Analysing Immersion, Presence, and Interaction and its effects in Augmented Reality (AR) Mobile Games

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Abstract

The first generations of computer games, like Spacewar! developed in 1962, did not have sufficient computational resources to implement realistic visualisations of the real world. With the advent of three-dimensional graphics in the 1970s, it became much easier to translate the real world into its corresponding virtual world. The evolution of computer hardware, thus more processing power and memory, along with the increased capabilities of design software has enabled us to create characters that look more realistic. Digital games have become a very distinct type of immersive media. The incorporation of fantasy and story have proved to be effective in creating strong immersive and interactive media across different platforms. It has been found that audio-visual and narrative features can also lead to immersion. Modern games are designed to be more engaging than ever considering the use of affordable Virtual Reality (VR) and Augmented Reality (AR) hardware. The smartphone industry has also harnessed the possibilities of AR and VR for developing games.

One of the objectives of the paper is to identify and define concepts like immersion, presence and interaction in digital games. The paper will also try to understand the relation between these concepts and how dependent they are on each other. Having defined these concepts, the main aim of the paper is to investigate the above-said concepts in Augmented Reality (AR) games for smartphones. The paper will evaluate how factors such as immersion, presence and interaction work together to create a good gaming experience while playing games on smartphones. The paper will also investigate how elements of the games like story, mechanics and aesthetics influence immersion, presence and interaction.

Keywords: Augmented Reality (AR), Virtual Reality (VR), Immersion, Presence, Interaction

1. Introduction

Video games have evolved since the first ever game of “Pong” launched in 1972 (Caroux, et al., 2015). From then, the video games industry has constantly worked on providing the users with good games, some based on its audio and visual qualities while others concentrated on the storyline. Since the inception of concepts like Virtual Reality (VR) and Augmented Reality (AR), the video game industry has gone through a significant change in incorporating these techniques with the present technology to provide a much better gaming experience. The technical advancements in the recent years allowed the users to

access and use augmented and virtual reality software better than before. Although the user accessibility of this hardware and software is not very global, these technologies have caught the attention of developers across different streams like education, medicine, military and so on. The advent of technologies like VR and AR have revolutionized the way humans interact with each other as well as with information. The particular interest of this paper is how these technologies were adopted by the smartphone industry to implement applications for various sectors, especially the gaming industry.

In recent years, developers have come up with quality applications based on VR and AR for the mobile platform. With the release of location-based AR game Pokémon GO, the mobile video game industry has taken a new turn. AR games like *Ingress* (2012) existed even before the launch of Pokémon GO but failed to reach a large audience. Thus, Pokémon GO was the first game that used the capabilities of AR to get a huge market audience. Although there has been a good amount of research on video games and the player's experience, little do we know about the player experience for augmented reality games based on the mobile platform. The objective of this paper is to investigate about the types of these interactive technologies, the key aspects that players experience during gameplay (immersion, presence, and interaction) and the relevance of these aspects in the mobile gaming platform.

2. Research Paper Road Map

The first chapter will be literature review where we will establish the concepts and definitions required for performing the analysis of the games at a later stage. In the first chapter, we will be identifying the concepts of digital gaming experience like immersion, presence, and interaction. We will also look into the interactive technologies used nowadays like Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR).

In the second chapter, which is the analysis part, we will be evaluating the selected games based on the concepts defined in the first chapter. We will use the defined concepts to understand how they affect the player's gaming experience as well as how these concepts are affected by the game's key elements like story, mechanics, aesthetics and technology (Schell, 2008).

3. Literature Review

One of the many ways to mark the evolution of humanity is to understand the advancements made in the media used for experiencing and sharing ideas. Archaeologists believe that the Neanderthal men used to paint on cave walls to express and share ideas

(Greshko, 2018). These paintings were a means to convey ideas and stories of the tribes among themselves and to the next generation. Since then, humans have invented different ways to express and share ideas. The way people interact with reality has changed over the past few decades especially after the advent of interactive technologies. Some of the most recent innovations in this area are Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) (Milgram & Kishino, 1994).

This chapter is aimed at providing a good understanding of the underlying concepts of the above-mentioned technologies. It also discusses the evolution and implementation of these technologies for various platforms, especially smartphones as it the major area of study for this paper. The literature review is also aimed at providing definitions of concepts like immersion, presence and interaction. These concepts are commonly used to evaluate the experience of a player during gameplay. This section provides the base for carrying out the analysis later on.

3.1 Virtual Reality

Webster's New Universal Unabridged Dictionary (1989) defines virtual as "being in essence or effect, but not in fact". A Virtual Reality (VR) environment is typically considered to be one in which "the user is totally immersed in and can interact with" (Milgram & Kishino, 1994). This world may imitate the properties of the real world, be it existing or fictional. However, it can also create a world that can defy the physical laws governing space, time, gravity and etc. A VR system gives the users the freedom to choose their viewpoints by standing in different directions and thereby influence events in the virtual world (Sherman & Craig, 2003).

The key elements in experiencing virtual reality are a virtual world, immersion, sensory feedback and interactivity (Sherman & Craig, 2003). A virtual world can be defined as the subject matter of any chosen medium. This alternate world can be a representation of an existing actual space or it can be a completely imaginary environment. Imagination is the starting point of any virtual world. The feeling of "being immersed" is generally associated with the emotional capacity of a person. It is a feeling of being involved in the experience. In a VR system, the outcome of entering a virtual world begins with physical (sensory) immersion, rather than mental immersion. Sensory feedback is an integral part of any VR system. The users are given direct sensory feedback based on their movements in the physical world. In order to achieve this, the system should track the user's movement. A typical VR system will track the head of the user and at least one hand or a controller held by the hand.

Major body joints can be tracked in advanced VR systems. A key feature of any VR system is that it should respond to user's actions or be interactive. The user should be able to interact with characters, objects and places in this virtual world (Sherman & Craig, 2003).

In 1838, a research by Charles Wheatstone explained that the brain takes the distinct 2D images captured by both the eyes and transforms it into an individual three-dimensional object (Virtual Reality Society, 2017). The user perceived a sense of depth and immersion when the two side by side stereoscopic images are viewed through a stereoscope. The popular Google Cardboard and low budget VR head-mounted displays for smartphones are made using the design principles of the stereoscope. In 1929, Edward Link created the first commercial flight simulator called the Link Trainer. It was an electromechanical equipment regulated by motors that are connected to the rear end as well as the steering column (Virtual Reality Society, 2017). Morton Heilig, a cinematographer, built the Sensorama in the mid-1950s. It was a theatre cabinet, similar to the arcade game cabinet, that could trigger all the senses (Virtual Reality Society, 2017). Fitted with a stereoscopic 3D display, stereo speakers, fans, and a vibrating chair, it was designed totally immerse a person in the film (Virtual Reality Society, 2017).

In 1965, Ivan Sutherland proposed the "Ultimate Display" concept. His concept included a head-mounted display for viewing the virtual world and the power to the users to interact with the objects in this world in a realistic way. It also proposed using a computer system to generate and maintain the virtual world in real time. He created the first VR/AR head mounted display later in 1968 (Virtual Reality Society, 2017). Jaron Lanier framed the term 'virtual reality' in 1987. The first 3D gaming console was the Nintendo Virtual Boy launched in 1995. It was a failure due to lack of colours in the graphics, limited software support and clumsy to use.

3.2 Augmented Reality

According to Milgram and Kishino, Augmented Reality (AR) refers to the integration of computer-generated graphics into real-world images (Milgram & Kishino, 1994). It enhances the user's experience of reality by integrating computer-generated virtual information into the user's real world (Milgram & Kishino, 1994). In other words, AR is an interactive technology that creates two-dimensional or three-dimensional virtual content in the shape of images, objects, or information, and then maps it onto the user's reality (Poushneh, 2017). It delivers useful output and enjoyment as well as gratify the users by creating a virtual world in which they can immerse themselves. In most AR applications, the

user will be able to see both natural and synthetic light. This is made possible by superimposing the projected images over a pair of glasses. This makes the interactive virtual objects and the images to layer on top of the user's view of the real world (RealityTechnologies.com, 2016).

Unlike virtual reality which requires the user to occupy a whole virtual environment, augmented reality uses the user's real-time natural environment and projects virtual information on top of it. Both the virtual and augmented environments coexist peacefully, the user experiences a new and improved natural world where virtual information is used as a tool to provide assistance in everyday activities (RealityTechnologies.com, 2016). Augmented realities can be overlaid on different types of displays, ranging from smartphones and computers to wearable glasses. The key components that an AR system should possess are sensors, camera, projection, processing, and reflection. Sensors and cameras are the basic input mechanisms for any AR system. They collect the user's real-world interactions and transmit them to be interpreted and processed. The data provided by these components help the device in formulating the correct output. Projection based AR systems are usually wearable AR headsets that use a miniature projector that can convert any surface into an interactive environment. AR devices require high computing power to collect the input and then deliver the appropriate output. Components like a CPU, RAM, Global Positioning System (GPS), flash memory, microchip and more, are an integral part of these devices. Microsoft HoloLens uses an accelerometer (to measure the speed), a gyroscope (to measure the tilt and orientation) and a magnetometer (as a compass). Reflective surfaces like mirrors are sometimes used in AR system to help the users see the virtual image (RealityTechnologies.com, 2016). Some AR devices like the Magic Leap have an array of many small mirrors while others have a simple double-sided mirror. One side of the mirror reflects the incident light on to a camera fitted on the side while the other reflects the light from the side-mounted display to the viewer's eyes (RealityTechnologies.com, 2016).

