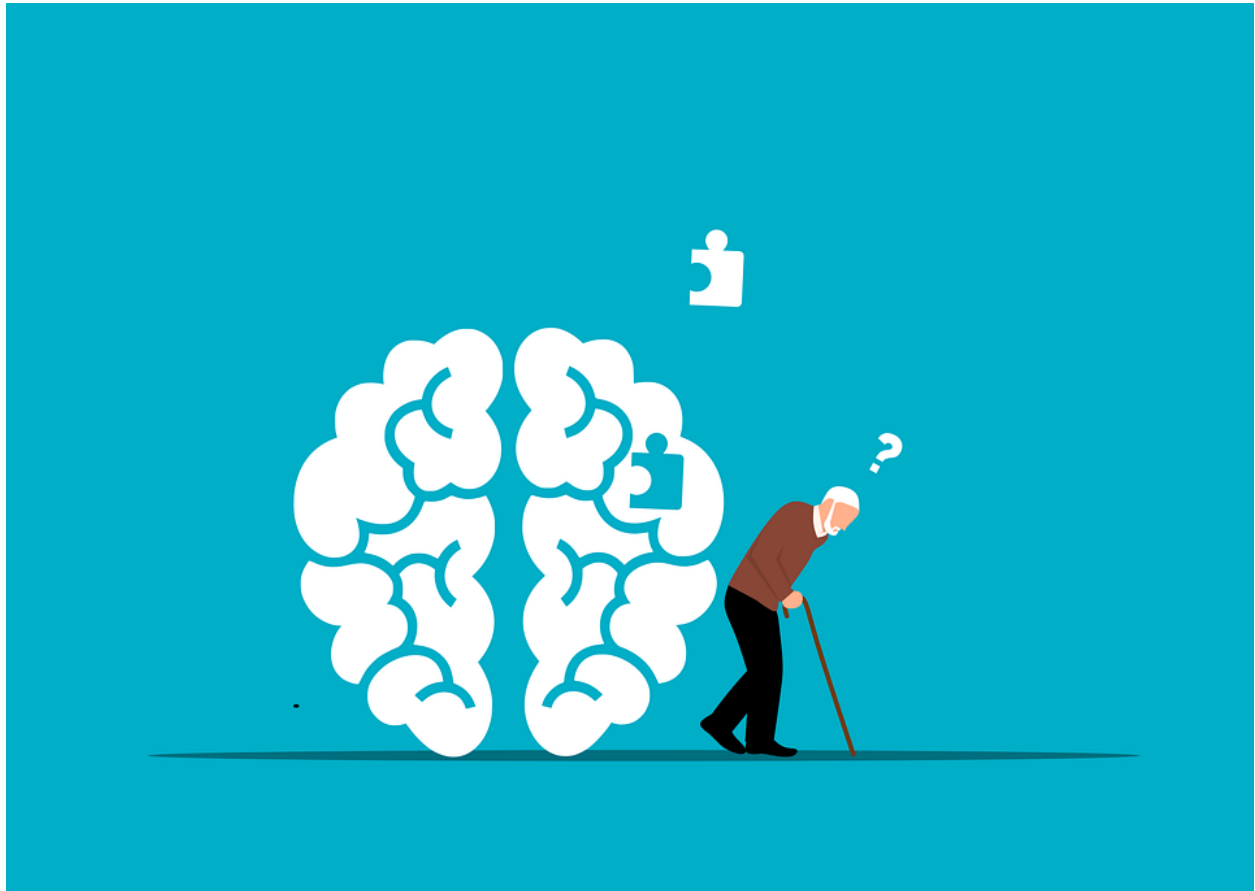# *Alzheimer's Awareness Crypto Game*

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***for use in* CS 440**
at the
University of Illinois Chicago

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I Project Description

1 Project Overview

Our application, Alzheimer's Awareness Crypto Game, will be a video game that brings awareness to Alzheimer's and Dementia. This will benefit the non-profit Alzheimer's Association and support its mission to cure/treat people suffering from Alzheimer's or Dementia by accelerating research, driving risk reduction and early detection, and maximizing quality care and support.

The Application will consist of 3 parts. An Alzheimer's Simulation Game where the user will experience what it is like to have Alzheimer's disease. An Alzheimer's Learning Mode where the user can learn about Alzheimer's and the latest research into this disease. A Cryptocurrency Mining Mode where the user (with their permission) can generate crypto that will be donated to support the Alzheimer's Association.

2 The Purpose of the Project

The main purpose of this project is to help grow awareness and donations for the Alzheimer's Association. While raising awareness does help the Alzheimer's Association become more well-known and therefore bringing it to the attention of more potential donors, we believe that giving everyday users the option to generate funds for Alzheimer's research would make a significant impact on donations given.

2a The User Business or Background of the Project Effort

The Alzheimer's Association is working towards finding a way to end Alzheimer's and other dementias through research and early detection, while also seeking to give quality care and support to patients and families. One aspect of the agency is its awareness initiatives. Early detection is very important and easier when more people know the signs of the disease.

Furthermore, as a non-profit organization, they are always seeking donations to drive their research and patient support. Unlike other companies, they are very open about where their dollars are being spent, and they have pledged to work with ethical companies and maintain their independence by not allowing other agencies or donors to sway any sort of the decision-making process.

2b Goals of the Project

We want to provide a convenient way for the average person to donate to the association without having to delve into their own pockets. Another goal of ours is to bring awareness to Alzheimer's Disease and make learning about it and the warning signs easier and more enjoyable to learn.

2c Measurement

On the website for the association and also in the game, we would like to show a ticker displaying the amount of crypto and dollars raised throughout the year. As well as a public Budget sheet to see how that currency was spent by the Alzheimer's Association.

3 The Scope of the Work

The work would be described as community outreach and education with a hassle-free way to seek donations as well.

3a The Current Situation

Currently, the client is conducting this work through their website, alz.org, utilizing reading and fact pages as well as YouTube videos.

3b The Context of the Work
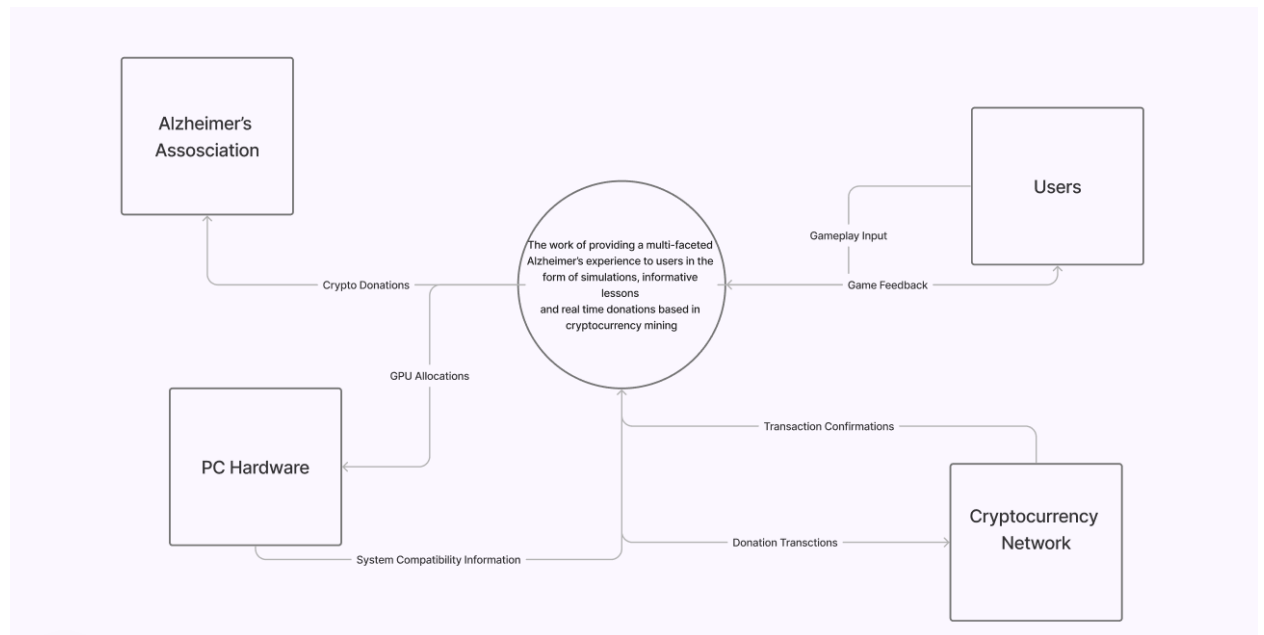
3c Work Partitioning

EVENT NAME	INPUT/OUTPUT	SUMMARY
User selects simulation	User selection (in), Sim environment (out)	Load selected simulation
User completes lesson	Completion Data (in), Updated dashboard (out)	Update user "XP" and show harder lessons
User mines crypto	Wallet fund increase (out)	Update total crypto mined
User donates crypto	Transfer funds from user wallet (out)	User wallet funds routed to beneficiary wallet
User defined duration to mine crypto is reached	Terminate mining process (in/out)	Synopsis of Mining session displayed (total crypto mined, estimated electricity bill, etc.)
User schedules automatic donations	Transfer funds from user wallet at scheduled time (in/out)	User wallet funds routed to beneficiary wallet at regular intervals
User fails task in simulation mode	Task result (in)	Provide feedback and options

Table 1 - Work Partitioning

3d Competing Products

As far as we are aware there aren't any products that compete with ours at all. The only other games we can find are made for patients themselves to help with their cognitive decline.

