Final Project Report

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Introduction

The Problem that I was trying to solve was how to collect traffic data. This is important because the collection of traffic data allows for better study of traffic and how to make roads safer and more efficient. My contribution to this problem is creating a decentralized application (dApp), that collects photos of traffic that can then be sent off and used to analyze traffic, this allows for more traffic data to be gathered over a larger area allowing for more thorough analysis of traffic.

Problem Statement

The problem I focused on was collecting Traffic Data. Traditionally to do this you would set up traffic cameras and sensors by the roads to capture photos and data to analyze traffic patterns. This, however, can be limiting because if you want to analyze a sizable area you would need a lot of cameras and sensors, which would take a lot of time and money to set up.

Solution

To solve the issues with collecting traffic data, I created a distributed application (dApp), that allows users to upload traffic photos taken from devices like cellphones and dashcams, in exchange for a small amount of ether being sent to their MetaMask account. The dApp has two roles, an admin who can add ether from their MetaMask account to be given out when photos are uploaded, and users who cannot add ether, but can upload photos in exchange for ether being sent to their MetaMask account. Every time ether is added by an admin or exchanged for a photo by a user, a log of the transaction is added to the transaction list.

Experimental Results

When creating the application, I ran into many issues and encountered many potential weaknesses to my solution to the problem. The biggest issue I ran into was the high cost of gas fees, this made it, so I had to set the ether reward for exchanging photos higher than the gas fees that would have to be paid for the transaction. Another potential issue with my solution is that the transaction list and the admin form are both on the same page as the user form, and the user should not have access to this as that presents a potential security risk. The final big issue with my solution is that the photo storage is not organized at all, as they are just lumped together in a single folder, all with random names and no indication of when or where they were taken.

Conclusions

If I spent additional time on this project, here are some ideas I could use to solve the potential issues listed above. To solve the issue of high gas fees, i think the best solution would be to make it so the user must upload a certain number of photos at once, so that only one gas fee needs to be paid. To solve the issues of the transaction list and admin form I would move them to a page that the user does not have access to. Finally, for organizing the photos, I would use the user's information to rename the files and use a hash table to organize the photos.

Other conclusions that I have come to after working on this project are that this solution to collecting traffic data does not collecting any data that is comparable to that collected by Senors in traditional solutions, so it would be best to still use sensors when collecting traffic photos this way. This solution also has no way of insuring that you'll get photos of every spot that you want, if you are studying the traffic in a specific town, there might be parts of or even entire roads that no one will upload photos of meaning you will have missing data.

What I Learned

From Doing this Project I learned how to use solidity to write smart contracts, hardhat to test and deploy the contracts, React.Js to create web application to interact with the smart contracts, node.js to create a JavaScript project, and uploadcare to upload photos to a website. I also learned about the strengths and weaknesses of using blockchain and cryptocurrency.