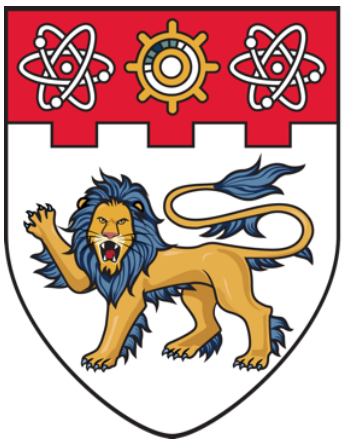

NANYANG TECHNOLOGICAL UNIVERSITY
SINGAPORE

CZ4001 Virtual & Augmented Reality

AR Assignment Project

Group 3C - PokemonAR

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Content

1. Background and Objectives

In this project, we have chosen to bring the Pokemon figures to the augmented reality environment using Vuforia and Unity.

Pokémon GO is one of the most successful mobile games of all time, breaking records such as fastest to earn $100 million and most-downloaded in its first month of release. To date, it has grossed almost $2 billion in revenue and been downloaded 800 million times. Although no longer the global phenomenon it was in 2016, the game remains incredibly popular. The success of the story consists of multiple factors, whereas one of the most important factors being the integration of Augmented Reality Pokemon figures into a complete Pokemon Trainer's story, which provided an engaging gaming experience to the users. The application of Augmented Reality in Pokemon Go has indicated a great potential for the partnership between collection-oriented games and AR in the future.

Thus in this project, we have experimented the AR technology, revisited the Pokemon Go topic and brought the Pokemon figures to life with AR. The 3D models can be viewed from any angle instead of only front view, as long the template image can be recognized by Vuforia. Last but not least, we implemented the virtual button for an uncommon but more interesting user interface. With these additional features to Pokemon Go or any collection oriented games, the user would be presented the most sensible collection experience.

2. Member Roles

Each of the member roles is listed as below:

1. Ng Jun Hui
    - Report Composer
2. Teng Yee Jing
    - Design 3D model animation
    - Implement the entire application
    - Writing technical information of the report
3. Zhu Jiahui
    - Report Composer

3. Project Timeline

The project timeline is planned as below:

Date	Process	Description
17 April	Project decision	The project theme is decided by team members.
18 April	3D model animation design	Design the animation of Pokemon 3D model with Blender.
19 April	Application implementation	Implement the application with Unity and Vuforia.
20 April	Game fine-tuning	The game is further tested and fine-tuned wherever necessary.

4. Implementation

4.1 Tools

To develop the AR application, the following tools are used:

- Vuforia
- Blender
- Unity

4.2 Image Targets

The Vuforia was used to train the images with Natural Feature Tracking (NFT). Four image targets of Pokemon were imported and each of them can be easily found by searching the image online with the Pokemon's name. Figure 1 shows the images used to be trained in Vuforia Cloud. The images were uploaded to Vuforia Cloud and the trained image target database was downloaded and imported to Unity for further implementation.

