**ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL**

# THE USE OF GAMIFICATION TO ENRICH THE PARK EXPERIENCE FOR THE VISITORS: ISTANBUL ATATÜRK URBAN FOREST PARK CASE STUDY

**M.Sc. THESIS**

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**FEBRUARY 2022**

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**Thesis Advisor: Assist. Prof. Dr. Muhammed Ali ÖRNEK**

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**ISTANBUL TEKNİK ÜNİVERSİTESİ ★ LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ**

# ZİYARETÇİLERİN PARK DENEYİMİNİ ZENGİNLEŞTİRMEK İÇİN OYUNLAŞTIRMA KULLANIMI: İSTANBUL ATATÜRK KENT ORMANI ÖRNEĞİ

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Sarvin Eshaghi, a M.Sc. student of İTU Graduate School student ID 502181607, successfully defended the thesis/dissertation entitled "THE USE OF GAMIFICATION TO ENRICH THE PARK EXPERIENCE FOR THE VISITORS: ISTANBUL ATATÜRK URBAN FOREST PARK CASE STUDY", which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

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***To my family,***

## FOREWORD

I would like to express my gratitude and appreciation to my dear advisor, Assist. Prof. Dr. Muhammed Ali Örnek. His support and guidance paved the way for me to step out in my academic career with courage.

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February 2022

Sarvin Eshaghi
(Architect)

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**ABBREVIATIONS**

| | |
|---|---|
| **AR** | **:** Augmented Reality |
| **GPS** | **:** Global Positioning System |
| **ICT** | **:** Information and Communication Technology |
| **LBMG** | **:** Location-Based Mobile Game |
| **VR** | **:** Virtual Reality |

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## THE USE OF GAMIFICATION TO ENRICH THE PARK EXPERIENCE FOR THE VISITORS: ISTANBUL ATATÜRK URBAN FOREST PARK CASE STUDY


### SUMMARY

The excessive population growth leading to urbanization and, subsequent to it, urban sprawl, increases the size and number of urban settlements. Consequently, to fulfill the land needed for this expansion, humans encroach the public open areas, including highly crucial urban green spaces. Generally, any kind of greenness within the city, known as urban green spaces, benefits the ecosystem and the inhabitants. Hence, the green infrastructure, universally, should be preserved. Urban parks, specifically urban forest parks, serving as recreational green public spaces, are beneficial for environmental issues and human's mental and physical health, in other words, well-being, by enabling them to interact with nature. To appropriately preserve the urban forest parks, being aware of the motivational factors for the visitors have a key role. While the willingness factors vary amongst people, it is important to know whether different people can experience the same park diversely, which is almost attractive in terms of general park features. Hence, the study refers to the concept of sense of place, capable of turning spaces into the desired places, framing the users' behavior and transmitting cultural meaning.

Augmentation occurs using Information and Communication Technologies (ICTs) in urban environments. It can be as simple as telecommunication technologies or very complicated ones. With their everyday use in peoples' lifestyles, they have penetrated humans' real lives, fading away the border detaching the real world from the world of computer-mediated services. Nowadays, a holistic technological perspective dominates the urban areas rather than individual ICT projects, which can reshape people's interaction with their surroundings. Hence, the ICT-enriched spaces result in augmented spaces that convey a sense of place, supporting meaning-making and behavior framing.

With its recent definition, gamification, which is the process of making activities more game-like, is a sample of augmentation. While triggering motivation in the users, it can support inducing new behaviors or reshaping the existing ones. Currently, gamification is spread out to various domains, both in academia and amongst practitioners. However, while gamification may involve any type of content, it is called a serious game in the case of transmitting serious educational content besides being entertaining. They are able to engage the player with the education of a certain topic or enhancement of a specific skill.

The recent covid-19 outbreak and consequent confinement periods affected people's everyday lifestyles. While suddenly, people lost the freedom of being outdoor, experiencing new places, and interacting with each other, the technology rescued them from such a phenomenon. Virtual environment served them as a mediator to be in the same place, interact, and experience their daily activities in a novel form. Additionally, gamification changed even the sense of their virtual places.

This thesis aims to enrich the park visitors' experience via entertainingly introducing the Atatürk urban forest park to them, accompanied with educational content, by means of a locative serious game. The game benefits from the public awareness reinforcement to serve urban green space preservation. It generates a sense of placeness in its in situ mobile version and desktop version, played remotely, to frame the players' behavior for the sake of its aim.

The thesis is divided into six chapters to achieve its intended aim:

The first chapter, the introduction, describes the excessive population growth leading to urbanization and its subsequent, urban sprawl, which increases the size and number of urban settlements and decreases the area of highly crucial urban green spaces. Discussing the green infrastructure benefits, this part emphasizes the importance of its preservation. After a brief debate around the possible ways of this conservation, this chapter continues with the thesis's purpose, method, and content.

The literature review part, located in the second and the third chapter, introduces the types, definitions, and the benefits of the urban green spaces, instanced as parks and urban forest parks. This chapter continues with a description of the park experience, followed by the concept of the sense of place. Augmentation and the use of ICTs for behavior framing are described, followed by the idea of gamification, serious games, related case studies, and software.

Next, in the fourth chapter, the thesis continues with the research part. Firstly, it introduces the selected area, Atatürk Urban Forest Park, with its detailed fauna and flora information. Then, it proceeds with the game development part, introducing the operated 360° panoramic field photography with a smartphone and using *3dvista Virtual Tour PRO* software as the game development tool to provide a locative serious game.

For the evaluation of the developed game's success, in the fifth chapter, the thesis conducts an online survey, including a Google form questionnaire, requested to be filled after the gameplay, focused on the remote version, inspired by the pandemic situation.

Finally, in the last chapter, the thesis results are concluded, and the discussions around the future possibilities of the provided method and its capabilities are made to enlighten the field for further studies.

# ZİYARETÇİLERİN PARK DENEYİMİNİ ZENGİNLEŞTİRMEK İÇİN OYUNLAŞTIRMA KULLANIMI: İSTANBUL ATATÜRK KENT ORMANI ÖRNEĞİ

## ÖZET

Kentleşmeye yol açan aşırı nüfus artışı ve onu takip eden kentsel yayılma, kentsel yerleşimlerin büyüklüğünü ve sayısını artırmaktadır. Sonuç olarak, bu genişlemeye ihtiyaç duyulan araziyi karşılamak için insanlar, son derece önemli kentsel yeşil alanlar da dahil olmak üzere halka açık alanlara tecavüz ediyor. Genel olarak, kentsel yeşil alanlar olarak bilinen şehir içindeki her türlü yeşillik, ekosisteme ve sakinlere fayda sağlar. Bu nedenle, evrensel olarak yeşil altyapı korunmalıdır. Kent parkları, özellikle kentsel orman parkları, rekreasyonel yeşil kamusal alanlar olarak hizmet vererek, insanların doğa ile etkileşime girmelerini sağlayarak çevre sorunlarına ve insanın ruh ve beden sağlığına, diğer bir deyişle esenliğine faydalıdır. Kent orman parklarının uygun şekilde korunması için ziyaretçileri motive eden faktörlerin farkında olmak kilit bir role sahiptir. İnsanların parkları ziyaret etme isteklerini çeşitli faktörler etkilerken, soru şu ki, farklı insanlar park özellikleri açısından yeterince çekici olan aynı parkı ziyaret ederken farklı park deneyimlerine sahip olabilir mi? Bu nedenle bu çalışma, mekânı, kullanıcıların davranışlarını çerçeveleyebilen ve kültürel anlam iletebilen, arzu edilen bir yere dönüştürebilen yer duygusu kavramına atıfta bulunmaktadır.

Büyütme, kentsel ortamlarda Bilgi ve İletişim Teknolojileri (BİT) kullanılarak gerçekleşir. Büyütme aynı zamanda telekomünikasyon teknolojileri kadar basit veya çok karmaşık olabilir. Bilgi ve İletişim Teknolojileri insanların yaşam tarzlarındaki günlük kullanımlarıyla, gerçek dünyayı bilgisayar aracılı hizmetler dünyasından ayıran sınırları ortadan kaldırarak gerçek hayatlarımıza nüfuz ettiler. Günümüzde, kentsel alanlara insanların çevreleriyle etkileşimini yeniden şekillendirebilen bireysel BİT projelerinden ziyade bütünsel bir teknolojik bakış açısı hakimdir. Bu nedenle, BİT ile zenginleştirilmiş alanlar, bir yer duygusu taşıyan, anlam oluşturmayı ve davranış çerçevelemeyi destekleyen artırılmış alanlar ile sonuçlanır.

Son tanımıyla aktivitelerin daha çok oyun benzeri hale getirilmesi süreci olan oyunlaştırma, bir büyütme örneğidir. Oyunlaştırma kullanıcılarda motivasyonu tetiklerken, yeni davranışların ortaya çıkmasına veya var olanların yeniden şekillendirilmesine destek olabilir. Şu anda, oyunlaştırma hem akademide hem de uygulayıcılar arasında çeşitli alanlara yayılmıştır. Ancak oyunlaştırma her türlü içeriği kapsayabilirken, eğlendirici olmanın yanı sıra ciddi bir eğitim içeriğinin aktarılması durumunda ciddi bir oyun olarak adlandırılmaktadır. Ciddi oyunlar oyuncuyu belirli bir konunun eğitimi veya belirli bir becerinin geliştirilmesi ile meşgul edebilirler.

Son dönemde yaşanan covid-19 salgını ve buna bağlı olarak yaşanan karantina dönemleri, insanların günlük yaşam tarzlarını etkiledi. İnsanlar bir anda açık havada olma, yeni yerler deneyimleme, birbirleriyle etkileşim kurma özgürlüğünü kaybederken, teknoloji onları böyle bir olgudan kurtardı. Sanal ortam, aynı yerde bulunmaları, etkileşim kurmaları ve günlük aktivitelerini yeni bir biçimde

deneyimlemeleri için bir aracı görevi gördü. Ek olarak, oyunlaştırma sanal yerlerinin anlamını bile değiştirdi.

Bu tez, bir yer bulma ciddi oyunu ile eğitim içeriği eşliğinde Atatürk kent orman parkını eğlenceli bir şekilde tanıtarak park ziyaretçilerinin deneyimlerini zenginleştirmeyi amaçlamaktadır. Oyun, kentsel yeşil alanların korunmasına hizmet etmek için halkın bilinçlendirilmesinden yararlanıyor. Oyuncuların davranışlarını amacı uğruna çerçevelemek için yerinde mobil versiyonunda ve uzaktan oynanan masaüstü versiyonunda bir yer duygusu yaratmaktadır. Oyun, gezegeni, insanların onu terk ettiği feci bir durumda tasvir ediyor. Bir grup araştırmacı, dünyanın el değmemiş tek yerinde bitki çeşitleri ve hayvan türleri arıyorlar. Bu nedenle, oyuncu oyun sırasında gerekli bazı unsurları toplamaya ve çevresel ve doğa ile ilgili bilgileri öğrenmeye çalışır. Dolayısıyla bu vesile ile, kentsel yeşil alanların korunmasına yol açan, parkı kullanma davranışlarını çerçevelenebilmektedir.

Bu tez, bahs edilen oyunu geliştirebilmek için, akıllı bir telefon aracılığı ila, Panorama 360 & Virtual Tours adlı bir iOS aplikasyonu kullanarak, 360 derecelik fotoğraflardan yararlandı. Bu yöntemle, 360 derece çekim yapan bir kamera aksine alanda gökyüzü ve yer yüzünü çekme imkanı olmamasına rağmen, düşük maliyetli ve verimli bir şekilde, sonradan düzenleme gerektirmeyen çekimler yapıldı. Daha sonra, *3dvista Virtual Tour PRO*'nun e-öğrenme yeteneğini bir oyun geliştirme aracı olarak kullanıp ciddi bir konum belirleme oyunu geliştirildi. Oyun geliştirme aşamasında, çekilen fotoğraflarda görsel olarak gerekli değişiklikleri sağlanmıştır. Oyun içeriği olarak metinler, PDF uzantılı dosyalar, ses kayıtları, ve web sayfası bağlantıları kullanılmıştır. Oyun geliştirme aracı olarak kullanılan yazılım HTML bazlı web sitesi olarak, tüm internet tarayıcılarında çalışabilen, hem masaüstü hem mobil çıktı sağlayabiliyor. Ayrıca, elde edilen çıktı formatı mevcut sanal gerçeklik cihazlarıyla da uyumludur. Yazılımın sağladığı puanlama, raporlama, ve oyunda geçirilen zamanı gösterme imkanı sayesinde oyuncu kendi performansını denetleyebilecektir. Oyunun masaüstü versiyonu, eğlencenin yanı sıra parkta büyüleyici bir sanal tur sunar ve Covid-19'un son durumunda parkı ziyaret edemeyen kullanıcılar için bir park deneyimi sağlar. Oyun, oyunculara başlangıç noktalarına ve doğrusal olmayan kararlarına göre çeşitli hedefler sunar. Hazine avı konseptine takiben oyuncu, oyunda ilerlemek ve verilen görevleri yapmak için bitkiler, hayvanlar, bilgi noktaları ve eğitim noktaları olan gizli oyun öğelerini bulmaya çalışır. Mobil versiyonu ise, insanların parktaki mevcut tesislere ve bilgilere dikkatlerini çekerek ziyaretlerini zenginleştiriyor, onları yürümeye motive ederken doğal çevrenin farkında olmalarını sağlıyor. Oyun sırasınca, ziyaretçiler anlatıyı takip etmek ve ziyaretleriyle ilgili bireysel deneyimler yaşamak için çeşitli yollar seçebilirler.

Sanal oyunlaştırmanın oyunculara amaçlanan durumu nasıl tanıtabileceğini ve içine çekebileceğini anlamak için oyunun masaüstü sürümüyle bir anket yaptık. Oyun ve anket sonuçlarına göre parkı daha önce ziyaret eden katılımcılar farkında olmadıkları noktalar, paneller ve tesisler fark ettiklerini beyan ettiler ve oyunun kendilerini parkı sık sık ziyaret etme konusunda motive edeceğini belirttiler. Parkla ilk kez karşılaşanlar, parka ilgi duyduklarını ve masaüstünde oynarken kendilerini gerçekten parkta olduklarını hissettiklerini dile getirdiler. Bu oyun Atatürk kent orman parkının sadece bir bölümünü kapsayan bir pilot test iken, araştırma ve sonuçlar böyle bir oyunun ticari olarak uygulanabilir bir oyun olarak tüm parkta uygulanabileceğini göstermektedir.

Bu tez amacına ulaşmak için altı bölüme ayrılmıştır:

Birinci bölüm olan giriş, kentleşmeye yol açan aşırı nüfus artışını ve ardından kentsel yerleşimlerin boyutunu ve sayısını artıran ve son derece önemli kentsel yeşil alanların alanını azaltan kentsel yayılmayı anlatıyor. Yeşil altyapı yararlarını tartışan bu bölüm, korunmasının önemini vurgulamaktadır. Bu korumanın olası yolları hakkında kısa bir tartışmadan sonra, bu bölüm tezin amacı, yöntemi ve içeriği ile devam etmektedir.

