and traceable donations, and empowering citizens, responders, and organizations with an intelligent centralized platform optimized for disaster resilience [4], [6], [8], [23], [28].

➢ *Objectives*

The main objective of SecureAid Bot is to architect and deploy a safe, smart, and decentralized platform for enhancing disaster communication and fundraising-based relief. It aims at real-time disaster warnings and situational advice using an AI-powered chatbot [4], [7], blockchain-based fundraising through smart contracts triggered on authenticated disaster identification [24], [26], secure donations using crypto wallets like MetaMask with end-to-end traceability [25], [27], admin panel for tracking donations by NGOs and government in- stitutions and coordinating the logistics of relief in a well- organized manner [12], [18], and secure, scalable, and com- pliant technologies to keep operations running continuously and ethically during disasters [19], [21].

➢ *Scope*

The scope of SecureAid Bot lies in two major pillars of disaster management: blockchain-based fundraising and AI-facilitated disaster communication. The module for commu-nication was programmed to give pre-emergency alerts for floods, earthquakes, fires, cyclones, and pandemics and send geo-targeted and personalized messages to the communities affected. It provides voice and text interfaces to make it more accessible over diversified populations and also includes real-time feeds from weather APIs, seismometers, and emergency feeds [5], [7]. The module for fundraising is auto-activated when a disaster is detected, making use of Ethereum smart contracts to securely handle donations. It receives donations through crypto wallets like MetaMask or WalletConnect, maintaining all transactions on the blockchain immutably. NGOs and government agencies can track funds in real time through its admin dashboard and withdraw those securely whenever required. This whole system is cloud-deployable, scalable, and accessible over web and mobile interfaces with SMS fallback capability for low-connectivity locations [24], [25].

➢ *Existing System*

The existing disaster management systems are based on a set of communication and fundraising tools. Unfortunately, most of the current systems are not only fragmented but also inefficient. Traditional broadcast media, like TV and radio, is suited for mass communication; however, it lacks interactivity and localization. EAS/WEA messages are one-way and not customized for individuals. Disaster management programs, like FEMA, have very limited real-time information and low interaction with the users. Social media is effective in provid- ing updates; however, it is prone to misinformation and lacks a single point of control. Most of the traditional fundraising platforms face latency and centralization problems and hence security issues that compromise the efficiency of the relief work. These limitations manifest in one-way communication, language and inclusivity barriers, bounded disaster-specific personalization, lack of automated fundraising triggers, and non-transparency regarding the processing of donations [3], [4], [9], [14], [27].

➢ *Proposed Solution*

SecureAid Bot fills up the gaps in existing systems by com- bining AI-facilitated communication with blockchain-based fundraising into one responsive system. The communication layer consists of a generative AI chatbot that can facilitate text and voice interactions. It provides real-time API-based alerts, geo-targeted and hyper-localized content, and it learns to improve its responses continuously through machine learning [4], [5]. The blockchain fundraising layer consists of smart contracts that get automatically deployed once a disaster is detected. Donations can be securely made by users using MetaMask, and the smart contracts include functionality for accepting donations, checking total funds, and authorized withdrawals. Donations are stored in an immutable fashion on the Ethereum ledger and accessible to both users and administrators in real time. Protecting against fraud is ensured by mechanisms such as reentrancy guards and access control through the onlyOwner modifier [24]–[27]. This integrated approach enables the fast dissemination of information, and authentic, transparent fundraising, that boosts both efficiency and scale manifold in disaster-related efforts.

II. PROBLEM STATEMENT

Natural or artificial disasters seriously threaten life, prop- erty, and infrastructure. There are considerable gaps in com- munication, access, and reliability in spite of traditional disas- ter management infrastructures. Most of the current emergency alert systems, including broadcast media, SMS, and social me- dia, are one-way, non-personalized, and limited in their reach, therefore leaving the vulnerable sections of the population uninformed in cases of emergencies. The disadvantages due to language, connectivity issues, and a lack of inclusiveness further bring down their effectiveness.

Equally, traditional disaster fundraising systems are be-devilled by delays, opaqueness, and fraud vulnerability. In most instances, centralized donation systems lack real-time

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tracking of funds and accountability in the distribution of resources, causing inefficiencies and low donor confidence. Further, these systems are manual or semi-automated, limiting their capability to act in response to fast-changing disaster situations.

The most important concern, therefore, is the absence of a single intelligent platform that would combine real-time, hyper-localized disaster information with secure, transparent, and traceable fundraising. There is a dire need for a platform that integrates state-of-the-art AI-powered communication with blockchain-driven fundraising in order to provide fast, inclusive, and credible disaster response and relief operations.

