A Decentralized, Collaborative Pixel Art Platform on Ethereum

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Abstract

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CCS Concepts

- Human-centered-computing
  - Collaborative and social computing systems and tools
- Software and its engineering
  - Smart contracts
- Decentralized blockchain
  - Layer 2 solutions
  - Ethereum
- Security and privacy
  - Decentralized systems security
- Applied computing
  - Digital art
  - NFT

Keywords

Ethereum, DApps, Collaborative Art, Blockchain, Layer 2 Solutions, Smart Contracts, Community Engagement, Tokenization, Pixel Art

I. Introduction

In April 2017, Reddit introduced a unique collaborative art project called r/place as part of their annual April Fools' Day event. This project captured the imagination of millions of users, who worked together to color individual pixels on a large canvas with time constraints. The result was a diverse and fascinating mosaic of images, logos, and symbols, representing various communities, interests, and countries. The r/place experiment demonstrated the immense potential of collective creativity and the power of community-driven collaboration. Building upon the captivating foundation laid by r/place, this paper presents Ethr/place, a decentralized version of the original project that leverages the benefits of blockchain technology. Ethr/place aims to create a more transparent, secure, and engaging platform for users to collaborate on digital art by harnessing the Ethereum blockchain's decentralization, immutability, and smart contract capabilities. In addition to replicating the core features of r/place, Ethr/place addresses some of the challenges encountered in the original project, such as bot interference and the influencer effect, by implementing additional logic and measures to ensure fairness and genuine user participation. Furthermore, Ethr/place introduces novel incentive mechanisms and potential monetization strategies that reward users for their contributions and foster active community engagement. This paper outlines the design, implementation, and key features of Ethr/place, highlighting its advantages over traditional collaborative art platforms and discussing potential use cases and future developments. Through the integration of blockchain technology and

community-driven governance, Ethr/place seeks to establish itself as a leading platform for decentralized digital art creation and collaboration in the era of Web 3.0.

II. Product Description

Ethr/place is an innovative, decentralized platform built on the Ethereum blockchain that enables users to create and collaborate on pixel art in real-time. Inspired by Reddit's r/place project, Ethr/place aims to harness the power of blockchain technology to provide a secure, transparent, and engaging experience for users worldwide. The platform leverages a Layer 2 solution **TBD (Solana, Polygon, Arbitrum?)** to minimize transaction fees and increase scalability, ensuring a smooth and cost-effective user experience. Smart contracts are employed to manage pixel placement, user interactions, and **potential** token transactions, providing a secure and decentralized environment for creativity and collaboration. To incentivize user participation and enhance the platform's utility, Ethr/place will implement a **referral program** that rewards users for inviting friends or other users to join the platform. Referrers receive a percentage of their referrals' pixel placement fees as a monetary incentive. Alongside this, Ethr/place will host an auction for the final produced NFT will employ a **revenue-sharing model** that distributes a portion of the revenue received from the NFT to users based on their contributions, such as the number of pixels placed. This model ensures that users are fairly compensated for their efforts and encourages active participation in the platform's development and decision-making processes. Ethr/place aims to redefine the collaborative art experience by combining the benefits of decentralization, blockchain technology, and community-driven governance. By fostering creativity, collaboration, and use engagement, Ethr/place seeks to establish itself as a alternative platform to the now defunct Reddit r/place.

II. Motivation

The r/place subreddit served as a unique and captivating collaborative project and social experiment, in which participants were given the opportunity to color a single pixel on a large canvas with time constraints. This exercise aimed to bring together individuals to create a contemporary artwork piece, demonstrating the power of collective creativity and cooperation.

Although the r/place project showcased several aspects akin to a ledger, its centralized nature left room for improvement. By eliminating the central authority and integrating the project with blockchain technology, the resulting platform would transform into a truly social experiment. This new approach would not only strengthen the collaborative aspect of the project, but also ensure that the resulting artwork remains immutable and securely archived on the blockchain.

The motivation behind the Ethr/place project is to build upon the foundation set by r/place, enhancing the original concept by leveraging the benefits of decentralization, transparency, and immutability provided by the Ethereum blockchain. By doing so, Ethr/place aims to foster an even more engaging and collaborative environment, creating a platform that stands as a testament to the power of community-driven art in the digital age.

The original r/place project faced certain challenges, such as the use of bots and the disproportionate influence of certain participants, which could potentially disrupt the collaborative nature of the platform. In order to mitigate these issues and promote a more equitable and engaging environment, Ethr/place can incorporate additional logic and measures. By implementing CAPTCHAs or user authentication, we can help ensure that only genuine users contribute to the platform, hopefully restricting automated actions so that the project can maintain its core focus on human collaboration and creativity.