İkinci ve üçüncü bölümde yer alan literatür taraması bölümünde, parklar ve kentsel orman parkları gibi kentsel yeşil alanların türleri, tanımları ve faydaları tanıtılmaktadır. Bu bölüm, park deneyiminin tanımıyla devam eder, ardından yer duygusu kavramını anlatmaktadır. Büyütme ve davranış çerçeveleme için Bilgi ve İletişim Teknolojilerinin (BİT) kullanımı açıklanmakta, ardından oyunlaştırma fikri, ciddi oyunlar, ilgili örnekler ve kullanılabilir oyun geliştirme yazılım önerileri gelmektedir.

Daha sonra dördüncü bölümde, tez araştırma bölümü ile devam etmektedir. Öncelikle seçilen alan olan Atatürk Kent Orman Parkı'nı detaylı fauna ve flora bilgileri ile tanıtmaktadır.Ardından, bir akıllı telefon ile yapılan 360° panoramik alan fotoğrafçılığından bahs edip, oyun geliştirme aracı olarak *3dvista Virtual Tour PRO* yazılımını kullanarak, bir yer bulma ciddi oyunun geliştirme aşamalarını anlatmaktadır.

Geliştirilen oyunun başarısının değerlendirilmesi için, beşinci bölümde, tez, pandemi durumundan esinlenerek uzaktan sürüme odaklanan, oyundan sonra doldurulması istenen bir Google form anketi içeren çevrimiçi bir anket yürütür.

Son bölümde ise, tez sonuçları ve sağlanan yöntemin gelecekteki olasılıkları ile ilgili tartışmalar, daha sonraki çalışmalar için alanı aydınlatmak için yapılmıştır.

## 1. INTRODUCTION

Urbanization ends up to built environment transformations by converting rural areas into urban accommodations. Consequently, while the number, size, and population of the urban settlements are rising, the occupants' culture, lifestyle, and behavior are also altering (United Nations, 2019). Subsequent to the urbanization phenomenon, one of the first city planners in the south-eastern United States, Earle Draper, invented the sprawl term in 1937 (Black, 1996). Following World War II, people started to discuss sprawl with its meaning in the current era (Nechyba and Walsh, 2004). Its relation to transportation and income was the topic of argument in that period (Osborn, 1965). Talking about its definition in more recent years, according to Brueckner (2000), sprawl means different things to different people. To Nechyba and Walsh (2004), sprawl generates cities with lower densities and expander footprints. Calthorpe (2017) indicates that sprawl can occur anywhere, at any density. The isolation of people is the major element of the sprawl issue. It divides people in terms of economic and land use and prevents their interaction with each other and nature. It means that sprawl could occur not only in low-density cities but also in high-density ones. China is a sample of this phenomenon by tackling the isolation problem with its superblocks. Each containing around 5,000 units, these new superblocks are gated with no sidewalk or ground floor shops resulting in stranger residents.

To fulfill the required land for the city's spatial growth, they encroach excessively on agricultural land and take over considerable space (Brueckner, 2000). Hence, open space amenities and their aesthetic benefits are lost, and the allegedly scarce resource, namely farmland, either fertile or not, is depleted. Additionally, about the open space amenities, it is investigated that housing prices change based on their adjacency to various uses indicating the importance of different types of land functions for residents. The conducted surveys regarding the open space amenities reveal that proximity to public parks, privately owned open space, the natural land cover immediately surrounding household locations, and access to natural views have high

value in residents' point of view. However, the households' taste for open space typically is not included when developing suburban cities (Nechyba and Walsh, 2004).

Urban green spaces, in general, including any kind of greenness within the city, have multiple benefits both for the inhabitants and the ecosystem (Ho et al., 2003; Kaczynski and Henderson, 2008; Konijnendijk et al., 2013). Due to their outstanding value, the universal green infrastructure should be preserved (Resende et al., 2021). To implement a proper preservation strategy for the urban forest parks, awareness regarding the park visitors' motivations carries a prominent role (Chen and Qi, 2018). While various factors affect people's willingness to visit these green areas, the question is, can different people have varied park experiences while visiting the same park, attractive enough in terms of park features. Hence, the research explores the concept of sense of place, which can turn space into the desired place capable of framing the users' behavior and transmitting cultural meaning (Harrison and Dourish, 1996). In this regard, the research focused on the ICT-enriched spaces meaning improved by the contribution of the Information and Communication Technologies, resulting in augmented spaces carrying a sense of place and its capabilities (Aurigi and De Cindio, 2008; Duarte and Firmino, 2009). With its recent definition, gamification, which is the process of making activities more game-like, is a sample of augmentation (Werbach, 2014). While triggering motivation in the users, it can support inducing new behaviors or reshaping the existing ones (Blohm and Leimeister, 2013; Werbach, 2014). Currently, gamification is spread out to various domains, both in academia and amongst practitioners. However, while gamification may involve any type of content, it is called a serious game in the case of transmitting serious educational content besides being entertaining (Anderson et al., 2009; Becker, 2007; De Freitas and Liarokapis, 2011). These games are able to engage the player with the education of a certain topic or enhancement of a specific skill.

Considering the last two years, during the covid-19 outbreak and its consequent confinement periods, the pandemia situation affected people's everyday lifestyles. All of a sudden, everyone lost their freedom of being outdoors, experiencing new places, and interacting with each other (Emiliani et al., 2020). However, fortunately, the technology rescued them from such a phenomenon. Thanks to the virtual environments, people could be in the same place, interact, and experience their daily activities in a novel form (Markopoulos et al., 2021; Shah et al., 2020). However,

whether real or virtual, a place can carry a sense of place by being interactive and engaging to its participants. It includes emotions and may create communities (Relph, 2007). Hence, in addition to the virtually held classes, conferences, etc., with the help of gamification, people change the sense of their virtual places. For instance, they gamified the conference events with virtual venues (Foramitti et al., 2021) and let the freshmen students who did not visit their university yet, experience it in the virtual world of *Minecraft* (Malgapu, 2021).

Due to the mentioned debates, a novel approach towards green space preservation for enriching the visitors' park experience by framing their behavior, especially in the restricted physical visit conditions or disabilities, is worth investigating and studying.

## 1.1 Purpose of Thesis

As mentioned before, a valuable field of study lies behind the issue of visitors' park experience, urban forest park, in this case. This thesis aims Atatürk urban forest park, inaugurated in Istanbul during the pandemia when people could not visit and experience parks. It aims to develop a locative serious game for enriching the people's park experience by entertainingly introducing the park and the integrated educational content to them. Therefore, the game, both played in situ on mobile and remotely on desktop, will frame their behavior in using the park by conveying a sense of place, leading to the preservation of the urban green spaces. However, inspired by the mentioned pandemic situation, the thesis focused its surveys on the desktop version for evaluating the effect and value of remote park visit experiences in the case of any disabilities or limitations for a physical visit. Hence, the study tries to answer the following research questions:

1. Is it possible to provide various experiences for different users of a specific park carrying the required attractiveness elements for the general public? Can multiple individuals experience the same park differently while the park elements and the features are the same for all the visitors? Is it possible to enable people to feel and make use of the currently available facilities of a park in a different way and from another point of view?

2. How will it be possible to convey a different feeling for the same space? Can the sense of place make this difference possible? Can this difference frame the visitors' behavior to increase their tendency to visit that park and convey cultural and natural meaning to them?

## 1.2 Method of Thesis

The thesis follows the below steps to achieve the intended aim, divided into four chapters. After the introduction in chapter one, the study continues with the literature review in chapters two and three. In the fourth chapter, the research part comes, followed by the survey section in chapter five. (Figure 1.1).

The literature review includes the definition, the benefits, and the types of urban green spaces. Considering the park experience issue, it continues with debates around the sense of place and the use of augmentation and ICTs for behavior framing. The concepts of gamification, serious games, and related case studies and software pursue to support the research hypothesis.

The research part, initializing introducing the selected area, Atatürk Urban Forest Park, proceeds with the game development part. As previously mentioned, the thesis aims to develop a locative serious game. Hence, as the visual material, it operates a 360° panoramic field photography using the pro version of the *Panorama 360 & Virtual Tours* application on an iOS smartphone. Furthermore, adopting *3dvista Virtual Tour PRO* software as the game development tool, the study firstly provides a virtual tour of the park's selected part. Afterward, by visually enhancing and editing the tour photos, combined with the texts, PDF files, sound recordings, and links driven from the park's panels and the Internet, the thesis provides a locative serious game, using the e-learning capability of the mentioned software. The selected software provides HTML-based desktop and mobile exports launchable as a web page that any web browser can run.

Finally, in the fifth chapter, to evaluate the developed game's success, the thesis conducts an online survey, including the desktop gameplay, followed by a Google form questionnaire.

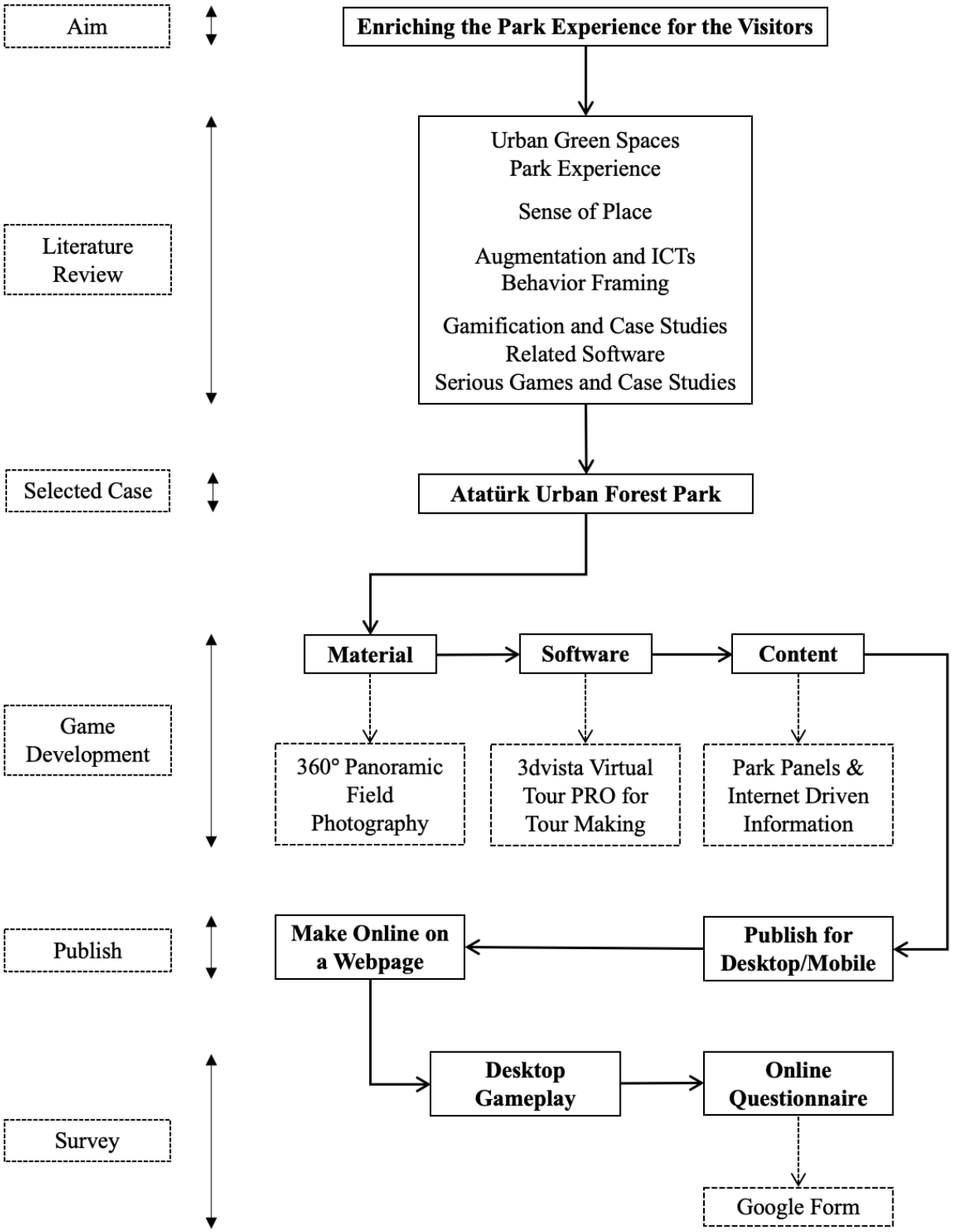


**Figure 1.1 :** Thesis development process.

## 1.3 Content of Thesis

As mentioned, the scope of this thesis is the Atatürk urban forest park, inaugurated in the pandemic lockdowns. While the developed game is a pilot test encompassing only a part of the park, such a game not only could be implemented into the whole park, but also other public spaces can take advantage of the proposed method for developing a commercially viable game.

This study is unique in its approach towards its aim, used software, and location. The software enables cost-effective game development regarding the currently required interdisciplinary professionals in the digital game development industry. Benefiting from this software, a small group of non-professionals is capable of developing a digital game using low-budget devices. It is also efficient in terms of demanded hardware for the gameplay. Since the resulting game can be launched in all available browsers on smart devices, it eliminates the need for highly configured systems, the inevitable necessity for nowadays complicated digital games. However, the developed game format is also compatible with existing virtual reality (VR) devices, enabling an immersive experience for its players.

In terms of assembling the needed visual material, as mentioned, the thesis takes advantage of using an application on a smartphone. While it is feasible and reasonable with high-quality outcomes, compared to available professional devices special for 360° shots like *GoPro* camera, it lacks capturing the sky and the ground for a fully 360° view. However, it is time-efficient at the same time in terms of not requiring post-editing needed for erasing tripod stands in *GoPro* shootings.

# 2. URBAN PARKS AND PARK EXPERIENCE

## 2.1 Urban Green Spaces

Urban green areas, including urban forests, parks, woodlands, public facilities, and private properties containing greenness, convey a broad range of benefits to the inhabitants and the ecosystem. While the green areas positively affect the citizens' mental and physical health, they also serve ecosystem services relevant to the air quality, water, climate, and biodiversity (Ho et al., 2003; Kaczynski and Henderson, 2008; Konijnendijk et al., 2013). Even a notable percentage of the UNESCO World Heritage sites consist of green areas due to their natural values and so-called benefits. As a sample of several attempts made for their preservation, the World Heritage Convention tends to preserve these natural heritage districts, caring Outstanding Universal Value (Lowenthal, 2005; Resende et al., 2021), as they do the same for the cultural heritage and cultural landscape (Rodwell, 2012; UNESCO World Heritage Centre, n.d.-a and b). Hence, UNESCO prompted the biocultural heritage to protect the areas caring value of high biodiversity regarding the fauna and flora, in addition to their cultural values (Eriksson, 2018; Lowenthal, 2005; UNESCO World Heritage Centre, n.d.-c).

### 2.1.1 Urban parks

Considering specifically the urban parks, with the dominance of greenness and water, they are generally accepted as the crucial factors of livability and sustainability in the urbs (Konijnendijk et al., 2013). Parks, as the sample of public open spaces (Koohsari et al., 2013), serving physical activity opportunities (Ho et al., 2003; Kaczynski and Henderson 2008), are supposed to be used by the public (Konijnendijk et al., 2013). They can also persuade people to walk through them as an appealing destination (Sugiyama et al., 2010). Narrowing exclusively to the benefits of the urban parks, Konijnendijk et al. (2013) suggest initially defining the meaning for the term benefit. According to Merriam-Webster's Online Dictionary, benefit brings wellbeing, and Defra defines wellbeing as the state of more than having the essential needs (as cited in Konijnendijk et al., 2013). In this regard, urban parks have social, economic, and touristic contributions in addition to their environmental and health benefits (Bedimo-Rung et al., 2005).