III. LITERATURE SURVEY

Tan et al. [1] provide an overview of the role of AI in managing natural disasters; they emphasize, in particular, the use of machine learning and deep learning for prediction, mitigation, response, and recovery. Big data and geospatial data are important for higher performance of the models; how- ever, several problems exist, such as those dealing with data quality, interpretability, and computational power. Nunavath and Hasanuzzaman also deal with AI for predictive analytics, readiness, and optimization of responses during disasters. Behravan et al. [2] put forward a decentralized voice commu- nication platform in disaster situations-a product of merging AI for real-time speech translation with blockchain for secure messaging. Characterized by high recognition accuracy and translation accuracy, there are some limits to authenticity verification and dependency on centralized modules.

Nunavath and Goodwin et al., [3] critically analyze disaster forecasting and risk estimation using AI methods like machine learning, data mining, and decision support systems. They also highlight the possibility of AI for better early warning systems and resource allocation but point out deficiencies with regard to real-time processing and data integration. Raj et al. [4] concentrate on Generative AI in estimating damage and dis- aster prediction, discussing its scalability, multimodality data support, ethical issues, constraints on dataset availability, and requirements regarding standardized benchmarks. Hasanuzza- man et al. [5] focus on predictive analytics by AI to enhance disaster preparedness, including strong models under dynamic conditions.

Gupta and Roy [6] present a snapshot of AI applications in early warning systems and decision-making, whereas Akhyar et al. [7], pointing out the issues of robustness and poor-quality data, provide a review on deep learning methods, including CNNs and RNNs, for disaster prediction and management. Simo˜es-Marques and Figueira [8] discuss how AI can alleviate the cognitive overload of a decision-maker, whereas Aboualola et al. [9] consider the fusion of edge technologies with social media information to gain near real-time situational awareness. Finally, Pang et al. [10] show the way AI can be used in various ways in different phases of disaster an- ticipation and recovery based on heterogeneous sources of data, emphasizing also the needs about actionable insights and resource optimization. Abid et al. [11] emphasize the role of AI throughout all the phases of disaster management, from prediction to recovery, based on real-time surveillance and early warning systems. They call for more reliability of AI by an interdisciplinary collaboration. Similarly, Harika et al. [12] and Reddy et al. [13] present AI applications in crisis management and disaster response by demonstrating how AI enhances situational awareness, decision-making, and resource allocation. An example is the" Rescue Me" system, which aims at a combination of AI, machine learning, and IoT for emergency coordination. Shafik et al. [14] consider AI in community-scale preparation with specific application to mountainous terrain, while Lau et al. [15] look into AI for coastal disaster response and climate resilience, focusing on identification of risks and real-time monitoring. Singh et al. [16] discuss drones with AI capability for real-time aerial surveillance, damage estimation, and resource deployment, while Teoh et al. [17] apply generative AI and YOLO in flood object detection and response optimization. Al-Rajab et al. [18] suggest an AI-based platform for volunteer training and real-time recovery, allowing for better coordination of the resources and readiness. Jolly and Moses Raj [19] discuss AI for addressing legal issues and regulatory compliance in disaster situations, whereas Guerrero Granados et al. [20] use genetic algorithms to improve decision-making in technology disaster situations. In [21], Elshoukry et al. address the use of IoT, AI, and smart city technologies for disaster preparedness, real-time monitoring, and resource optimization from a stakeholder-collaboration perspective. Fan et al. in [23] introduce the concept of a digital twin disaster city-considering man-machine intelligence-to simulate scenarios to maximize resource utilization and make better decisions in real time. Kumar et al. [24], Ka¨llner [25], Demir et al. [26], Deshpande et al. [27], and Sarumathi et al. [28] focus on the blockchain solution for disaster management, highlighting its transparency and traceability with safe donation processes, decentralized coordination, and mentioning several drawbacks like the need for connectivity and scaling issues.

In all, the existing literature shows that AI and blockchain technologies can provide impactful enhancements in disaster forecasting, response, recovery, and fundraising transparency but are still facing data quality, model robustness, connectivity, and ethical application challenges as areas demanding further research.

IV. REQUIREMENT ANALYSIS

- *Functional Requirements*

The functional requirements detail the operation, interac- tion, and behavior that SecureAid Bot must carry out in order to realize its purpose. It is all about intelligent disaster detec- tion, AI-powered communication, and blockchain-supported fundraising in ensuring efficiency within the management of disasters.