The concept of AR has been around since the 1960s and companies have implemented it in different ways. Ivan Sutherland, a computer scientist at Harvard, created the first ever AR head-mounted display system in 1968. The term 'augmented reality' was termed by Tom Caudell, a researcher at Boeing in 1990 (Augment, 2016). In 2000, Hirokazu developed an open source library that superimposes virtual content on a video camera by tracking the video, called the AR Toolkit (Augment, 2016). In simpler words, it allowed video capture of the real world and combined it virtual objects. The first commercial AR application was launched in 2008 in Munich by German advertising agencies (Javornik,

2016). In 2000, Bruce Thomas, from Wearable Computer Lab, launched an AR based mobile game that can be played outside (Sung, 2011). This was the first game that allowed players to move around without using a joystick or handheld controller. It was called ARQuake and allowed the players to wear a head-mounted display to see a completely different view of the game as based on the player's physical location (Sung, 2011).

3.3 Mixed Reality

In location-based AR games, the movement is an important factor of the player's experience because the game's progress is defined by the player's activities in these locations. Location-based AR games are thus situated in a mixed reality continuum. Milgram and Kishino described mixed reality as a dimension between real and virtual environments (Milgram & Kishino, 1994) as shown in figure 1 (Milgram & Kishino, 1994).

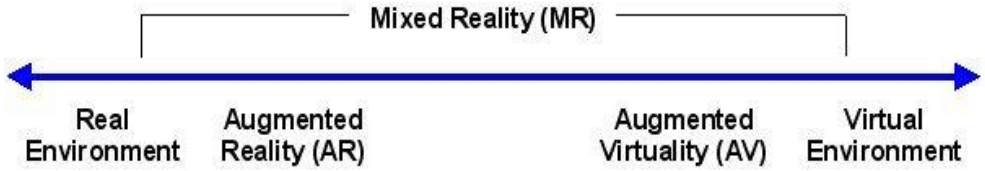

Figure 1: Representation of a 'virtuality continuum'.

The first case, to the left, defines an environment that comprises of real objects and includes for instance what is observed through a traditional video display of a real-world scene. The second case, to the right, defines an environment that consists of virtual objects, for example, a traditional graphics simulation. Mixed reality is the space between these two environments. It consists of two parts: a) augmented reality (AR), where the physical world is enhanced by the overlaying virtual objects in real time, and b) augmented virtuality, where a virtual space is enhanced with real objects (Milgram & Kishino, 1994). Thus, MR environments can be described as one in which real world and virtual world objects are displayed together in a single screen, at any point in between the two extremes of the continuum as shown in figure 1 above (Milgram & Kishino, 1994).

MR environments aim to integrate the best features of both augmented reality and virtual reality. The users can simultaneously navigate through both the real and the virtual environments with ease, in these kinds of MR atmosphere (RealityTechnologies.com, 2016). Virtual information and objects are integrated into the user's physical environment and are augmented to this space. This makes the virtual interactions of the user to appear 'real' and

doesn't create the sense of the living in a completely virtual world. These interactions are designed to resemble the natural way in which humans interact, for instance, objects get bigger when we walk towards to it and change of perspectives when we walk around the object (RealityTechnologies.com, 2016).

One form of mixed reality is the one in which it starts with the real world. In this case, the virtual information is not just overlaid on the real world but allows interaction with it. The user remains in the physical world while digital information is added into user's real world. This form of mixed reality can be considered as an advanced form of AR (Tokareva, 2018). An example of this type of mixed reality environments is the one deployed in Microsoft HoloLens. The next form of mixed reality environment is the one in which it starts with the virtual world. In this case, the digital world is integrated into the real world and replaces it. The user will be completely immersed in the virtual environment and blocked out from the real world. This might sound like virtual reality and it indeed is. The difference is that in MR environments the digital objects overlap the real ones whereas in traditional VR the virtual environment isn't connected to the real world around a user (Tokareva, 2018). A good example of this is the Windows MR headsets.

MR has its applications similar to AR. However, at the moment the major application of MR is in the education field. It is also used to simulate combat situations for military training. Real Estate Virtualization Environment (RAVE) is an MR application that is used to simulate 3D models of manufacturing assets integrated into a virtual environment and then linked to the real-time data associated with the assets (Chronicloop, 2018). Interactive Product Content Management (IPCM) is used to transfer static product catalogues to interactive 3D models (Chronicloop, 2018). A company called Scopis have developed an MR application for Microsoft HoloLens that allows surgeons to perform spinal surgery (Conficio Product Design, 2018). For instance, it helps the surgeons in planning the position and orientation of pedicle screws used during a vertebra fixation surgery. A company named Daqri have developed an MR headset that can be used for a variety of applications like providing users access to updated information and instructions about using, repairing and maintaining different types of machinery (Conficio Product Design, 2018).

3.4 Immersion

Games are experienced by players in a subjective way, from the anxiety before purchase to the desire to pick a game and play it again (Cairns, et al., 2012). Though the players experience a variety of emotions like immersion, presence, etc. are specific types of

feelings that are always reported. The engagement or involvement a player feels while playing a digital game is termed as immersion. A simpler interpretation would be to say that immersion is when a player feels as if "they are inside" the game, like the feeling of being immersed in water (Cairns, et al., 2012).

In a study by Brown and Cairns to understand the gamer's experiences of immersion, they were able to identify different stages of immersion during gameplay (Brown & Cairns, 2004). And the stages of immersion correspond to the player's sense of engagement and involvement in the game (Brown & Cairns, 2004) (Cairns, et al., 2012). Engagement is the first stage of immersion where the players devote their time and effort to play a game (Cairns, et al., 2012). Once the players start dedicating significant attention and get emotionally attached to the game, they move to the next stage of immersion termed as "engrossment". The last and highest stage of immersion is considered total immersion, a state where the player is completely involved with the game (identified with presence which will be discussed later on in this section). From a player's perspective, nothing else matters at this stage and the player feels completely "in the game" (Cairns, et al., 2012).

Pine and Gillmore categorized the player's experiences are into two dimensions, participation, and connection. Participation varies from active to passive participation and connection varies absorption to immersion (Pine & Gilmore, 1999). When an experience is registered to the players' mind, they direct attention to it and it's called absorption. Immersion, however, occurs when the player physically or virtually becomes a part of the experience itself. This supports the findings by Brown and Cairns that immersion is defined as a state where the player is involved with the game completely. According to Pine and Gilmore, playing games can be categorized as escapist experiences, where immersion plays a pivotal role along with active participation. "Presence" is another concept used to analyse the sense of "immersion" associated with a system (Pine & Gilmore, 1999).

Immersion in game-play experiences is interpreted in different ways. It is a general perception that great immersive experiences can be achieved by using bigger screens and high-quality audio (Ermi & Mäyrä, 2005). Audio-visual aspects definitely play a role in a game's immersive experience, but it is not the only or most important factor. According to McMahan, three conditions have to be fulfilled to create immersion in digital games: the user's expectations meeting the games' conventions, the player being able to do meaningful things, and a consistent game world (McMahan, 2003). The players are encouraged to create assumptions and expectations by using fiction, and the sense of immersion is derived from this (Douglas & Hargadon, 2000). Immersive experiences can be achieved if the relationship

between actions and outcomes are both anticipated and integrated, says Salen and Zimmerman (Zimmerman & Salen, 2004). Therefore, according to Järvinen, Heliö, and Mäyrä, the essential components for immersive experiences in digital games are the functional, audio-visual and structural playability (Heliö, et al., 2002).

Ermi and Mäyrä conducted research by interviewing children who actively played digital games to understand immersion in gameplay. The common belief was that the high-quality realistic graphics and audio of the games were the main reason for its immersive powers. Children stated that games allowed the freedom to make decisions and take actions and thereby have an impact on the gameplay. For them, this was considered the most immersive factor of a game. The quality and style of the audio and visuals are one of the significant aspects of any good digital game (Ermi & Mäyrä, 2005). Games were more appealing when they had good graphics and image quality. Distinct and well-functional camera angles had an impact on the games' playability. This dimension of the gameplay experience is termed as **sensory immersion** (Ermi & Mäyrä, 2005), associated with the audio-visual implementation of games.

The type of challenges was another factor that influenced immersion for children. The contentment achieved while playing games could be related to instances of winning and advancing through the stages, and the unpredictable final outcome of the game. This was an important factor in creating the suspense while playing for children. This type of immersion fundamentally based on interaction is called **challenge-based immersion** (Ermi & Mäyrä, 2005). This feeling of immersion can be most dominant when there is a satisfactory balance between the game's challenges and the player's abilities. The challenges in gameplay can be of two types: challenges based on cognition and sensorimotor skills like using the controls and reacting at faster speeds.

Another important aspect that created immersion, according to children, was the fictional world of the games and the fantasy it helps create. For them, these imaginary worlds, the characters and the storylines associated with them, were the core elements of the games they preferred to play. This dimension of gameplay experience where one gets absorbed with the game world and its stories is termed as **imaginative immersion** (Ermi & Mäyrä, 2005). In simpler terms, this is when players identify themselves as the games' characters. A remarkable feat of the fictional game worlds was it allowed the players to do things not practically possible in the real world. This gave the players the freedom to use their imagination and feel for the characters.