### 2.1.2 Urban forest parks

A forest park, differentiating from an ordinary forest, serves recreational purposes in addition to timber production (Chen and Qi, 2018). Forest parks can be categorized as mountainous, suburban, or urban forest parks based on their distance to the urbs (Luo et al., 2005). In more detail, urban forest parks are an assemblage of woodies and vegetation, inside or in the vicinity of the civilizations, acting both as an urban forest and recreational green space for public use (Sop Shin et al., 2005; Wang et al., 2016). Same as any other green space, these areas are positively influential in peoples' physical and psychological well-being (Kaplan and Kaplan, 1989) by providing the opportunity of encountering nature, including the sounds and scents (Haviland-Jones et al., 2005; Jo et al., 2019) and escaping from the stress and the routine of urban life (Liu et al., 2021; Sop Shin et al., 2005). Socializing is also another outcome of urban forest parks (Jay and Schraml 2009; Seeland et al., 2009). Urban forest parks contribute to the air quality improvement (Rowntree and Nowak, 1991), water management (Sanders, 1986), and other ecological services of the city by increasing the green space capacity, strengthened through biodiversity (Gao et al., 2020). They also have a prominent role in canceling the negative noise of urban areas (Cook, 1979; Dzhambov and Dimitrova, 2014).

## 2.2 Park Experience

As mentioned before, due to their primary purposes, urban forest parks have a prominent role in recreation and ecological conservation. Regarding the visitors, people, above all, can interact with nature and take advantage of recreational activities and landscape. Since the park users have differing motivations during their visits to the parks (Zhai et al., 2018), it is essential to understand and consider the visitors' desires to have a proper forest park preservation strategy (Chen and Qi, 2018).

Prior to forest parks, in a broader point of view, considering the effective elements for which the users prefer some specific parks, many features are influential in the people's park usage willingness. Bedimo-Rung et al. (2005) name these factors as parks' environmental characteristics and conceptual areas. They claim that many disciplines such as landscape architecture, public health, and parks and recreation are exploring ways of enhancing these features to increase the number of park visitors. The environmental aspects are geographic areas, including park activity areas,

supporting areas, and the overall park environment and neighborhood. The conceptual areas that are the features, aesthetics, condition, safety, and policies are other effective factors (Bedimo-Rung et al., 2005). Additionally, distance to the park, the number of green areas, comfortable walking paths, and dense residential vicinity are essential factors (Baek and Park, 2014). While characteristics of the users are also effective in park usage, they are ignorable due to their immutable nature (Bedimo-Rung et al., 2005).

According to the literature, various factors are effective in different cultures for the attractiveness of forest parks. While in Denmark, walking and being in nature are the most appealing reasons to visit the forest parks (Jensen and Koch, 2004), the enrichment and quality of the urban environment and microclimate are mostly emphasized as important in China (Jim and Chen, 2006). In Taiwan, scenery and unique forest landscapes are the most important attractions besides the climatic issues (Lee et al., 2010). Regarding the parks with an entrance fee, the living conditions of the citizens play an important role in the willingness to visit the park (Jim and Chen, 2006; Lo and Jim, 2010).

The mentioned features and factors attracting people in park visit willingness arose a question examining the possibility of providing various experiences for different users of a specific park carrying the required attractiveness elements for the general public. How can a distinctly individual experience the same park disparately than others while the park elements and the features are the same for all the visitors? Is it possible to enable people to feel and make use of the currently available facilities of a park in a different way and from another point of view?

### 2.3 Space, Place, and Sense of Place

According to Harrison and Dourish (1996), " . . . , the "place" is more than simply a point in space" (p. 69) and "The sense of place transforms the space" (p. 69). In his opinion, physically, a place is a space valued by behavioral understandings and cultural intentions. In other words, space is where we are located, but the place is where we act. Relph (1976) adds that people can feel the places in the presence of a feature combination containing rituals, personal experiences, and even other people and other places. He defines the three fundamental elements for a space to be identified as a place; a stationary physical setting, the meaning, and the activities. Tuan (1997)

expresses his interpretation of place as the deeper cognition of the person and the added value of a distinct space. Also, Sixsmith (1986) declares that physical, social, and personal dimensions are effective factors in identifying a space as home. Hence, a specific location can function as different places in various temporal periods without spatial variations. It means that while space is unchanged all the time, the place is how that space is used and is more specific (Harrison and Dourish, 1996). Turner and Turner (2006) conclude that the environment's physical characteristics, the meanings, the activities provided by the place, and the social interactions that occurred in that specific space are the components that generate the sense of place in a particular space. Hence, according to them, the sense of place is a unique experience for any individual based on the people's interaction with the environment, despite the mutual elements existing in the space.

Harrison and Dourish (1996) claim that places remind cultural understanding that boosts our behavior framing ability. Social analysts have always dealt with concepts of place and frameworks transmitting cultural meaning and framing behavior. They indicate that human behavior can be framed by understandings, cooperations, and involved assumptions, besides the spaces. The reason for spatially-organized collaborative environments is their behavior framing ability in the real world. However, it is not the spaces that frame it; it is the place. They carry social meanings grounded in communities' actions and understandings. Additionally, they arise over time and get converted within the groups. Consequently, while various groups will have different interpretations of the same place, changeable during the time, the places should also be created by practices for alternative cultural groups. Hence, place-making is a complex issue. It is a space accommodating activity within an arrangement of elements.

Considering the argued discourses, how will it be possible to convey a different sense of place to the visitors of a specific park? Would it be possible to make a "place" of that park "space" in a way that frames the users' behavior? Can we increase their tendency to visit that park and convey cultural and natural meaning to the visitors by generating a sense of place?

# 3. AUGMENTATION AND GAMIFICATION

As discussed in the previous chapter, we are seeking a method by which the visitors of a forest park can have an exclusive enriched park experience in their visit by conveying a sense of place to them. By this means, besides attracting them for more frequent park visits, we also want to figure out a solution for transmitting our intended content: natural heritage. This information conveyance will enable us to frame the users' behavior to serve the considered park's natural heritage preservation. Hence, the question is, what can help us reach this aim?

## 3.1 Augmentation

### 3.1.1 ICT enriched spaces resulting in augmented spaces

According to Duarte and Firmino (2009), technologies, specifically ICTs, influence urban life more than ever as they are getting smaller, more invisible, and penetrating to the human's surrounding built environment. In their opinion, the pervasive use of these technologies resulted in the present-day urban space, in which all sorts of data and information flow through ICT. For instance, urban ICT can be materialized by its presence as big screens in urban locations, hidden in the people's pockets in the form of mobile phones, and non-physical such as geo-referenced spatial databases (Aurigi and De Cindio, 2008). Due to Aurigi (2006), with the normalization of the ICT's presence in everyday lifestyles such as mobile telecommunications and the Internet, its existence in everyday objects, space, and place increases more than ever and shifts the usage patterns and notions and perspectives. Consequently, the border detaching the real world and the world of computer-mediated services is fading away (Agre, 1999). This everyday junction between the physical and digital makes it possible to use the simple consideration of the high technologies in global megacities, as much as local and small urban spaces complemented by very ordinary telecommunication networks (Allen, 2012).

All these technologies and how they are being used in the cities shape what is called augmented space, according to Duarte and Firmino (2009). However, due to Aurigi

(2006), with the development of technology and the changes that occurred regarding the perceptions of the relation between cities and ICT, the concept of digital cities has also changed. Currently, a technological and project-based point of view is being replaced by a more holistic one focusing on an urban space enhanced by technology. In other words, instead of conceiving isolated ICT projects, the city should be considered/planed augmented by technologies in the contemporary world. Augmentation is a complicated event, enveloping the whole city and its ingredients such as spaces, people, businesses, etc. (Aurigi and De Cindio, 2008). Hence, measuring a space's augmentation is not just based on the used number of apparatuses. Instead, the qualitative aspects acquired by specific ICTs are important in this regard (Duarte and Firmino, 2009).

### 3.1.2 The effect of augmented space on the sense of place

The term "place" and our understanding of it get an addition to its meaning when forming a concept through media technologies (Saker and Evans, 2020). However, on the one hand, electronic media negatively influences our understanding of place due to the critical literature of the 1980s and 1990s (Wilken, 2008). On the other hand, they can also reshape the way people interact, involve, and personalize their physical surroundings by cooperating with new features and functionalities to the mobile phones (Evans and Saker, 2017; Saker and Frith, 2019). In the opinion of Lee (2016), augmented space has emotional senses, including a qualitative variable between people and digitally-enhanced space besides being intelligent and efficient. The qualitative sense of these ICT-enriched spaces can support interactions, public-ness, and meaning-making in cities (Aurigi and De Cindio, 2008). It is essential to consider the generated signs by the way of using technologies and experiencing space to understand the ICTs' influence on the urban territorialities (Duarte and Firmino, 2009). Hence, since the placeness is generated and maintained by the patterns of use, we can not design in it; instead, we can design for it. With a similar explanation, the intention of the media spaces was to make the emergence of placeness possible by providing the required structure, not to be used as a place themselves. Therefore, when a sense of place emerges in a media space, there is a division between spatial features provided by technology and the place-oriented features of interaction derived in that place. While the spatial features can be instanced as visual access, adjacency, and movement, the place-oriented ones may be a formal and informal conversation, confidence, a

sense of control and property, etc. (Harrison, 1996). While providing a sense of place via augmentation, rather than only putting together just the new technologies in various types, an open and undefined space of possibilities supporting activities by the technology is being emerged. Specifically, an augmented space is not a problem space; it is an opportunity space providing new possibilities that are not essentially required, which prepares various experiences for each person (Hornecker et al., 2006).

### 3.1.3 Using augmentation to frame people's behavior

As mentioned before, augmentation can turn spaces into places, and places are capable of framing people's behavior. So, the behaviors that we desire infusing people can be framed by the use of augmentation for the sense of placeness. Additionally, we discussed providing an enriched park experience to the visitors of a forest park by conveying a sense of place to them. Meanwhile, we intend to frame their natural heritage preservation behavior. Hence, we need to increase their tendency to visit that park as the first step.

"When the city is not used, it is not represented and, consequently, it disappears from our perception" (Duarte and Firmino, 2009, p. 558). Hence, we should return this kind of space to people by injecting a sense of placeness. According to Odendaal (2008), doing this is difficult from a land-use point of view, and it needs more flexibility not to sacrifice the public good. Hence, to do so, the less noticeable spaces should be empowered and mobilized using augmentation. Therefore city makers and planners have a prominent role here in this stage. While it is a flexible, inventive, and more cooperative method, public well-being is its central concern.

#### 3.1.3.1 Body Movies

*Body Movies* by Rafael Lozano-Hemmer is a great sample of what we discussed (Figure 3.1). This project was designed in a vacant public space, using one of the surrounding building's facades as its screen. The project's aim, which was presented initially in the city center of Rotterdam, Schouwburgplein, in 2001, was to convert the mentioned square to an association place. They projected approximately a thousand portraits to the Pathe´ cinema´s building facade for this aim. In each projection time, a layer of light produced via two powerful projectors placed on the ground was brightening randomly selected seven portraits. People were standing between the projectors and the facade in the large square. The light radiated on them produces

shadows on the building differing between 2 and 25m in length, based on the participant's distance to the projector and the screen. While the navigating bodies should try to match their shadow with the projected images, accompanied by the related sounds, the whole process resulted in playful moments of visitors interacting with their own shadow or the others' (Hesselberth, 2013).

**Figure 3.1 :** Photo by Arie Kieviet (Hesselberth, 2013).

### 3.2 Gamification

The term gamification emerged originally in 2008, for the first time, in a blog written by Brett Terill. His description of gamification encompasses the web properties to be more engaging by using game mechanics. Later, the most known definition of the term came from Deterding et al. (2011), describing it as " . . . the use of game design elements in non-game contexts" (p. 10). In 2012, Huotari and Hamari referred to gamification as a process providing gameful experiences to enhance a service assisting the user for value creation. While Werbach (2014) refers to Deterding's description (2011) as the elemental definition and Huotari and Hamari's (2012) as the service marketing definition, he brings about a term definition with a process attitude to the gamification. According to Werbach (2014), gamification is " . . . the process of making activities more game-like" (p. 266). In his opinion, this definition connects

both academia and the practitioners, and the gamification and the persuasive design better.

Gamification fundamentally intends to trigger motivation in the users to invoke a specific behavior of the user. It can support inducing new behaviors or reshaping the existing ones (Blohm and Leimeister, 2013; Werbach, 2014). Hence, gamification is concluded of the motivation, the psychological outcome, and the future behavioral modification (Hamari et al., 2014). Hamari (2013) underlines the importance of the badges as a motivational reward to the users for their favorable behaviors as the gamification mechanics. The definite goals carried by badges enable the behavior guidance of the users. In this point of view, he claims that gamification is also called badgification due to the importance of the so-called badges. Each badge has a descriptive element, a reward, and a condition that should be accomplished to earn that specific badge (Hamari and Eranti, 2011). However, Werbach (2014) claims that gamification is not limited to using points and badges as the game elements in his process definition. Hence, in this case, gamification is not restricted to artificiality.

Currently, gamification has been spread to a variety of domains investigated in academia. Electronic market and commerce (Hamari, 2013), business and marketing (Kumar, 2013), education (Li et al., 2012), logistics (Hense et al., 2013), healthcare (Hamari and Koivisto, 2013), and many other fields take advantage of gamification. Regarding urban planning, as discussed in the augmentation section, city planners can also use gamification in the practitioner world to develop socially interactive places through design. Using gamification, pedestrians can experience fun and enjoyment added to the original functions of their daily places and elements (Setton and Eizenberg, 2020).

### 3.2.1 Gamification case studies

Among the gamification cases encompassing the urban environment, those including locative media are the most focused types. Locative media, referring to location-based technologies, is related to the devices and apps linked to location. It is being used for various innovative purposes, especially through mapping, geo-catching, and walking in the cities for gaming or in-site narratives, including entertainment. Locative related technologies deal with the people's understanding of the space and their sense of place (Cornelio and Ardévol, 2011). According to Saker and Evans (2020), locative media

provide hybrid spaces to the users altering their engagement with the surrounding environment. This phenomenon contributes to their urban experience by enhancing and personalizing it. People can encounter alternative paths than their daily ones and reform their everyday mobility patterns to recognize unseen environments.

*Geocaching.com* (2000), *Foursquare* (2009) and *Swarm* (2014), *Zombies, Run!* (2012), *Ingress* (2012) and *Ingress Prime* (2018), *Pokémon Go* (2016), *Agent P's World Showcase Adventure* (2016), S*tar Wars: Datapad* (2019), and *Pikmin Bloom* (2021) are the commercially available location-based gamification samples we will explore in this section.