The primary major functionality of the system is disaster detection and alerting. SecureAid Bot makes use of

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numerous APIs, including but not limited to weather, seismic, and environmental data sources, which allow it to detect disasters. Whenever it detects a disaster, the system sends users real-time notifications based on their location and automatically triggers a blockchain-based fundraising mechanism that will mobilize response efforts.

The second critical functionality is User Interaction through Chatbot, through which users can have interaction with the system in both text and voice forms in multiple languages. Safety tips, nearby evacuation directions, shelter locations, and all the necessary numbers for emergency contacts can be provided to the users through this interactive chatbot. Such a chatbot offers inclusiveness and access to all kinds of users and makes communication effective and compassionate during emergency situations.

The third component is the Blockchain-Based Donation System, which automatically triggers when a disaster is detected. It allows users to donate securely through Ethereum smart contracts, which ensure all transactions are fully transparent and immutable. After a successful transaction occurs, it sends a confirmation message along with a one-time transaction hash ID to the donor. It also displays the total donation collected along with the list of donors, anonymized for privacy and transparency. Admin Control module provides the feature of real-time donation tracking, with a simple dashboard for the registered users, including governmental organizations and NGOs. The administrator should be able to safely withdraw, for the verified wallets, accumulated funds by calling the method withdrawFunds(). They shall also have the right to update the knowledge base and add new data sources about emergencies to the system for its effectiveness and relevance. Finally, it contains Integration with External APIs for reading and processing data from social media feeds, weather, and geolocation. Also, the communication with the Ethereum blockchain using Web3.js or Ethers.js is needed to execute smart contracts and verify the transactions. Donation is easily facilitated due to integrations with crypto wallets like MetaMask or WalletConnect that provide secure and easy-to- use transactions. By combining these functional requirements, SecureAid Bot aims to achieve a reliable, intelligent, and totally decentralized platform that will make both communication in disasters and fundraising easier.

➢ *Non-Functional Requirements*

Non-functional requirements define how the SecureAid Bot system should behave within a given operating condition and constraint. These are requirements that will ensure that the system will work efficiently, securely, and dependably at times of disaster.

From a performance perspective, the response of a chatbot should occur in less than two seconds to guarantee real-time efficiency in communication. Confirmations of smart contracts should be finalized within thirty seconds so as to enable smooth transaction processing. The most desired scalability of the system is during high incidences of disaster; thus, it should be able to handle upwards of 10,000 users at any moment in time without any drop in performance.

The solution should be able to run around the clock, especially in times of crisis, for high availability. It should have 99.9% uptime, supported by automated recovery mechanisms and backup systems like SMS alerts, so that no communication gets lost in the process. Safety remains a key concern; therefore, it is of ultimate importance to include end-to-end encryption of everything the users communicate and safely develop smart contracts with a reentrancy guard and onlyOwner logic. The system must be GDPR- and HIPAA-compliant to protect users' data.

Ease of use of the platform is made available and simple. The interface needs to be simple in operation and accessible through web and mobile applications. It needs to accommodate multiple languages, such as Indian major regional languages and text and voice modes, so as to serve literate as well as semi-literate groups of people.

From the point of view of maintainability, the system should be architected on a modular and microservices-based model so that the AI model and smart contracts can be updated or upgraded with ease without disrupting the functionality of the system. Finally, adherence to known standards is mandatory. The SecureAid Bot has to adhere to the Ethereum blockchain protocol, recommendations of GDPR, and formal disaster management procedures so that it runs ethically and lawfully at every stage of deployment.

V. DESIGN

➢ *High Level System Architecture*

Modular, layered architecture is how the SecureAid Bot includes Generative AI and Blockchain Technology into one platform for communication in disaster scenarios and relief fundraising. Such architectural features as real-time responsiveness, scalability, and integrity of data for all operations are possible with this architecture. This is a multilayered architecture, wherein each layer is dependent on others and is concerned with different functions of the system.

The User Interface Layer provides the front-end on which users will interact with the platform. It encapsulates the web and mobile chatbot interfaces, and the donation interface is enabled in a way that users can receive notifications, ask questions, and donate funds in a secure manner. The AI and NLP Engine form the core of the intelligence of the system, imbuing it with natural language understanding for parsing user requests and returning appropriate responses in a user-friendly conversational manner.