III. Project Complexity/Challenges

The Ethr/place project, being a decentralized version of the original r/place built on the Ethereum blockchain presents certain complexities in its design, development, and implementation. These complexities stem from integrating blockchain technology, addressing the challenges encountered in the original project, and incorporating novel features to enhance user experience and engagement.

1. Designing and implementing smart contracts: Developing secure and efficient smart contracts to manage pixel placement, user interactions, and potential token transactions while ensuring seamless integration with the Ethereum blockchain.

2. Integrating Layer 2 solutions: Selecting and incorporating an appropriate Layer 2 solution, such as Optimism, zkSync, Solana, Arbitrum, or Polygon, to address scalability and transaction fee concerns without compromising security or decentralization.

3. Ensuring security and privacy: Addressing potential security and privacy risks related to user data, smart contract vulnerabilities, and platform interactions, and implementing measures to safeguard the platform and its users.

4. Developing an intuitive and responsive user interface: Creating a user interface that is visually appealing, easy to navigate, and responsive to user actions, while integrating blockchain functionalities such as wallet connections and transaction confirmations.

5. Balancing user experience with monetization strategies: Implementing monetization strategies that generate revenue for the platform while preserving a positive user experience and fostering genuine collaboration and engagement.

6. Bot prevention and rate limiting: Navigating potential misuse of the platform will be a challenge. Addressing bots with CAPTCHAs and pixel placement rate limiting should help prevent misuse.

These complexities and challenges highlight the need for careful planning, design, and execution to successfully develop Ethr/place as

a leading decentralized, collaborative pixel art platform on the Ethereum blockchain.

IV. Project Goals

1. Goal: Develop a decentralized, collaborative pixel art platform on the Ethereum blockchain.

- Expected Result: A fully functional Ethr/place platform that allows users to create and collaborate on pixel art in real-time.

- How to Reach: Design and implement smart contracts, integrate Layer 2 solutions, and develop a user-friendly interface that connects to the Ethereum blockchain.

2. Goal: Address the challenges faced by the original r/place project, such as bot interference and the influencer effect.

- Expected Result: A fair and engaging platform that encourages genuine user participation and minimizes the impact of bots and undue influence.

- How to Reach: Implement bot prevention and detection mechanisms, introduce rate-limiting features, ensure incentive balancing, and enable community moderation.

3. Goal: Implement user incentives and monetization strategies that balance revenue generation with a positive user experience.

- Expected Result: A sustainable platform that rewards users for their contributions while generating revenue to support development, maintenance, and marketing efforts.

- How to Reach: Integrate a referral program, establish a revenue-sharing model, and explore partnerships or licensing opportunities for monetization.

4. Goal: Foster community engagement and decentralized governance.

- Expected Result: An actively engaged user base that participates in decision-making processes and contributes to the platform's growth and success.

- How to Reach: Enable voting and proposal mechanisms for platform updates, allocate incentives for governance participation, and encourage user involvement in content moderation and flagging.

5. Goal: Ensure the security, privacy, and scalability of the Ethr/place platform.

- Expected Result: A secure and privacy-respecting platform that can accommodate a growing user base and adapt to increasing demand.

- How to Reach: Perform thorough security audits, implement privacy measures, and leverage Layer 2 solutions for improved scalability.

By focusing on these project goals and working diligently towards the expected results, the Ethr/place project aims to establish itself as a leading platform for decentralized digital art creation, collaboration, and community engagement on the Ethereum blockchain.

V. Schedule

Week 1 (April 10 - April 14):

- Finalize project scope and objectives

- Assemble the development team

- Define roles and responsibilities

- Select a Layer 2 solution

Week 2 (April 17 - April 23):

- Design the system architecture and smart contracts

- Begin developing the user interface

- Begin smart contract design

Week 3 (April 24 - April 30):

- Complete smart contract development

- Finish user interface development, including wallet integration and transaction handling

- Implement bot prevention and rate-limiting features

- Review and finalize the incentive mechanisms and monetization strategies

Week 4 (May 1 - May 7):

- Turn in final report and presentation for CS458

- Perform thorough security audits and address any vulnerabilities

- Test the platform for scalability and performance

Week 5 (May 8 - May 14):

- Launch a beta version of Ether/place for user testing and feedback

- Monitor platform performance and user engagement

- Address any bugs or issues identified during beta testing

Week 6 (May 15 - May 21):

- Incorporate user feedback and make any necessary adjustments to the platform

- Prepare marketing materials and promotional campaigns

Week 7 (May 22 - May 28):

- Finalize the platform for public release

- Launch marketing campaigns and community engagement initiatives

- Release Ether/place to the public

Week 8 (May 29 - June 4):

- Monitor user adoption and platform performance

- Address any post-launch issues or concerns

- Begin planning for future updates and feature enhancements

VI. Conclusion

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