#### 3.2.1.1 Geocaching.com (2000)

Geocaching is an outdoor activity where the participants seek artifacts, called geocaches, hidden by other geocachers in interesting locations (Garney et al., 2016). They should replace it with another treasure and sign the logbook (Schlatter and Hurd, 2005). The locations where the geocaches are located, and consequently participants visit for the game, can be famous historical places, beautiful landscapes, landmarks, inaccessible locations, or even crowded areas that are hard to figure by accident (Gram-Hansen, 2009). Hence, its core motivation is to be outdoor, socialize, be physically active, and relax (Garney et al., 2016).

The emergence of the geocaching idea was by Dave Ulmer in 2000, the day after serving the global positioning system (GPS), originally developed for the military, to the public use (Gram-Hansen, 2009; Schlatter and Hurd, 2005). While the idea was firstly implemented by posting coordinates of the hidden objects in various groups, with the growth of the participant community, a need for a central website appeared. Hence, as the first and still the largest database, Jeremy Irish developed *Geocaching.com* (Url-1) (Figure 3.2) that you can register for free and start the adventure (Gram-Hansen, 2009). Geocaching is indeed a type of treasure hunting combined with technology. It has the same concept of letterboxing dating back to almost 150 years ago (Sherman, 2004), which was finding hidden objects with some given hints without the help of technology. It combines technology and nature, turning it into a healthy activity that can be played individually, in groups, or specific communities such as schools or recreational agencies, and local parks (Gram-Hansen,

2009; Schlatter and Hurd, 2005). According to Gram-Hansen (2009), geocaching is persuasive by framing people's behavior to change their habits.

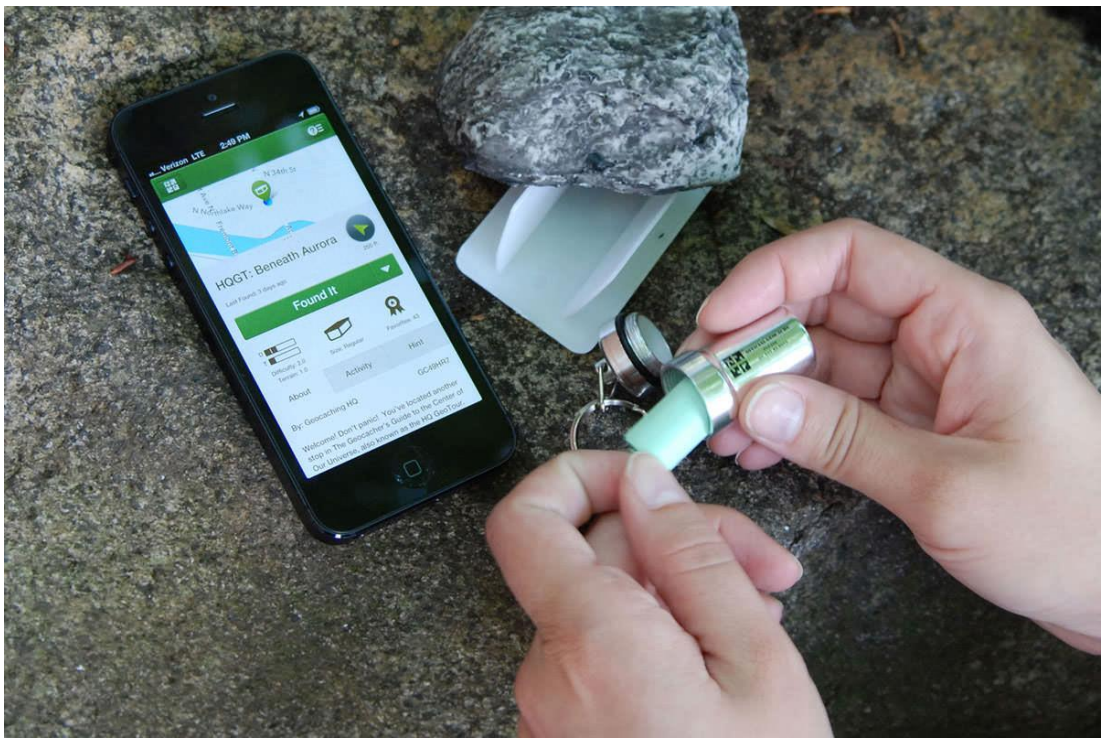


**Figure 3.2 :** Sample of geocaching activity (Url-1).

### 3.2.1.2 Foursquare (2009), Swarm and City Guide (2014)

Developed by Dennis Crowley and Naveen Selvadurai, *Foursquare* is a leader location-based social networking application in the gamification marketplace. Initially, in its emergence in 2009, *Foursquare* enabled users to gain points for their check-ins and badges for visiting specific locations. *Foursquare*, divided into two separate apps in 2014, allows users to check-in at the places they visit and generate individual logs using geospatial information in the *Swarm* (Url-2) application (app) (Figure 3.3), and provides personalized locations to the users via the *Swarm*'s database in its *City Guide* (Url-3) service (Chapman et al., 2021). Generally, in this app, players can keep in touch with friends, discover nearby areas, and save money and unlock rewards.

This app has a social side, allowing you to share your location with friends, being locational permits you to leave place-based tips available for the public. With its playful side, *Foursquare* gamifies the real world and awards the users in the real world with offers and discounts, rewards them with badges in the virtual world, and makes them known by the public as the mayor of the most checked-in places or ranked

between their friend list (Saker and Evans, 2020). Additionally, according to Humphreys and Liao (2013), *Foursquare* could change and impact users' sense of place. They mention *Foursquare*'s contribution to public parochialization through its effect on the connection between people and people with the places.

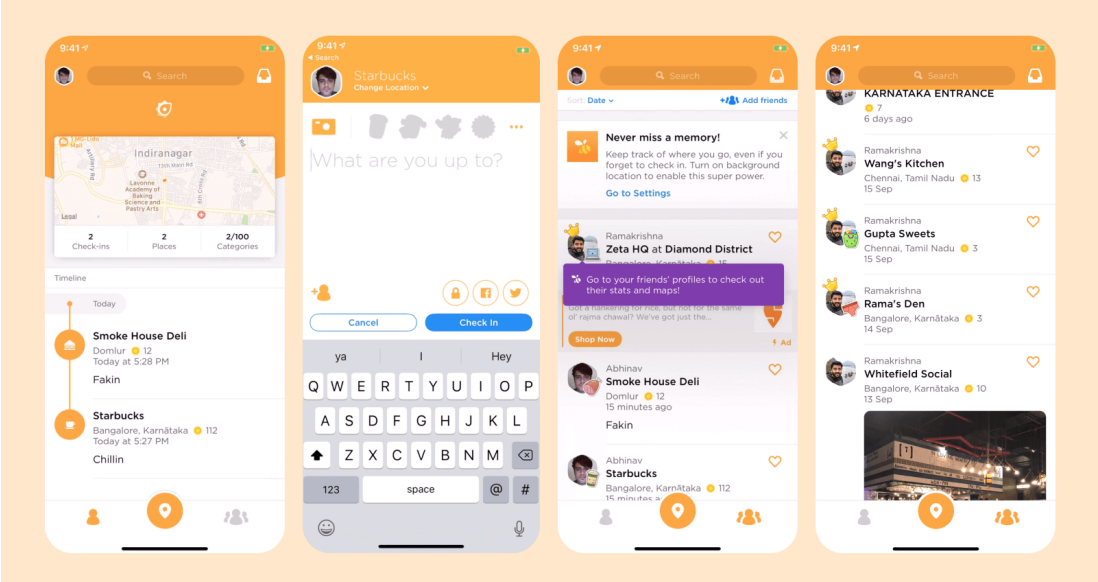


**Figure 3.3 :** Screenshots from *Swarm* by *Foursquare* (Foursquare Labs, Inc, 2019).

### 3.2.1.3 Zombies, Run! (2012)

*Zombies, Run!* (Url-4) is a location-based mobile game (LBMG) that brings digital games outdoors. Naomi Alderman from *Six to Start* developed this audio adventure gamified mobile running app compatible with iOS and Android devices involving GPS tracking available in smart devices in 2012. It has an immersive story divided into missions that the runners listen to, between their loaded music on the phone. The player, called Runner 5, collect gamification elements as items required to build a base while running or walking. During simulated fast-running interval pieces of training, named zombie chases, the player needs a running speed increase for about 90 seconds (Figure 3.4). This casual game enables hyper-real experience creation for players and allows them to contribute to the arrangement of a story during their regular open-air runs. Hence, many users run outside through this app, mostly in their neighborhood outdoor spaces. Such an application evokes the questions like how continued participation in this app can affect the users' neighborhood experience, the effect of LBMGs on the perception of everyday shared spaces, and its role on daily activities (Henthorn et al., 2016; Witkowski, 2013).


**Figure 3.4 :** Screenshots from *Zombies, Run!* (Six to Start, n.d.).

### 3.2.1.4 Ingress (2012) and Ingress Prime (2018)

In 2012, *Google* and *Niantic Labs* launched *Ingress* (Url-5), a global in situ augmented reality (AR) mobile game (Fragoso and Reis, 2016; Majorek and Du Vall, 2016). This game combines AR technology with geolocation, creating a complicated game space and a cross-platform digital narrative (Chess, 2014; Fragoso and Reis, 2016). The game's narrative introduces the emergence of strange energy named *Exotic Matter* or *XM* flowing worldwide. Players should join either group, supporters of the *XM* or those against it. There are portals in the *Ingress* map, the *Intel*, which the players should hack for adding to their groups' territory. These portals are monuments, historic areas and buildings, outdoor artworks, specific structures, etc., that are placed by the game developers or proposed by the payers (Figure 3.5).


**Figure 3.5 :** Screenshots from *Ingress* (Numerama, 2012).

Hence, the game increases the players' attention to the city elements chosen as portals and makes them familiar with the urban structure. This game is a recreational and cultural project, upgrading electronic entertainment to a new level. With its strategic theme, *Ingress* requires both cooperation and coordination between the players, enabling real and virtual interaction by combining the real and virtual world through technology (Majorek and Du Vall, 2016).

In 2018 *Niantic* released the new version of the *Ingress* as *Ingress Prime* (Url-5), with new updates driven from the previous version and the *Pokémon Go* game, which we will describe later. Laato and Laato (2020) mention that *Ingress Prime* can transform physical points of interest in archeological sites into virtual ones and control the real world like a playground. According to them, the AR technology can provide supplementary information on these sites and deepen the visitors' experience there.

#### 3.2.1.5 Pokémon Go (2016)

Released by *Niantic* in 2016, the developers of the *Ingress*, *Pokémon Go* (Url-6), is an AR app using the smartphone camera and GPS. The players of this game should physically figure out their surroundings to find and capture *Pokémon* by throwing a virtual ball through the AR functionality of their smartphones (Figure 3.6).


**Figure 3.6 :** Screenshots from *Pokémon Go* (Pokémon Go Review, 2016).

*Pokéstops* and *Gyms* are the game's community features in which players can respectively collect stuff and battle with each other (Figure 3.7). Both *Pokéstops* and *Gyms* are located in valued places such as historical sites, monuments, artistic

installations, and interesting places (Saker and Evans, 2020). The research Saker and Evans (2020) conducted demonstrates that *Pokémon Go*, as a locative app, pushed its users to be more outside in the real world rather than being indoors. They also are eager to use different paths between two specific destinations to have more chances of finding new *Pokémons*.

**Figure 3.7 :** Members of the public playing *Pokémon Go* (Chua, n.d.).

#### 3.2.1.6 Agent P's World Showcase Adventure (2016)

*Agent P's World Showcase Adventure* (Wiki Targeted, n.d.) is a smartphone location-based game taking place in the *Walt Disney's Epcot Theme Park*, the *World Showcase* area. Prior to its 2016 version's release on its website available for all smart devices, it was only compatible with specially customized devices since 2009. This game is different from its similar kinds by allowing the player to control the restricted surrounding physical environment elements, linking it to the digital world. While the player walks around the park to complete assigned missions, the cutscenes demonstrated on the phone express the backstory of the game and guide the player to the correct location, not by the help of GPS, but by means of clues, hints, and images (Figure 3.8). Hence, in this regard, it is similar to letterboxing, an ancient game guiding the players to hidden locations. To make progress in the game, the players need to

physically go to certain places and solve puzzles to confirm their location, increasing the immersion and sense of presence (Brennan, 2017).

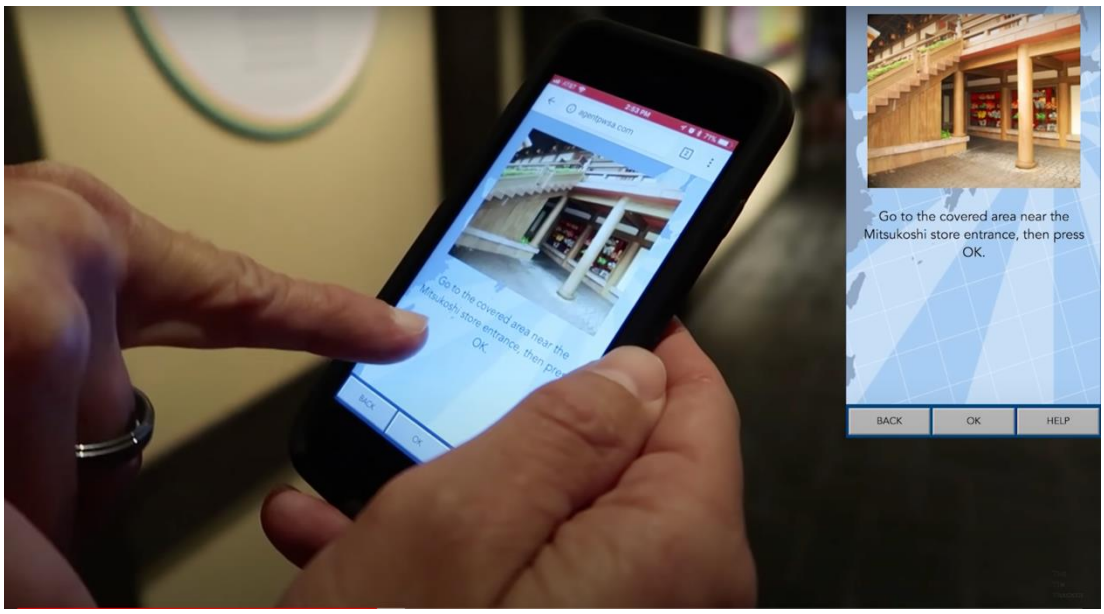


**Figure 3.8 :** Leading the player to the intended location (TheTimTracker, 2018).

### 3.2.1.7 Star Wars: Datapad (2019)

*Star Wars: Datapad* (Url-7) is a hybrid game similar to the *Agent P's World Showcase Adventure* in the *Play Disney Parks* app that you can play during your visit to the *Star Wars: Galaxy's Edge*, a themed area in *Disneyland Park* inspired by the *Star Wars* series (Datapad in Star Wars, n.d.).


**Figure 3.9 :** Playing *Star Wars: Datapad* in *Disneyland* (Datapad in Star Wars, n.d.).

As mentioned, it is a hybrid game, using your smartphone as a channel to convey the story and the park's physicality as a space to locate the players in the story. During the gameplay, the user should do some given duties by decoding scripts in the land, listening to some caught recordings, hacking some areas, scanning barcodes to see the ingredients, and using the game's currency to buy required supplies (Figure 3.9). The game makes the player feel in a role-playing game, and it involves them in the *Star Wars*' universe by the texts that the series' characters directly send to them with addressing their username (Eddy et al., 2020).