Disaster Data Integration Layer continuously fetches and processes real-time disaster information from third-party APIs, such as weather services, seismic monitoring networks, and emergency databases. This way, location-based alerts are de- livered to the users with complete accuracy. The Blockchain Layer implements Ethereum smart contracts for donation management, enabling all transactions to be traceable, tamper- proof, and transparent.

The Backend Server will be the coordinator of the system, allowing all the parts to talk to each other, executing

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business logic, logging, and making sure everything works smoothly. The Admin Dashboard provides a unified dashboard for autho- rized government and NGO staff to monitor donations, track disaster status, and deal with user inquiries.

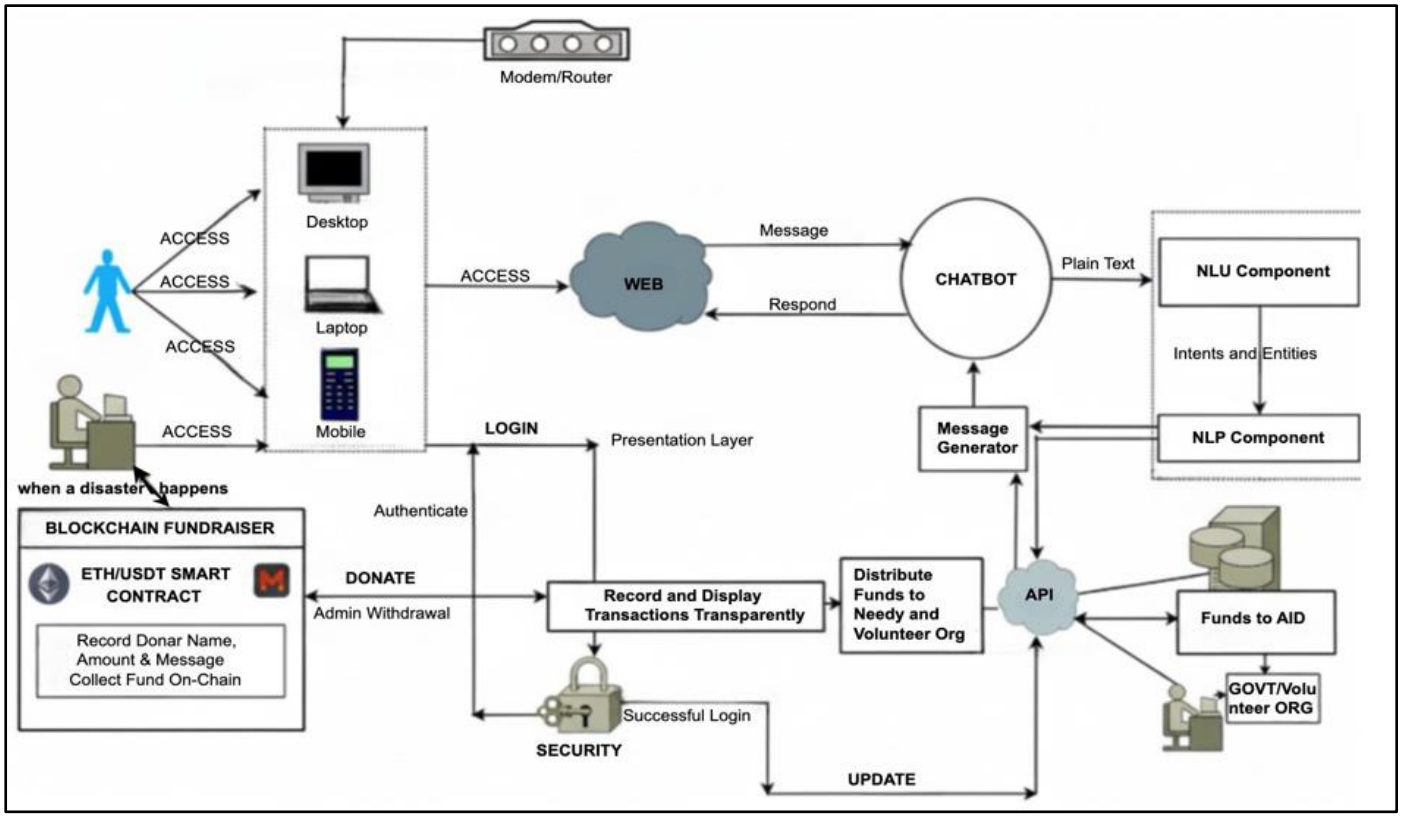

Fig 1 High – Level System Architecture of SecureAid Bot

Figure 1 shows the updated system architecture of SecureAid Bot integrating both Generative AI and Blockchain.