Thon defines **social immersion** as "a shift of attention to the other players as social actors and the relationships between them" (Thon, 2008). Social immersion should generate genuine social interactions within the game/virtual world. The player's avatars should be considered as intelligent beings rather than normal game characters. Online multiplayer games are highly social places, where many diegetic and non-diegetic elements of the game support social immersion (Valtin, et al., 2014) (Quandt & Kröger, 2014). The highest degree of social immersion can be observed in real-world interactions. A high level of social immersion in the game world means that the player's social behaviour is similar to their social behaviour in the real world.

3.5 Presence

The term 'presence' is associated with the immersion that a system can produce. Audio-visual elements help in creating the virtual world of the game. This is the space where the player interacts with the game world. The players use distinct elements to interact with this virtual space. These elements are usually the characters of the game, known as avatars. This sense of belonging to the virtual world, with technology as a medium, is called **telepresence** or simply **presence** (Bastos, et al., 2017). Slater et al. defines presence as the "*being in a virtual environment*" (Slater, et al., 1994). Ermi and Mäyrä defined sensory immersion which is associated with the audio-visual implementation of games (Ermi & Mäyrä, 2005). The feeling of presence in games is constructed with the help of the audio-visual elements of the game world. Thus, telepresence or presence is closely associated with sensory immersion. In most first-person shooter games, like *Call of Duty: Black Ops* (2010), the virtual world looks like the real world and the player can navigate through this world. The player uses his perspective of a person in this world to explore it, track enemies and finally kill them. Thus, the player feels the sense of being present in the virtual world, complimenting immersion at some levels.

According to Slater, presence is the extent "*to which the unification of simulated sensory data and perceptual processing produces a coherent 'place' that you are 'in'*" (Slater, 2002). Therefore, it is not just about the quality of the user's involvement or engagement (Valtin, et al., 2014). Slater says that one can be present but not involved in the day to day activities. Similarly, one can be involved and not present in other situations, for instance watching a movie. Thus, defining immersion means that considering both the perceptual processing that generates presence as well the psychological processing that occurs during the gameplay (Valtin, et al., 2014).

Presence is categorized into six types by Lombard and Ditton. Three of them are associated with the social factors in the virtual world: the social richness of the interaction; the sense of being a social actor within the environment; and the sense that the environment/others in the environment are also social actors (Lombard & Ditton, 2006). These three factors contribute to what is termed as **social presence** (Cairns, et al., 2012). The remaining three factors are a sense of realism of the virtual environment; a sense of transportation usually characterized by the sense of "being there"; and a psychological and sensory immersion (Cairns, et al., 2012). These factors make up what it termed as **spatial presence**. Most of the modern games are designed to allow all these types of presence to occur. Many first-person shooting games, where the player has the perspective of the character itself, have a virtual world with a high standard of realism.

The players need to work in groups in multiplayer online games and thereby allowing them to experience a considerable amount of social presence. These multiplayer games allow various settings like co-located and mediated play among opponents. Gamers tend to play a significant amount of online games in the recent years. These online gaming communities offer the gamers the opportunity to play against or in association with other gamers through the internet. Massively Multiplayer Online Role-Playing Games (MMORPG) are the leader of these online games as they are known to exhibit intricate social dynamics (Cairns, et al., 2013). An example of MMORPG is *World of Warcraft (2004)*. It is said that playing socially is more fun but with less immersion. If immersion is the feeling of being in the game, playing socially is a means to alert the player about the other players around him/her. Thus, the presence of other players in a game can be considered something of a distraction or interruption to an individual's immersive experience (Cairns, et al., 2012). Gajadhar inspected how social presence, the realization of being connected to others socially, is related to the enjoyment of playing and discovered that the higher the social presence, the better entertaining experience it was (Gajadhar, et al., 2008). In social presence, there are conducts with social significance like being able to talk to other players or working in teams with a definite strategy. Social presence is, thus, the feel of being and connecting with others. Early portrayals of gamers depicted them as socially isolated individuals with insufficient social skills (Bryce & Rutter, 2003). Playing computer games is arguably much more of a social activity than originally thought to be. Massively multiplayer online games are the most common form of social gaming, where an important factor to consider is social play (Cairns, et al., 2013).

Wirth (Wirth, et al., 2007) described that spatial presence consists of two elements: the feeling of physically belonging to the virtual environment; and the recognized opportunities to interact with this environment. The total impression of presence is certainly influenced by the latter of these elements (Cairns, et al., 2012). As discussed before, immersion is divided into three types, sensory, challenge and imaginative immersion by Ermi and Mäyrä (Ermi & Mäyrä, 2005). Out of these, sensory immersion is often associated with spatial presence whereas challenge and imaginative immersion is associated with the psychological aspects of immersion (Cairns, et al., 2013). According to Slater, presence is described as a system through which a person develops and judges assumptions based on his/her experiences (Slater, 2002).

3.6 Interaction

The existing literature for digital games describes interactivity in different ways. This categorization was based on the type of interaction, like user-machine interaction, user-user interaction or user-message interaction (Cho & Leckenby, 1999). Presence or telepresence exists in environments that show liveliness and interactivity (Steuer, 1992). Steuer defined **interactivity** as "the extent to which users can participate in modifying the format and content of a mediated environment in real time" (Cairns, et al., 2013). Liveliness is a measure of the quality of the audio-visual aspects of the game environment, whereas interactivity refers to the way in which the virtual environment reacts to the player's actions. Incorporating all these definitions from different researchers, Liu and Shrum defined interactivity as

> *"the degree to which two or more communication parties can act on each other, on the communication medium, and on the messages and the degree to which such influences are synchronized"* (Liu & Shrum, 2002).

They proposed three aspects of interactivity: active control, defined as a player's ability to freely participate in and opt out a communication; two-way communication, the flow of information; and synchronicity, which defines the pace of interaction.

The one common characteristic of all digital games is that the player can interact with the virtual environment with the help of controls like joysticks or keyboards. This can be defined as the player-video game interaction. The player aspects of this interaction relate to the experience that a player gets or hopes for when interacting with video games, especially **engagement** and **enjoyment** (Caroux, et al., 2015). Engagement is often compared to immersion and presence, while enjoyment is based on flow and emotions. The video aspects

of this interaction are based on the technical components of the video games, mainly the means of **input** and **output**, **game contents** and **multiplayer games** (Caroux, et al., 2015).

Charlton & Danforth defined engagement as the "high degree of involvement in computer usage" (Charlton & Danforth, 2010). It is related to the degree of motivation exhibited by the player and includes immersion, presence and perceived realism (Caroux, et al., 2015) and thus supports the findings of Brown and Cairns. Engagement can be thus connected to total immersion. Perceived realism refers to the subjective realism of the virtual world that user feels (Malliet, 2007). According to Ribbens and Malliet, perceived realism in video games was comprised of different factors like the realism of the simulation, freedom of choice, character involvement, perceptual pervasiveness, authenticity regarding subject matter, and authenticity regarding characters and social realism (Malliet & Ribbens, 2010). Enjoyment is a positive reaction experienced by a player when playing a game. It is generally connected to the emotions perceived by the player. The existing literature uses flow to describe the positive experience during gameplay. Enjoyment is classified into three aspects: affective, cognitive and behavioural (Caroux, et al., 2015). Affective aspect of enjoyment defines the player's emotional connection to the game. In simpler terms, it shows how emotionally affected the player is while playing a game. The cognitive state is linked to the judgements that the player makes about the game elements and the behavioural aspect relates to the behaviour of a player while playing. Enjoyment is mainly connected to the concept of flow in digital games. Flow is a euphoric state of concentration and involvement, often claimed to be one of the most enjoyable and valuable experiences one can have (Csikszentmihalyi, 1991). Engagement and enjoyment are concepts related to the player aspects of the player-video game interaction.

When describing the interface of a video game, there are two key elements taken into consideration: the way in which the player can interact with the game world (information input) and the information provided by the interface that allows the user to interact with it (information output). **Information output** in video games consists of visual and auditory information. Nacke, Grimshaw, and Lindley (2010) conducted a research on the influence of auditory information on game experience. They tried to exploit the presence of sound and music during a first-person shooter game session (Nacke, et al., 2010). They found that the game experiences like flow and tension are more dependent on the sound than the music of the game. Skalski and Whitbread also found out that the player's presence and enjoyment were higher with better quality of sound (Skalski & Whitbred, 2010). According to Bracken and Skalski, image quality has an influence on immersion in video games. They found that

the levels of immersion were high with high image quality rather than low-quality images (Bracken & Skalski, 2009). However, this did not affect the spatial presence experienced by the player. The traditional **information input** techniques in a player-video game interaction are a controller with buttons and joysticks or a keyboard and mouse. The recent method of interacting with the game is by touching the screen with the fingers, especially for handheld gaming consoles, smartphones, and tablets. According to the research conducted by Shafer, the interactivity, perceived realism and the enjoyment experienced are higher for touch-based games on smartphones rather than traditional console games (Shafer, 2013).