4 The Scope of the Product

The work to be handled by the proposed product is the Simulation Mode, Learning Mode, and Mining Mode. The Simulation Mode will be a simulation of what it is like to live with Alzheimer's disease, the Learning Mode will be an area for users to develop their understanding of Alzheimer's disease and topics surrounding it, and the Mining Mode will allow users to generate funds for the Alzheimer's Association as donations.

4a Scenario Diagram(s)
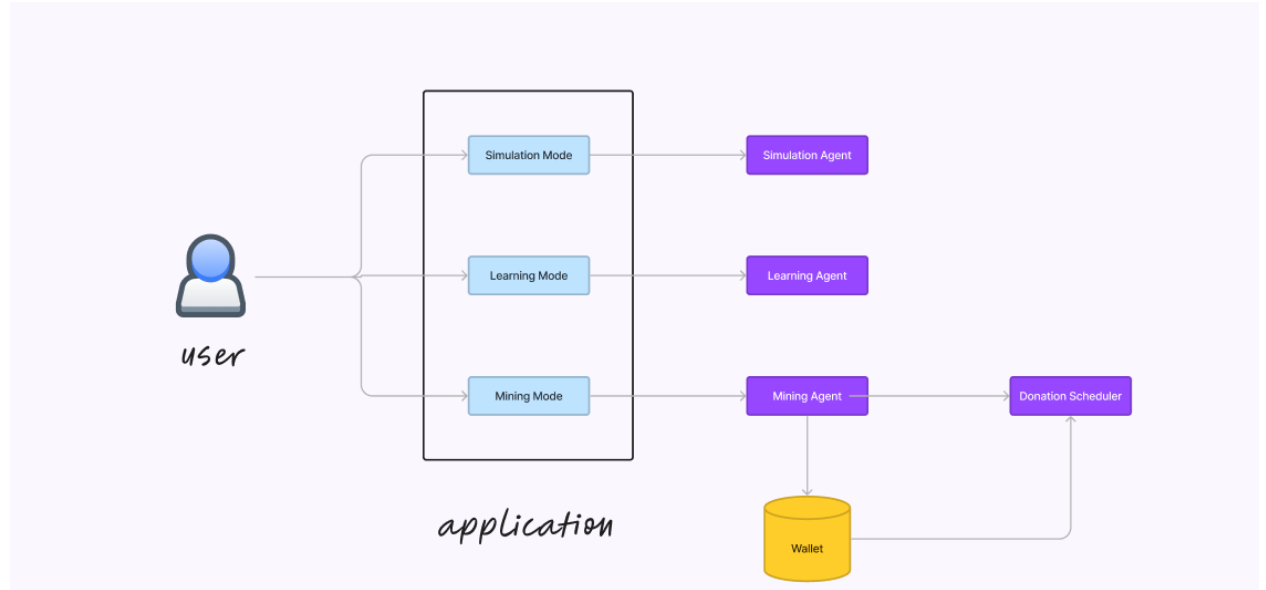
Figure 2: Scenario Diagram

4b Product Scenario List

Scenario Name	Participating Actors
Alzheimer's Simulation Mode	*Alzheimer's Awareness Crypto Game users*
Alzheimer's Learning Mode	*Alzheimer's Awareness Crypto Game users*
Crypto Mining Mode	*Alzheimer's Awareness Crypto Game users*

Table 2 - Product Scenario List

4c Individual Product Scenarios
- Alzheimer's Simulation Mode: The player initiates this mode by selecting it from the main menu. The system explains what this mode is about and instructions on how to navigate the simulation. After the player has understood the instructions, they will be able to navigate the simulation via keyboard/controller input and be able to interact with the game world environment.
- Alzheimer's Learning Mode: The system displays an opening screen explaining the educational purposes of this mode to the player. The player can navigate through different sections such as: "What is Alzheimer's?", "How to support someone with Alzheimer's?", etc.

- Crypto Mining Mode: Upon entering this mode, the system explains that any mined currency will automatically be donated. The user can then select how many GPUs they want to use, how long they want the miner to run, and other settings. The system starts the mining process, displaying a counter of the amount mined.

5 Stakeholders

5a The Client

The client for this application will be the Alzheimer's Association. They'll work closely with the developer team to ensure that their guidelines are met with the final product. With the cooperation of this non-profit organization, their goals of spreading awareness of the disease will be met.

5b The Customer

Upon completion of the application, the customers will be any Online Video Game Distributors such as Steam, Epic Games Store, iOS App Store, or Google Play Store. With the application being on these Game Distribution platforms, the entire product will be seen by more users.

5c Hands-On Users of the Product

The users of this application could be anyone with an applicable machine and access to Steam or another gaming client as well as anyone with an interest and a smartphone. The target demographic is ideally every human on earth so that education on the topic can be as widespread as possible.

5d Maintenance Users and Service Technicians

Installation of the game will be handled by the user themselves. Maintenance will be handled by the updates team who will handle server upkeep and any changes to what crypto is being mined as requested by the client.

5e Other Stakeholders

Other stakeholders that this application would need to include would be:

- Testers
  - Testers will be needed in being in the place of the user during development. They will need skills in debugging and test cases to provide technical feedback with the developing application.
- Marketing
  - To ensure the application brings more Awareness to Alzheimer's, a team of individuals with experience in advertising or who have high influence on the market will be needed to accomplish this goal. They will need to be proficient in using Social Media and other Marketing tools.

5f User Participation

Users can participate in various alpha/beta tests of the game if enough of the application has been implemented to be playable. Upon their participation, they can provide feedback and criticism to the application before the final product is pushed out.

5g Priorities Assigned to Users

The key users for this application will be younger avid video game players who want to support the Alzheimer's Association or learn more about Alzheimer's and how detrimental the disease is. The secondary users will be other video game players who are just looking for a new game to play. They may or may not care about the cause, but with their help, they are still able to support it via the Crypto Miner. The unimportant users will be people who do not play/like video games or are not skilled in Computers/Technology. This application is more tailored to the user group that enjoys playing video games.

6 Mandated Constraints

6a Solution Constraints

Description: The final product will be a desktop application that can run on a PC as well as a mobile application.

Rationale: The crypto miner will need to be run on a robust system more advanced than a mobile device, however, a slimmed-down version of the game being available for mobile users will allow a wider audience to be reached.

Fit Criterion: The game must be available for download online or from other game clients such as Steam as well on the Apple App Store and Google Play.

Description: The crypto miner needs to take precedence over other processes on the machine.

Rationale: The bread and butter of the system is the crypto miner, without that client will be missing out on valuable donations. If the game will only run on extremely robust machines then the education of as many people as possible will be hindered.

Fit Criterion: Playing the game modes can't be too taxing on the system to take away from the crypto miner, or too demanding overall so that users with average PC specs are prohibited from playing.

Description: Wallet security concerns.

Rationale: If a hacker gains access to the crypto wallet or otherwise diverts the crypto from ending up in the correct place, half of the client's expectation from the application will be unfulfilled.

Fit Criterion: Security experts will need to be hired along with special clearance for devs working on specific aspects of the application.

6b Implementation Environment of the Current System

The product will be designed to work as a desktop application catering to PC users as well as a slimmed-down version for mobile users. The product will run on all major PC operating systems as well as all major mobile platforms.

6c Partner or Collaborative Applications

This product must be compatible with the current Unity Engine.

6d Off-the-Shelf Software

There is no commercial off-the-shelf (COTS) software that must be included in the final product.

6e Anticipated Workplace Environment

Content

The product is designed to be used anywhere a PC or mobile device can be used.

Motivation

The client wants as widespread use of the application as possible so constraints on ability of use must be minimalized as much as possible.

Examples

Power consumption might be greater due to the miner and needs to be explained to the user.

6f Schedule Constraints

There are no deadlines unless given by the client.

