Design and Implementation of a Blockchain-Based Trusted Online Social Media Platform (Postprint)

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Abstract

[Purpose/Significance] With the rise of cryptocurrencies and new distributed community computing paradigms based on blockchain technology such as Bitcoin and Ethereum, an increasing number of traditional Internet projects can leverage blockchain's chained data structure, decentralized network, and security mechanisms to reshape the "data" production relations, thereby helping to improve system utility. This study aims to empower online social media platforms using blockchain technology and establish a trusted community ecosystem with clear economic incentives. [Methods/Process] Through bottom-up cluster "voting" based on user credit values, the value contributions of platform "community" users are quantified, and incentive mechanisms for platform content producers and content evaluators are designed to motivate content producers to publish high-quality and authentic content, encourage content evaluators to actively participate in content evaluation, while simultaneously suppressing collusive "voting" among evaluators and encouraging evaluators to engage in critical thinking "voting". [Results/Conclusions] The effectiveness of the designed incentive mechanism is verified through numerical analysis and simulation, and finally, the designed online social media platform is implemented based on the Ethereum blockchain.

Full Text

Abstract

With the rise of encrypted digital currencies and novel distributed community computing paradigms based on blockchain technology such as Bitcoin and Ethereum, an increasing number of traditional Internet projects can leverage blockchain's chained data structure, decentralized network, and security mechanisms to reshape data production relationships, thereby enhancing system utility. This paper aims to empower online social media platforms using blockchain technology to establish a trusted community ecosystem with clear economic incentives. The platform quantifies user value contributions through bottom-up cluster voting based on user credit scores, designs incentive mechanisms for content producers and evaluators to encourage high-quality authentic content creation and active participation in content evaluation, while simultaneously suppressing collusive voting and promoting critical evaluation. Numerical analysis and simulation validate the effectiveness of the designed incentive mechanisms, and the proposed online social media platform is finally implemented on the Ethereum blockchain.

Keywords: social network, blockchain, value contribution quantification, incentive mechanism design, Ethereum

1 Introduction

In recent years, the rapid development of the Internet has spawned a series of online social media platforms that have shortened the "distance" between users while simultaneously facilitating the rapid spread of rumors. Previous research on rumor suppression in online social media has primarily focused on analyzing social network topology structures, proposing rumor propagation suppression strategies, and validating their effectiveness through rumor propagation models. Building upon this foundation, scholars have conducted extensive research on both rumor suppression strategies and propagation models. For instance, Qiao Yafeng analyzed the topological structure of online social networks and node behavioral characteristics, proposing an opinion leader identification method based on user intimacy to suppress rumor propagation by injecting truth into these leaders [1]. Zhang Jinbo extracted "key nodes" through analysis of node risk levels and rumor propagation path trees in social networks for targeted suppression [2]. Gu Yiran et al. proposed an important acquaintance immunization strategy based on node contraction methods for node importance evaluation in real online social networks [3]. The fundamental mechanism underlying these rumor suppression strategies involves analyzing the topological structure among nodes in complex networks to identify "key nodes" for rumor refutation. However, this approach consumes significant computational resources. Moreover, relying solely on top-down rumor refutation depends heavily on "central nodes" for credit endorsement. If these central nodes act maliciously, they may cause social unrest and economic losses. Additionally, China's education system rarely emphasizes the cultivation of critical thinking and independent learning abilities, resulting in obvious herd behavior in current online social media platforms [8]. Meanwhile, rumor refutation on domestic online social media platforms heavily relies on government official accounts, private mainstream media, or bottom-up consensus from unorganized communities, lacking effective incentive mechanisms.

Considering the decentralized, tamper-proof, and programmable nature of blockchain technology, novel online social media platforms have emerged.

For example, the Steemit social website (steem.com) has established a free, secure, and user-incentivized trusted social media platform based on the Steem blockchain [4]. Academia has also investigated the application of incentive mechanisms and blockchain technology in social networks. Wang Huixian studied user participation incentive mechanisms in social media platforms, proposing that effective user contribution incentive mechanisms could suppress free-riding behavior among end users (selfish users who consume content but rarely produce it), and that reputation-based content quality review incentive mechanisms could effectively curb the proliferation of redundant or spam information [5]. Xie Xiaosong et al. proposed introducing blockchain-based social network incentives, social device owner incentives, and order-grabbing incentive mechanisms into the power Internet of Things to reconstruct the management system for transmission line anti-external damage [6]. Bin Sheng studied the impact of incentive mechanisms arising from quantified value contributions on user information dissemination under the blockchain technology-social network paradigm, constructing profit-risk matrices under different dissemination behaviors and using evolutionary game theory to calculate stable strategies' impact on various forwarding probabilities [7]. These studies demonstrate that blockchain, as a tamper-proof, decentralized, and programmable distributed ledger, can effectively record user behaviors in social networks and construct open, programmable incentive contracts based on smart contract technology.