Game contents are another important factor of the player-video game interaction which includes the challenges in the game and the game narrative. One main aspect about of challenges is the fact that the tasks should not be made simple in order to promote interaction but should be difficult enough to maintain the player's motivation (Caroux, et al., 2015). In any video game, a challenge is commonly defined by the difficulty of the task to be completed. Qin, Rau, and Salvendy (2010) studied the effects of changing difficulty on the immersion levels of the player. They changed the difficulty level either by increasing it constantly or by alternately increasing and decreasing. They found that the player's immersion levels were higher when the difficulty was alternated than when it increased constantly (Qin, et al., 2010). Some of the digital games have stories associated with it. According to Pagulayan et al., the game narrative can be a storyline incorporated with the game and can also develop in the course of gameplay (Pagulayan, et al., 2002). Fantasy also plays an important role in player-video game interaction by boosting motivation and immersion in gameplay (Choi, et al., 2013). A study conducted by Park, Lee, Jin, and Kang (2010) showed that the presentation of a narrative context during the introduction of a video game increased the player's presence (Park, et al., 2010). The overall evaluation of the game was improved as a result of the player's increased presence.

Multiplayer games account for a sizable proportion of the video games industry. There are two types of multiplayer games: the "local" situation in which the players are physically located in the same location or the "Internet" scenario where all the players are connected online through the internet (Caroux, et al., 2015). The nature of the game (competitive/cooperative) and the nature of the game companion have an effect on the player's game experience in local multiplayer games. Chanel, Kivikangas, and Ravaja (2012) identified that the player's overall gaming experience is different based on whether the game is competitive or cooperative. They found that the degree of feelings, both positive and negative, were higher in the competitive games than the cooperative games (Chanel, et al.,

2012). In competitive games, the player's presence was higher when the opponent was controlled by a human being rather than a computer (Ravaja, et al., 2006). Again, the degree of presence was higher when the opponent was a friend of the player than when it was a stranger. Peng and Hsieh (2012) also confirmed that the players have a stronger engagement to the in-game goals when they were friends than strangers (Peng & Hsieh, 2012). A large number of players connect to the same world in an online multiplayer game through the internet. The flow experience in online multiplayer games consists of five dimensions namely achievement, activity/passivity, interaction, thoughtfulness/spontaneity and cognition (Voiskounsky, et al., 2004). A positive flow experience was a result of good interactivity with the game and the player's social interaction (Caroux, et al., 2015).

Weibel, Wissmath, Habegger, Steiner, and Groner (2008) investigated the impact of the nature of the opponent on the player's presence, flow and enjoyment in an online game (Weibel, et al., 2008). According to their findings, the levels of presence, flow and enjoyment were greater when the player assumed that the opponent was a human being than a computer. Cairns, Cox, Day, Martin and Perryman (2013) also confirmed that the levels of immersion were also higher when the opponent was a human player (Cairns, et al., 2013). The emotional responses of the player also varied according to the nature of the opponent. Another study showed that the emotional engagement of the players was greater in the case of the opponent being another human player (Lim & Reeves, 2010).

4. Analysis

Concepts like immersion, presence, and interaction are commonly used for evaluating the player's experience while playing digital games based on consoles (PlayStation and Xbox) and computers. The aim of this chapter is to investigate these concepts defined in the previous chapter for AR games based on smartphones. The analysis will discuss how these factors affect the gameplay and the player's gaming experience. We will discuss the four key elements of any game as defined by Jesse Schell (Schell, 2008): Mechanics, Story, Aesthetics, and Technology.

In this section, we will be analysing three very innovative and promising games. We will start with Pokémon GO, the recent trend in mobile gaming. Father.IO is argued to be the first ever multiplayer AR First Person Shooter (FPS) game for smartphones. A location-based game similar to Pokémon GO, it brings traditional FPS games to the real world. Genesis is an innovative approach to the traditional trading card games. It is a trading card game featuring real-time combats. All three are similar when we talk about the AR capabilities but falls into

different categories. Pokémon GO and Father.IO are location-based games and need the player to go outside. This will make a good basis for doing the analysis as the players are out of their comfort zones (home) and the concepts defined in the previous chapter can depend on various factors.

4.1 Pokémon GO

Pokémon GO is a multiplayer, location-based augmented reality game that brings fictional creatures known as Pokémon into the real world using smartphone technology (Tang, 2017). It became one of most successful smartphone games ever [cite]. The most important feature of Pokémon GO is the implementation of Augmented Reality (AR) and Global Positioning System (GPS). Ingress (2013) was a game, designed by Niantic Labs for Android devices, which used AR and GPS technologies. Niantic launched Pokémon GO in 2016. Pokémon GO emerged to be more successful than all its predecessors not just because of the technology but mainly because of the perfect way in which the technology helped to connect to the story (Pokémon) - the concept of roaming around the world and having random encounters with creatures (Tang, 2017). The success of Pokémon GO can be thus pointed at the animated television series where the young protagonist travels around the world with his friends to find magnificent creatures called Pokémon. Therefore, when the game was released it was a childhood dream-come-true for the youth.

4.1.1 Story

Pokémon GO gives the players an imaginative world filled with wonderful creatures called Pokémon. The game world takes the players to their childhood fantasy of the Pokémon animated series and enables the player to the hero they always aspired to be, a Pokémon Trainer. This feature of the game helps the players to believe that there are a large number of Pokémon out there in the real world and motivates the player to catch them. The game also allows the players to teach their Pokémon to grow into more powerful ones and then compete with other players. This allows the player to have a good immersive (imaginative) experience, with respect to the concept of the game. The game, however, lacks a proper storyline that engages the player to keep playing. The player is restricted with the game's choices of finding and collecting Pokémon. Again, the game allows the players to battle each other, but with restricted control over the Pokémon during battle (as discussed in the mechanics' section later on). This reduces the degree of engagement and immersion the player experiences.

4.1.2 Mechanics

The main aim of the player is to discover the location of virtual creatures that are hidden in the physical world with the help of their smartphones and finally catch them. The virtual characters of the game are displayed on the player's mobile device in such a way that they are close to the player's physical location, thanks to the capabilities of augmented reality. The app uses Google Maps, thus real locations and settings for the gameplay (Lucas & Blain, 2016). The players, thus, have to catch Pokémon whilst they explore the physical world (Rauschnabel, et al., 2017).

4.1.2.1 Mechanics: Search

Searching can be considered as the primary mechanic of Pokémon GO. The players need to keep searching the map for finding the locations of the Pokémon. This mechanic needs the player to roam the streets and parks in order to locate Pokémon. This is an engaging process for the player and results in high degrees of engagement with the game depending on how interested the player is. The app has a radar section which displays nine Pokémon in the player's vicinity and the distance to them using a pawprint system. This gives the players an opportunity to go hunting for Pokémon out in the real world allowing the players to immersive themselves in the game world, leading to good imaginative immersion as defined by Ermi and Mäyrä. As the game uses Google Maps as the base and a game map that is overlaid on top of it, it prevents the player from getting lost. Walking through the streets looking at Google Maps itself is a distracting process. The difference in using the game map and the Google Maps is that the player needs to constantly check for any signs of Pokémon around. As the player keeps checking for Pokémon in the real world through the smartphone, he/she can be disconnected from the real world. Having high degrees of engagement and immersion, thus leading to the presence in the game world, can have negative outcomes for the player in the physical world, for instance, running into other people or vehicles and thereby causing accidents.

Spawn points are an integral part of the search mechanics of the game. Spawn points, or simply 'spawns', are spots on the map where the players have a high possibility of confronting a wild Pokémon (Pokémon GO Hub, 2016-17). All the wild encounters are connected to its corresponding spawn points. In other words, if an area doesn't have a spawn point, the chances of finding a wild Pokémon at this point are minimal. All the spawn points have the same properties. A spawn point generates a Pokémon every one hour at a pre-set number of minutes of that hour (Pokémon GO Hub, 2016-17). The generated Pokémon is not

always visible to the players to catch and is placed at random locations around the spawn point. The spawn points are active at all times, both day and night. This allows the players to have a chance of catching a rare Pokémon at the spawning point.

Figure 2: Screenshot of the game map showing spawn points and Pokéstop (Taken by Bebito)

4.1.2.2 Mechanics: Catch

In Pokémon GO, the main aim of the player is to discover the location of Pokémon that are hidden in the physical world with the help of their smartphones and finally catch them. The Pokémon are displayed on the player's mobile device in such a way that they are close to the player's physical location.

Figure 3: Screenshot of the catching screen (Taken by Bebito)

The catching mechanics allow the player to capture the Pokémon once the player reaches these locations. The players can do this by simply throwing a Pokéball at the Pokémon. If the player fails to hit the Pokémon precisely, chances are high for the Pokémon to run away (GamePress, 2018). Although the mechanic is simple, the rate of success of catching the Pokémon depends on various factors. Throwing the Pokéball is simple as it sounds but it is challenging as well. As the chances for the Pokémon to run away are high in case the Pokéball failed to hit it, the players need to have a good focus on the movements of the Pokémon as well as a good aim. This leads the player to be highly immersed when he/she is catching a Pokémon. Both sensory and challenge-based immersions can be connected to this mechanic as the augmentation quality of the catching screen is good and the catching process itself is challenging.