6g Budget Constraints

Since the product will essentially be handling money it will be in the team's best interest to create a high-quality product using skilled security experts. The only budget constraint would be the expected salary of the development team for the expected development timeframe.

7 Naming Conventions and Definitions

7a Definitions of Key Terms

Alzheimer's: A progressive neurodegenerative disorder characterized by a decline in cognitive functions.

Cryptocurrency: A digital currency in which transactions are verified and records maintained by a decentralized system.

Coins: A digital currency native to its blockchain, storing value and acting as a medium of exchange.

Blockchain: A decentralized and public ledger that is used to record transactions between different computers.

Mining: the process used to generate new cryptocurrency coins and verify new transactions.

7b UML and Other Notation Used in This Document

The Report follows the Version 2.0 OMG UML standard, as described in, M. Fowler, UML Distilled, Third Edition, Boston: Pearson Education, 2004. Exceptions are noted in their given cases.

7c Data Dictionary for Any Included Models

Due to the nature of this application being a video game, there are no included models needed at the moment.

8 Relevant Facts and Assumptions

8a Facts

6.7 million Americans are living with Alzheimer's and that number is expected to increase to 13 million by 2050.

Alzheimer's and other dementias will cost the US $345 billion in 2023 rising to $ 1 trillion by 2050.

8b Assumptions

Assuming users have basic computer proficiency.

Assuming developers will be able to code in necessary environments.

Assuming the cryptocurrency is still available to mine.

Assuming users will have devices that meet our minimum requirements.

II Requirements

1 Product Use Cases

1a Use Case Diagrams
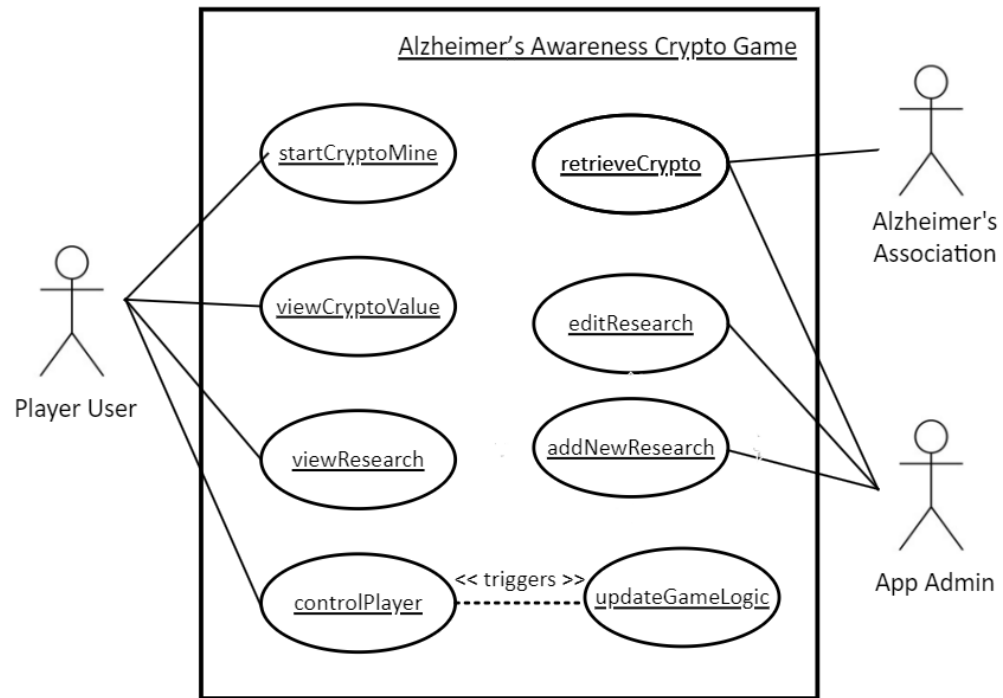
Figure 3 - Use Case Diagram of Alzheimer's Awareness Crypto Game

1b Product Use Case List

Use Case Name	Description	Participating Actors
controlPlayer	This case is to host the inputs associated with the game section of the game.	Player User
updateGameLogic	This case is triggered by the controlPlayer case, which it updates the game logic/environment to reflect the user's choices.	Player User (indirect)
viewResearch	This case is to host all different research articles and information on Alzheimer's that is held in the system's database.	Player User
startCryptoMine	This case is to inform the user about Crypto Mining and to start the mining on their personal computer.	Player User
viewCryptoMine	This case is to visually show how much crypto was mined on their computer and was donated to the Organization.	Player User
retrieveCrypto	This case is to direct all crypto that was generated by the User's computer to a ledge for the Alzheimer's Association.	App Admin, Alzheimer's Association
editResearch	This case allows the Admin to delete or edit existing research articles that are currently on the system's database.	App Admin
addNewResearch	This case is to allow the Admin to add new research articles into the app's database for the User to see in the viewResearch.	App Admin

Table 3 - Use Case List of Alzheimer's Awareness Crypto Game

1c Individual Product Use Cases

- controlPlayer
- updateGameLogic
- viewResearch
- editResearch
- addNewResearch
- viewCryptoMine
- startCryptoMine
- retrieveCrypto

Use case ID: 001	Name: controlPlayer

pre-conditions: The Player User selects 'Play Game' Button.

post-conditions: NA

Initiated by: Player User

Triggering Event: updateGameLogic

Additional Actors: NA

Sequence of Events:

1. Player User moves the character to initiate the game logic

2. The system gives a task for the Player User to complete.

3. Player User will move in the environment, interacting with the objects

4. System response will have various negative effects on the Player simulating Alzheimer's disease.

5. Player User will continue playing until they complete the task or select the give up button.

6. System will display whether the user succeeded or not, and prompt them to play again.

Alternatives: NA

Exceptions: The user will be familiar with the general inputs of the game system.

Figure 4 - Individual Product Use Case of controlPlayer

2 Functional Requirements

ID#001 - Game Interaction

Description: This covers the game's interface allowing the user to play.

Rationale: Without a functioning playable game the application loses purpose.

Fit Criterion: Does the game run correctly without crashing or unexpected behavior.

Acceptance Tests: Game State.

ID#002 - Viewing Research

Description: Shows the user what research the Institute is currently working on.

Rationale: Gives a face to what the user is helping the Institute with by playing the game therefore giving meaning to the applications usage.

Fit Criterion: Is the research being displayed the most updated information?

Acceptance Tests: Institute Test.

ID#003 - Start/View Crypto Mining

Description: Shows the user if the miner is running.

Rationale: If the miner isn't running then the application's purpose is reduced in the eyes of the Institute.

Fit Criterion: Is the miner running and updating information?

Acceptance Tests: Miner Running.

3 Data Requirements

ID#004 - Crypto Address

Description: The address where all the cryptocurrency will be deposited.

Rationale: There needs to be an address stored to have somewhere to put the mined currency.

Fit Criterion: There must be a valid address for mining the cryptocurrency.

Acceptance Tests: Address Format.

4 Performance Requirements

4a Speed and Latency Requirements

ID#005 - Game section

Description: The smoothness of the game as a user plays it.

Rationale: We need a standard playability level for the game portion so users feel satisfied.

Fit Criterion: Must be able to run at least 60 frames per second on medium settings.

Acceptance Tests: Game Smoothness.

4b Precision or Accuracy Requirements

ID#006 - Alzheimer's Game

Description: How precise the game is to simulate Alzheimer's disease.

Rationale: The game needs to give a mostly realistic simulation of how Alzheimer's feels.

Fit Criterion: Must be approved by an expert in Alzheimer's disease.

Acceptance Tests: Game Pass/Fail.

4c Capacity Requirements

ID#007 - Simultaneous Users

Description: How many users this product can handle simultaneously.

Rationale: We don't need to keep track of simultaneous users as each instance of the product is local.

Fit Criterion: The product must be able to support 1 user locally on a machine.

Acceptance Tests: Single User Operate.

5 Dependability Requirements

5a Reliability Requirements

ID#008 - Cryptomining

Description: How reliably a user can mine cryptocurrency.

Rationale: A user must be able to mine reliably so that maximum donations go to the Alzheimer's Association.

Fit Criterion: A user must be able to mine 99% of the time without interruption.

Acceptance Tests: Miner Reliability.

5b Availability Requirements

ID#009 - Availability of Product

Description: Can the user use the product?

Rationale: The user must be able to use the product so they can learn and donate.

Fit Criterion: The user must be able to operate the product reliably 99% of the time they open it.

Acceptance Tests: Product Availability.

5c Robustness or Fault-Tolerance Requirements

ID#010 - Cryptocurrency service down

Description: This describes if for any reason mining cryptocurrency fails.