#### 3.2.1.8 Pikmin Bloom (2021)

*Pikmin Bloom* (Url-8), developed by *Nintendo* and *Niantic*, the developer of *Ingress*, *Ingress Prime*, and *Pokémon Go*, is a global augmented reality mobile game for everyday walkings. While wandering outside, the player gets rewarded with items to feed and grow *Pikmin* creatures in the game. The trail in which the player walks get bloomed on the map by flowers (Figure 3.10). Multiplayer collaborative events let the users get larger flowers. It has a lifelogging part, encouraging the players to take daily photos with *Pikmins* and caption them in their calendar. The game can be connected to *Apple Health* and *Google Fit*, turning your everyday walking activities into entertainment (Pikmin Bloom, Review, 2021; Pikmin Bloom, 2021).

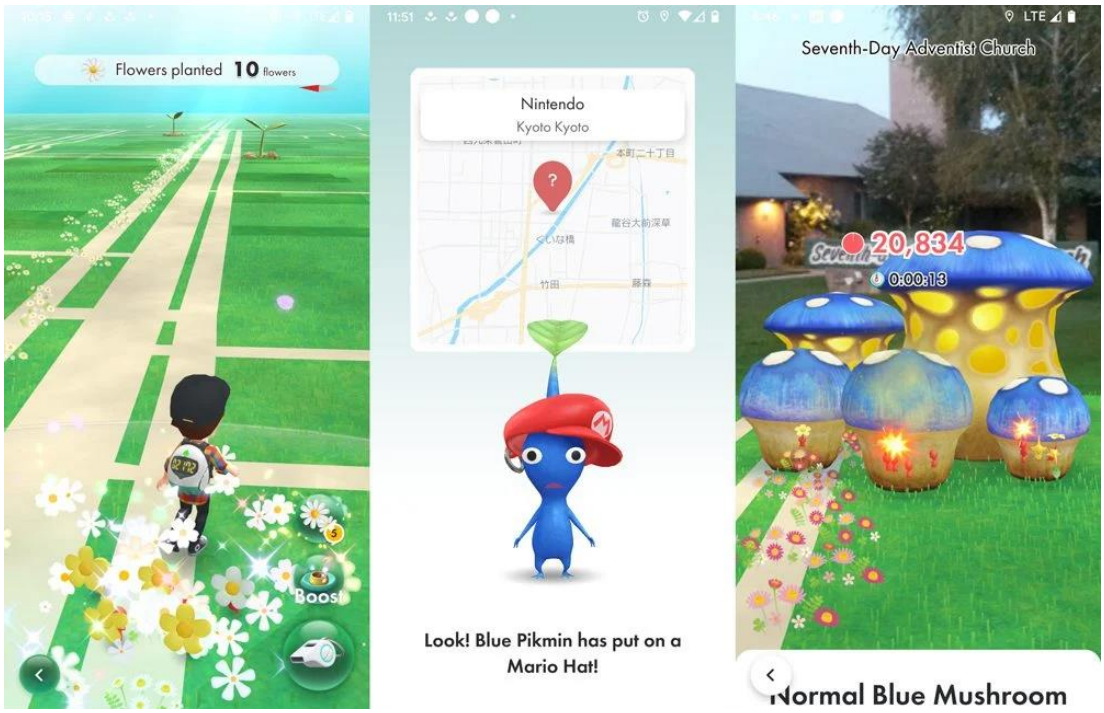


**Figure 3.10 :** Screenshots from *Pikmin Bloom* (Andriessen, 2021).

### 3.2.2 Serious games

Regarding the contexts that gamification may include, the seriousness of the content is not mandatory (Seaborn and Fels, 2015). However, in the case of transmitting serious educational content during gamification, as a real-world activity other than leisure, the result is called serious game (Anderson et al., 2009; Becker, 2007; De Freitas and Liarokapis, 2011). Serious games, also called educational or edutainment games, contain educational content besides entertainment and have been rapidly popular since 2002 (Alvarez and Djaouti, 2011; Mouaheb et al., 2012). They are able to engage the player with the education of a certain topic or enhancement of a specific skill regarding varied professions such as landscape architecture and architecture (Örnek and Seçkin, 2016). Due to De Freitas and Liarokapi (2011), serious games carry this capability because of being audiovisual and supporting the data absorption process to the memory.

*LOGO Programming* game was the first educational game released in 1967, educating mathematical concepts and coding (Figure 3.11).

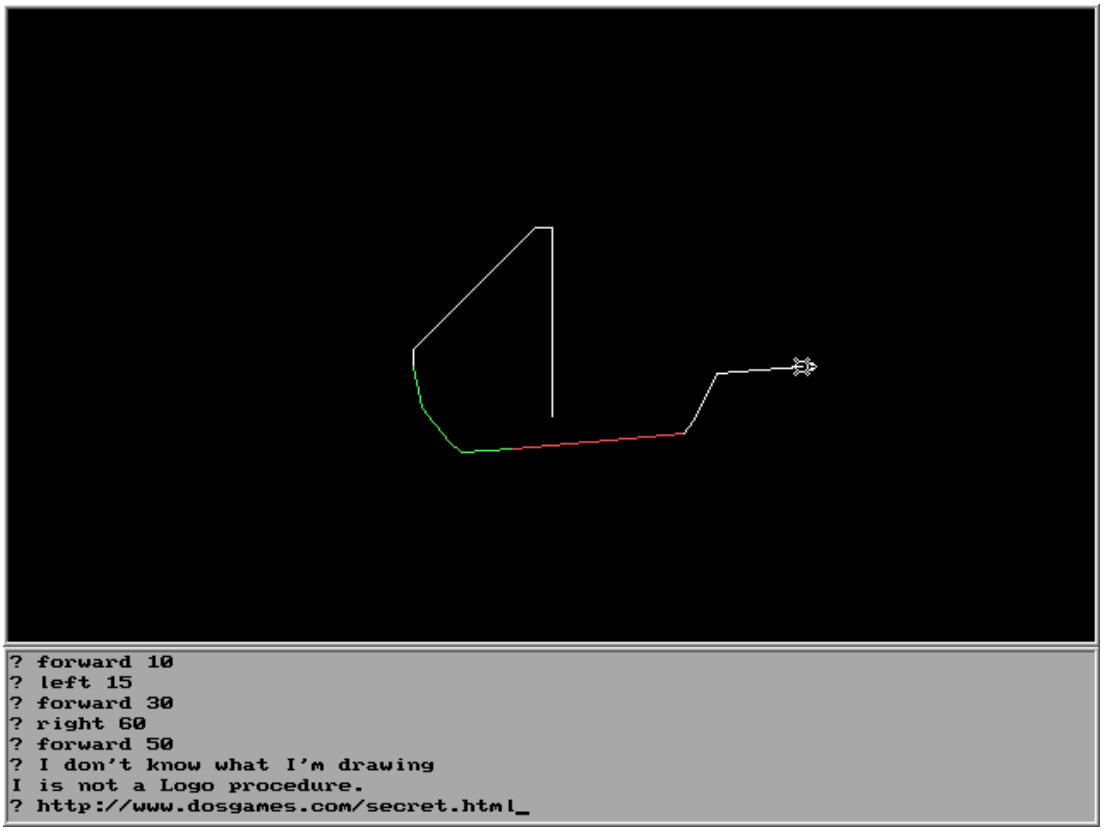


**Figure 3.11 :** *Logo Programming* gameplay screenshot (Url-9).

Next, the *Oregon Trail* was an educational game played for the first time in the classrooms in 1974 (Needleman, 2017). As one of the best representatives of its genre, the *Oregon Trail* (Figure 3.12), addressing the challenges of pioneer life on the Oregon Trail in the 1990s, is considered in most studies focusing on the serious games. Students in elementary schools played this game for an approximate period of two decades in the mid-1980s (Becker, 2007; Bigelow, 1997; Caftori and Paprzycki, 1997; Kane, 2020; Regalado, 2017; Slater, 2017). Back then, children were the audience of the serious games, however, currently, it has been spread out to all generations (Allers et al., 2019; Needleman, 2017).


**Figure 3.12 :** *Oregon Trial* gameplay screenshot (Url-10).

The mentioned samples are the milestones of the serious games; however, prior to explaining more recent examples, we will introduce the possible related software for developing serious games in the next part.

#### 3.2.2.1 Related software

Following the film production strategy in the cinema business, the game industry involves large multidisciplinary groups carrying various professions to develop digital games (Moulthrop, 2020). The sector companies mostly use *Unity* (Url-11) and *UnrealEngine* (Url-12) as the lead game engines of the market (Barbara, 2020). Nevertheless, the emergence of hypertext games enabling interactive fiction

development reduced the variety and number of professionals to few authors. Thanks to this, the gap separating the programmers and non-programmers is bridged (Moulthrop, 2020). Numerous studies investigated various text-based tools, namely *Twine* (Url-13), *Inform 7* (Url-14), *Padlet* (Url-15), considering their advantages and disadvantages. While we will discuss the *Twine* platform further in detail, according to Moulthrop (2020), *Inform 7* (Figure 3.13) generates virtual worlds through English syntax; Cruzeiro (2020) describes *Padlet* (Figure 3.14) as a similar platform to *Twine*, with a more educational nature.

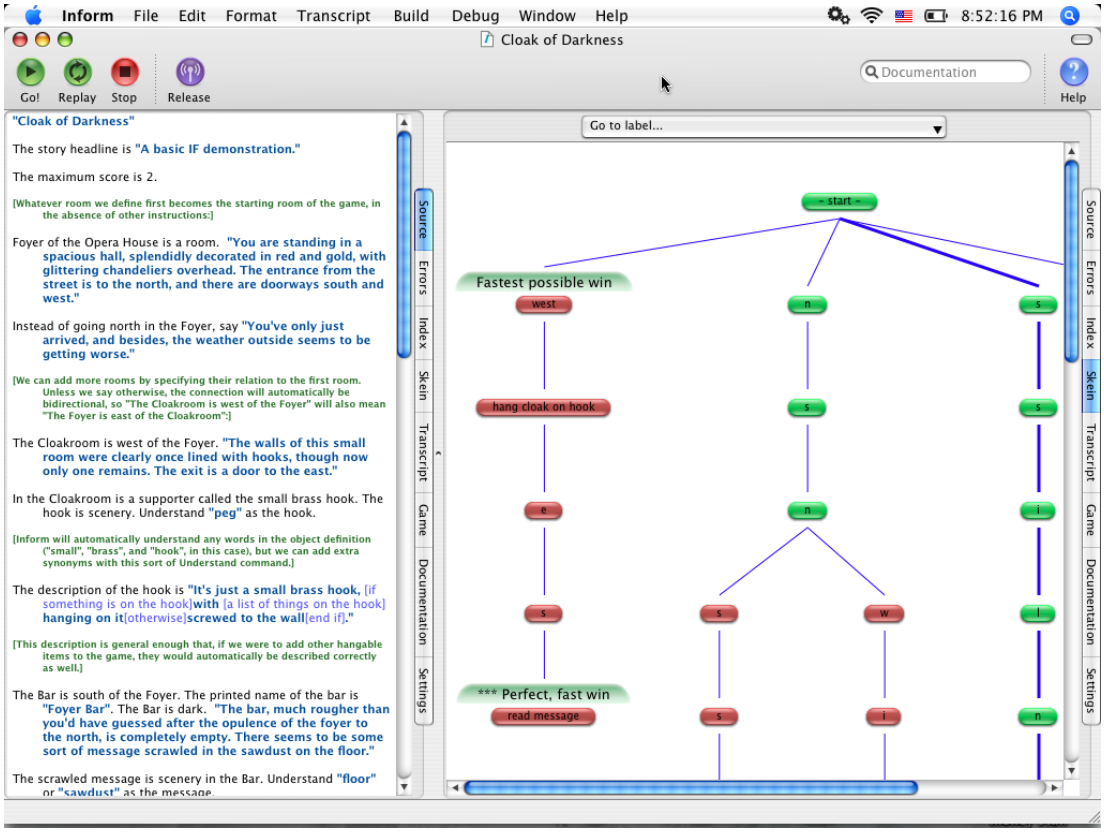


**Figure 3.13 :** *Inform 7* screenshot (Inform, 2022).

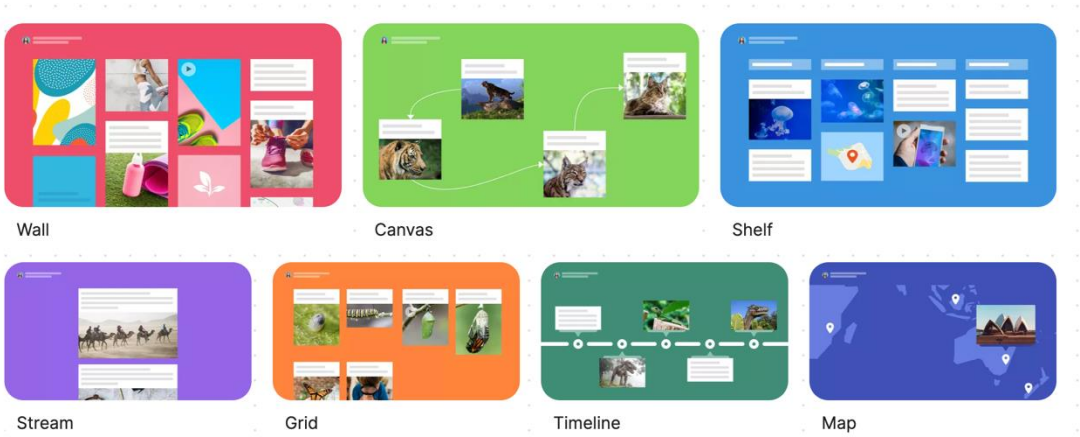


**Figure 3.14 :** *Padlet* screenshot (Url-15).

In addition to text-based tools, *Scratch* (Url-16), *Stornaway.io* (Url-17), and *3dvista Virtual Tour PRO* (Url-18) are examples of easy-to-use tools, with no need for coding, which are more visually enhanced. *Scratch* (Figure 3.15) is a programming environment created by MIT Media Laboratory. The novice coders can drag and drop LEGO bricks like solving a puzzle and develop interactive animations, games, and simulations. They can share what they created with the *Scratch* community for revisions (Brennan and Resnick, 2012; Maloney et al., 2008; Nikiforos et al., 2013; Resnick et al., 2009). Further, we will explain *Stornaway.io* and *3dvista Virtual Tour PRO* more comprehensively.


