Studying the Applicability of Proof of Reputation(PoR) as an alternative consensus mechanism for Distributed Ledger Systems

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Outline

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- Background
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Introduction

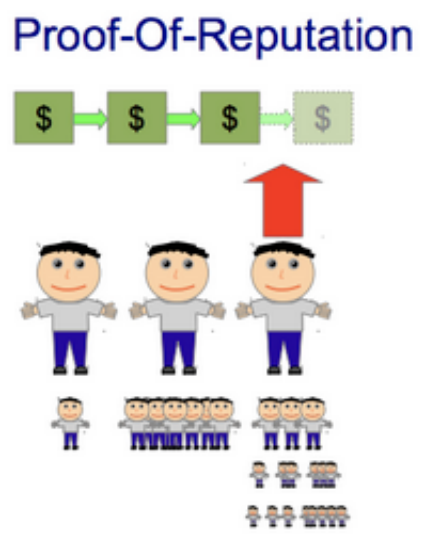
- Reputation can be defined as the rating of a node by another node within a system
- Consensus mechanism refers to how DLTs consisting of nodes reaches an agreement concerning a shared state

Background

- Data sharing across multiple platforms and among multiple agents has become ubiquitous but this has introduced the challenge of data integrity and traceability
- DLTs have historically been known for solving challenges around traceability of data
- Consensus mechanisms within DLTs dictate how the system will behave and determine the overall performance that can be achieved
- The aim of this work is to provide an alternative approach to the problem of consensus using an experimental implementation of the PoR based on the reputation principle proposed by earlier works [1, 2]

Method

- The implementation of PoR is based on the concept of "liquid democracy"



- Computational model that describes this concept can be defined:

$$S_{i,k+1} = \sum_{j} (S_{j,k} * R_{i,j}) \tag{1}$$

Method(contd)

- Introduce normalization to constrain rating values
- Normalization function can be defined:

$$S'_{i,k+1} = \frac{S_{i,k+1} - min_i(S_{i,k+1})}{max_i(S_{i,k+1}) - min_i(S_{i,k+1})} \tag{2}$$

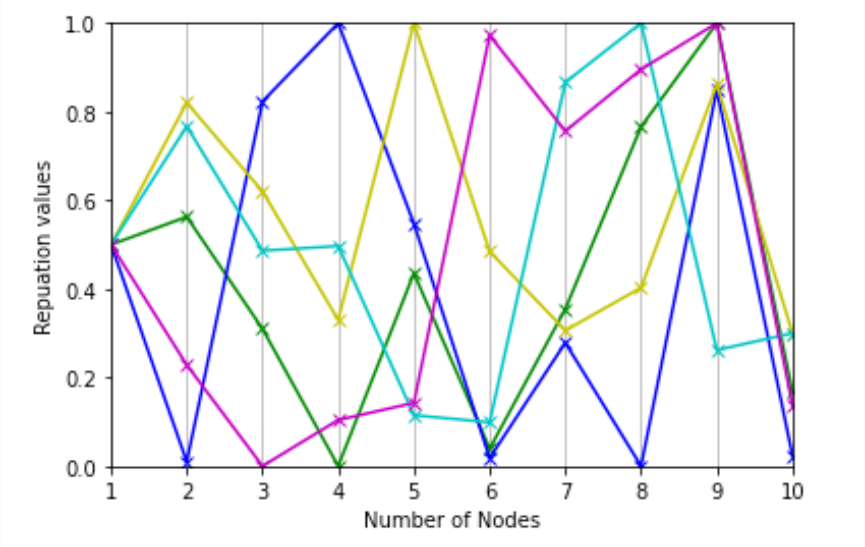
Method(Enhancement)

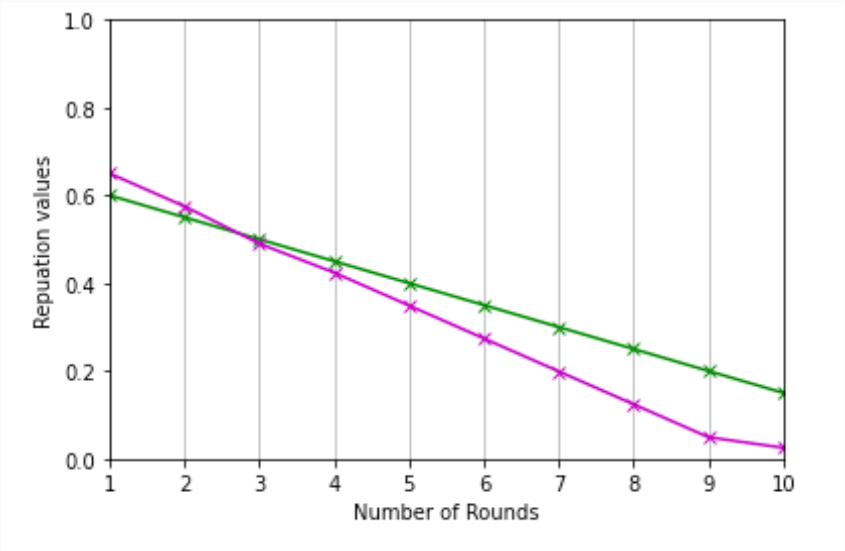
- Conservatism can be added
- Conservatism function can be defined:

$$S_{i,k+1} = S_{i,k+1} * (C - 1) + S_{i,k} * C \tag{3}$$

where $C \in [0.0, 1.0]$

Results so far





Future Work

- ☑ Proof of Concept Implementation for reputation ratings
- ☐ Provide experimental implementation of PoR within the context of a functional Distributed Ledger Systems
- ☐ Explore resistance of PoR compared to other proof based consensus mechanisms


A. Kolonin and S. SingularityNET, “Reputation systems for human-computer environments,” *Complexity, Informatics and Cybernetics*, 2019.


A. Kolonin, B. Goertzel, D. Duong, and M. Ikle, “A reputation system for artificial societies,” *arXiv preprint arXiv:1806.07342*, 2018.