

Requirements Document

AR Pet Pals

REVISION HISTORY

Revision #	Author	Revision Date	Comments
0.0	Anya Tewari	September 14, 2023	Initiated
0.1	Anya Tewari	September 14, 2023	Project abstract
0.2	Anya Tewari	September 14, 2023	conceptual design
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Document Overview

The Requirements Specification document defines the features and requirements for AR Pet Pals.

- System Overview
- General Requirements
- Features and Requirements
- Use Cases

System Overview

Project Abstract

ARPetPals is a mobile augmented reality (AR) application designed for Android and iOS smartphones. ARPetPals aims to aid users in their health and fitness journey in a fun and interactive way. ARPetPals allows users to adopt and interact with virtual pets in their real-world environments such as one's desk at work. The virtual pet requires care, attention, and playtime, with their happiness and health metrics affected by user interactions. The game also leverages object recognition AI to enable virtual pets to interact with real-world objects, enhancing the gameplay experience. The health of the virtual pet is directly correlated with the user's diet and exercise habits. Using object recognition, the game will recognize food a user is eating and record the nutrition information. The healthier the food, the more nourished a pet becomes. The app will remind users to nourish their pet throughout the day and to interact with it by exercising. The pet will become more fit and content based on a user's activity level. There is an interactive aspect to the game where the health of a virtual pet is displayed on a public leader board. This gives users incentive to keep up their pets' health status by adding a competitive nature to the game. The game also uses speech to text AI to give commands and interact with the virtual pet. ARPetPals will be developed using the Unity 3D game engine.

Conceptual Design

Unity 3D will serve as the development platform. C# will be used for scripting within the Unity 3D engine. The application will be developed for Android and iOS operating systems. Object recognition AI and speech to text AI will be integrated to allow virtual pets to interact with real-world objects and a user's food and activity .

Background

ARPetPals is a unique mobile AR game concept that combines virtual pet care with fitness, using augmented reality and object recognition. While there are several virtual pet simulation games available, the integration of AR and AI and focus on health sets ARPetPals apart. This app offers players a more immersive and interactive fitness experience. Based on a search on the iOS mobile app store a game called Peridot seems to be a similar product based on its AR spin on a pet game, but does not contain any AI features. The link for Peridot can be found here: <https://playperidot.com/en> .

System Block Diagram

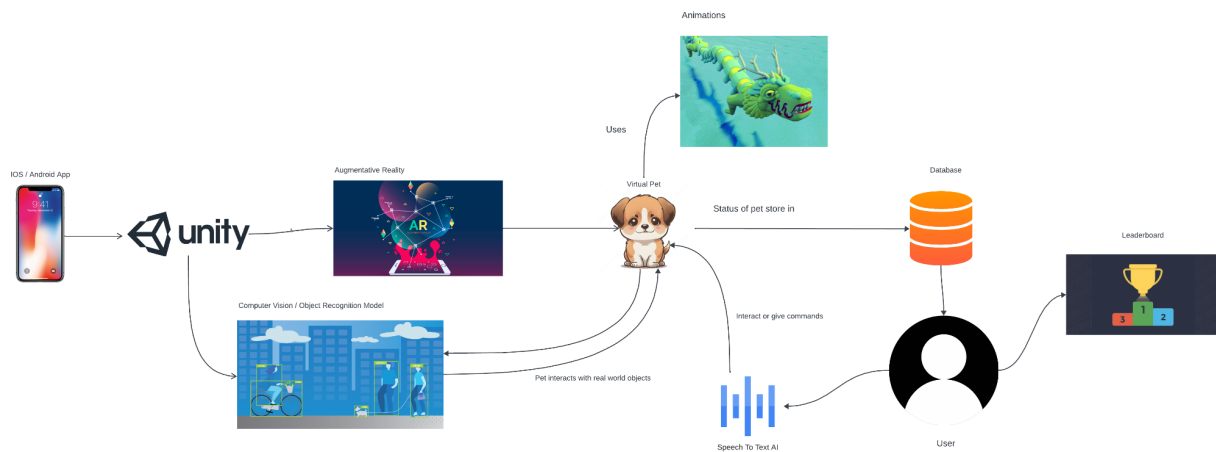


Figure 1. High level design of the AR Pets Pals application

Figure 1 depicts the high-level design of the application from a user's mobile device. They will be able to open the app on their mobile device and start interacting with their virtual pet. The application will run on Unity, a cross-platform game engine, which will then interact with a augmented reality engine that will create a pet of their choice. That pet will later be able to recognize real-world objects around it using Object Recognition and be able to interact with them using animations. The main idea of the pet is to make it content or not based on food that you eat, it will be able to analyze your food and determine how healthy that food is, which will make it sad/angry or happy. Users will compete with other users based on their pet's status.