➢ *Blockchain Fundraising Flow*

The Blockchain Fundraising Flow module provides not only an efficient and guaranteed process of donation but also em- bodies sophisticated technologies in achieving high efficiency and security. Through automation, the system removes any time lags involved in conventional donation systems so that donations are raised and transferred in real time in times of emergencies. Each transaction is cryptographically protected, so that no one unauthorized can alter or manipulate any donation information. The flow here is governed by the smart contract in that it validates and executes donations automati- cally based on pre-set conditions, hence minimizing the level of human intervention.

The implementation of MetaMask provides donors with full control over their wallets in a private and secure manner, yet it is still transparent via the Ethereum public ledger. This module also gives analytical data to administrators on how to track patterns in donations, total funds received, and engagement by donors. The system dashboard reflects broad visual reports, thus boosting the ability of organizations to manage disaster- specific campaigns.

Also, every transaction is stored with timestamps forever so that there is accountability for every rupee or token con- tributed. The inclusions of blockchain oracles make the real- world disaster information itself initiate automatic campaigns for donations by correlating IoT sensors or data streams with blockchain activities. This linking of real-time information to blockchain logic makes assistance reach where it's most required without delays caused by human intervention.

Instant confirmation messages and transaction IDs are sent to the donors, making them feel secure and satisfied. The admin panel allows the movement of funds to be traceable in their entirety, while unauthorized withdrawals are restricted. Above all, this blockchain-based fundraising module revolutionizes humanitarian relief, making it faster, equitable, and fully auditable-a new touchstone for transparency in disaster relief administration.

➢ *Algorithm: Blockchain Donation via Chatbot*

- *Steps:*

✓ Start
✓ Show the" Donate" button on blockchain page.
✓ The user clicks on the" Donate" button and the amount and message to start the donation process.
✓ Connect the user's MetaMask wallet
✓ Confirm the wallet connection and transaction data

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(amount, recipient address).
- ✓ Call the Ethereum Smart Contract to carry out the donation.
- ✓ Store the donation transaction data on the blockchain ledger.
- ✓ Show message of successful donation.
- ✓ Refresh the admin dashboard with the new donation transaction data and transaction logs.

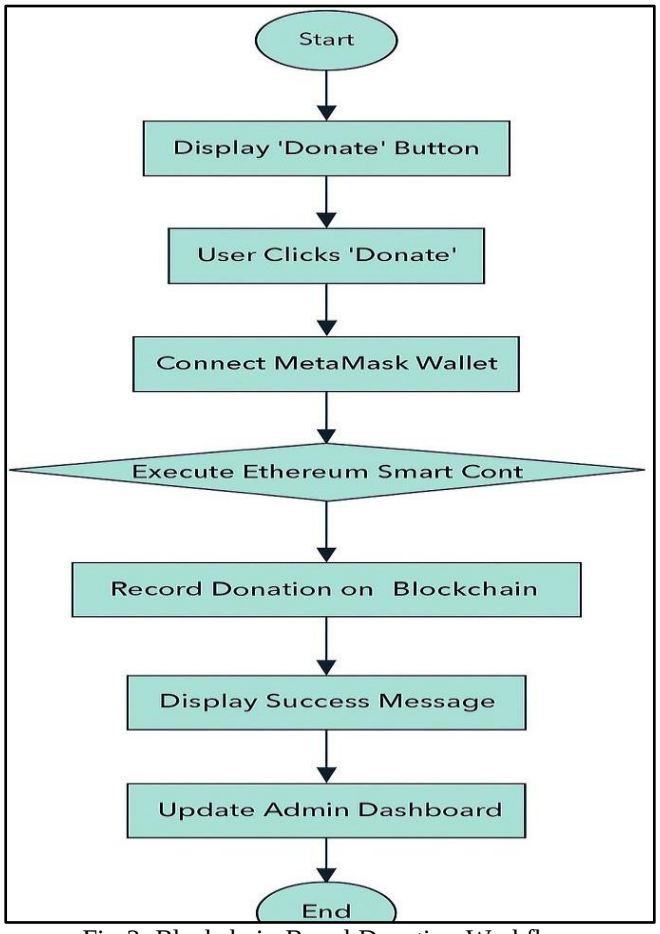

Fig 2 Blockchain Based Donation Workflow

Figure 2 illustrates a flowchart detailing the process for a user making a donation on a blockchain-based platform.