Once the player goes into the catching screen, the Pokémon is displayed as an augmented animation on top of the player's real world. Although the quality of this screen and the Pokémon themselves are good, it can be distracting at certain times, for instance trying to catch a Pokémon in between a moving crowd. The game allows to turn off the AR viewpoint and by doing so the game stops augmenting Pokémon to the player's real world. Interaction is achieved by the player by interacting with the Pokéball in order to catch the Pokémon. As the player is really focused on the task at this point of time, the degree of engagement is high. Higher the engagement factor, higher is the immersion the player experiences. If the player is successful in catching the Pokémon, he/she experiences a sense of joy. This emotional experience can be related to the enjoyment aspect of interaction.

4.1.2.3 Mechanics: Combat

Train stations, churches, and similar huge landmarks are Pokémon Gyms where the player can compete with other players. The players have only partial control over the Pokémon Gyms. The players can assign their Pokémon to help defend the Gym if they are a member of the team that holds the gym, but the players cannot control the actions of the Pokémon (GamePress, 2018). While competing with other Pokémon, the player battles Pokémon in the order they were assigned to the gym, meaning the Pokémon to spend the longest time in the gym will battle first. Once the Pokémon is assigned to a gym, the trainers will no longer have control over that Pokémon as long as it is in the gym. An artificial intelligence system takes over the control of the Pokémon and does the battle. Pokémon Go have different mechanisms for attacking and defending. Attackers use high-DPS (damage dealt per second) fast moves while the defenders use slower and heavier hitting fast moves (GamePress, 2018). This allows the defenders to receive less damage as well as to inflict more damage. The defenders will gain more energy from the damage received over a round of battle which allows using more charging moves. The battles are an important mechanics of the game as it is the only way of making use of all the Pokémon the player has been collecting that far.

Figure 4 & 5: Screenshot of the screen for selecting a team and a Pokémon Gym respectively (Taken by Bebito)

The player can choose up to 6 Pokémon when attacking another gym. The Pokémon is switched automatically as one Pokémon faints during battle. The players can also switch between Pokémon manually during the battle to prevent a Pokémon from fainting or take advantage of the opponent. The player can also dodge the Pokémon to reduce damage from incoming attacks. Dodging can be done by swiping left or right across the screen after the yellow flash of the defender's attack animation (GamePress, 2018). Gyms in Pokémon Go are designed to be easy to attack and difficult to defend (GamePress, 2018).

The battles are not purely under the user's control and are controlled by the game AI, the player doesn't get to do much unlike other action games like *Call of Duty: Black Ops* (2010). The levels of immersion are lower in this case compared to the other mechanics of the game. This is a direct result of the game's automated battle feature. The visual effects of the battle scene result in good sensory and imaginative immersion levels compared to the

challenge-based immersion. The player is really captivated at the screen during the battle and leads to increased presence. Switching and dodging mechanisms help in controlling the Pokémon to an extent and thus helps the player have a good interactive experience. The levels of engagement are good even though the player doesn't have full control over the battle. During the battle, the player goes through a lot of emotions, for instance, joy when he/she have defeated the opponent or sadness/frustration when he/she loses the battle. As enjoyment is a positive reaction experienced by the player during the game, the enjoyment levels can vary according to the player and the emotions he/she experience during the game.

4.1.3 Aesthetics

The combination of AR or computer-generated characters and the physical world helped in creating an immersive game experience in terms of the story as well as gameplay. The video and audio quality, animations and the interfaces are well designed and easy to use.

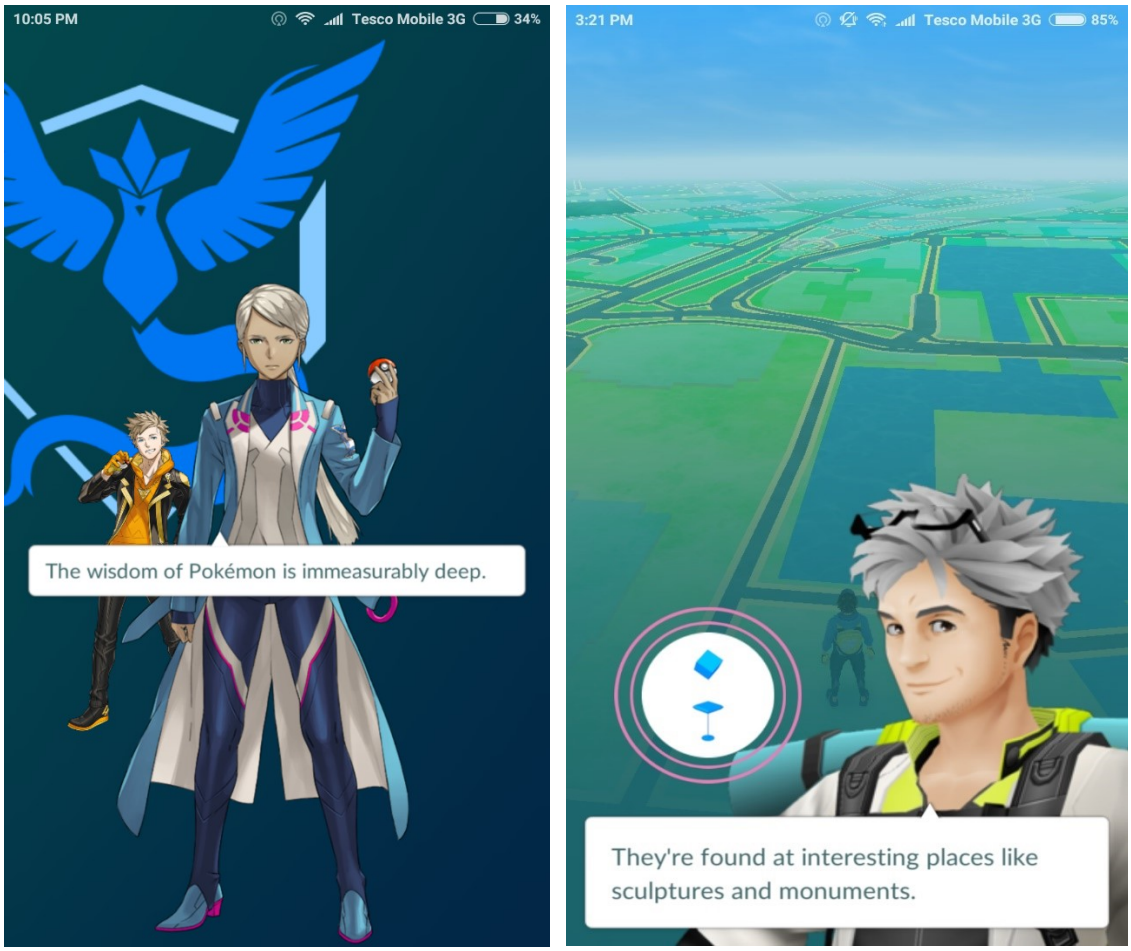

Figure 6 & 7: Screenshots of the characters, the leader of the Blue team and Professor Willow respectively (Taken by Bebito)

The elements are simple, aesthetically built and provides easy interaction to the players. The designers have done a good job in creating the characters. The characters are similar to the ones in the Pokémon animated series and this in a way increases the player's participation and connection to the game like Pine and Gillmore stated. The cartoonist visualisation of the game characters, both the player's avatar and the Pokémon, makes the player's feel more present in the imaginary world of Pokémon. As we discussed in previous chapter, this will increase the player's sensory and imaginative immersion. The audio elements of the game are also very subtle and helps in binding the game together. The game has audio effects for basic interactions of the player like clicking a Pokémon to catch or clicking a Pokémon Gym to enter it. The game also let the player's smartphone vibrate when a new Pokémon is suddenly found in the area. The Pokémon also have their own sound effects as well, for example if the player has already caught a bird type Pokémon, then touching it will produce bird sounds. The characters also have their own voices. Unlike FPS games, the player does not actually interact much with the avatar, limiting the avatar's functionalities. The only character to have a voice in the game is Professor Willow, who is researcher of Pokémon. The character gives a brief about how the game works and directs the player in the initial stages. Once the player has got the general idea of how to play the game, the professor limits his appearance to rare occasions like when the player has got a very rare Pokémon or so.

4.1.4 Discussion

Having analysed the different aspects of the game Pokémon GO, we can come to certain conclusions. Although the game does provide a good immersive experience for the player, the game fails in providing a totally immersive experience during gameplay. As Brown and Cairns define the last stage of immersion of immersion as when the player is completely involved with the game, the game fails to meet this. Having played the game for the purpose of this paper, we can say that the degree of immersion and engagement experienced were higher when we are in the catching screen to catch Pokémon. The video and audio quality of the catching screen, the difficulty of catching the Pokémon and the design of the Pokémon helps us to experience all types of immersion as defined by Ermi and Mäyrä. The lack of a proper storyline and narrative reduces the degree of immersion perceived. This results in the player feeling less present in the game. Interaction with the game is also simple and allows the player experience immersion as said by Shafer. The

emotions experienced by the players range from enjoyment (catching a Pokémon or winning a battle) to frustration (losing a Pokémon or a battle).

The game's task depends on the player's real-time location mostly. There are no Pokémon to catch if the player is in an area with no spawn points. The player needs to be around any landmark or structure that is identified as a Pokéstop or a Pokémon Gym in order to collect resources or battle other Pokémon. This can increase the player's engagement (to find these places) to a certain extent but fails to give the player a consistent gaming experience. The player's perception of immersion and presence in the game world is disrupted in case there is network connectivity issue or no data allowance. The player can be highly engaged with the game at certain points and this can lead to the players causing inconvenience to other humans.