Drawing inspiration from platforms like Steemit, this paper proposes a trusted online social media platform based on blockchain (hereinafter referred to as OSMP-BChain) with clear economic incentives. Unlike previous research, we propose quantifying the value contributions of "community" users through bottom-up cluster voting based on user credit scores, while simultaneously designing specific incentive mechanisms that suppress collusive voting and encourage critical evaluation. The effectiveness of these mechanisms is validated through numerical analysis and simulation, as detailed in Section 2. Additionally, we implement the proposed platform based on the Ethereum blockchain, as described in Section 3.

2 OSMP-BChain Platform Design

In mainstream domestic online social media platforms, user interaction bars typically only involve likes, comments, forwards, and favorites (e.g., Sina Weibo, Toutiao, Bilibili, Douyin), with few platforms incorporating negative evaluations (e.g., dislikes or negative forwarding). Platform operators prioritize user stickiness; while negative evaluations provide evaluators with greater freedom, they may also demotivate content producers. In the era of self-media, retaining content producers is crucial for sustainable platform operation. However, as users increasingly demand truth, some unique platforms have incorporated negative evaluations into their interaction bars. For example, Zhihu, which emphasizes high-quality original content, includes user negative evaluation needs in its interaction bar, as shown in [Figure 1: see original paper]. The clever aspect lies in displaying only the number of "agree" votes while providing action input for "disagree" votes without showing vote counts, making evaluators more inclined toward positive evaluations.

From a forward-looking perspective, we propose that building a trusted online social media platform should encourage evaluators to voice different opinions, allowing content authenticity to emerge through the "collision" of opposing viewpoints. According to dialectical principles, proving the authenticity of something requires full consideration of its opposite. To simplify the model, we dichotomize content evaluation in OSMP-BChain into positive evaluations (likes, positive forwards) and negative evaluations (dislikes, negative forwards). Each user evaluation is weighted by their credit score; hereafter, evaluation and voting are used interchangeably. Let v_{up} and v_{down} denote the positive and negative votes a content receives, respectively. Then $v_{up} - v_{down}$ represents the net positive vote difference, denoted as $diff$. Generally, if $diff > 0$, the content is judged authentic; otherwise, it is judged false. The larger the absolute value $|diff|$, the clearer the content's authenticity, with $|diff|$ serving as an indicator for rewarding relevant users.

Based on this, the platform's social interaction and token circulation are illustrated in [Figure 2: see original paper]. In the figure, variables R_A and R_V represent the reward amounts allocated by the platform token system to creators and evaluators, respectively. V_i denotes all evaluators of the i-th content in the current token settlement period (the settlement period refers to the valid vote-counting time for content, positively correlated with the platform's average content activity period). Depending on evaluation strategies, V_i can also be represented as $\{U_i, D_i\}$, i.e., the sets of positive evaluators (upVoters) and negative evaluators (downVoters).

2.1 Platform Blockchain System

Previous scholars have often divided blockchain system infrastructure models into five layers from top to bottom: application layer, contract layer, consensus layer, network layer, and data layer. Building upon this foundation and incorporating the characteristics of our designed platform, the OSMP-BChain platform infrastructure is shown in [Figure 3: see original paper]. The application layer encapsulates various platform applications, including content publishing and evaluation, social relationships and information flow, and "miner" node election. The contract layer packages various scripts, algorithms, and smart contracts, forming the basis of the blockchain system's programmability. The consensus layer encapsulates distributed network node consensus algorithms, ensuring democratic network operation and system data consistency. The network layer packages network organization, data propagation, and verification mechanisms. The data layer encapsulates block data structures, timestamps, and data encryption.

In the blockchain ecosystem, digital cryptocurrencies can be divided into two categories: native coins and tokens. The former operate directly on their own blockchain, while the latter are issued on existing blockchain platforms, providing more flexible settlement forms for value circulation. Among these, the Ethereum token ecosystem is the most prosperous, mostly following the ERC-20 token protocol. Furthermore, Ethereum is a global open-source platform for smart contracts and distributed applications, with its token ecosystem dependent on smart contract development. Our platform is built on the Ethereum blockchain as a social media network. The operational mechanism of smart contracts in Ethereum is shown in [Figure 4: see original paper].