**Figure 3.15 :** *Scratch* screenshot (von Wangenheim and von Wangenheim, 2014).

**Twine**

*Twine* platform (Figure 3.16) is a great instance for developing interactive text-based fiction. It is a free and open-source tool with a supportive community and plenty of tutorials. It is enough to connect passages in the platform to generate your game's story. It is possible to simply develop a text-based game or enrich it with perfectly designed visuals and audio to export it as *HTML* web pages. The developer can integrate it with *Twine macros*, *HTML*, *CSS*, and *JavaScript* to make it as complicated as possible. The branching system of the connected passages enables the game writer to think with a non-linear sense to produce stories with multiple endings. However, the platform can be used only for the storytelling part of complicated games when combined with *Unity* and *DooM* (Url-19), professional gaming engines (Alstergren et

al. 2020; Anderson and Smith 2021; Barbara 2020; Boom et al. 2020; Cruzeiro 2020; Hargood 2018; Moulthrop 2020; Not and Petrelli 2019; Vrettakis et al. 2019). Due to previous experiences, Game Jams and few-hour workshops are proper to educate the participants well enough about the platform for further deeper diggings. In this way, any professional will be able to convey the content of their expertise through easy-to-develop serious games (Boom et al. 2020). Many domains are currently using *Twine* as a cost-effective and accessible platform. MorningstarKywi and Kim (2021) tried to educate the players on pharmacy-related clinical decision-making; Muhammad (2020) developed branching storytelling for English language tutoring in a conversation chatbot. Twine is also used to convey cultural heritage-related information, as well as for developing other storytelling tools, namely, *StoryPlaces* (Hargood 2018), *BEACONING* (Cruzeiro 2020), *Narralive* (Vrettakis et al. 2019), *DreamScape* (Alstergren et al. 2020).

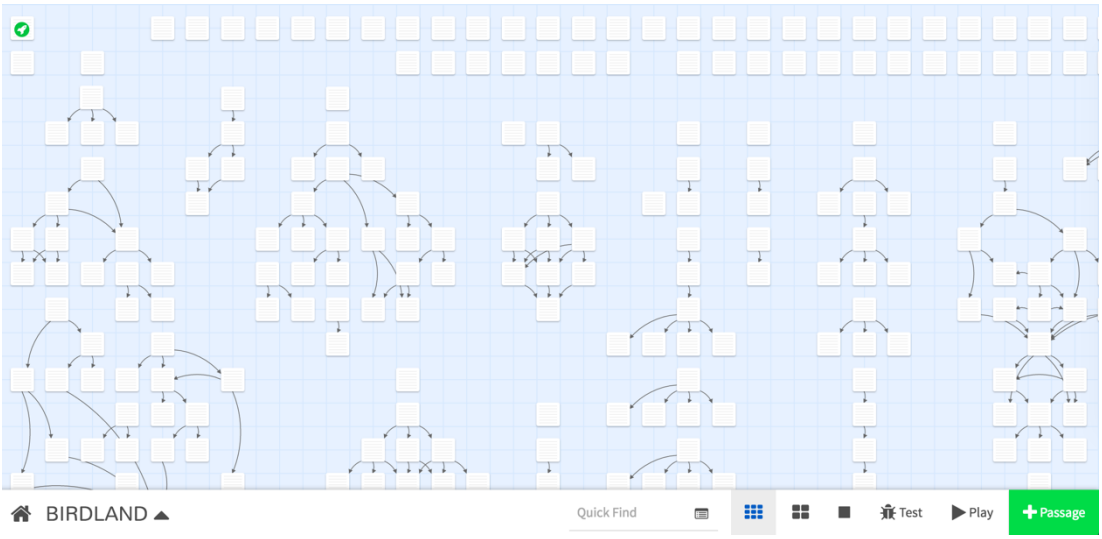


**Figure 3.16 :** *Twine* screenshot (Url-13).

**Stornaway.io**

*Stornaway.io* is a tool enabling interactive, branching, and nonlinear video story-making. The generated videos or games immerse the audience and encourage them to rewatch and replay it several times. Similar to Twine, it lets the viewer have a personalized journey, even more appealing in terms of visuality. It is pretty straightforward to upload and connect the videos without any coding knowledge (Figure 3.17). Moreover, with the easily defined buttons and time bars for videos, players can choose what they want to experience as their next story step. It is a newly published platform and is getting updated with additional features. It lets the users

upload their 360° videos for a more immersive adventure as a currently added capability. The results can be published on its web page and embedded in the developers' websites (Url-17).

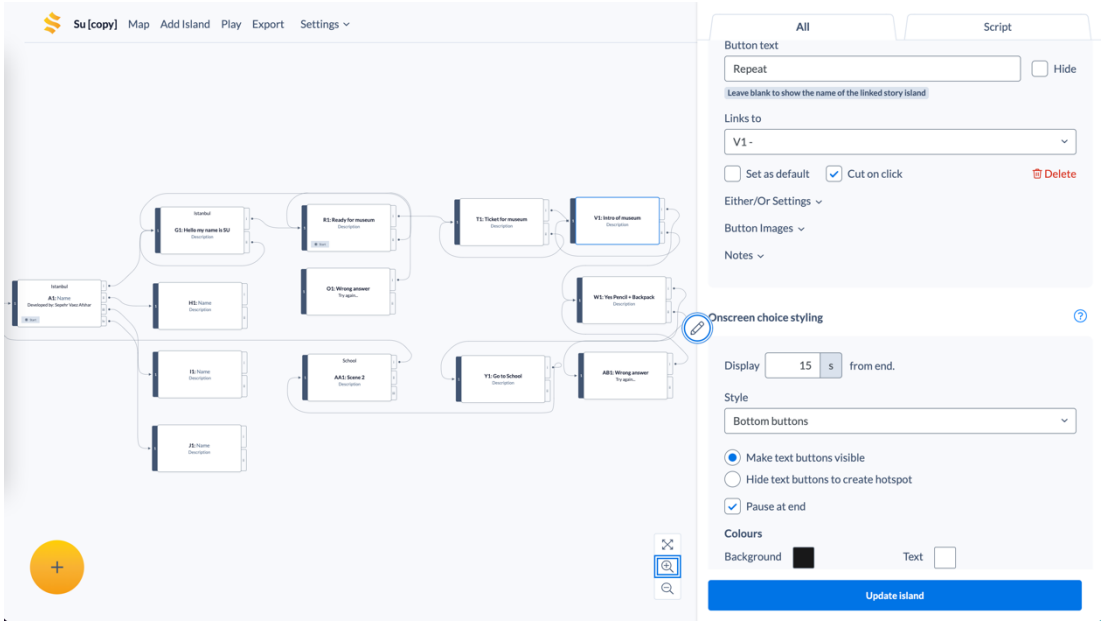


**Figure 3.17 :** *Stornaway.io* screenshot.

### 3dvista Virtual Tour PRO

*3dvista Virtual Tour PRO* (Figure 3.18) enables interactive virtual tour creation through 360° images.

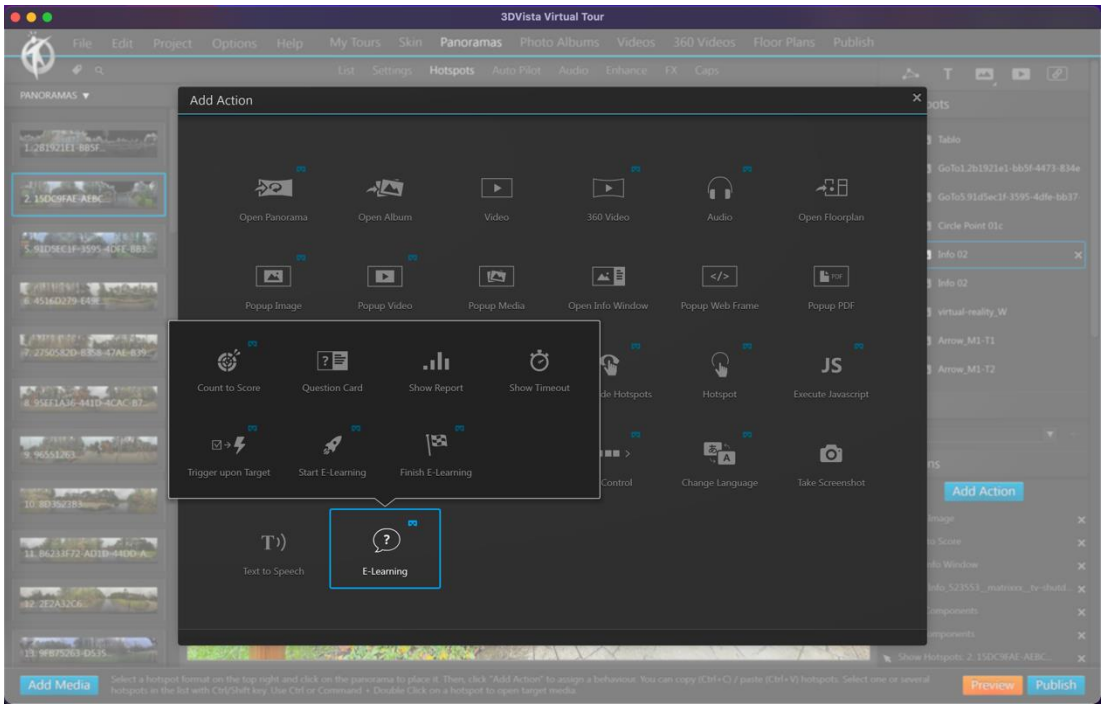


**Figure 3.18 :** *3dvista Virtual Tour PRO* screenshot.

It allows adding texts, URLs, media such as audios, videos, photos, etc., on your 360° tours. Through these capabilities, the generator can make the content more immersive and interactive for the end-user (Nemtinov et al. 2020). Its results are compatible with various Web browsers run on all smart devices and VR apparatuses. With the recently integrated e-learning functionalities, the software paved the way for creating educational tours. Features like question cards, scoring system, and reporting capability allow the user to create entertaining educational or non-educational games such as treasure hunts, however, it is not originally developed for gaming. Regarding the literature, while the tool is used for virtual tour-makings (Perdana et al., 2019), it is challenging to find any study that takes advantage of *3dvista Virtual Tour PRO* for the sake of game development.

#### 3.2.2.2 Serious game case studies

As stated previously, plenty of fields is currently using serious games to educate their audience with entertainment in their particular topic. *The Fort Ross Virtual Warehouse* in the area of historical landscape transmits the cultural heritage of a region and promotes consciousness to the player by immersing he/she in the provided data via a cultural virtual environment (Forte et al., 2012; Lercari et al., 2015). *SimCity* is a classic and well-known example in the urban planning domain, allowing the players to manage the city dynamics such as energy, economy, waste, etc., to develop settlements (Poplin, 2011). Linguistics also took advantage of the serious games. *Tactical Languages and Culture Training Systems* is one of the best samples of the field educating language and culture by letting them communicate and speak in various foreign tongues in the form of courses that served as immersive gameplay with the help of artificial intelligence. The players get engaged in the communications during the games and can pass the levels by speaking, allowing the language education based on the users' pace (Johnson and Valente, 2009). Video games can simulate an intended environment, letting the player repeatedly experience a specific activity until gaining expertise before trying it in the real world (Albar, 2014). Hence, as a great sample, the *PULSE* (Platform for Undergraduate Life Support Education) simulation serious game used in medical sciences to train students in life-supporting (Cook et al., 2012).

Discussing my previous background in the process of developing serious games, during my thesis, I tried alternative platforms and various fields with interdisciplinary

research groups to gain more expertise. *Yedikule Bostans* takes İstanbul's market gardens named *Yedikule Bostanları* survived despite the excessive urbanization growth and the *Theodosian Walls* associated with them into the subject. It aims to convey the importance of the cultural heritage and its maintenance ways. The text-based serious game developed by *Twine* is attracting the players' attention towards their perishing threat. The interactive time-traveling journey in the game uses audiovisual materials (Figure 3.19), fill in the blanks (Figure 3.20), and decision-making to transmit the farming culture, generally cultural landscape inherited from the ancient times and the milestones of the history leading to the destruction of these landscapes (Eshaghi and Örnek, 2020).


**Figure 3.19 :** Gameplay screenshot.


**Figure 3.20 :** Fill in the blanks.

The *Sericum Via* (Eshaghi et al., 2021) and the *Anatolian Journey* (Vaez Afshar et al., 2021c) are two serious games regarding cultural heritage, particularly caravanserais located on the Silk Roads, respectively about Safavid Iranian and Seljuk Anatolian ones. The *Twine* platform is used as the game development tool, and a comprehensive geolocational database has been generated regarding the known and unknown caravanserais with an accuracy-based methodology to locate them in QGIS. While the first study tries to figure out the factors in the game that distracted the players from the provided data, the second one evaluated the learning rate of the players in comparison

to the traditional educational methods considering the user feedback of the previous study (Figure 3.21 and Figure 3.22).