General Requirements

Hardware Required

- iPhone X or later with iOS version 11.0.1 or later
- An android phone that supports version 8.0 (Oreo) or later
- Functional front facing camera
- Functional microphone and speaker

Development Environment

- Xcode (for iOS) and Android Studio (for Android)
- Unity Hub (for Unity 3D) or Unreal Editor (for Unreal Engine 5)
- Github and Jira - for Project and Code Management
- Reliable Database System

Deployment Format

- Compiled Binary (in APK for Android or IPA for iOS)

Features and Requirements

Functional Requirements

- ARPetPals will require registration with Google account.
 - Users must have the option to register using their Google account for easy sign-up.
 - During registration, users will be prompted to grant necessary permissions to the app.
 - User data obtained from the Google account, such as name and profile picture, may be used to personalize the experience.
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- User must allow access to the Camera and fitness app to play the game.
 - The app will request access to the smartphone's camera to enable augmented reality features.
 - Users will also have the option to grant access to their fitness app data, which can be used to enhance the pet's health and activity level within the game.
 - Clear explanations and prompts for granting these permissions will be provided to the user.
- A welcome screen will appear first when the user first signs up explaining the game.
 - Upon initial sign-up, a welcoming screen will provide a brief and user-friendly explanation of the game's concept and mechanics.
 - It will introduce users to their virtual pet and its role in their daily life.
 - The screen may also offer a tutorial to guide users through basic interactions.
- User picks the avatar of the pet and gives it a name.
 - Users will have the opportunity to select and customize their pet's avatar from a range of options.
 - They will be prompted to give a unique name to their pet, fostering a sense of ownership and attachment.
 - Customization options may include selecting the pet's color, size, and features.
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- Main screen shows the pet, health and happiness measurements, settings
 - Upon completing setup, the smartphone's camera will activate, merging the virtual pet with the user's real-world environment.

- The main game screen will prominently display the virtual pet, accompanied by health and happiness metrics.
 - Users can access the settings menu from this screen to configure preferences.
- ARPetPals will use ai to detect what kind of food you are eating, and will affect the health and happiness of the pet.
 - AI algorithms will analyze the user's eating habits through the camera feed.
 - The app will identify the type of food being consumed and simulate its impact on the pet's health and happiness.
 - A variety of food items and their corresponding effects will be programmed into the game.
- ARPetPals will use ai to tell you jokes about objects that it recognizes.
 - The AI will recognize real-world objects through the camera.
 - When an object is recognized, the virtual pet may spontaneously generate and share relevant jokes or comments about the object.
- Users can feed the pet by searching within the AR environment by double clicking on a space.
 - Users can initiate the feeding interaction by double-clicking on different areas of the ground within the augmented reality environment.
 - When the user double-clicks on a specific spot, the app will simulate a "food search."
 - The outcome of the search will vary; in some instances, virtual food items will appear, while in others, nothing will be found.
- ARPetPals will track the user's activity and will affect the health and happiness of the pet.
 - ARPetPals will integrate activity tracking through the smartphone's health app.
 - The app will monitor the user's physical movement and encourage a healthy level of activity throughout the day.
 - The virtual pet's well-being, including both happiness and health metrics, will be influenced by the user's activity level.
 - Regular physical movement and engagement with the pet may lead to improved pet happiness and health.
- The pet will have different animations depending on the event.
 - The virtual pet will exhibit different animations and behaviors based on various events and interactions.
 - For instance, it may dance when happy, display curiosity when shown an object, or express hunger when it's time to eat.
 - These animations enhance the pet's realism and engagement.
- Users will be able to play with and clean their pet to increase health and happiness.
 - Users can engage in playtime activities with their pet, such as throwing virtual toys.
 - Cleaning interactions, like brushing or bathing the pet, will also be available to boost its happiness and hygiene.
 - Different interactions will yield varying degrees of health and happiness improvement.
- The leaderboard button will display other user's pets with the happiest and healthiest pets.
 - The leaderboard button allows users to view other players' virtual pets.

- Pets on the leaderboard will be ranked based on their happiness and health metrics.
 - Users can use this feature to compare their pet's well-being with others and strive for a top-ranking position.
- Users can sign out of the app.
 - Users will have the ability to sign out of the app when they choose to do so.
 - Signing out ensures the privacy and security of user data.
 - Appropriate warnings and confirmation prompts will be provided to prevent accidental sign-outs.

Nonfunctional Requirements

Usability

1. User-Friendly Interface: The app should offer an intuitive, user-friendly interface that allows users to easily navigate through different features.
2. Quick Response: The application should be responsive and quick in processing actions. Interactions with the virtual pet should not lag or delay.
3. Tutorial: An optional tutorial should be provided to familiarize new users with the app's functionalities.

Performance

1. Real-Time Processing: The object and speech recognition algorithms should operate in real-time to provide a seamless user experience.
2. Low Latency: Latency should be minimized for all augmented reality functions, and any delays should not exceed 1-2 seconds.
3. Smooth Animation: Animations of the pet should run smoothly, without glitches, for an immersive experience.