Compared to other online contracts, Ethereum smart contracts offer several advantages: a triggerable reflection mechanism, a decentralized execution environment, and immutability after deployment. This helps establish trust in shared code among non-trusting parties (on-chain computation). Smart contracts deployed on the blockchain are subject to verification by the latest block transactions. When a smart contract meets its preset trigger conditions, it changes relevant state variables in the blockchain through "transactions."

In the OSMP-BChain platform token system design, tokens are divided into two types: circulating tokens and credit tokens. The former is used for direct transactions between users, while the latter represents users' discourse power and profit rights on the platform. The relationship between the two token types is shown in [Figure 5: see original paper]. Circulating tokens can be converted into credit tokens after a specific time delay according to a particular conversion relationship. When users participate in social activities (e.g., content publishing, content evaluation, "miner" competition) in the social network, their profits are related to their credit scores.

Additionally, OSMP-BChain continuously incentivizes the platform through periodic token issuance. Newly issued tokens are allocated proportionally to different user group reward pools, as shown in [Figure 6: see original paper]. The blockchain "miner" node reward pool provides token incentives for platform blockchain system maintenance nodes.

Based on the platform blockchain system proposed in this section, we analyze user value contributions and design corresponding incentive mechanisms. The logical rules of these incentive mechanisms are compiled and deployed on the Ethereum blockchain in the form of smart contracts, with the token system developed based on the Ethereum ERC-20 protocol.

2.2 Incentive Mechanism for Content Creators and All Evaluators

The token incentive mechanism in OSMP-BChain primarily aims to guide content producers to publish authentic, high-quality content and guide content evaluators to verify content authenticity. For a single piece of content, if it is judged authentic, its creator contributes "positive work" to the platform; otherwise, they contribute "negative work." Considering platform user stickiness and model simplification, creators who contribute "positive work" are rewarded, while those who contribute "negative work" are ignored (neither rewarded nor punished). On the other hand, regardless of whether the content is judged authentic, all its evaluators receive rewards because they have cast valuable "votes" for verifying content authenticity.

Specifically, the token revenue algorithms for creators and all evaluators of content in the current settlement period are shown in and formula (1), where N is the number of contents in the current token settlement period. In , the algorithm first inputs the net positive vote differences $diff_1, diff_2, \ldots, diff_N$ for all contents in the current settlement period, then calculates the total "positive work value" of platform creators. The token system rewards creators based on the proportion of their "positive work" to the total "positive work value."

$$R_{Ai} = \frac{diff_i}{\text{Total Positive Work}} \times R_A \quad (1)$$

2.3 "Monopoly Evaluation Punishment" Mechanism

According to the analysis in Section 2.2, the larger the net evaluation votes ($|diff|$) a content receives, the clearer its authenticity judgment and the higher the revenue, reflecting the dialectical concept of contradictory struggle. However, contradictions also possess identity, interdependence, and interconnection. In reality, viewpoints are often relative—if a viewpoint faces no opposition, it is often subject to some imposed "external force," such as ideological imposition, mass hiring of "internet water armies," or tampering with user data stored on servers. Based on this, we propose a "monopoly evaluation punishment" mechanism to suppress collusive voting and malicious manipulation of voting results, with the punished tokens used to incentivize high-quality authentic content production.

"Monopoly evaluation" refers to the tendency of one competing side to dominate during content evaluation. In OSMP-BChain, we use the proportion of positive votes to total votes (positive plus negative) received by content, denoted as *proportion_up*, as the "ruler" for determining "monopoly evaluation." As shown in [Figure 2: see original paper], the platform has two monopoly scenarios: positive evaluation monopoly and negative evaluation monopoly, corresponding to positive and negative evaluation monopoly thresholds, denoted as Th_{up} and Th_{down}, respectively.

When a content's *proportion_up* value exceeds Th_{up}, the content exhibits positive evaluation monopoly, and the evaluator punishment intensity varies with *proportion_up* as shown in the CD function segment of [Figure 7: see original paper]. When *proportion_up* is below Th_{down}, negative evaluation monopoly occurs, as shown in the AB segment. In these cases, the content's evaluators are punished, with higher "monopoly" degrees incurring greater punishment intensity. The punishment intensity $Intensity\_p$ changes linearly with *proportion_up*. Specifically, when one voting side completely dominates, the punishment intensity is 90%, corresponding to points A or D in [Figure 7: see original paper]; when *proportion_up* just reaches the monopoly threshold, the punishment intensity is 0, corresponding to points B or C.

