ConVo: Sybil-Resistant Quadratic Voting with Conviction for Digital Governance

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In the realm of digital voting, particularly within decentralized autonomous organizations (DAOs), where the creation of multiple identities is easy, the prevalence of Sybil attacks poses a significant challenge. To mitigate this issue, DAOs tend to utilize token-based voting systems as a strategic countermeasure to safeguard the integrity of the voting process. Among the token-based voting mechanisms, majority voting has emerged as the standard, where a pre-specified quorum, a (super)-majority of total tokens, is required for a proposal to pass. This quorum threshold ensures that decisions are made with sufficient community support and that the community's voice is heard. Even though majority voting is straightforward, these systems suffer from a few drawbacks. The decision making is often binary and lacks the ability to represent the intensity of individual preferences adequately. Additionally, these are susceptible to collusion and bribery, and also result in the risk of marginalizing minority voices with persistent convictions. Quadratic voting (QV) has emerged as a viable alternative for DAO governance. Under this voting mechanism, participants receive a budget of "voice credits" and the cost of votes is quadratic in the number of "voice credits" spent. For example, 1 vote costs 1 "voice credit", 2 votes cost 4 "voice credits", 3 votes cost 9 "voice credits" and so on . This mechanism enables participants to show how strongly they believe in a proposal. However, the exact intricacies and practicalities of implementing quadratic voting in a digital governance system is challenging especially under the token-based voting regimes which is equivalent to real money quadratic voting. Tokens are often distributed unevenly which results in wealth disparities and quadratic voting in such scenarios could lead to distorted voting outcomes that favor the wealthy and results in voices of certain members not being captured. Therefore, there arises a need for an alternative and equitable voting system that is less prone to vote buying and actually captures opinions of participants with strong conviction such as core contributors in DAOs while addressing the initial concern of Sybil Attacks in DAOs. To this end, we propose ConVo , an enhanced and augmented quadratic voting system for DAO governance. This system has two additional components on top of the vanilla quadratic voting mechanism : Sybil Resistance and temporal conviction. We employ biometrics-based Proof of Personhood leveraged by World ID to counter Sybil attacks where each verified human who has native tokens/certain NFTs can obtain "voice credits". Additionally, we utilize the temporal mechanism to recompute the weight of votes cast based on both square root of "voice credits" and time for which that conviction was held. This approach not only bolsters the system against manipulation but also ensures that the collective decision-making process is more reflective of the community's long-term interests and values. Thus, our contributions can be summarized as follows: we modify quadratic voting in the digital setting to include Proof-of-Personhood and design an additional function to account for temporal conviction in the voting mechanism.