4.2 Father.IO

Father.IO is the world's first augmented reality First Person Shooter game for smartphones (Indiegogo, 2016). The game is developed is Proxy42, an augmented reality gaming, and hardware company headquartered in San Francisco (Forbes, 2014). It is a first of its kind AR game for smartphones allowing the players worldwide to compete against each other through the app and the web. The game is described as a Massive Multiplayer Online First-Person Shooter (MMOFPS) game (Fandom, 2016). The company has created a device that can convert any smartphone into a virtual reality laser tag system (Proxy42, 2017). Known as the Inceptor, it is the first of its kind compact micro-platform created exclusively for gaming (Spensieri, 2017). The main aim of the device is to immerse the player in the game. According to Brookstone's Chief Information Officer Lauren van Heerden, the Inceptor is "capable is converting the whole world into one massive game of 24/7 laser tag" (Spensieri, 2017).

4.2.1 Story

The storyline of the game is very similar to the present day dystopian sci-fi novels and movies. The story is set in the 2040s where the players are grouped into two teams: The Humans and the Evolved. Humans who have connected their physical brains to Ethereus are called the Evolved. Ethereus is the artificial intelligence developed by humans to help them rule the planet. Ethereus have helped the humans in resolving conflicts of various origin like religious, territorial and race. Things go wrong when a digital virus of unidentified origin, Father.IO, infect the behavioural algorithms of Ethereus. This results in Ethereus sending out

orders to kill all the humans who have not yet become the Evolved. This is where the game starts, with all the real cities as battlefields (Forbes, 2014). The storyline and narrative of the game successfully engage the players in becoming an integral part of the fantasy world, resulting in higher levels of motivation and immersion (imaginative) for the players as stated by Ermi and Mäyrä. This can be connected to the findings of Choi et al.about the influence of fantasy in boosting immersion as discussed in the previous chapter. The story also makes the player work together in teams to fulfill the goals of the game, thereby increasing the social immersion (as described by Thon) and social presence (as defined by Lombard and Ditton). The fact that Father.IO is a multiplayer game allows players of different emotional and behavioural traits to play together and interact with each other. This increases the social presence as discussed before but as well as increase the enjoyment of the players according to the findings of Gajadhar et al.

4.2.2 Gameplay

When the game starts, the player's physical world is split into different hexagonal areas. The teams control these areas. The player's smartphone can pick up any other smartphone with the game installed and get activated when they are inside a 15 meters range (Forbes, 2014). Father.IO has two types of gameplay: Tactical Battlefield and First-Person Shooter modes. The tactical battlefield mode can be described as zone and resource management. This mode is typically a map overlay that allows the players to see the area they are presently in through an AR viewpoint. The player's physical location is divided into tiles. The map information from OpenStreetMap is integrated into the game map. As the player walks around in the real world, their movements are reflected in the AR map in real time (Fandom, 2016). The tiles are overlaid over the physical locations making it easy for the players to identify whether they have crossed a tile to another. The players have the power to claim any tile and by doing so the tile colour changes to represent the player's area or zone. Tiles claimed by the players in the Human team change the colour to blue while the factions held by the Evolved team are golden in colour. The tiles also have logos assigned depending on the faction holding the tile (Fandom, 2016).

Once a tile is claimed, all resources that can be collected are generated in that tile. The player needs to move to that particular tile he/she claimed in the AR map in order to collect the resources. The players also have the option of using a drone to gather resources in case they are not in the area. There are three types of resources in the game: energy, crypto coin and hacking power (Fandom, 2016). Energy and crypto coin is used for creating buildings in

the player's faction or tile. The purpose of hacking power is to allow the players to reserve a tile for the team (Fandom, 2016). Energy and crypto coins are generated at solar panels and crypto miners respectively. The players can create AR objects called buildings in the tactical battlefield. Each building has a specific purpose in the game and can be upgraded (Fandom, 2016). For instance, the solar panels are designed to generate energy and a vault to store resources.

4.2.3 Mechanics: Search

The augmented map of the player is divided into tiles that are controlled by either the Humans or the Evolved. These tiles are the main source of resources for the player. The tiles display two types of options: the Info and the Harvest. The Info option displays the number of resources that the player can gather from the tile whereas the Harvest option will assign all the resources to the player's resource stock (Fandom, 2016). The game uses an advanced real-time GPS location system within the radar and the satellite map to help the players locate their team as well as their enemies. Like all FPS games, the enemies cannot be spotted until they are closer to the player.

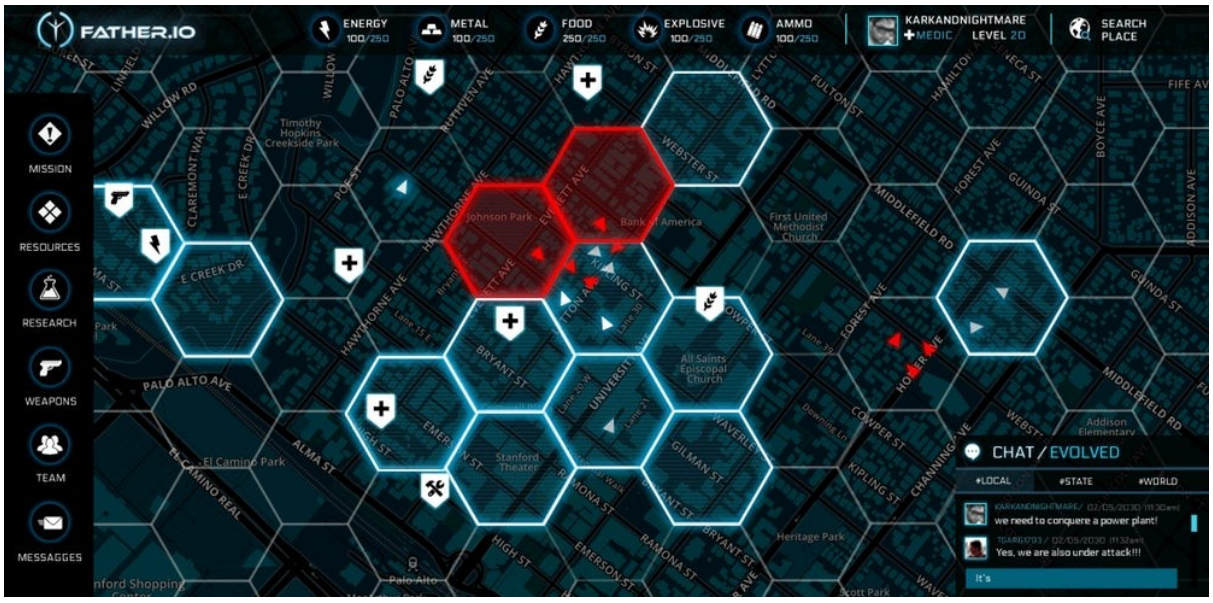

Figure 8: The game map showing the location of teammates and enemies (Moss, 2016)

The player interacts with the game by touching the game's interface displayed on the smartphone. As the game possess good image and sound quality, it helps in creating a better game world. This makes the player get more emotionally attached to the game world and be a part of it, resulting in good imaginative immersion and presence. The player needs to team up with his/her team and complete the mission assigned. This results in the player being

concerned about the other players, teammate or opponent. The players start interacting with each other in the game world just like they do in the real world. This results in the players experiencing high levels of social immersion.

4.2.4 Mechanics: Movement

Movement is an important aspect of the game. Father.IO converts the real world into a virtual battleground making the players compete with each other through the streets, parks, buildings and so on. An important aspect of the movement mechanics is that the player is not restricted by any predefined set of movements like in traditional FPS games. The player's movements in the real world are directly translated into the game world. This means that the player can easily perform complex movements that he/she used to do it on a controller or keyboard by pressing multiple keys/buttons. The player can do all real-life movements like walking, running, jumping over objects, hiding and much more. All these movements are translated into the player's character movement in the game. As the movements of the character are directly dependent on the player's movement, the player needs to think and act fast to prevent from getting eliminated giving the player a good challenge based immersive experience. The levels of imaginative immersion are also high as the player needs to defend their factions be it the Humans or the Evolved. As the game is based on a good and strong storyline, the player feels immersed in the game world driven by the storyline. This also increases the level of spatial presence of the player. As the player performs complex movements, the levels of his/her engagement with the game also increase resulting in good overall immersion and presence. The game provides the player a completely immersive and interactive experience for the player but creates a huge concern about the safety of the player running around the streets and roads in an immersed state. The chances of the player getting into accidents can be high if not careful about the activities in the real world while playing.

4.2.5 Mechanics: Shooting

The most important mechanics of the game is shooting. The players can shoot each other to eliminate them. For shooting an opponent, the player needs to look at the opponent through the smartphone and aim. The players can use the scope of the guns depending on what type of gun they use. Snipers and assault rifles have better-scoping range than pistols and handguns.

Figure 9: Image of the shooting screen (Palladino, 2017)

The players can shoot at the opponent's body to inflict damage or perform a headshot to eliminate them instantly. The players can also choose between different weapons from their collection. The game also allows the players to swap weapons with other players. The player can perform these actions by interacting with the interface of the game. The information input in the game is by touching the screen to shoot, choose weapons, collect resources and so on. The levels of interactivity, immersion, and enjoyment are higher as defined by Shafer in his research. The information output, the audio and visual features, of the game, is remarkably good and increases the player's sensory immersion. Shooting opponents and eliminating them accurately is challenging and makes it difficult for the player with all the fast movements of the player as well as the opponent. The player thus shows high degrees of engagement with the game leading to a good immersive experience (challenge-based). As the game requires the player to work with other players as a team, the players tend to devote attention towards other players. This makes the player socially immersed with the other players. Again, as the player is playing against other human players and not a computer, the player experiences higher emotional engagement to the game. This increases the player's presence and flow as well.