In [Figure 7: see original paper], assuming a 90% punishment intensity when one voting side completely dominates serves specific numerical simulation calculations—in practice, this value can be any number between 0% and 100% (i.e., adjustable based on real-world requirements for complete monopoly punishment intensity). This design avoids excessive punishment of evaluators for common-sense or axiomatic content (natural monopolies). For instance, setting 100% punishment intensity for complete monopoly would reduce evaluator revenue to zero, negatively impacting user evaluation enthusiasm considering the voting cost based on credit score consumption. Additionally, collusive monopolies typically have higher operating costs than natural monopolies, resulting in greater economic losses under the same punishment intensity. The punishment intensity operates as a multiplier on evaluator revenue, so even monopoly evaluators still receive partial earnings, albeit reduced compared to the mechanism's absence.

By substituting the *proportion_up* of the i-th content in the token settlement period into the functional relationship shown in [Figure 7: see original paper], we obtain the "monopoly evaluation" punishment intensity $Intensity\_p^i$. The token amount punished from all evaluators (V_i) of this content is $Punish_i = R_{Vi} \times Intensity\_p^i$, which is used to incentivize high-quality authentic content production. After introducing the "monopoly evaluation punishment" mechanism, the revenue for all evaluators of the i-th content updates to $R'_{Vi} = R_{Vi} \times (1 - Intensity\_p^i)$, and the token amount allocated by the platform token system to high-quality authentic content creators updates to $R'_A = R_A + \sum_i Punish_i$.

2.4 Critical Thinking Voting Strategy and Incentive Mechanism

Section 2.2 analyzed the token distribution mechanism for content creators and all evaluators from a macro perspective. This section focuses on individual evaluator behavior strategies and proposes a novel content evaluator incentive mechanism that correctly guides evaluators to judge content independently and critically.

2.4.1 Evaluator Behavior Strategies In OSMP-BChain, evaluator motivations include: authenticity judgment of content, social relationship incentives, and token incentives. Social relationship incentives subjectively influence objective authenticity judgment. If real-time information sharing among evaluators is cut off during evaluation, content judgment results become more objective. However, this contradicts the psychology of "liking" and "disliking" in online social media platforms, as single evaluation yields minimal revenue, and evaluators prefer to see real-time updates of voting results from frontend interface operations (recognition and being recognized). Furthermore, users often need to know mainstream voting opinions during evaluation. The content evaluation process in online social media platforms is a complete-information dynamic process, described in [Figure 8: see original paper], where each evaluator knows "previous" voting results when voting. Voting consistent with "previous" mainstream strategies is called "conformist" voting, while inconsistent voting is called "rebellious" voting. Additionally, at the token settlement moment, a content's evaluators are divided into "winners" and "losers" based on consistency with mainstream opinions.

The "winner-takes-all" concept in market competition, when applied to token distribution for OSMP-BChain content evaluators, means that if content is judged authentic, its positive evaluators receive the system-assigned evaluator rewards; otherwise, its negative evaluators receive the rewards. However, in the complete-information dynamic voting process shown in [Figure 8: see original paper], the "winner-takes-all" incentive mechanism clearly leads to a "bandwagon effect" in voting, 不利于得出与客观相符的评判结果. To eliminate the "bandwagon voting effect," one could make "winner" and "loser" utilities identical, but this would also lead to abuse of a single "vote." To prevent vote abuse while maintaining voting market competitiveness, we consider two dimensions: (1) whether the evaluator is certified as a "winner" at token settlement time, and (2) whether the evaluator voted "conformist" at voting time. A single "vote" can be classified into four types based on these dimensions: conformist winner, rebellious winner, conformist loser, and rebellious loser. Generally, evaluators vote based on risk-reward assessments, with the main influencing factors being the probability of expected "vote" types and their revenues. Under natural conditions, becoming a "winner" should be the primary motivation, and setting winner revenue higher than loser revenue is reasonable and beneficial for voting market competitiveness. However, to become a "winner," "conformist voting" remains the optimal strategy because the probability of becoming a "conformist winner" is much greater than that of a "rebellious winner" under natural conditions, meaning users' motivation for "conformist voting" far exceeds that for "rebellious voting." This is detrimental to authenticity judgment. To weaken "conformist voting" motivation, appropriate "rebellious voting" rewards and "conformist voting" penalties can be introduced.

