



Mestrado em Engenharia Informática e Computação

Realidade Virtual e Aumentada

Project 2 - SenshiKing

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1. Description

SenshiKing is a local multiplayer turn-based game with rock-paper-scissors mechanics, inspired by Mesuking and Mushiking: The King of Beetles.

The players can choose one from various fighters and use different power-ups during the battle. In addition, the players can perform all these actions by presenting and placing other markers in the arena field. The game environment mimics the day/night light and the weather conditions that dwell in real-life.

In the end, only the toughest luckier survives.

2. Instructions

Since this is a mobile game, to execute the project, the user needs to extract the APK file from the RVAU-P2-7-Exe zip file and install it on a mobile device. After that, the user can start the game by opening the SenshiKing app.

The user needs to print some markers to play the game, which can also be found in the RVAU-P2-7-EXE zip file. They can be printed in any size the user wants.

Disclaimer: The game was tested using a Samsung Galaxy S8 and a Huawei P10. Malfunctions in other equipment can sometimes happen due to Vuforia's limitations. The game also uses the users' location without asking for permission. Users who do not want to share this information with the service providers should not play the game.

3. Features Implemented

3.1. Markers

In total, the game has ten markers available, divided into four categories:

- Character markers: five available, one for each character;
- Arena marker: only one available;
- Attack markers: three available, one for each attack. Their meaning in the game is randomized in each turn;
- Power-up marker: only one available.

The arena marker is available throughout the game and places the board where the battle will happen. The other markers will be explained more in-depth in the following sections.

3.2. Choose Characters

At the beginning of the game, the players can choose between a catalogue of characters to use during the battle. To do that, both players need to select the character's correspondent marker and show it to the camera's lens in turns. A countdown of three seconds will start, and when it reaches zero, the player has selected the character. While the countdown does not match zero, the player can change his option as many times as he wants. After the characters' selection is made, it is time to start the battle phase.

3.3. Game Mechanics

The battle phase is the nucleus of the game, where all the mechanics are present. It goes through three turns in a continuous loop until a player loses, or even both, calling a tie. The first two turns represent each of the players' turns. During a turn, depending on the case, the player can implement two actions:

- If a power-up was generated, he can use it right away to decrease his opponents' health or increase his own, accordingly to what is described in the "Power-ups and spatial use" section;
- Choose an attack in a rock-paper-scissors game.

After both players have chosen an attack, the clash starts, where the best attack decides who will take the opponent's life. Each player starts with one hundred life points, and each successful regular attack takes twenty points, making it necessary to win five times to end the game with regular attacks.

However, to make the game more unpredictable and fun, besides the power-ups described in the following sections, we introduced another type of attack: a combo attack. The combo attack doubles the damage (forty points), and to achieve it, the player must have the best attack three times in a row.

3.4. Choose Attacks

During their turn, each player must choose one of the three available attacks, Rock, Paper, or Scissors. Each player must use the camera lens to see which type of attack each of the three-attack markers belongs to. Then, the player may select one of them and show it to the camera. A countdown like the one of the characters choosing will start. When it reaches zero, the attack is chosen.

Each time the turn changes, a randomizer algorithm switches the attack types' markers positions so that the next player does not know which attack was selected by the previous player.

3.5. Power-ups and spatial use

The power-ups introduce unpredictability in the game and use the spatial functionalities Augmented Reality provides to game development. The game currently keeps three power-ups, described in the following subsections. They are randomly generated according to the players' health:

- When the player has the maximum possible health, it has a chance of 15% of getting a power-up;
- When the player does not have any health left, it has a chance of 75% of getting a power-up;
- Other values are interpolated from the previous two.

Cloud

A rainy cloud that changes its color according to a gradient, dependent on both players' distance. When it is closer to the player using it, it turns green and gives him health points. When it is closer to the other player, it turns red and takes health points from him. When the distance to both players is the same, the cloud becomes yellow. The cloud has a maximum radius of effect, which means that, although it can change its color, it only affects the player's characters if it is inside the defined radius. The amount of health drained from or given to the player depends on the cloud's time interval above the player's character.

Meteor

The player can place a marker in the arena with a target, then a countdown of three seconds starts, and when it reaches zero, a meteor falls from the sky and hits the character inside the target. If the target is near some player's character, the meteor damages it. This works even if the character belongs to the player using the power-up.

Arrow

The player can place an arrow in the arena and choose its orientation. This will create different effects regarding position and orientation:

- When placed behind the player using it and pointing towards the opponent, if the player has the best attack, it triples the damage to its opponent. In this state, the arrow turns green.
- When placed behind the player using it and pointing in the opposite direction of the opponent, it does not affect the attack damage values, but the arrow turns red.
- When placed in the middle of the player and his opponent and pointing towards the opponent, the arrow turns blue, and it can have one of two effects:

- If the player has the best attack, it doubles the damage to its opponent;
- If the player has the worst attack, it takes half the damage from its opponent's attack.
- The inverse positions and orientations of those described above have the same effects but in reverse.

3.6. Sound Effects and Music

Sound is an essential part of games and can make them more immersive. Since SenshiKing is a 3D AR game, it made sense to implement 3D audio, especially for sound effects (Sfx) related to the virtual world. This way, we can divide the game's sound into three main categories: music, 2D Sfx, and 3D Sfx.

Music

Since one of the main inspirations for this project was Mesuking, we decided to use the songs from that game as the main songs for the main menu and game scenes. An arena reverb was applied to the game's music, and also some unnecessary parts were cut from the original songs.

2D Sound Effects

The central part of the game happens in the augmented reality space through 3D objects, but there are also some interactions with the canvas. Sound Effects, such as the timer countdown, do not need to be spatialized since their visual equivalents appear on the screen. This way, we implemented the timer countdown, and the power-ups trigger as 2D Sfx since these only alert the players that something is happening in the game.

3D Sound Effects

These types of Sfx are fundamental in our game. The players can notice their sources in the 3D space by hearing them.

Character sounds, such as the jump, hurt, or death noises, are implemented using the 3D spatialization, as well as the user's selection feedback (the small effect underneath the characters when player's are choosing their move), and the power-ups sound effects (the raining and meteor falling noises).

3.7. Current Weather Conditions

The game presents effects that mimic the current weather conditions in real life, where the device is.

At start-up, a script called "GetLocation.cs" is responsible for contacting an API: ipify.org, that retrieves the current device IP. Then, another API is requested: ip-api.com to retrieve the coordinates related to the device IP. Lastly, these

coordinates are used to request another API: api.openweathermap.org. This request retrieves a relatively complex response, from which a string is obtained with the current weather.

The game has three weather effects implemented: clear, rain, and fog - these effects were accomplished using post-processing manipulation of light characteristics.

The real-life conditions also define the game's light ambience, simulating day or night. A call to the system retrieves the current time. From 8:00 a.m. until 07:00 p.m. is considered daytime, and the day conditions are applied. The rest of the hours are considered nighttime.

The other post-processing effects are disabled when nighttime is enabled because the summation led to a poor result.