Figure 1: Images used to be trained

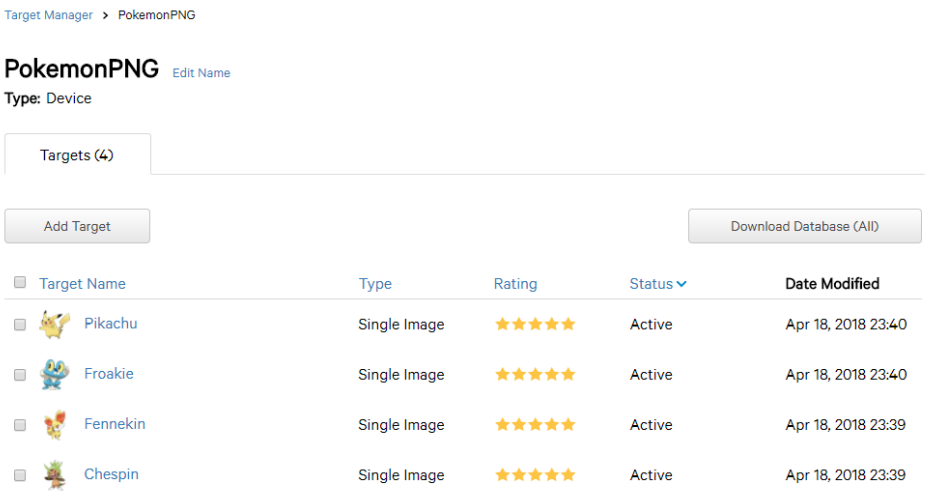

Figure 2: The trained image target database in Vuforia Cloud

4.3 3D Models and Animations

The 3D models of the Pokemon were provided by Root of Evils Studio. The 3D models can be downloaded at http://roestudios.co.uk/project/3d-pokemon-models/. These 3D models come with different data types which are supported by different 3D modelling software. However, they do not come with animation. To design the animation of the Pokemon, we used Blender to modify the .blend type 3D models. We added an armature in each 3D model, and design a simple bone structure according to their bodies. Each vertex was assigned to the nearest bone so the wireframe will follow the bone during the animation. After designing the bone structure, the animation was designed by changing the bone translation and rotation at different keyframes. Figure 3 shows the bone structure of each Pokemon we used in the application.

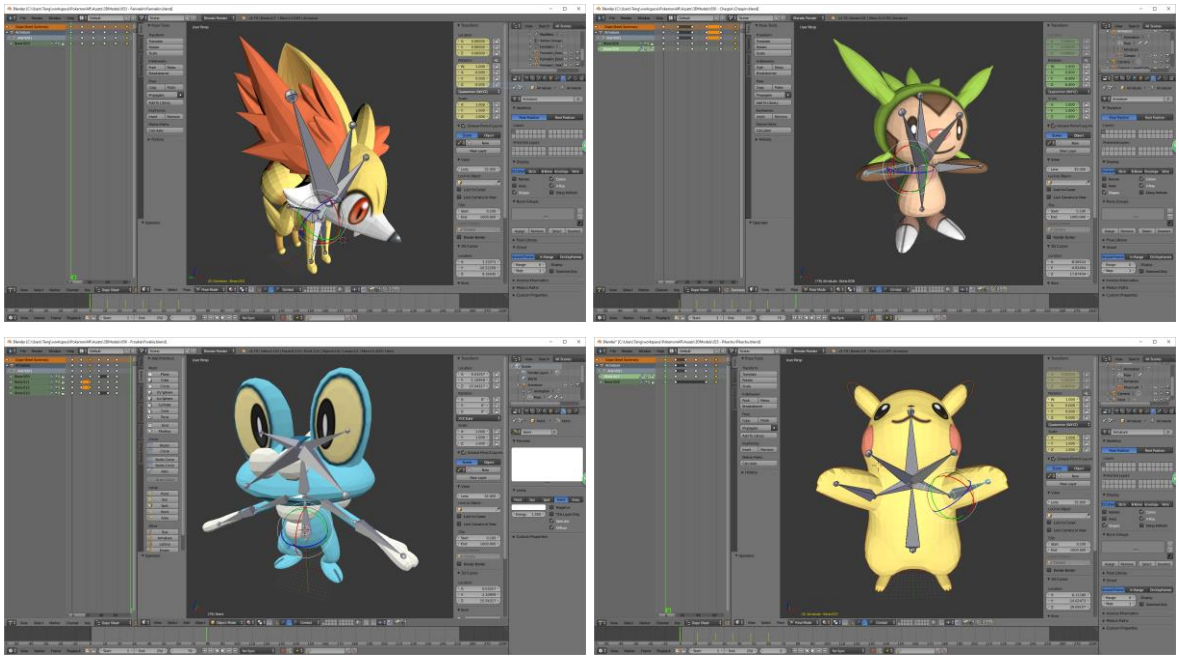

Figure 3: Bone structure of Pokemon

4.4 Application Development

After the preparation of image target database and 3D models, we start the development on Unity. The database and 3D models and imported into Unity.

An ARCamera prefab from Vuforia was used to capture the live camera view in the application. Some Android devices might face the focus issue with Vuforia. CameraFocusController was the script as the component of ARCamera to change the camera focus method to continuous autofocus.

Four ImageTarget game objects were imported to the scene and assigned to different targets in database. Each image target was allocated the corresponding 3D model on it. A virtual button was also placed on the target image for user interaction. The virtual button function was provided by Vuforia. When the player places the hand on the button, the Vuforia will notice part of the feature points in the button area are occluded by hand, trigger the button pressed event. To get the best effect of virtual button, it should be about 10% of the image target's size and placed on the border of image target with sufficient features. Figure 4 shows the feature points of each image target and Figure 5 shows the example of virtual button placement on the image target.