Security

1. User Authentication: The Google account sign-up process must be secure, and any data collected must be stored securely.
2. Permission Management: The app should securely manage permissions for camera access and other sensitive data, revoking them if necessary upon user sign-out.

Scalability

1. Multi-Platform Support: The app should be compatible with both Android and iOS, and be scalable for future platforms.
2. Database Scalability: The system should be able to accommodate an increasing number of registered users and pets without degradation in performance.

Availability

1. Backup and Recovery: A backup system should be in place to recover user data in case of any loss or corruption.

Accessibility

1. Voice Commands: Voice recognition should be accurate and efficient for differently-abled users.
2. Visual Aids: Text should be clearly readable, and the app should offer some degree of customization for those with visual impairments.

Quality

1. High-Quality Graphics: The AR representation of the pet should be of high quality, enhancing the realism and engagement levels.
2. Sound Quality: Any sounds or speech produced within the app should be clear and free from distortion.

Use Cases

Use Case 1

A user is a college student and spends lots of time studying at their desk.

1. User has been studying for hours and has not eaten or done any physical activity.
2. User receives a notification from the app reminding them to feed their pet.
3. User opens the app and sees their virtual pet sitting on their desk, looking very malnourished and weak.
4. User gets a bowl of ramen noodles and a can of Monster to drink.
5. User points the camera at its food and the app recognizes the food correctly, asking the user to verify.
6. User taps a button to confirm that the food is correctly recognized.
7. The pet is nourished slightly but is not at 100% health due to the poor nutritional value of the user's meal.
8. User cooks a chicken breast and repeats steps 4-6.
9. The virtual pet is now nourished and at 100% health due to the high nutritional value of the chicken breast.

Use Case 2

A user is a software engineer working from home full time and has eaten but has not moved in a while due to several long morning zoom meetings.

1. The user receives a notification from the app letting them know that their pet is in need of a walk.

2. The user opens the app and sees their virtual pet in their room, looking very hyper and needing exercise. The pet's happiness bar is low.
3. The user taps a button to indicate they are starting their activity.
4. The user stands up and takes a walk down their hallway and back to their room.
5. The app tracks the users steps using their smartphones built in hardware sensors.
6. The user taps a button on the app to record their activity.
7. The virtual pet is seen on screen in the users room visibly calmer/happier, and its health bar is at 100%.

Use Case 3

A corporate employee who's been working from home due to recent global circumstances. With a sedentary lifestyle, they struggle to incorporate regular exercise into their daily routine.

1. User wakes up to a notification: "Your pet wants to exercise!"
2. User opens the app, sees the pet stretching, and does a quick workout.
3. Post-workout, the pet signals it's hungry.
4. User makes oatmeal with fruits and scans it with the app.
5. App recognizes food, the user confirms, and the pet eats.
6. Pet's health improves, and the user climbs a few spots on the leaderboard.

Use Case 4

A user is a nurse who had a long day at the hospital and needs to relax and decompress before bed.

1. User comes home and receives a notification: "Your pet feels tired. How about some calming activities?"
2. User opens the app and sees the pet meditating.
3. Following the pet's lead, the user does a short meditation session.
4. After, the user makes chamomile tea and scans it.
5. App recognizes the tea, and both user and pet sip it, enhancing relaxation.
6. The pet, now calm and peaceful, curls up and falls asleep, promoting restful sleep for the user.

Use Case 5

A user is an outdoor enthusiast who spends weekends hiking and exploring.

1. During a hike, the user gets a notification: "Your pet is excited for an adventure!"
2. User opens the app to find their pet equipped with hiking gear.
3. As the user hikes, the pet interacts with virtual elements in the natural environment.
4. The user reaches a viewpoint, eats a sandwich, and scans it.
5. The pet enjoys its virtual sandwich, replenishing energy.

6. Both share a moment enjoying the virtual sunset, increasing the pet's happiness and the user's relaxation levels.

Use Case 6

A user is a high school student preparing for exams and requires short breaks to stay efficient.

1. After two hours of studying, the app prompts: "Your pet suggests a quick brain break!"
2. User opens the app to see the pet juggling virtual balls.
3. User attempts to mimic the juggling, causing some laughter and relaxation.
4. The user grabs a fruit snack and scans it.
5. Pet nibbles its virtual fruit, and both feel rejuvenated.
6. The user returns to studying, feeling more refreshed and focused.

Use Case 7

User is a young adult on a fitness journey with friends.

1. User has been keeping up with their health and nutrition goals using the app and interacting with their virtual pet.
2. At the end of the week, user opens the app and taps on the leaderboard tab.
3. Sees the users with the most amount of points.
4. Taps on another user's username and sees their profile, pet's health score, and badges.
5. Taps on ribbon icon to see how to earn badges.
6. Sees that there is a badge for feeding virtual pet the most protein in grams/week.
7. User taps on the information circle icon to see what tasks reward users with points.
8. User makes new goal to eat more protein this next week so they can get higher on the leaderboard and compete with their friends.
9. User earns points and moves up on the leaderboard.