4.2.6 Aesthetics

Father.IO has a very good image and sound quality compared to other AR shooter games like *Real Strike* (2012). The design of the characters and the interface are well balanced and helps the player to be a part of the game world as defined by the story.

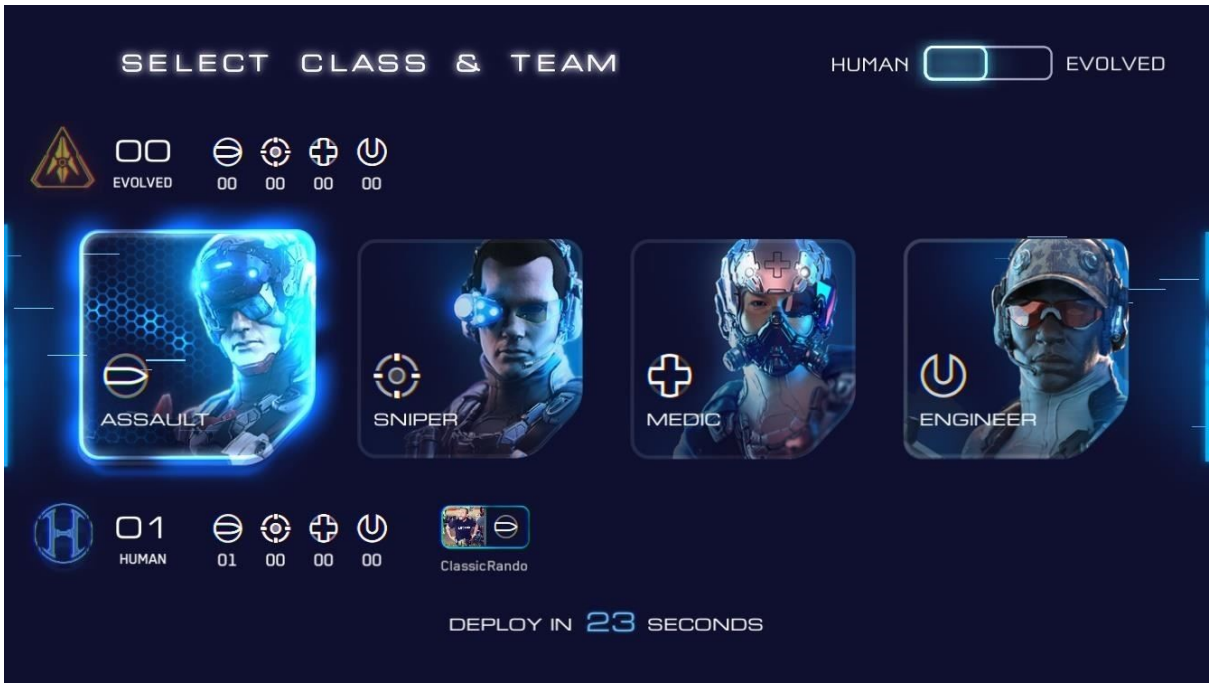

Figure 10: Image showing the selectable class and team (Palladino, 2017)

Figure 11: Image showing the augmented screen of the player's weapon's scope (Solutions by Softonic, 2017)

Unlike Pokémon GO, the game does not show animated characters as an augmented image to the users. The game relies on its camera to allow the players to see the opponents as real human beings as shown in figure 11. The screen of the player's smartphone is augmented with the weapons and the interactive buttons that can be touched to perform actions like shooting. The design of the interface is good considering the image quality and the

interactivity the interface provides. This result in the player experiencing good levels of sensory immersion and presence in the game.

4.2.7 Discussion

Father.IO is a remarkable AR mobile game opening the video game industry to new dimensions. Using external hardware compatible with smartphones allows the players to have a better gaming experience on smartphones just like the way it is on traditional consoles (PlayStation and Xbox) and computers. The game features a good storyline and helps the player to involve with the game in a much better way than we saw in Pokémon GO. The game also features better quality for images and sound. The difficulty of the game depends on how the players interact in the virtual world. All this lead to a good immersive experience for the player. The game is more fun and engaging when played with other human players. This increases the player's social immersion and presence. Having multiple players on the team improves the interaction between the players. As the player is constantly on a lookout for other players, both team members as well as opponents, this results in higher presence in the game as well as increase the connection between the players as discussed in the previous chapter.

Although the game provides much better immersive and interactive experience than Pokémon GO, the gameplay is restricted to certain factors. In order to play the game in real-time, the player needs to have a team as well as a team to compete with. Unlike traditional multiplayer FPS games where there will be a number of players available online at a point of time, Father.IO needs the players to be located in and around a particular place and the players need to be physically present. Even though this helps in increasing the social immersion and presence of the player, it is a drawback of the game restricting the players to only play the game depending on the availability of the other players. As we discussed, the game requires an external hardware to play the multiplayer FPS mode. Unlike Pokémon GO, Father.IO requires the player to actually run around the streets to shoot the opponents (as discussed in the mechanics' section). Running around the streets looking through a smartphone screen can be too immersive for the player and end in accidents.

4.3 Genesis

Genesis is an augmented reality trading card game (TCG) for mobile developed by Genesis Augmented Pvt. Ltd. based in Australia (Genesis Augmented, 2015-2018). It is a mixture of the traditional TCGs and real-time dynamic combat systems (Kickstarter, 2016).

Genesis is not just a typical card game. With the help the AR, the game allows the players to experience an addictive skill-based real-time battle system (Kickstarter, 2016). All the battles are thus dynamic and responsive.

4.3.1 Story

Orios (the Hands of Creation), Kromora (the Eyes of Fate) and Gaia (the Blood of Life) were the three great Celestial beings who brought the Great Harmony when the world was in complete chaos. By sacrificing themselves, they created the flow of time, the expanse of space, and the very core of creation, and thus Genesis was created (Kickstarter, 2016). Rharkon, also called the Old One, was an immortal being known for causing chaos and destruction. Rharkon was in an everlasting battle with Orios, Kromora, and Gaia and was defeated when they sacrificed themselves and destroyed him in the act. Before his defeat, Rharkon infected the newly created Genesis with his own malicious thoughts. This resulted in the concepts of time and space to be corrupted and broken (Kickstarter, 2016). As a result of this, time stopped behaving as it supposed to be, causing disruptions known as Rifts. Rifts are passageways that are used by the beings to travel to different ages. Due to the anomaly in time and space, the beings that travel through the Rifts are no longer sane and get corrupted by Rharkon's curse driving them towards madness.

The Genesis chooses a mortal being (the player) to end to the influence of Rharkon and save the universe. Known as a Riftlord, the character's purpose is to travel to unexplored Rifts and defeat the cursed beings of the Rifts and thereby build an army of powerful beings from all of the different Ages (Kickstarter, 2016) (Genesis Augmented, 2015-2018). As a RiftLord, the player's duty is to defend the universe from the curse of Rharkon. The integration of a very strong storyline with the game has enabled the player to be in this world and do the necessary to protect it. The strong storyline incorporated with the fantasy elements allows the players to visualize the game world in a much better sense (according to Pagulayan et al. and Choi et al.). As a result of this, the player experiences strong immersion (sensory & imaginative) during gameplay, and thereby leading the player to have a good spatial presence in the game.

4.3.2 Gameplay

Like traditional trading card games, Genesis uses specially designed cards as its base. The game stands out in its implementation, by employing real-time strategy gaming mechanics and by having an RPG like system already built around it (Moreno, 2017). When

the game starts, the players can select the roles of six drifters: Auroba, Alatus, Baron, Erebus, Tyran, and Osirus. Each character has got its own backstory, powers, and equipment. The powers of the characters range from simply using brute force to using dark magical properties, allowing a perfect combination of skill, strategy, and foresight (Kickstarter, 2016). The players can summon these characters to battle each other by using the cards and their smartphones (Moreno, 2017).

Genesis has two game modes: Dungeon and Arena (Kickstarter, 2016). In the Dungeon mode, the players can choose a character and battle against the games' powerful Genesis AI. The players can compete or battle with each other in the Arena mode. Genesis is still in its beta version, allowing only one on one battles at the moment. However, the stretch goal of the company is to allow two on two battle, 3 player deathmatch and a team dungeon mode (Kickstarter, 2016). If you win a battle against an opponent, their character will be transferred to the player's account and the vice-versa. The gameplay doesn't require the players to roam the streets outside. The game can be played anywhere with a flat surface like a table. This reduces the physical exertion of running around the streets like in the case of Pokémon Go and Father.IO. The game requires the players to take a printout of the "anchor", which acts as a spatial landmark for the 3D models to be positioned appropriately in the real-world space (Genesis Augmented, 2015-2018).