2.4.2 Critical Thinking Voting Strategy and Its Incentive Mechanism

The revenue calculations for the four vote types are shown in . Let R_1, R_2, R_3, and R_4 denote the revenues for conformist winner, rebellious winner, conformist loser, and rebellious loser, respectively. Assuming equal credit scores (or unit credit scores), the relationship between winner revenue ($Income_w$) and loser revenue ($Income_l$) is $Income_l = \mu \cdot Income_w$, where $\mu \in (0,1]$. Then $R_2 > R_3$, $R_2 > R_1$, $R_2 > R_4$, $R_1 > R_3$, and $R_4 > R_3$. The only uncertainty among the four revenue relationships is between R_1 and R_4. Based on their calculation formulas, the necessary condition for $R_1 > R_4$ is: winner revenue - loser revenue > rebellious reward + conformist penalty. Assuming rebellious reward equals conformist penalty and revenue is proportional to utility, the necessary condition for $R_2 > R_1 > R_4 > R_3$ can be rewritten as: $(1-\mu) \times$ winner revenue >

2×rebellious reward. Further, the necessary condition becomes: winner revenue : rebellious reward > 2 : (1 - μ).

If $\mu = 0.7$ (i.e., evaluators with equal credit scores who are "losers" receive 70% of the token rewards of "winners"), based on the above inequality constraint, we can set winner revenue : rebellious reward = 10 : 1. Thus, the ratio for unit credit score becomes winner revenue : loser revenue : rebellious reward : conformist penalty = 10 : 7 : 1 : 1.

Under this token distribution mechanism, the revenue ratio for the four vote types with equal credit scores (or unit credit scores) is $R_1 : R_2 : R_3 : R_4 = (10-1) : (10+1) : (7-1) : (7+1) = 9 : 16 : 6 : 8$. By setting appropriate financial configuration parameters to achieve $R_2 > R_1 > R_4 > R_3$ with quantitative relationships, this mechanism effectively weakens evaluators' "conformist voting" motivation. Even if an evaluator votes "rebelliously" and is unfortunately judged a "loser," their revenue (R_4) remains higher than that of a "conformist loser" (R_3). Conversely, if their truth is judged as truth ("winner"), their revenue (R_2) will be the highest among the four types. Similarly, for "conformist" evaluators, if judged "winners," their revenue (R_1) ranks second among the four types; if unfortunately judged "losers," their revenue (R_3) ranks lowest. In summary, this mechanism prevents vote abuse while maintaining voting market competitiveness, yielding more objective judgment results.

2.5 Numerical Simulation

Sections 2.3 and 2.4 elaborated on and analyzed the proposed "monopoly evaluation punishment" mechanism and the novel content evaluator incentive mechanism. This section establishes a simulation model based on the platform's social interaction and token circulation shown in [Figure 2: see original paper]. The model assumes 11 pending settlement contents ($c_1, c_2, \ldots, c_{11}$) and 10 content evaluators ($v_1, v_2, \ldots, v_{10}$) in the current token settlement period. Each content corresponds to one creator, and each evaluator is "connected" to each creator, casting credit-weighted votes. The token amounts allocated by the platform token system to all creators and evaluators, R_A and R_V, are set to 100 and 100, respectively. Additionally, the *proportion_up* values for the 10 pending settlement contents are uniformly distributed between 0 and 1. If each evaluator's credit score is 10, the net positive vote differences ($diff$) for the 10 contents are -100, -80, -60, -40, -20, 0, 20, 40, 60, 80, and 100, respectively.

The distribution of "votes" received by contents in this model is shown in [Figure 9: see original paper], where red-filled markers represent negative votes and green-filled markers represent positive votes. For example, [Figure 9: see original paper] shows that c_2 receives 9 negative votes from v_1 to v_9 and 1 positive vote from v_{10}.

We validate the impact of the proposed "monopoly evaluation punishment" mechanism and content evaluator incentive mechanism on creator and evaluator revenues using this model.