Rationale: There are more parts to our product than just cryptocurrency so we can use the other parts.

Fit Criterion: Must be able to play the game and use the learning section while mining cryptocurrency is unavailable.

Acceptance Tests: Non-Miner Functionality.

5d Safety-Critical Requirements

ID#011 - Mining Safety

Description: Make sure that the user's machine is protected while mining cryptocurrency.

Rationale: We don't want mining cryptocurrency for Alzheimer's to be a risk to the user's machine.

Fit Criterion: Cannot overheat or create vulnerabilities in the user's machine.

Acceptance Tests: Temperature Test, Vulnerability Test Suite.

6 Maintainability and Supportability Requirements

6a Maintenance Requirements

ID#012 - Updates

Description: How updates will be handled moving forward in the future.

Rationale: It's important to think about how we are going to improve the product through updates in the future.

Fit Criterion: It must be easily updated through a service like Steam.

Acceptance Tests: Update Test.

6b Supportability Requirements

ID#013 - Discord Server

Description: The Discord server will be a place for users to join for free and ask questions or get support.

Rationale: Discord is a free-to-use service that will lower our operating costs and also allow us to build a closer connection with our community.

Fit Criterion: There must be a functioning discord server where users can get help with their problems.

Acceptance Tests: Discord Server Test.

6c Adaptability Requirements

ID#014 - PC

Description: The product must be able to be played on PCs.

Rationale: It is most common to mine cryptocurrency on PCs and it is unknown if there will be future problems if we use a console to mine cryptocurrency.

Fit Criterion: Must be playable on any PC.

Acceptance Tests: PC Spec Test.

6d Scalability or Extensibility Requirements

ID#015 - Scalability

Description: How big do we need to scale this product?

Rationale: This product only needs to be available to run locally and how many users there are does not affect the product.

Fit Criterion: The product must be able to run on PCs locally.

Acceptance Tests: Scalability Test.

6e Longevity Requirements

ID#016 - Alzheimer's Game

Description: How accurate the facts and relevant information are.

Rationale: As time progresses so does understanding of diseases, meaning eventually there will be more to learn about Alzheimer's disease.

Fit Criterion: Must be the most up-to-date facts about Alzheimer's disease at the time of updates.

Acceptance Tests: Information Test.

7 Security Requirements

7a Access Requirements

ID#017 - Access to Product

Description: Who can access the product and what sections.

Rationale: Any user can access any part of the product as it is made to be available for all ages.

Fit Criterion: The product must be available for all ages.

Acceptance Tests: Access Test.

7b Integrity Requirements

ID#018 - Cryptocurrency Wallet

Description: Where the mined cryptocurrency is stored.

Rationale: We need to protect the address so that the mined currency is always being sent to the right location.

Fit Criterion: Protect the cryptocurrency address in a file and backup file.

Acceptance Tests: Address Recovery Test.

7c Privacy Requirements

ID#019 - User Privacy

Description: How we handle the user's privacy data.

Rationale: We do not ask the user for any personal information so we have nothing to protect.

Fit Criterion: Make sure that the user does not provide any personal information to be stored.

Acceptance Tests: Privacy Test.

7d Audit Requirements

ID#020 - Cryptocurrency Mined

Description: A count of how much cryptocurrency is mined by the user.

Rationale: For the user's reference it is good to keep track of how much was donated to the cryptocurrency wallet.

Fit Criterion: Make sure that the count is working properly locally for the user's discretion.

Acceptance Tests: Currency Count Test.

7e Immunity Requirements

ID#021 - Vulnerability Resistance

Description: How our product will protect against malicious actors.

Rationale: We need to make sure that the product does not open doors for malicious actors to gain access to the user's machine.

Fit Criterion: Make sure no vulnerabilities can be exploited to gain access to the user's computer.

Acceptance Tests: Vulnerability Test Suite.

8 Usability and Humanity Requirements

8a Ease of Use Requirements

ID#022 - Intuitive Interface

Description: The system must provide an intuitive interface with clear instructions and easily identifiable controls for all 3 application modes

Rationale: An intuitive interface will reduce the learning curve for users and enhance user satisfaction

Fit Criterion: 90% of users should be able to complete primary tasks without consulting the help guide or FAQ. The 10% that cannot should be able to after consulting the guides.

Acceptance Tests: Usability test

8b Personalization and Internationalization Requirements

ID#023 - Multi-Currency Support

Description: The system must allow users to select and display prices in their preferred currency. It should support real-time currency conversion and be able to fetch the latest exchange rates

Rationale: To cater to a global audience and allow users to make transactions in a currency they are familiar with. This fosters trust and increases user satisfaction.

Fit Criterion: The system should support at least ten major global currencies and reflect current exchange rates

Acceptance Tests: Conversion Check

8c Learning Requirements

ID#024 - Learnability

Description: The system should offer interactive tutorials for first-time users.

Rationale: Interactive tutorials will expedite the learning process and improve user retention.

Fit Criterion: New users should be able to complete a primary task within 10 minutes after going through the tutorial.

Acceptance Tests: Help Test

8d Understandability and Politeness Requirements

ID#025 - Clear Messages

Description: The system's messages, prompts, and notifications should be concise and easy to comprehend.

Rationale: Clear communication prevents user confusion and ensures they can use the system effectively.

Fit Criterion: There are no grammatical or wording issues with any text in the system.

Acceptance Tests: Message Test.

8e Accessibility Requirements

ID#026 - Cognitive Friendly Interface

Description: Although the app is not targeted directly to Alzheimer's patients as users, the system should incorporate design principles tailored for individuals with Alzheimer's, such as simple layouts, clear icons, large fonts, consistent navigation patterns, and easily distinguishable buttons.

Rationale: In case somebody with Alzheimer's decides to use this app to see what it is about, they should be able to have ease of use.

Fit Criterion: The majority of users with Alzheimer's should be able to perform basic tasks on the system without external assistance, and user testing should confirm an intuitive experience for this target group.

Acceptance Tests: Cognitive Test.

8f User Documentation Requirements

ID#027 - Comprehensive User Guide

Description: The system must come with a detailed user guide, explaining all features and functionalities.

Rationale: A user guide provides a reference for users and reduces the need for customer support interventions

Fit Criterion: The guide should cover 100% of the system's functionalities.

Acceptance Tests: Usability Test

8g Training Requirements

ID#028 - Video Tutorials

Description: The system should offer video tutorials covering crypto wallets/donations.

Rationale: Video tutorials can visually guide users, making it easier for them to understand how the wallet works.

Fit Criterion: The video should go step-by-step on how the crypto wallet/donation works.

Acceptance Tests: Tutorial Test.

9 Look and Feel Requirements

9a Appearance Requirements

ID#029 - Control Feel

Description: The system must have smooth and user-friendly controls so when the user interacts with the application they spend less time on learning and more time on playing the game.

Rationale: Users will likely stop playing a game if the controls are very odd and not easy to learn, and this must be avoided.

Fit Criterion: The application must be developed with controls that have been tested thoroughly by the developers and testers as well.

Acceptance Tests: Control Feel Test

9b Style Requirements

ID#030 - Color Imaging

Description: The system must have friendly color imaging throughout all sections of the application. These color imaging will be the contrast, saturation, and brightness of all assets in the application.

Rationale: All types of users are welcoming to the application. To better hit a wider audience the coloring must be associable and make game objectives clear.

Fit Criterion: The application is to maintain high contrast between interactable objects and those that are not. Moreover, to make sure everything is readable and visually appealing.

Acceptance Tests: Color Test

10 Operational and Environmental Requirements

10a Expected Physical Environment

The product will be used by anyone with access to a desktop and digital distribution service like Steam. A strong wifi connection will be required for accessing the blockchain, and large power capabilities as well.

ID#031 - Platforms

Description: The user can be anywhere with a desktop where downloading software is acceptable, generally their own home.

Rationale: The only socially acceptable place to download and play a game is the user's home.

Fit Criterion: The user needs to download the application and use quite a bit of power to run the miner.

Acceptance Tests: Platform Test.

10b   Requirements for Interfacing with Adjacent Systems

The application will need to interface with blockchain to mine while it is running. It will also need to connect with the Alzheimer's Institute's website to show what research is being done.

ID#032 - BlockChain

Description: The application will be compatible with the blockchain.

Rationale: Without access to and compatibility with the block chain the application wouldn't be able to mine.

Fit Criterion: The blockchain must be accessible at all times.

Acceptance Tests: BlockChain Test.

10c   Productization Requirements

The product will be distributed by any digital storefront like Steam or Epic Games.

ID#033 - Steam

Description: Using the Steam client will allow users to download the Application by searching and then selecting the product.

