

Blockchain-Enabled Decentralized, Secure and Reliable Voting Through Biometric Identification Using Metaverse Immersive Devices and Deep Learning

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Abstract

Electronic voting (e-voting) (online or with electronic machines) was proposed to mitigate the shortcomings of paper-based voting (i.e. paper ballots). However, e-voting, with a centralised scheme, has various drawbacks such as the manipulation/corruption of the records in the central database, Generative Adversarial Networks (GAN) attacks and Single Point of Failure (SPoF), leading to untrustworthy systems concerning accuracy, transparency, and reliability. The voters have shown insufficient confidence in the e-voting scheme, and numerous complaints have been made.

Establishing a secure, reliable and transparent voting system is vital to preserving democracy and providing sufficient confidence in results. Blockchain and metaverse technologies can be combined to provide healthy elections and avoid rigged elections by i) enabling valid/legitimate voters to cast their votes, ii) eliminating the requirement of a trusted third party for the verification of the authenticity of voting, iii) avoiding repetitive casting of votes iv) avoid SPoF concerning the centralised server and v) eliminating GAN attacks by detecting malicious nodes.

This research aims to build an online voting framework by incorporating blockchain, metaverse and biometrics signatures (i.e. digital body footprint) using immersive metaverse devices (e.g. VR/AR headsets, MoCaps, haptics gloves, Hand Tracking Toolkit (HTT), and different types of many other Wearable Sensors) and Deep Learning (DL) for generating cyber signature models. This framework, based on the somatic data (e.g. facial and eye biometrics, vocal pitches, posture, gestures) and with its decentralised architecture, enables a secure, reliable, scalable, and transparent voting scheme through performing smart voting transactions. The votes can be counted from scratch without revealing the privacy of the voters, requiring no third trusted party, using hash keys, smart contracts and reserved tokens attributed to individual biometric signatures. All private data are in the private blockchain ledgers and encrypted with hash functions considering data sovereignty. The proposed framework in this research, using urban metaverse cyberspaces, has the potential to replace paper-based voting and the conventional electronic voting system without visiting voting centres.

Index Terms— Blockchain, Metaverse, electronic voting, biomedical identification, body signature, gesture signature, Generative Adversarial Networks (GANs), Single Point of Failure (SPoF)

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