At last, the application was built with Android SDK. The built APK file can be used to install the application on Android devices. The repository of the application can also be found at https://github.com/yeejing17/PokemonAR.

Figure 4: Feature points of image targets

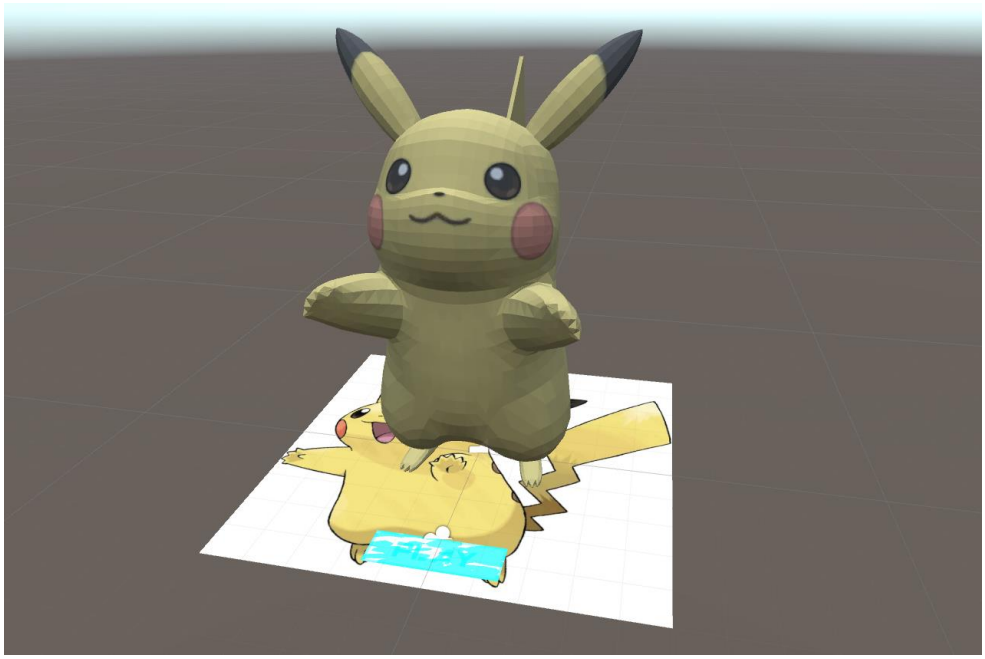

Figure 5: Virtual button placement on image target

5. I/O Control and UI Interfaces

Figure 6: Screenshots of the demo video

As illustrated in Figure 6, the UI interfaces include 3 main parts: Background, 3D Model, and PLAY Button.

The background shows up since the start of the application. The background shows the view from the camera of the phone, while the image recognition engine powered by Vuforia keeps searching the target image appeared in the camera view to identify the Pokemon character. The 3D model appears when the system recognises an image target from the camera view.

The PLAY button is the virtual button provided by Vuforia. It appears with the 3D model and keeps to the ground simulating a flat button to be pressed by the user. When the button is pressed, the 3D model reacts with a predesigned sound and animation. The animation is designed with Blender.

6. Visual and Audio Effects

The application was installed on Xiaomi Redmi Note 3 Pro and tested. The demo video of the application can be found at https://photos.app.goo.gl/4zVGEqXSCynMOgjI2. Further explanation can be found below.

6.1 Visual Effects

Figure 7: Screenshots of the Pokemon animation

Figure 7 illustrated the animation of the pokemon character when the PLAY button is pressed (punching movement in this case). Different animations for different pokemon characters were designed using Blender.

6.2 Sound Effects

The vocal sounds of different Pokemon were played too when the PLAY button was pressed. The soundtracks were selected from the original Pokemon anime to keep the consistency of the original pokemon characteristics.

7. Resources and Economies

The AR application utilises the camera of the smartphone, and performs angle modifications of the displayed 3D model. The application requires high power consumption and low CPU computation power. The mainstream medium-high end android smartphones are able to support the game seamlessly

8. Conclusion

The game has only 4 characters implemented and simple animations designed due to the short period of implementation. However, there is a lot of potential for this game. We can further it into the official Pokemon Go game to realise the true AR experience of the game by providing the object placement tracking feature and camera angle movements. Moreover, the application provides a new approach to the collection-oriented mobile games to engage the users with a realistic collecting experience, thus the future game design would consider with the implementation of the AR technology as the catalyst for the next viral “Pokemon Go”.