Rationale: The Steam website is easily accessible by anyone with an internet connection, or by downloading the Steam application.

Fit Criterion: This is the simplest way to distribute large-scale games/applications.

Acceptance Tests: Steam Store Test.

10d   Release Requirements

ID#034 - Biannual updates

Description: The Alzheimer's Awareness Crypto Game should be updated biannually, incorporating the latest research on Alzheimer's, improvements in the simulation, and enhancements to the cryptocurrency mining mode

Rationale: Continual updates ensure the information provided in the learning mode remains current, keeping users engaged with the latest findings about Alzheimer's. Additionally, technology and crypto algorithms evolve and regular updates would ensure optimal and secure performance.

Fit Criterion: Each release should include at least one significant feature addition or improvement in the Alzheimer's Simulation Game or Learning Mode. The Cryptocurrency Mining Mode must undergo compatibility and security checks to ensure it's using up-to-date and secure algorithms.

Acceptance Tests: Update Test.

11 Cultural and Political Requirements

11a   Cultural Requirements

ID#035 - Culture Localization

Description: The system must take into consideration the culture and language of the country in which the product is being used. The application must be accessible to all groups of people from all different cultural backgrounds.

Rationale: Since video games are very popular around the world, a lot of the users will be from different countries, and localization will be adhered to accomplish this.

Fit Criterion: There will be a localization team for all different regions of the world that will change text and inputs to fit the given region the product is being used in.

Acceptance Tests: Localization Test

11b   Political Requirements

ID#036 - Political Friendliness

Description: The system must be aware of the political surroundings of the world before the release of the product. The application must be inoffensive to the user and the development team and should be enjoyable.

Rationale: Considering the diversity of the user group, the user should be enjoying the application and not feel uncomfortable using it.

Fit Criterion: The development team must be accountable for being aware of the political environment of the world when developing the application.

Acceptance Tests: Political Test

12 Legal Requirements

12a   Compliance Requirements

ID#037 - Fundraiser Needs

Description: The System's Cryptominer and all funds generated from the user's Computer must comply with the Illinois Charitable Trust Act to preserve the integrity and legality of the Alzheimer's Association.

Rationale: Users should be able to generate crypto that will be given to the Alzheimer's Association with no malicious intent hindering the user's wishes.

Fit Criterion: The persons who will be able to access the crypto funds will only be in high standing in the Alzheimer's Association or the development team that is aware of the seriousness of these funds and the consequences of violations of the Charitable Trust Act.

Acceptance Tests: Fundraiser Test

12b   Standards Requirements

ID#038 - Standards

Description: The standard that the system must follow for this project is to adhere to what the user expects from the application from the marketing of the product.

Rationale: When the user uses our product, they must understand what the application does before they download it onto their personal computer.

Fit Criterion: The functionality and the features of the application will be posted clearly during the marketing process of the product that doesn't have any areas of confusion of what the user is buying.

Acceptance Tests: Legal Standards Test

13 Requirements Acceptance Tests

13a   Requirements – Test Correspondence Summary

Test	Req1	Req2	Req3	Req4	Req5	Req6	Req7	Req8	Req9	Req10	Req11	Req12	Req13	Req14	Req15	Req16	Req17	Req18	Req19	Req20	Req21	Req22	Req23	Req24	Req25	Req26	Req27	Req28	Req29	Req30	Req31	Req32	Req33	Req34	Req35	Req36	Req37	Req38
Test 1	X																																					
Test 2		X																																				
Test 3			X																																			
Test 4				X																																		
Test 5					X																																	
Test 6						X																																
Test 7							X																															
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Table 1 - Requirements - Acceptance Tests Correspondence

13b   Acceptance Test Descriptions

ID #001 - Game State

Description: Tests to check if the game is running properly.

ID #002 - Institute Test

Description: Tests connection to the Institute's website.

ID #003 - Miner Running

Description: Tests to make sure the miner is running.

ID #004 - Address Format

Description: Check if the address is formatted correctly and the correct length.

ID #005 - Game Smoothness

Description: Test the game on medium settings on the recommended hardware for frames per second.

ID #006 - Game Pass/Fail

Description: Send the game to an Alzheimer's disease professional to get a fail or pass.

ID #007 - Single User Operate

Description: Test to see if a single user may operate the product on a machine.

ID #008 - Miner Reliability

Description: Test to see if a user can mine for 99% of the day

ID #009 - Product Availability

Description: Test to see if the user can access the product 99% of the time randomly throughout a week.

ID #010 - Non-Miner Functionality

Description: Test to see if game and learning sections work if cryptocurrency cannot be mined.

ID #011 - Temperature Test

Description: Test the machine temperature.

ID #012- Vulnerability Test Suite

Description: General vulnerability testing.

ID #013 - Update Test

Description: Test updating the game through a service like Steam.

ID #014 - Discord Server Test

Description: Test out using the Discord server and example problems.

ID #015 - PC Spec Test

Description: Run the product in its entirety on a couple of different PCs.

ID #016- Scalability Test

Description: Test if the PCs can run the game locally.

ID #017 - Information Test

Description: Have an Alzheimer's specialist look at facts and provide the relevant information we have in the current day.

ID #018 - Address Recovery Test

Description: Test accidental deletion and recovery of cryptocurrency address.

ID #019 - Currency Count Test

Description: Test to see if the currency mined equates to the amount shown.

ID #020 - Usability Test

Description: Tests the application's ease of use.

ID #021 - Conversion Check

Description: Check that the current conversion rate being used is correct.

ID #022 - Help Test

Description: Tests to make sure that the tutorials are functioning properly.

ID #023 - Control Feel Test

Description: Test the controls with test users to see their opinions on controls.

ID #024 - Color Test

Description: Checks that the coloring of the application is normal.

ID #025 - BlockChain Test

Description: Checks to connection to the BlockChain.

ID #026 - Steam Store Test

Description: Checks connection to distribution storefront.

ID #027 - Localization Test

Description: Checks application output is correct based on the region of the user.

ID #028 - Political Test

Description: Checks the political correctness of the application.

ID #029 - Fundraiser Test

Description: Checks that all funds generated are being sent to the Alzheimer's Association.

ID #030 - Legal Standards Test

Description: Tests various information with legal standards

ID #031 - Access Test

Description: Make sure that the game gets a rating for everyone.

ID #032 - Privacy Test

Description: Have the game not store any personal information.

ID #033 - Message Test

Description: The majority of users should understand system messages without seeking external clarification.

ID #034 - Cognitive Test

Description: Tests with users with cognitive issues that ensure they are still able to play.

ID #035 - Tutorial Test

Description: Tests the video tutorials with test users to see if they comprehend that information.

ID #036 - Platform Test

Description: Tests the system on different types of Computer builds to ensure it is playable.

ID #037 - Update Test

Description: Tests the updated system with various functionalities to ensure playability.

III Design

1 Design Goals

The goal of the Alzheimer's Awareness Crypto Game is to bring awareness to Alzheimer's and forms of Dementia through a game that simulates these conditions. Moreover, this is also done through a Learning Mode in which the user can learn more about the disease and see the latest research on Alzheimer's and Dementia, as well as generate cryptocurrency to then be donated to the Alzheimer's Association to give the user a sense of generosity without having to spend their own money. Specifically, these design goals are to create a fluid and enlightening experience for the user. These will need to be accomplished in this project with limited complications to ensure the user can enjoy and be aware of the severity of this disease.

2 Current System Design

The purpose of this proposed system is not to replace a pre-existing system. It is to create a new system that could potentially have inspiration from other systems such as 'A Walk Through Dementia' which is a game that simulates Dementia. However, this system is to be a new system of its own. This is done by including a Crypto Miner and Learning Mode sections of the system to give the user different options when using the application.