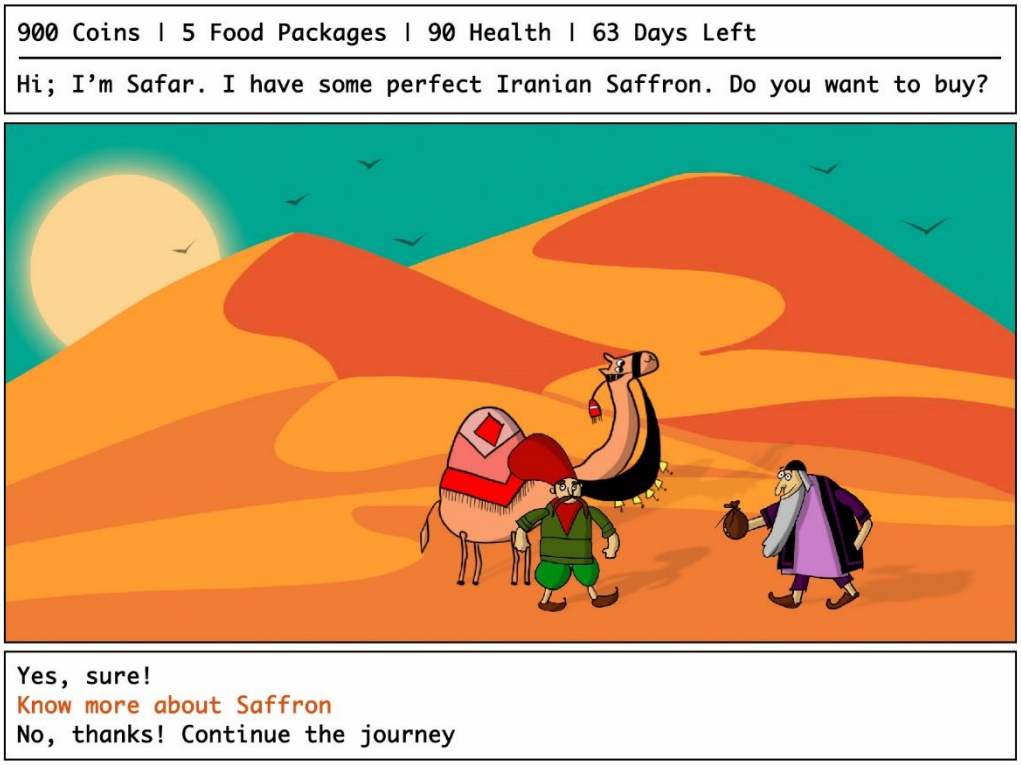


**Figure 3.21 :** The Sericum Via gameplay screenshot.

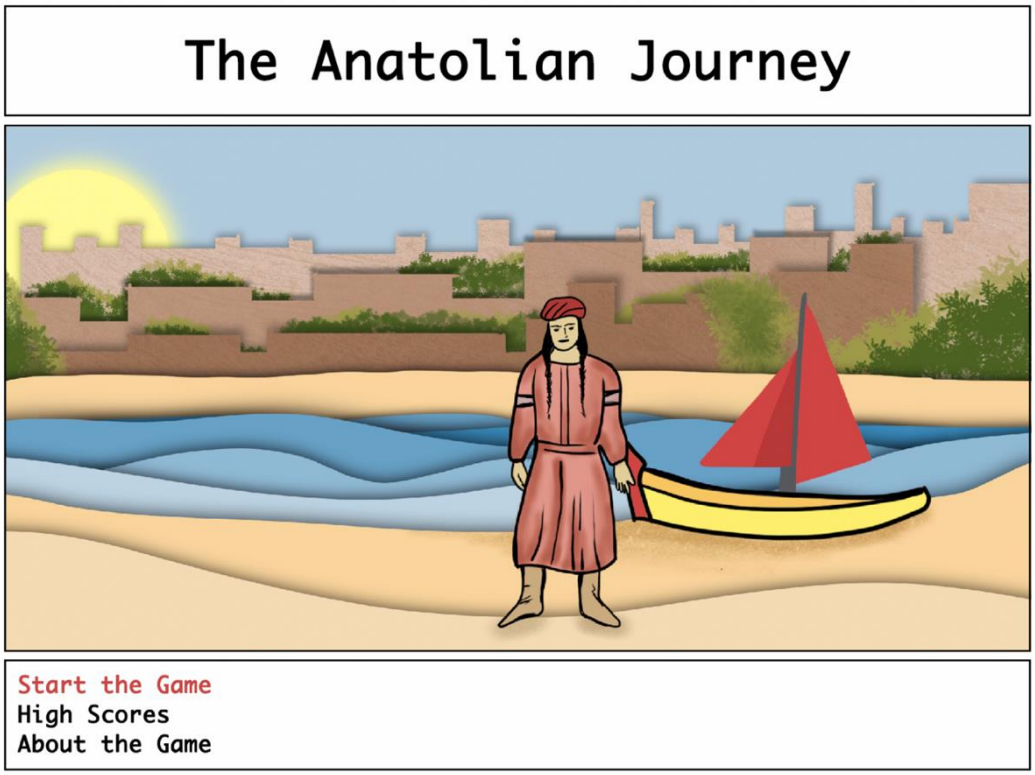


**Figure 3.22 :** The Anatolian Journey gameplay screenshot.

Using the *Twine* platform, we also developed a game-based orientation tool for freshmen design students, which can be used during the pandemic distance learning or later on the campus using QR codes (Figure 3.23). This tool aims to help tactile learner students with the needed technical tools, definitions, methods, software for them, and also the general campus map, contacts, and online and social platforms that *Istanbul Technical University* provides through the Architecture faculty (Vaez Afshar et al., 2021b).

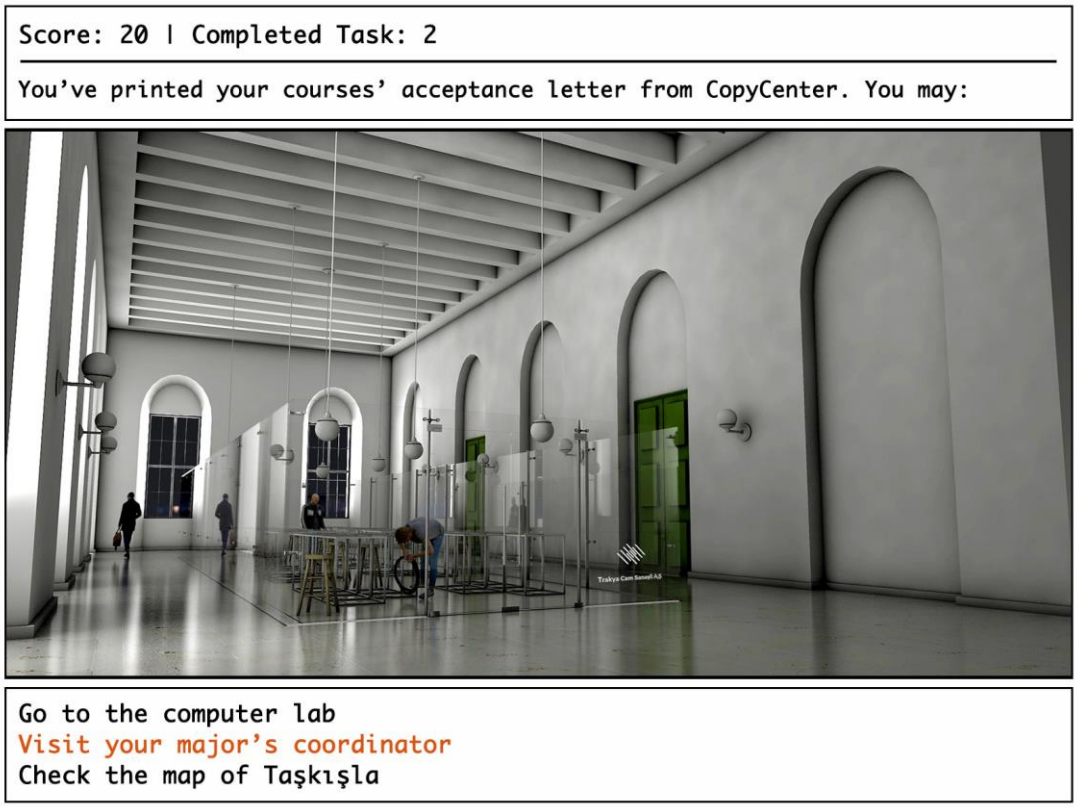


**Figure 3.23 :** Orientation tool screenshot.

Su is a serious game taking the world's water scarcity problem and its effects on the environment and landscape into the topic. With the increasing pace of population growth, human beings are being threatened with water accessibility. Hence, with its fatal importance, the water management issue needs to be educated to people for the sake of public awareness, specifically from an early age. To develop the game, we used the *Stornaway.io* platform. To be more visually appealing for the children, we used *Animaker* software (Url-20) which allows creating animations for non-professionals (Figure 3.24). This study focuses on Istanbul's dams' water level, inspired by a documentary named 25 Liters: In Pursuit of Water, cast by National Geographic Turkey. With its visually enriched nonlinear narrative, the game asks the

kids, as its target audience, to make their decisions wisely to survive in the drought situation they are facing. It teaches them the water's importance and its effect on the planet (Figure 3.25). The study aims to change the children's lifestyle to help the country in reviving its in-dangered future (Vaez Afshar et al., 2021a).

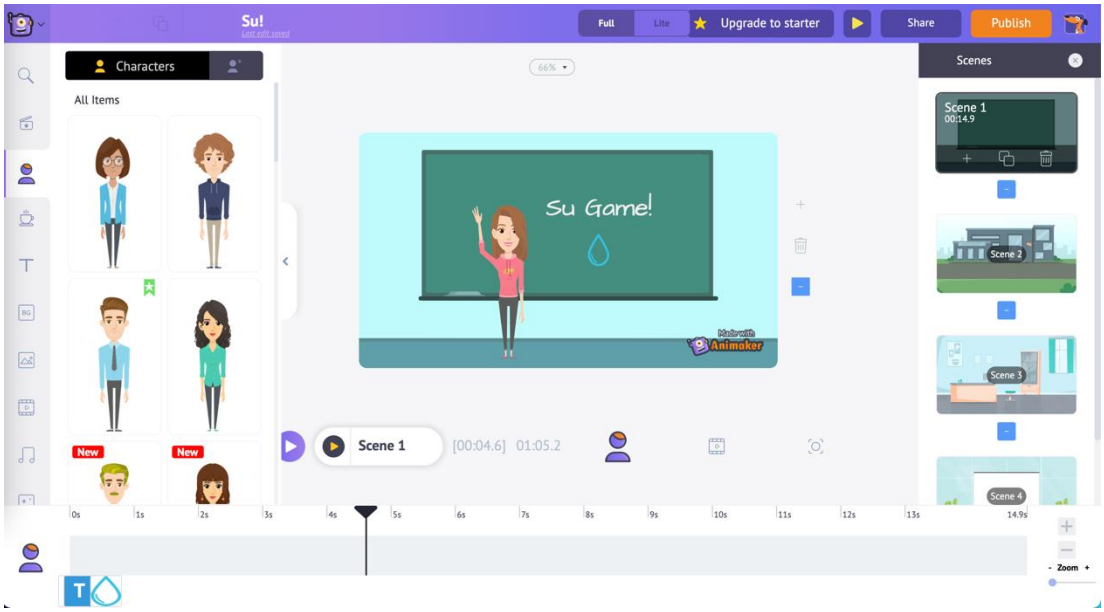


**Figure 3.24 :** *Animaker* animation design interface.

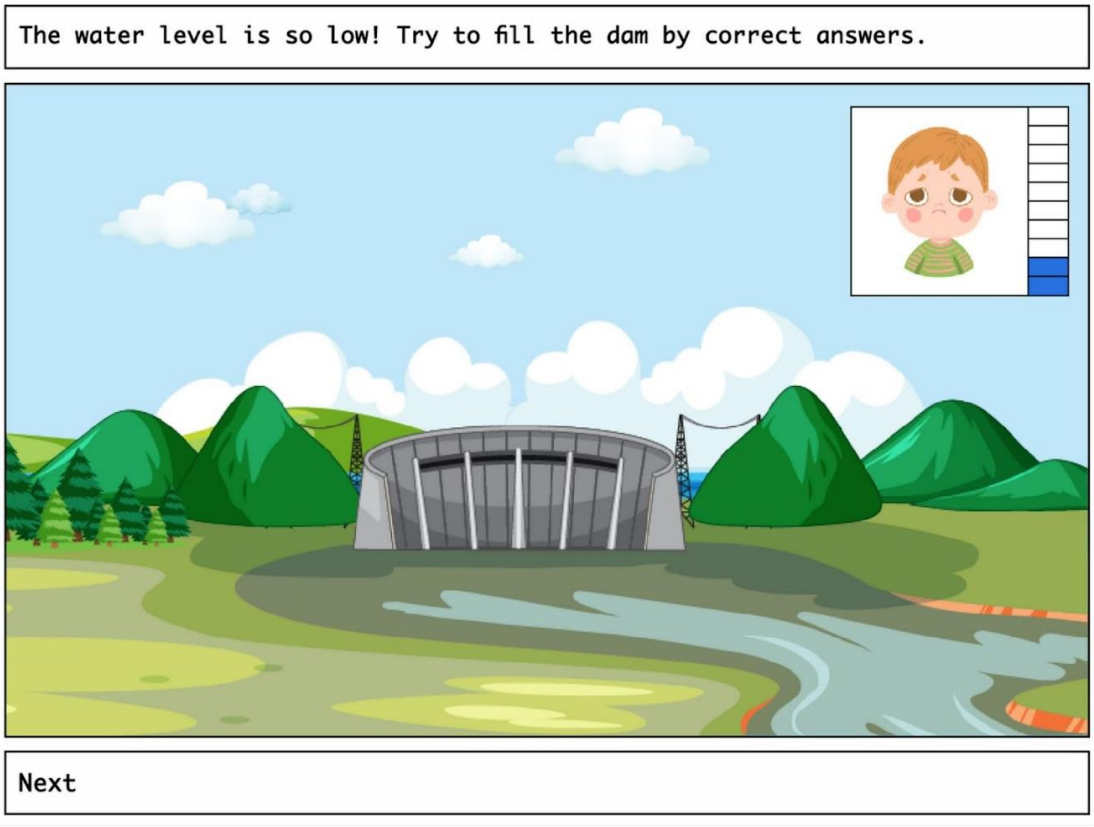


**Figure 3.25 :** Effect of wrong answers on the environment in the game.

# 4. RESEARCH

## 4.1 Purpose and Scope

Urbanization and its consequent urban sprawl caused by the population growth led to a rise in the urban settlements' size and number. Hence, humans fulfill the required land for this need by encroaching the public open spaces, including urban green areas, despite their importance regarding the benefit they carry for the ecosystem and the inhabitants.

The main purpose of this thesis is to enrich the park experience for the visitors by introducing the park including the educational content during an entertainment activity through a locative serious game. The public awareness raised by this game will lead to the preservation of the urban green spaces. The game will use behavior framing by generating a sense of placeness in both in situ mobile game and its remotely playable desktop version. The thesis selected Atatürk urban forest park as its study area for the game development.

## 4.2 Study Area: Atatürk Urban Forest Park

Atatürk urban forest park, previously known as Hacıosman Grove, is located in Sarıyer district of Istanbul, surrounded by Hacıosman, Derbent, Ferahevler, and Darüşşafaka neighborhoods. Administratively, it is affiliated with the Istanbul Metropolitan Municipality (IMM). With its current name, on May 18, 2020, it got inaugurated symbolically due to the pandemic limitations. The park covers more than 1,000 acres with three ponds and hiking trails. After its recent renovation, the park includes spaces such as a cafeteria, sports field, children's playground, open parking lot, toilet, urban agricultural areas, disabled elevator, festival area, and viewing area. The mentioned walking tracks are named Çıtkuşu Track, Water Track, and Forest Track, with respectively 1.8 km, 2.8 km round trip, and 3 km length. Therefore, the total walking track reaches 12 km. It has eight entrances called South Gate, Darüşşafaka Metro Gate, West Gate, Bostan Gate, Hacıosman Metro Gate, North Gate, East Gate, and Pond Gate. All roads of Atatürk urban forest park are illuminated with street lamps, and benches and trash cans have been placed (Milliyet, 2020).

Regarding the flora, the park contains more than ten tree species. As listed on the park information panel (Figure 4.1), Pinus brutia, Quercus infectoria, Pinus nigra, Prunus, Pinus pinaster, Cupressus, Populus alba, Populus tremul, Pinus pinea, Juglans, Pinus sylvestris, Quercus frainetto, Quercus petraea, Alnus, Fraxinus are amongst the existing trees. Apart from these, there are fruit trees such as figs, apples, cherries, and hawthorn in the forest. The bushes existing in the park can be listed as Phillyrea, Arbutus unedo, Corylus, Spartium junceum, Daphne pontica, Quercus ilex, Cornus mas, Lavandula stoechas, Ligustrum, Cistus, Crataegus monogyna, Mespilus germanica, Osyris alba, Rosa canina, and Erica. There are many types of flowers in the Atatürk urban forest park. Major roadside flowers include Veronica spicata, Lamium, Primula, Viola, Ranunculus, Sanguisorba officinalis, Potentilla erecta, Asteraceae, Medicago sativa, Trifolium incarnatum, Geranium, Lathyrus montanus, and Vicia pannonica. Amongst the endemic plants of this park, Pilosella, Lathyrus odoratus, Symphytum officinale, Euphoria, and Lilium martagon can be mentioned (Atatürk Kent Ormanı, 2021).

Atatürk urban forest park provides a rich environment for bird species with its wide and diverse vegetation and ponds. In addition to a few Carrion Crows, the most common bird species in the forest are Eurasian Robin, Eurasian Wren, Eurasian Blackbird, and Nightingale. While an average of 15 bird species live in Istanbul's other parks, this number reaches 30 in the Atatürk urban forest park. Kingfisher, Mallard, Pygmy Cormorant, Waterfowl, and Gray Heron live in the ponds at the bottom of the valley. Parrots also live in the grove, although they are not settled. The most appropriate lookout points for the existing birds and the breeding, resting, feeding, and wintering areas of birds living around ponds are marked on the park maps. Vadidibi Pond is the breeding ground of Mallard duck, Waterfowl, and Kingfisher. The blackberries between the big Pond and the Little one are also the breeding grounds for Nightingales and the wintering ground for Blackbirds. Small Pond is the resting and feeding area of Cormorant, Kingfisher, and Gray Heron (Atatürk Kent Ormanı, 2021).