4.3.3 Mechanics: Battle

One of the important mechanics of Genesis is the attacking mechanics for battle. As discussed above, the player can battle with other players as well as the game's AI. The players choose their respective characters for the battle. The attacking mechanics is based on the character's powers and capabilities. Each character has got its own attacks and powers. For example, the character Osirus, also known as the Intergalactic Sheriff, uses a gun Xypher-27 (Kickstarter, 2016). The weapon is accurate and powerful with fatal results. Osirus also has a rolling attack movement called the Justice Roll which makes him roll in the direction he is pointed. He also has an option for Rapid Release making him shoot rapidly at the pointed direction. The sheriff also has a Tesla Rifle which can be used to shoot a powerful beam at the enemy. When the player selects any of the characters, the character's powers and attacks will be displayed on the screen. The player just needs to select the desired attack by touching the screen. The player can also control the movement of the character by using the real-time joystick displayed on the screen. This is the only form of information input is by

touching the screen increasing the player's interaction with their smartphones. As an outcome of this, the player experiences enjoyment which in turn leads to a good flow of the game. Battling other players or the Genesis AI requires the player to really concentrate and choose their characters wisely.

Like all trading card games, the games rely on the idea of strategically defeating the opponents. This allows the player to be more involved with the game resulting in experiencing high levels of immersion and presence. Again, battles are challenges in the game which need to be completed to proceed in the game. The difficulty of the battles varies depending on how the opponent makes his attacks as well as the powers of the character. These alternating difficulty levels allow the players to experience very good challenge-based immersion as we discussed before. The nature of the player (human or computer) also affects the player's immersion, flow, and presence as stated by Lim and Reeves.

Figure 12: Image showing the real-time battle between two characters. (Genesis Augmented, 2015-2018)

4.3.4 Mechanics: Movement

Unlike Father.IO where the character movement is dependent on the player's real-life movements, Genesis restricts its character movements to the real-time joystick displayed on the screen of the smartphone (as shown in figure 12 above). The joystick allows the player to move their character on the surface where the game is set up. Again, the characters have their own signature attack movements which can be discussed in this section as well. Osirus has a

Justice Roll attack movement which allows the character to roll in the direction he is facing. Tyran, a Bastiosaurus Rex, have the ability to slash his tail to inflict damage to the opponent (Kickstarter, 2016). These special movements depend on the character and whether they have it. The characters can be a little hard to control at times as the player is restricted to just the joystick on the screen. This can reduce the degree of immersion the player has during gameplay. Again, the player needs to interact with the screen for making the characters move thus increasing the level of engagement and interaction. As an overall result, the player experiences a good degree of immersion and presence.

4.3.5 Mechanics: Trade

Although Genesis is a called a trading card game, in truth it is more of a fighting game using trading cards as "anchors" for characters the player controls (Gardner, 2017). As the game is still in its beta versions, the game doesn't actually have real trading cards. The game now works by having the players print out the "anchor" card and activate them by signing up for the game. Actual trading cards are planned to be released at a later stage giving the players a much more interactive and immersive way of playing card games.

4.3.6 Aesthetics

The game's overall image and audio quality are good. The design of the characters makes them look mystic and dark which helps in binding them to the storyline of the game. The quality of the augmented animation of the characters during battle is also good and makes the player more engaged in the game. As a collective result of the above discussed factors, the player feels strongly immersed (sensory and imaginative) in the game as well as enjoy a good level of spatial presence in the game. The game features a very minimal interface, unlike Pokémon GO and Father.IO. The interface of the game displays a real-time joystick controller, the character's attacks, and the player's health points as well as the augmented animation of the player's character (Kickstarter, 2016). The interface is simple and easy to use enabling good interaction for the player. Seeing the characters come to life with the help of augmented reality is indeed a treat for the players. This invokes a good level of enjoyment for the player thereby increasing the flow of the game. The player also engages very well with the character during battles and leads to increased immersion and presence.

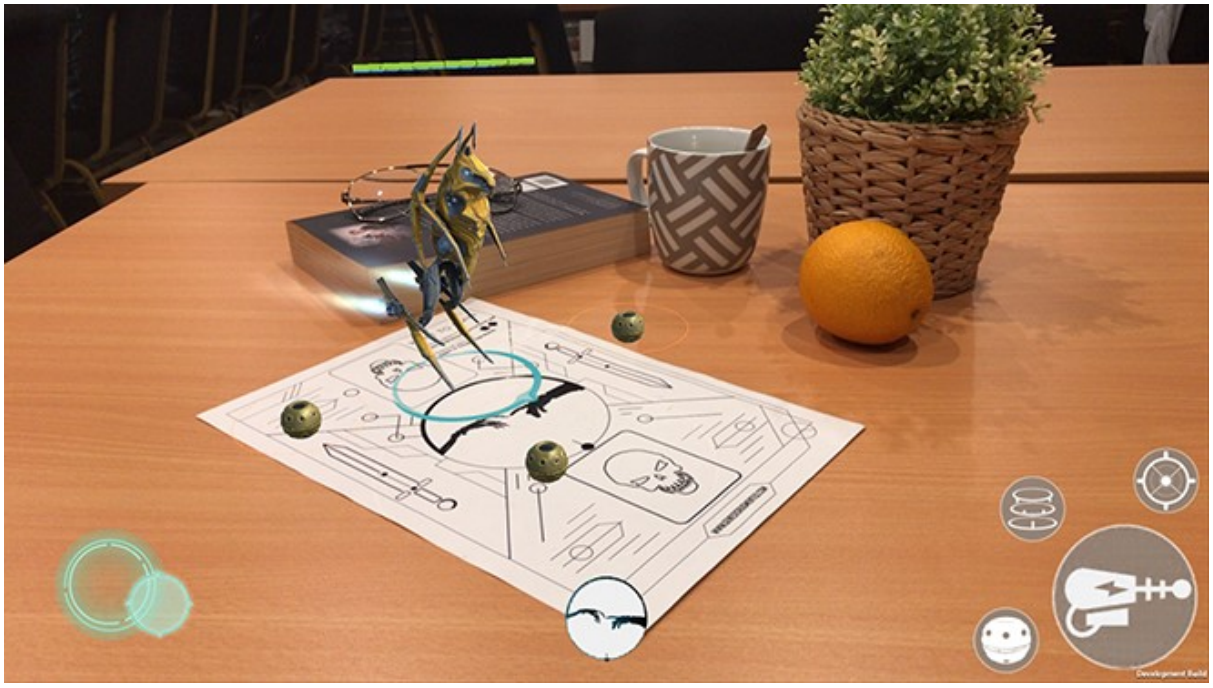

Figure 13: Image showing a character and the anchor (Genesis Augmented, 2015-2018)

4.3.7 Discussion

Genesis is an innovative approach in implementing a traditional trading card game. The possibilities of a game like *Magic: The Gathering* (2002) combined with AR is huge. Having analysed the available aspects of the game, we can say that Genesis also provides the players a good degree of immersion and presence. The game features a very convincing and strong storyline and makes the player the protector of the universe. The real-time combat feature of the game allows the player to battle other players locally and online. The interface of the game is pretty simple enabling easy interaction which is very helpful during combat situations. The image and animation quality of the characters are really good thereby helping to increase the appeal of the game. Altogether these above said features collectively help in providing a good degree of sensory, challenge-based and imaginative immersion.

Unlike the games we analyzed before, Genesis doesn't require the players to go outside to fulfill the goals of the game. This can reduce the level of engagement and interaction the players have with each other to an extent but the game compensates for this in its own way as discussed in the paragraph above. Although Genesis is called as a trading card game, it really is a real-time combat game for the characters invoked through the cards. The main drawback of the game is this, the lack of physical trading cards, which restricts users to play only with the available set of characters.

5. Conclusion

Augmented reality games are the recent trend in the gaming industry. Unlike, traditional video games, there aren't many AR games for mobile that has good image quality, content, and interactivity. And many of the games are still in their beta versions and awaiting crowdfunding on Kickstarter and Indiegogo. The paper was an attempt to analyse the concepts like immersion, presence, and interaction associated with normal video games. There are not many papers that have done the analysis for AR games based on mobiles. Unlike traditional video games, these AR mobile games require the players to venture out into the streets and parks in order to complete the game tasks, as many of them are geo-location-based games. The paper has attempted to investigate the defined concepts of immersion, presence, and interaction in AR based mobile games.

The paper was able to identify these factors associated with trending games such as Pokémon GO, Father.IO, and Genesis. Similar to traditional video games, players experience very good levels of immersion and presence in these games. The immersion was stronger when there was a storyline for the game. The sensory immersion was good for most of the games but the augmentation quality can be improved. The degree of interaction was also higher for these games leading to an overall good gaming experience. Pokémon GO and Father.IO are location-based games and require the player to go outside to complete challenges. And being multiplayer games, this has allowed players to connect with each other more formally than traditional video games. And as a result of this, the players were able to experience high levels of immersion (challenge and social) and presence. Playing against other human players were more engaging and enjoyable than playing against a computer.

Although these games provide a totally immersive gaming experience for the players like traditional video games, there are few aspects of this that needs to check. Having a totally immersed player running around the streets to catch a Pokémon (Pokémon GO) or eliminate opponents (Father.IO) have some serious risk coming with it. The chances of players running into other humans and vehicles, leading to accidents. Games like Father.IO require additional hardware which can be expensive for the players. As many of the games are still in their beta versions and have limited gameplay, the comprehensive analysis of the games is not possible. However, it can be found that these games employ all of its features, especially augmented reality, to give the players a very good gaming experience just like the traditional video games.

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