3 Proposed System Design

3a Initial System Analysis and Class Identification

The Player class is the main class that interacts with the other three main mode classes. It can interact with the simulation mode, learning mode, and cryptocurrency mining mode. The simulation mode does not connect to any other class. The learning mode connects to an external article/research database to use in the learning mode. The cryptocurrency mining mode uses the Ethereum Blockchain to connect to mine cryptocurrency for donations to the Alzheimer's Association.
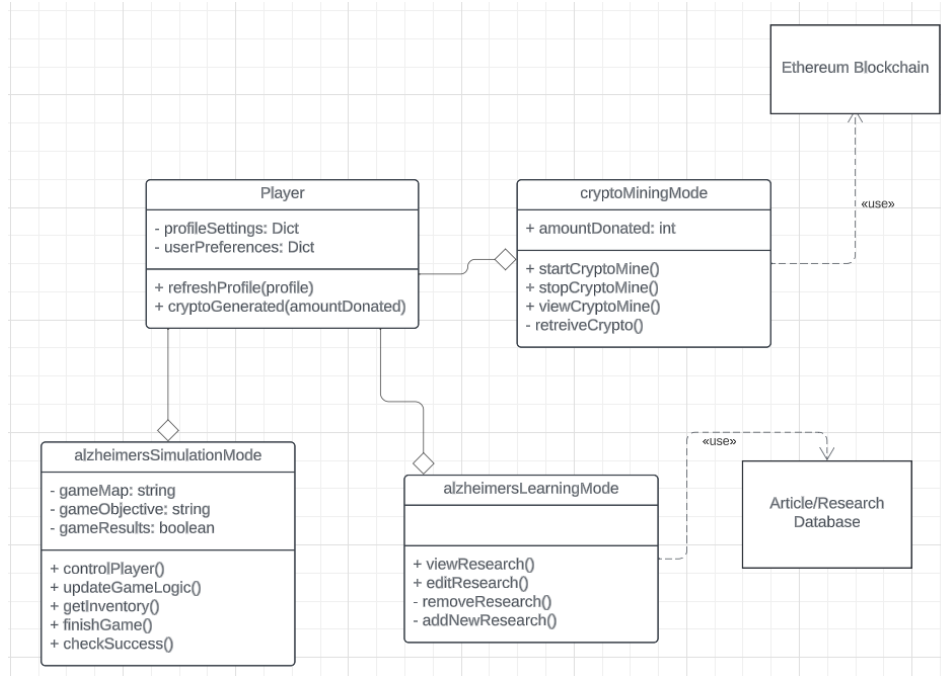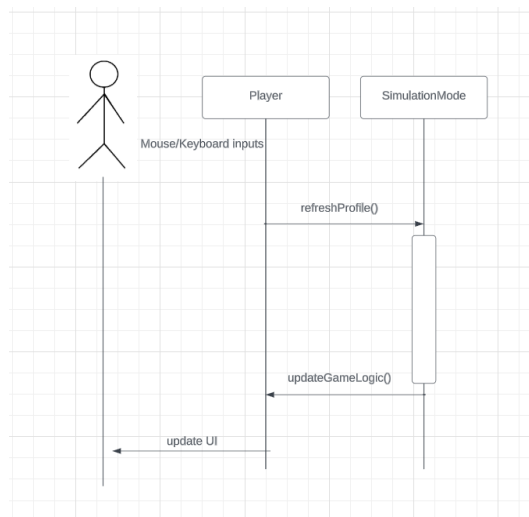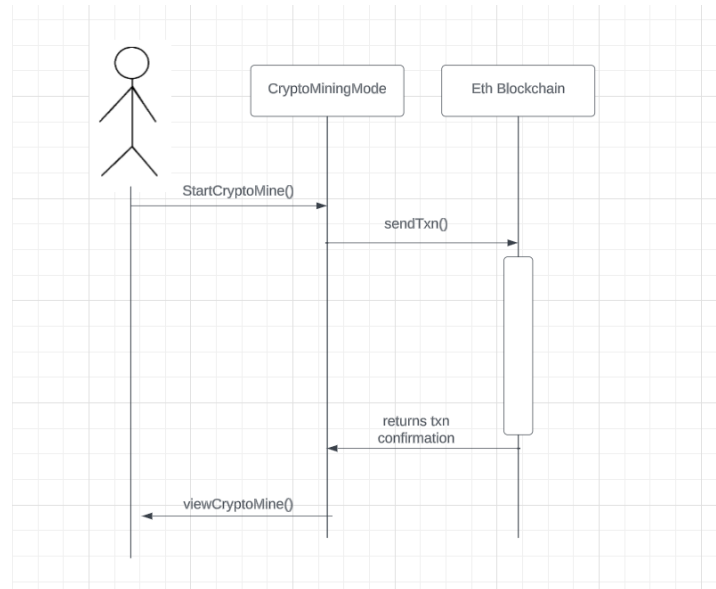
Figure 5 - Proposed System Design

3b Dynamic Modelling of Use-Cases

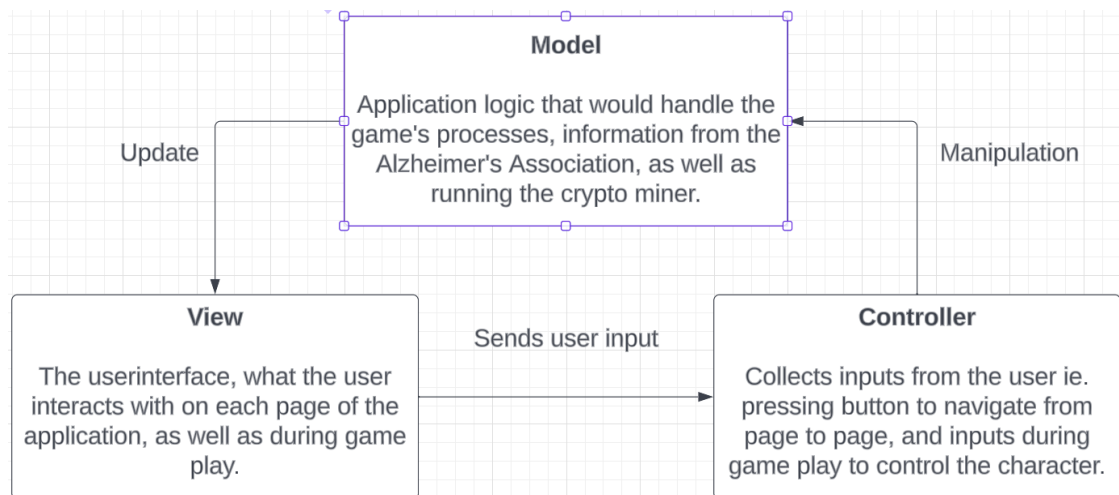The primary use-cases for the application are the following:

1. Control Player

2 . Start Crypto Mine

Figure 6 - Sequence Diagram of Use-Cases

## 3c Proposed System Architecture

The System Architecture to be used is the Model-View-Controller (MVC). Refer to the Figure below to see the details for each section of the architecture.

Figure 7 - MVC System Architecture

3d Initial Subsystem Decomposition

The Player class is where all the settings and information unique to the player are stored and can be accessed. The cryptoMiningMode subsystem is where the user mines cryptocurrency and that cryptocurrency is tracked and sent to a wallet that the Alzheimer's Association can manage. The alzheimersSimulationMode subsystem is where the Player can interact with the simulation of how it feels to have Alzheimer's disease. It is responsible for keeping track of all game-related tasks and logic. The alzheimersLearningMode subsystem is responsible for all learning done by the Player. The Player should be able to open the mode up and have access to research and articles taken from the database.
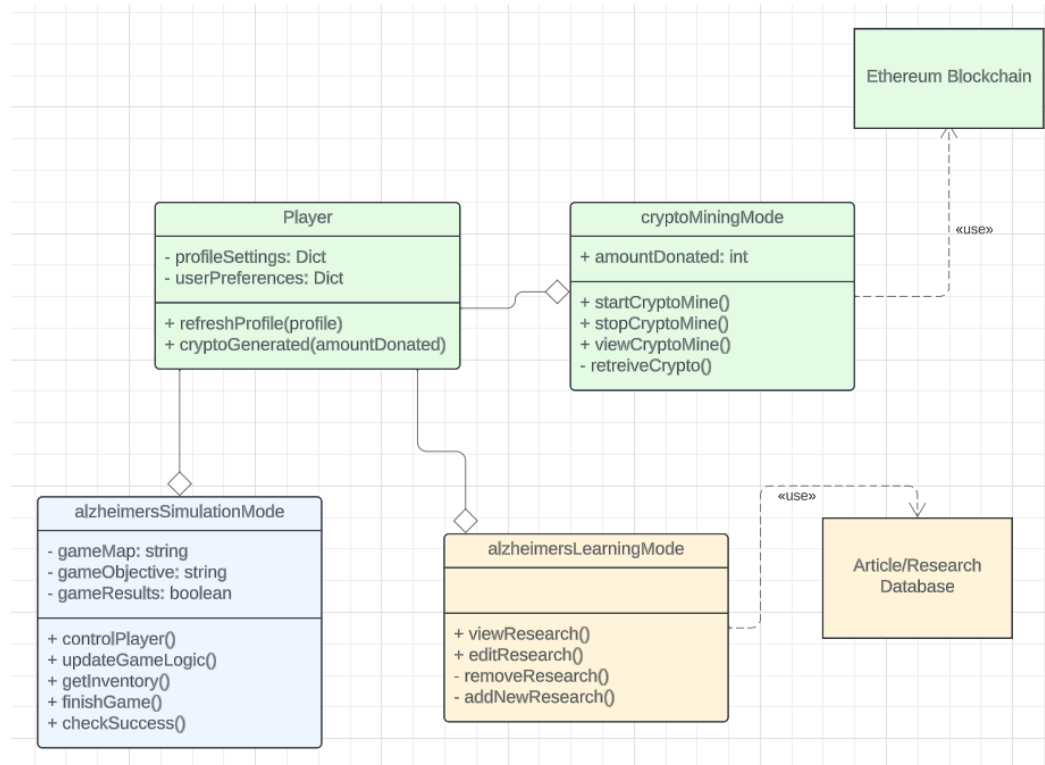
Figure 8 - Initial Subsystem Decomposition