(1) Impact of the "Monopoly Evaluation Punishment" Mechanism. Setting the positive evaluation monopoly threshold (Th_{up}) and negative evaluation monopoly threshold (Th_{down}) to 0.8 and 0.2, respectively, the revenues of content evaluators and creators before and after introducing the mechanism are shown in [Figure 10: see original paper]. The results demonstrate that after introducing the mechanism, revenues for all evaluators of c_1, c_2, c_{10}, and c_{11} decrease because they meet the "monopoly punishment" criteria, while revenues for c_3 to c_9 remain unchanged as they do not meet the criteria. Revenues for creators of content judged authentic (c_7 to c_{11}) increase, while revenues for creators of false content (c_1 to c_6) remain zero, as the punished tokens from evaluators are used to incentivize authentic content creators.

(2) Impact of the Novel Evaluator Incentive Mechanism. Under the "monopoly evaluation punishment" mechanism, we introduce the novel evaluator incentive mechanism from Section 2.4. The simulation results show evaluator revenues from each content in [Figure 11: see original paper]. Taking the first bar chart as an example, v_1 receives token values of 0.2, 0.89, 1.22, 0.82, 0.42, 0, 0.3, 0.59, 0.87, 0.63, and 0.2 from c_1 to c_{11}, respectively, with a total revenue of 6.13 tokens.

These simulation results will be compared with the application engineering results of the Ethereum-based OSMP-BChain platform in Section 3 to verify whether the implemented platform satisfies the designed data computation and control logic.

3 OSMP-BChain Platform Implementation

Ethereum is a global open-source platform for distributed application development based on blockchain technology. This section implements the designed OSMP-BChain platform on the Ethereum public blockchain.

3.1 Development Framework

The Truffle framework is a development environment based on the Ethereum Virtual Machine. We develop the OSMP-BChain platform application using this framework, which compiles and deploys smart contracts to the Ethereum blockchain. The control 端 interacts with local or remote Ethereum nodes through the Web3.js library, while users communicate with the blockchain project through Web browsers sending requests to and receiving responses from the Node.js Web server. The development framework is shown in [Figure 12: see original paper].

3.2 Project Setup

The OSMP-BChain platform application development process is shown in [Figure 13: see original paper]. This section focuses on requirements analysis, module design, and Node.js Web server design, with functional integration discussed in Section 3.3 in conjunction with experimental results.

3.2.1 Requirements Analysis This platform aims to identify authentic content and false information (rumors) in online social media through bottom-up cluster voting, providing blockchain-based token incentives for content creators and evaluators. Since the platform is developed on the Ethereum blockchain, any Ethereum account can register as a platform user to participate in content publishing, evaluation, forwarding, and other social activities.

3.2.2 Module Design Based on requirements analysis, the main system modules include platform configuration information settings, user registration and login, user personal information display, and content information display. The main functional modules and details are shown in [Figure 14: see original paper]. The green background displays platform configuration; the blue background shows user personal information and platform content, allowing users to initiate evaluations and forwards; the orange background displays revenues for content creators and evaluators within the current blockchain token settlement period.

3.2.3 Node.js Web Server Design In OSMP-BChain, the Node.js Web server acts as a "pipeline" for communication between Web browsers and the blockchain system. Its program flow is shown in [Figure 15: see original paper].

3.3 Verification

To verify whether the application project meets the designed data computation and control requirements, we test consistency between application project results and simulation results. The verification process is shown in [Figure 16: see original paper]. Under the same "inputs" as the simulation experiment (identical token issuance mechanism, user incentives, content publishing, and evaluation), the collected creator and evaluator revenues from the application project frontend interface are shown in [Figure 17: see original paper], and evaluator revenues from each content are shown in [Figure 18: see original paper].

The verification confirms that under identical inputs, the application project results match the simulation results, demonstrating that the Ethereum-based OSMP-BChain platform implementation satisfies the designed data computation and control logic.

4 Conclusion

By embedding blockchain technology into social media platforms and leveraging its tamper-proof, decentralized, and programmable smart contract characteristics, this paper designs detailed incentive mechanisms based on a blockchain token system. By quantifying user value contributions and incorporating both collusive voting suppression and critical evaluation encouragement, the mechanisms guide users to actively participate in authentic content publishing and objective authenticity evaluation. Numerical analysis and simulation validate the effectiveness of the designed incentive mechanisms, and the proposed social media platform is implemented based on the Ethereum open-source platform. Currently, blockchain applications in online social media platforms remain in their infancy. Like other high-traffic blockchain applications, they are primarily constrained by the blockchain system's "impossible triangle" [9], requiring comprehensive balance among "high efficiency and low energy consumption," "decentralization," and "security" to meet the "high traffic and high bandwidth" demands of online social media platforms.

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Note: Figure translations are in progress. See original paper for figures.