

CHAPTER

5

AUGMENTED REALITY VIRTUAL BLOCK GAME

Cik Suhaimi Yusof, Ajune Wanis Ismail, and Nuraliaa Zulraimi

5.1 INTRODUCTION

As technology continues to advance, three-dimensional (3D) hand gestures are expected to play a significant role in making augmented reality (AR) experiences more intuitive and lifelike. 3D hand gestures involve specific hand movements and positions that are recognised and interpreted by technology, usually through sensors or cameras capable of capturing the depth and motion of the hand in three dimensions (Ismail & Sunar, 2015). These gestures are typically used for interacting with digital devices, such as smartphones, tablets, virtual reality (VR) headsets, or AR systems. 3D hand gestures are purposeful actions specifically designed for interaction with technology and are detected and interpreted by sensors or cameras to control digital devices or interfaces. Examples of 3D hand gestures include swiping your hand in the air to control a virtual interface, making pinching motions to zoom in on an object, or forming specific hand shapes to trigger commands or actions in a virtual space.

The 3D hand gestures in AR refer to the use of hand movements and positions in 3D space to interact with AR environments and digital content. This technology allows users to manipulate and control AR elements using their hands in a more immersive and precise manner. To

enable 3D hand gestures in AR, the system employs advanced hand-tracking technology. This technology captures the real-time 3D position and orientation of the user's hands, typically employing sensors such as depth cameras, structured light sensors, or infrared cameras to achieve precise tracking. In this chapter, we used the Leap Motion device to enable hand tracking. It comes with its own software development kit (SDK), and SDK provides the algorithms to interpret the 3D hand movements and positions. It recognises specific hand gestures or actions and associates them with particular commands or interactions in the AR environment.

Virtual block game is not a specific term or a well-known concept in the context of video games or virtual environments. In this game, players typically can place and manipulate blocks or various building materials within a virtual world to create structures, landscapes, or objects. Minecraft (Duncan, 2011) is one of the most famous and successful examples of a block-building game, where players can explore, mine resources, and build structures from various types of blocks. Another example is Roblox (Long, 2019), which allows users to create their own games and experiences using block-based building tools. This chapter discusses 3D hand gestures in AR virtual block games where pinch and swipe gestures have been implemented.

5.2 AUGMENTED REALITY GAME

Augmented reality games differ from traditional games in several key aspects, primarily in how they integrate virtual elements with the real world. AR games overlay virtual elements, such as characters, objects, or gameplay elements, onto the real-world environment using a device's camera and display. Players interact with these virtual elements within their physical surroundings. Traditional games without AR are typically played within a virtual environment created entirely within a digital space, such as a computer-generated world, a game board, or a video game console. AR games require devices equipped with AR technology, such as smartphones, tablets, or AR glasses. These devices use sensors, cameras, and displays to overlay virtual content onto the real world.

Augmented reality technology overlays virtual elements onto the user's view of the real world, typically through the camera of a smartphone or tablet. Tracking using the natural feature was said to be an image-based tracking technique. Natural feature tracking was defined as a tracking technique that recognises feature points found naturally in an image. Implement robust spatial mapping and tracking to accurately overlay digital content onto the real-world environment. Utilise features like plane detection, object recognition, and motion tracking to create seamless AR experiences. Define the game concept, mechanics, and overall design. Consider how AR technology can enhance gameplay and immersion. Create a compelling game narrative, characters, and objectives that leverage the unique features of AR.

One of the defining features of AR games is their ability to leverage real-world locations and objects as part of the gameplay. Players can interact with virtual content that interacts with physical surfaces, landmarks, or objects in their environment. Players can explore and interact with virtual characters, objects, and environments as if they were part of the real world. AR games often introduce innovative gameplay mechanics that take advantage of the unique capabilities of AR technology. These mechanics may include gesture-based controls, spatial mapping, object recognition, and real-time multiplayer interactions. Compared to VR games that immerse players in a completely virtual environment. VR games provide a higher level of immersion by completely replacing the user's real-world surroundings with a virtual environment, creating a sense of presence and immersion in a simulated world. VR games require dedicated hardware, such as VR headsets, which may limit accessibility due to cost and hardware requirements. However, AR games are more accessible to a wider audience since they can be played on existing devices, such as smartphones and tablets, without the need for specialised hardware (as in Figure 5.1).