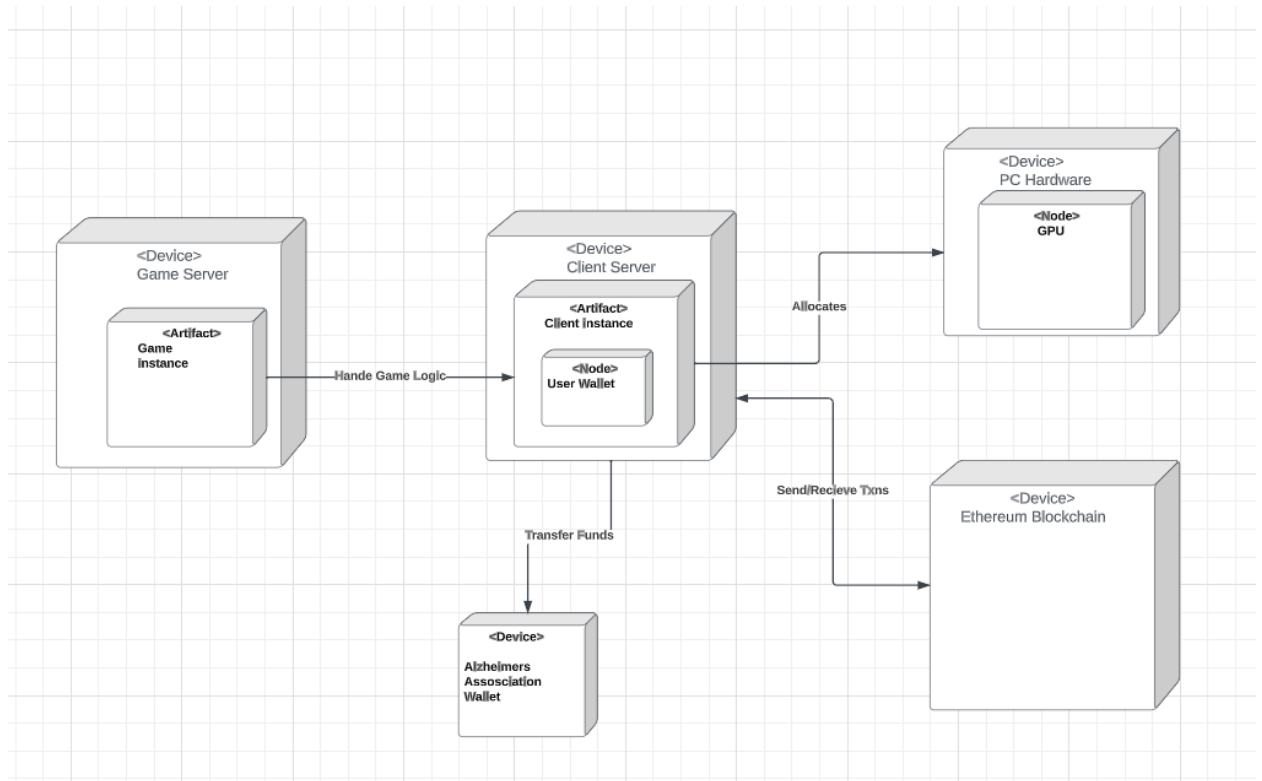# 4 Additional Design Considerations

4a Hardware / Software Mapping

Figure 9 - Hardware/Software Mapping

4b Persistent Data Management

The subsystems of our application that will need to have data properly stored will be the Learning Mode and Cryptocurrency Mining subsystems. Due to the potential size of the Learning Mode's Database, a graph or a hashmap data structure will be the most useful. Due to the layout of these data structures, it will allow quick access to the large amount of data that is needed to be stored. When the system is shut down, all information from the Cryptocurrency Mining subsystems will be properly stored. When the system is starting up, retrieval of the Learning Mode Database will be first priority. The Cryptocurrency Mining subsystem will be loaded when the user confirms for it to run when they open the application.

4c Access Control and Security

Access control will be very important for this application since it deals with collecting and sending cryptocurrency. Users can only see data that relates to them, i.e. how much crypto they have mined. Allowing other users to see how much another user has mined could lead to targeted attacks. Access to the wallet or wallets holding the crypto needs to be controlled very tightly as well.
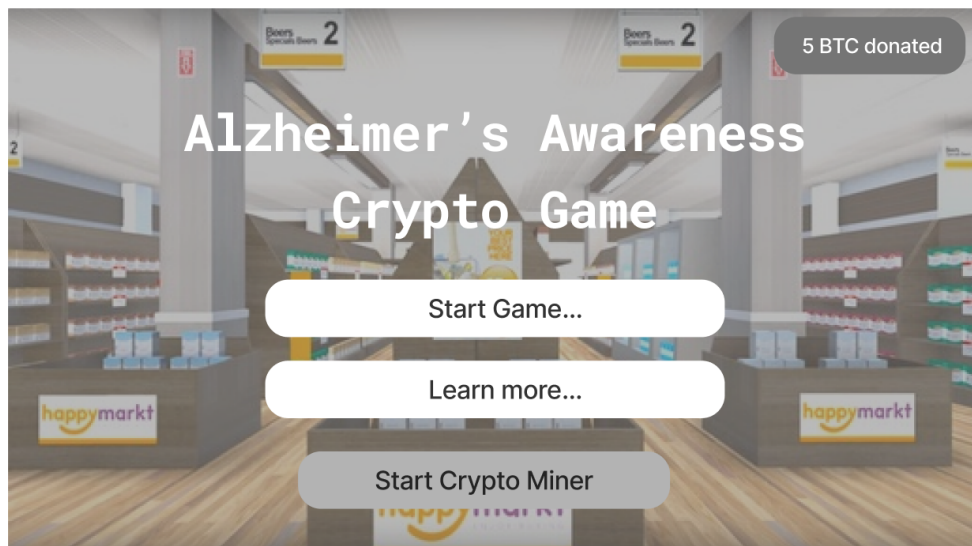
4d Global Software Control

Global software control can relate to the local version of each application based on the user's location. Users can expect the app to be displayed in their device's native language. This includes menu texts, information from the association on the learning page, and even different versions of the game that show varying backgrounds/textures. These differences show the need for another subsystem or at least a class that handles the changes between regions.
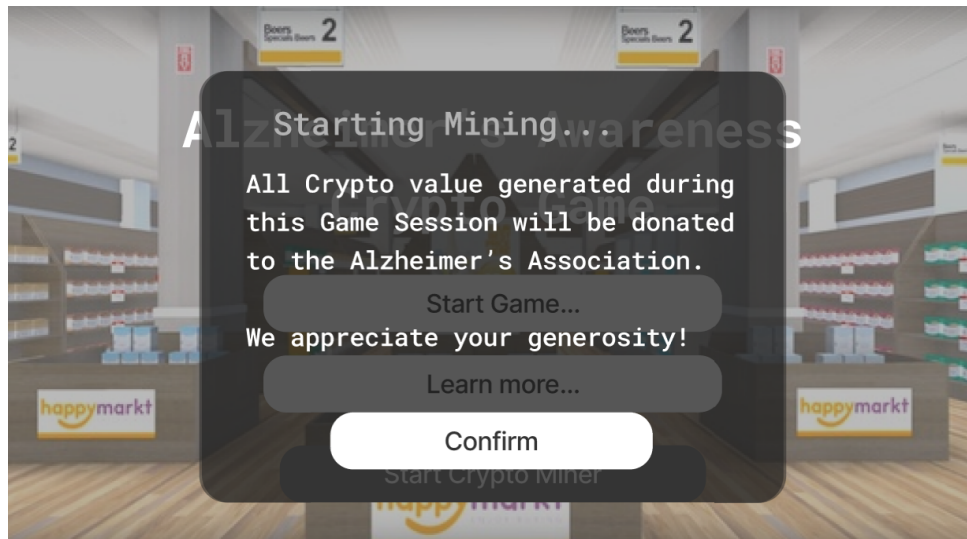
4e Boundary Conditions.