➢ *Algorithm: Blockchain Donation Withdrawal*

- *Steps:*

- ✓ Start
- ✓ Show the" withdraw" button on blockchain page
- ✓ Admin type needy address and amount
- ✓ Admin clicks" withdraw" button to trigger the withdraw process.
- ✓ Connect admin's MetaMask
- ✓ Confirm the wallet connection and transaction information (amount, recipient address).
- ✓ Invoke the Ethereum Smart Contract to carry out withdraw.
- ✓ Store the withdraw transaction information on the blockchain ledger.
- ✓ Show message of successful withdraw.
- ✓ Update the admin dashboard with remaining amount and transaction information and transaction logs.
- ✓ End

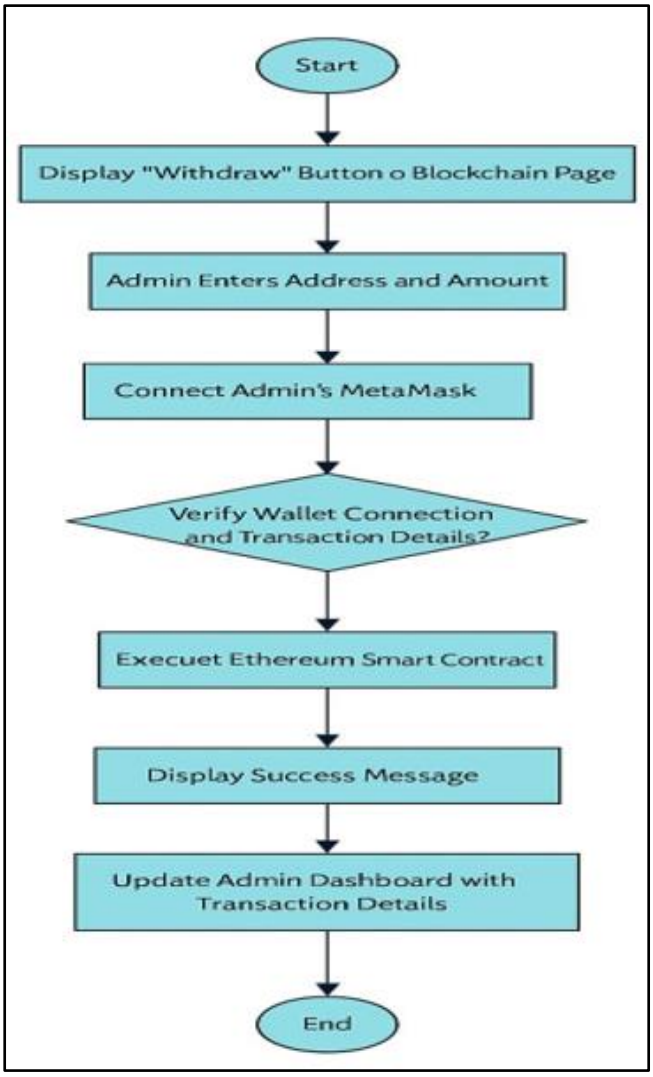

Fig 3 Blockchain Based Withdraw Workflow

Figure 3 presents a flowchart outlining the administrative process for withdrawing funds from a blockchain-based sys- tem.

VI. CONCLUSION

These have created an urgent need for intelligent, rapid, and reliable systems that allow for effective communication and coordination of relief efforts due to the ever-increasing frequency and intensity of natural and artificial disasters. Motivated by the imminent need, this project on SecureAid Bot presents a new, futuristic approach toward filling in the critical gaps left by conventional paradigms in the process of disaster management.

The system will, therefore, integrate Generative AI and Blockchain Technology to serve two essential facets of disaster relief: donation and communication. While the SecureAid Bot is powered with an AI chatbot, it provides multilingual, empathetic, and easy real-time communication

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to ensure peo- ple are notified appropriately, receive guidelines, and have updates even during times of emergency. Simultaneously, its blockchain-supported donation uses Ethereum Smart Contracts and MetaMask Integration to make donations secure, transpar- ent, and automated.

Adopting modular design, robust backend, secure smart contracts, and ease of use interface, SecureAid Bot promises scalability, decentralization, and high reliability in the wake of disasters. This system will not only enhance resilience from disasters but also encourage more civic activism and trust in relief operations by bringing complete transparency into them.

Overall, this project highlights very strong synergies between Blockchain and AI technologies in solving real-world humanitarian problems. The SecureAid Bot framework can be easily deployed and further developed by governments, international relief agencies, and NGOs to bring about real-time, global, and transparent disaster information transmission and fundraising-representing a new frontier in technology empowerment in responding to disaster.

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