

A Secure Electronic Voting System Using Multifactor Authentication and Blockchain Technologies

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Abstract: This chapter presents a distributed e-voting system that solves the problems of vote-rigging, voter impersonation, and vote falsification, all of which are prevalent in traditional paper ballot systems. In general, the digitization of democratic decision-making is convenient, fast, and cost-saving but can become a gateway for electoral fraud if not properly secured. Authentication and the simultaneous achievement of confidentiality, integrity, and availability represent major challenges toward establishing e-voting as a reliable means of democratic decision-making. In this chapter, a combination of multifactor authentication (MFA) and blockchain techniques is used to secure electronic voting. MFA hampers the compromising of voters' identities and allows for easy verification, while blockchain technology protects the integrity of the votes and ensures the verifiability of the cast votes. Combining a facial recognition algorithm and RFID authenticates and authorizes voters to participate in the election process. A smart contract implemented on an Ethereum network provides the required measures of integrity and verifiability for secure e-voting. Performance evaluations of the proposed approach show that the MFA yielded a 0.1% false acceptance rate and a 0.8% false rejection rate for 100 voters, respectively. This illustrates that the proposed technique can solve issues of authentication and integrity, thereby paving the way for free, fair, and credible e-democratic decision-making in digitally enabled voting scenarios.

Keywords: Biometrics, Data communication, Distributed system, Security and privacy protection, Smart cards

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