Boundary condition concerns for the application include startup/shutdown of the crypto miner as well as the transportation of the cryptocurrency itself. If the miner is started but runs abnormally, or shows that it's running but actually isn't mining anything then the application loses a large amount of its functional use. In the event that the miner is shut off, but doesn't actually shut down then the user could be wasting quite a bit of electricity when they wouldn't want to be. As for sending the crypto, if it isn't being sent to the correct place then the association wouldn't benefit anyways and it becomes a moot point.

4f User Interface

The User Interface provided below is a general concept of the potential finished product of the Application. This UI design is centered around a grocery store that the user will explore and complete tasks; however, depending on the development team, the location can change if needed.

Figure 10 - UI Title Screen

**Figure 11 - UI Cryptocurrency Miner**

Figure 12 - UI Learning Mode

Figure 13 - UI Game Mode

4g Application of Design Patterns

Due to the scope of this application being mainly a game simulation of a person with Alzheimer's/Dementia, the creational design pattern will need to be Singleton with a Composite structure. This is due to the structure of the game which will only need one instance of the game class, learning class, and crypto class. This will align with many other games which also use a Singleton design pattern. If there are multiple instances of these classes, various functions of the applications will have conflicts.

5 Final System Design
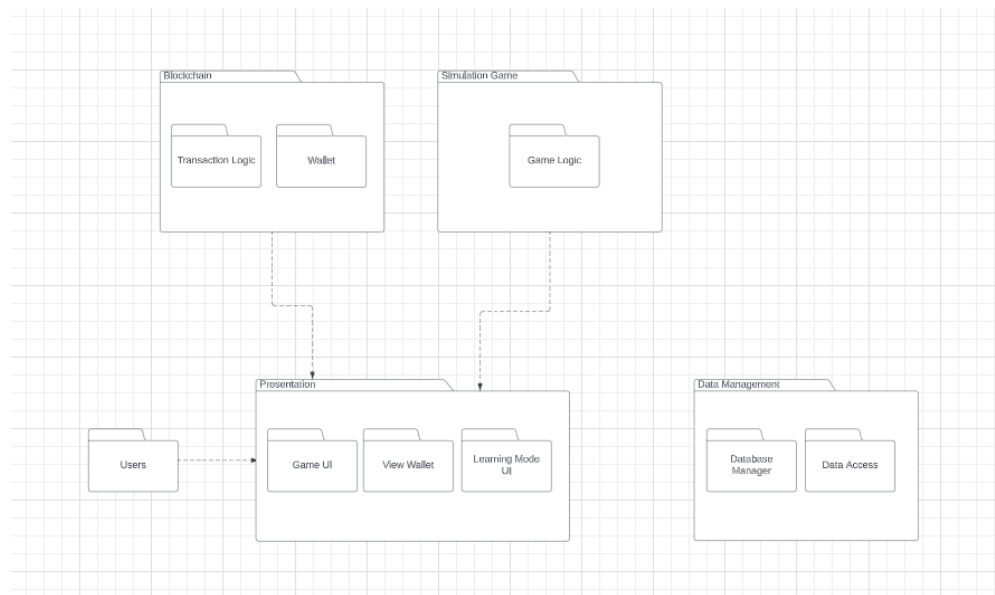
Figure 14 - Final System Design

6 Object Design

6a Packages

For this project, there are no strict packages or APIs that need to be used for the application to be functional. The developers can use any packages (or none at all) that the system can benefit from.

6b Subsystem I

The Simulation Mode subsystem will include the game logic for managing simulation scenarios, player interactions, and responses to player actions, as well as the game UI that the player will interact with via keyboard/controller inputs. This subsystem will also have an environment that the user can interact with and will be tasked with different activities with various effects in-game that simulate Alzheimer's and Dementia.

6c Subsystem II

The Learning Mode subsystem encompasses an interactive front end incorporating textual and visual elements to engage the user and reinforce learning. It will retrieve the articles/research papers from an external/internal database.

6d Subsystem III

The Cryptocurrency Miner subsystem handles the crypto mining portion of the application, allowing for customization of the mining process (GPU allocation, mining duration, etc.). An emphasis is placed on security, ensuring that the wallet and transaction processes are fully encrypted and invulnerable. Another part of this subsystem is the user's data of how much crypto they have generated as well as linking their profile to that crypto donation.

IV Project Issues

1 Open Issues

There are no open issues on this product currently.

2 Off-the-Shelf Solutions

There are simulations of dementia that are already released as interactive demos and the Alzheimer's Association themselves have a simulation people can do at home with some simple materials. These could be used as alternatives for the simulation part of this product. The learning component of this product could be replaced by information packets already available on the internet, but we have not seen any interactive learning games for dementia. The cryptocurrency mining aspect of this product could be taken from any other mining operations currently available and added to the product easily.

2a Ready-Made Products

There are multiple Alzheimer's simulators out for purchase on the internet, but we don't believe that any of them could be incorporated into our implementation.

2b Reusable Components

Components like the Unity game creator will be reused to create the entire product.

2c Products That Can Be Copied

We don't believe there are any products that we can legally copy as our product is unique in itself as a simulator, learning tool, and donation tool all in one.

3 New Problems

3a Effects on the Current Environment

The new system would not have any adverse effects on the working environment.

3b Effects on the Installed Systems

The only issue we can foresee is users' GPUs might lower their lifespan by continually using the cryptocurrency mining mode.

3c Potential User Problems

The new system would not have any adverse effects on the users of the software. This product would only help strengthen the users' understanding of Alzheimer's disease.

3d Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

The physical limitations that could inhibit the proposed product from functioning at full capacity are the lack of reliable power and internet access.

3e Follow-Up Problems

The only other possible problem that could occur is that the cryptocurrency the users mine becomes useless and therefore not able to be used as a donation to the Alzheimer's Association.

4 Migration to the New Product

Not Applicable

5 Risks

Potential risks that can greatly impact the success of the project, would be a lack of security and quality-of-life regarding the game section of the application. Suppose the handling of the cryptocurrency is not secure or manipulated. In that case, the project

and the development team can fall into legal issues which will likely cause a shutdown of the project. Moreover, if the video game experience underperforms and has excessive glitches/bugs/performance issues, the game downloads will be hindered causing failure of the purpose of the application.

6 Costs

Due to the scope of this application to incorporate three different functionalities, development will be very intensive and will require a wide range of specialized programming. These will range from game programming to security programming to graphic design. Considering all these, the estimated cost of this project will be around ~$500,000 USD. With this funding, the application will be able to be fully visualized with unique art assets and unique gameplay.

7 Waiting Room

Possible new features to the game could be different maps that the user can play to help increase replayability. Moreover, to help increase the monetization of the application to then be donated to the Alzheimer's Association, the additions of microtransactions, such as cosmetics or different UI designs, will be able to help in that endeavor, when handled respectfully.

8 Ideas for Solutions

The development of this application should likely be created through a Game Engine such as the Unreal Engine or Godot. The use of these Game Engines will ease the workload on the developers and help them focus on more important tasks such as game security and use experience instead of wasting time on technical setup. Depending on the Game Engine the team chooses, the programming language will be specific to what the Engine accepts, such as Unreal Engine being in C++ or Godot. Depending on what Engine is chosen, the developments can focus on implementing the composite system design first and foremost.

9 Project Retrospective

What worked well for us in this project was splitting up the work between each group member so that the burden of work on one person wasn't too great of a task. We also set deadlines for a day before the project parts were due so that we would not run into a situation where we needed more time to complete the given assignment. While we never ran into the issue of turning in assignments by the deadline, we slacked on our deadlines given by ourselves to finish earlier. This put a little more pressure on each of us to finish our parts quicker, but overall we got everything done on time and well. What could be improved in the future is more concrete assignments to each member of what part of the project they are working on as we had a system where each person would do the same amount of work, but they could choose which parts they want in any order. This made it confusing sometimes but overall a minor issue.

V Glossary

Alzheimer's: A progressive neurodegenerative disorder characterized by a decline in cognitive functions.

Cryptocurrency: A digital currency in which transactions are verified and records maintained by a decentralized system.

Coins: A digital currency native to its blockchain, storing value and acting as a medium of exchange.

Blockchain: A decentralized and public ledger that is used to record transactions between different computers.

Crypto Mining: The process used to generate new cryptocurrency coins and verify new transactions.

Player User: This is the user who is interacting with the system itself and only has access to the front-end features that the developer has implemented.

App Admin: These users will have admin privileges to the system and will be able to access the backend features of the application that retrieve the research articles and the cryptocurrency.

VI References / Bibliography

[1] Alzheimer's Association, "Alzheimer's Disease Facts and Figures".

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