The World Urban Parks has chosen the Atatürk urban forest park as one of the top 5 parks of 2020 (Url-21). Due to its rich flora and fauna, the park is a highly valuable area in a metropolitan city like Istanbul in terms of a relaxing nature for the citizens, in the city's heart with feasible accessibility. Hence, the thesis selected this urban green area for its aim, preservation.

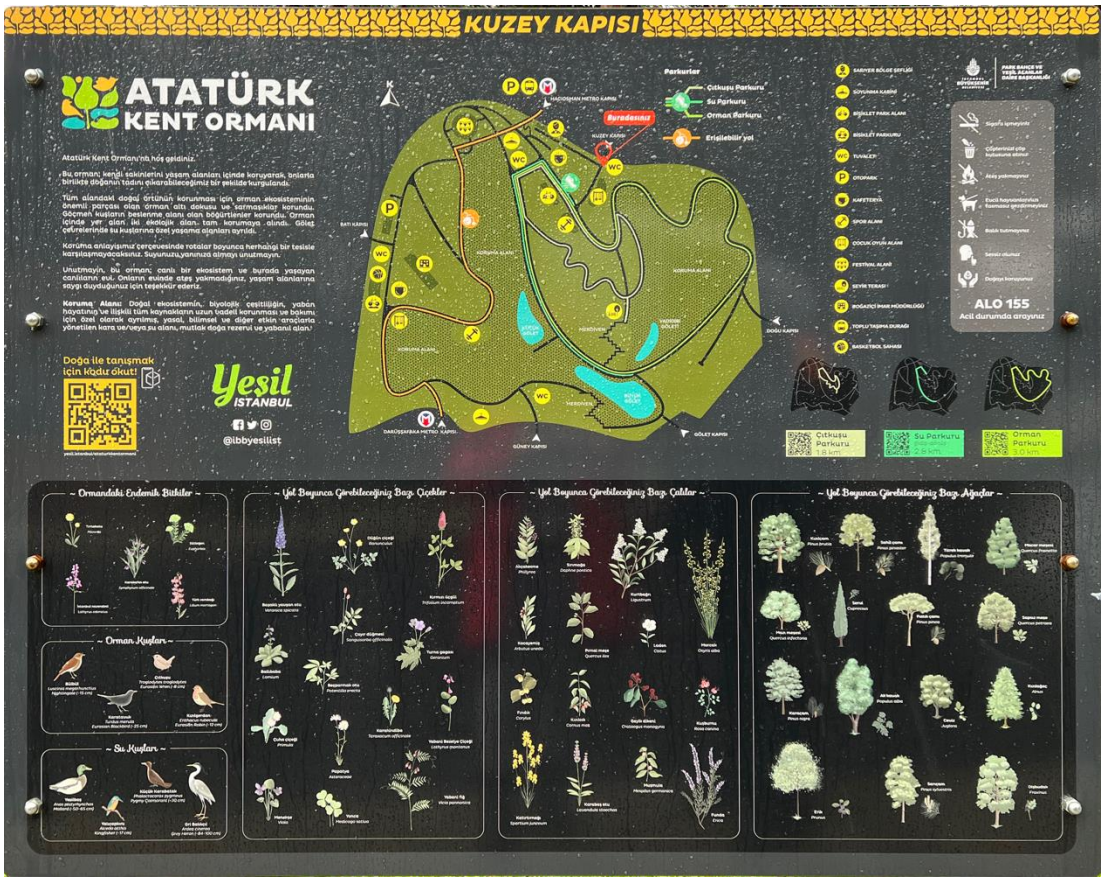


**Figure 4.1 :** The sample of park information panel (North ).

### 4.3 Game Development

Previously mentioned, this thesis aims to end up developing a locative serious game. As discussed in the gamification part, locative games use location-based technologies via location-related devices and apps. However, as mentioned in Agent P's World Showcase Adventure sample, location-based games do not necessarily need GPS technology. It is possible to guide the player to the correct location only through clues, hints, and images, similar to ancient letterboxing games. Generally, these media influence people's sense of place and engage them differently with the surrounding environment, enhancing their urban experience.

On the other hand, using experimental media like 360° videos is recommended for digital storytelling to have engaging experiences through VR technology (Sylaiou et al., 2018). Apart from Head-Mounted Displays for being involved in the world of 360° media (Argyriou et al., 2020), users can adopt low-cost smartphones, inexpensive VR headsets, and VR apps that facilitate viewing VR-supporting games and 360° videos and panoramas more than before (Vishwanath et al., 2017). However, according to

Alamäki et al. (2021), low-cost VR headsets decrease the user experience due to the complexity of the setup, leading to distraction from the content, compared to simply watching 360° videos or photos.

### 4.3.1 Visual Material

Considering the discussed issues, the thesis chose 360° panoramic photos for the game development process as the visual material. Hence, the study opted to operate a 360° panoramic field photography. In this regard, 360 cameras and action cameras are an option to be used as a low-budget, fast, efficient, lightweight, and high-resolution tool (Prittinen, 2021). *GoPro* cameras, *GoPro Max*, i.e., is one of the currently available 360 action capturing devices in the market. Despite their relatively low prices, as a thesis project, a more cost-efficient device would be beneficial in terms of financial issues and innovativeness in using the available devices in hand. Hence, the thesis sought how to enable 360° photography with smartphones. Amongst the existing tools, *Panorama 360 & Virtual Tours* (App Store, 2015) application, compatible with iOS devices, seemed to be the most efficient and sufficient shortcut (Figure 4.2).

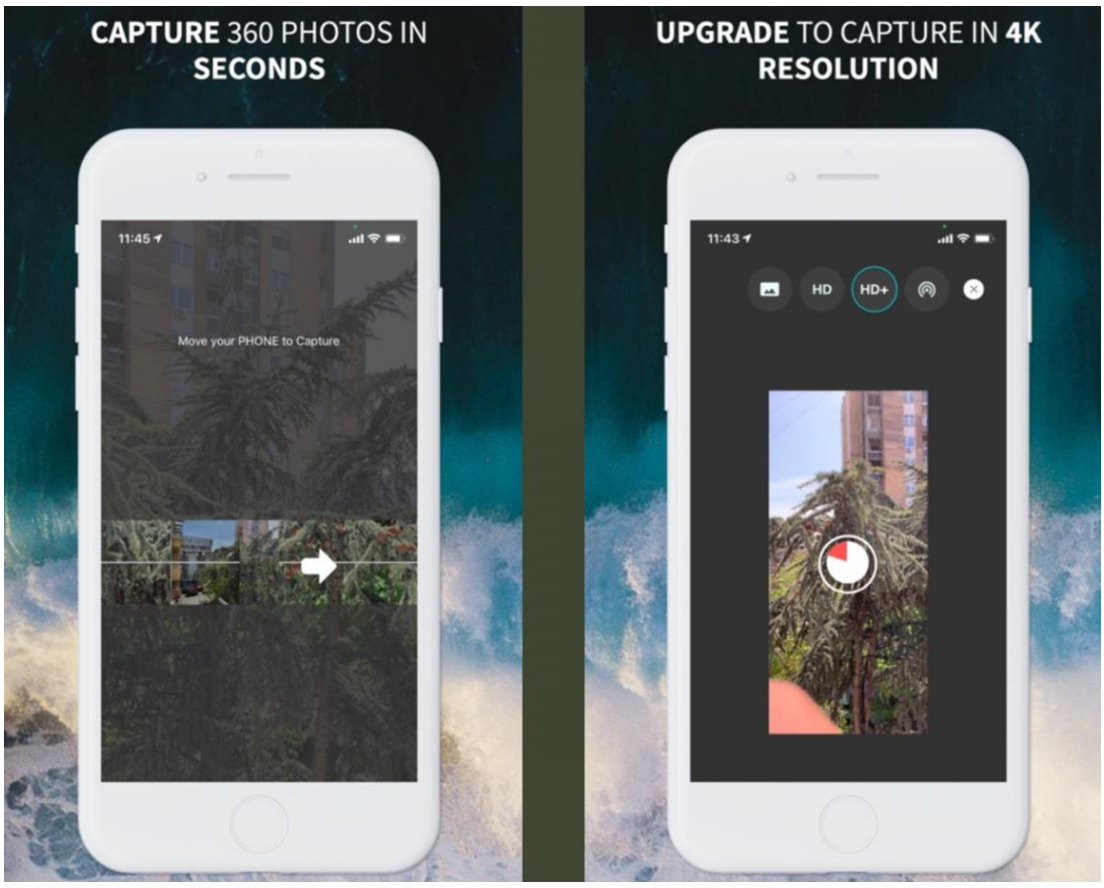


**Figure 4.2 :** *Panorama 360 & Virtual Tours* application.

Via the application's free trial, the 360° views of the parks' intended areas have been captured. Considering the pros and cons of this method, the resulting photos lack the sky and the ground view for having a comprehensive 360° experience as possible in the *GoPro Max*. However, since a tripod stand is needed in the *GoPro* shootings, visible in the final captures, needing further edits to be concealed from the scene, the smartphone photography outcomes are instantly ready to be used without any post-editings.

### 4.3.2 Development Process: *ApocalyptiCity*

Discussed in chapter three, related software for serious game development section, the thesis introduced *3dvista Virtual Tour PRO* tool, which enables interactive and immersive virtual tour making, using 360° images. Hence, with the park's captured 360° photos, a virtual tour of the park had been made at the first stage, enabling the user to walk around and experience the park remotely. Due to the research's intended aim, the study should consider a narrative conveying the game's story. The game's initial story depicts the planet in a catastrophic condition in which humans abandoned and moved to Mars. A group of researchers is seeking plants and animals in the only untouched location of the earth, Atatürk urban forest park, for transporting to Mars. Hence, the main character of the game, the scientist, asks the player to help him gather the required elements and teaches environmental and nature-related information to the player during the gameplay. The game has a shocking atmosphere at its start, encountering the player with the possible future of the earth (Figure 4.3).

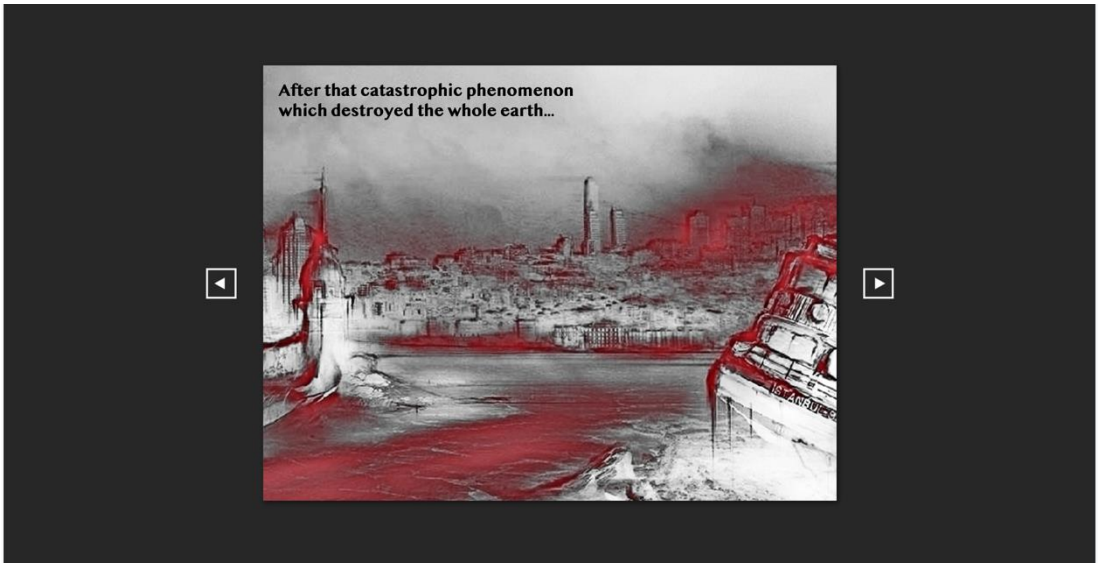


**Figure 4.3 :** Game's story (Visual credit: Url-22).

Hence, it is named *ApocalyptiCity*, depicting the post-apocalyptic version of Istanbul. It asks the player to choose the entrance he/she wants to start the game. However, since the game is in its alpha version and is developed as a pilot test, only the North Gate is working (Figure 4.4). The intended story is being conveyed to the player with the help of visually transformed digital arts of Cihan Engin, post-apocalyptic Istanbul and Ankara works (Url-22), accompanied with a piece of dramatic background music.

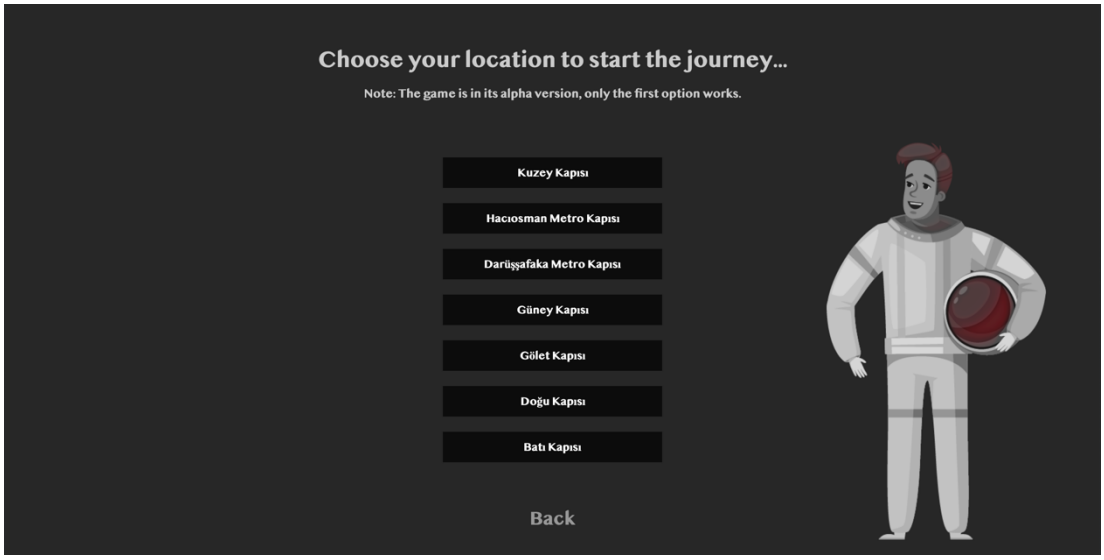


**Figure 4.4 :** Selecting the starting gate.

As mentioned, *ApocalyptiCity* aims to entertainingly introduce the park and its existing facilities while conveying educational content to the players (Figure 4.5).


**Figure 4.5 :** The provided data available on the park panels.

To do so, it uses the fauna and flora-related information on the park's panels, cultural data from online resources, and general information about appropriately behaving the environment. To add these data to the previously generated virtual tour, the thesis uses the e-learning capability of the software to develop a game. The software allows adding any kind of media like images, videos, links, soundtracks, PDFs, and texts. This allows the game to convey the currently available data in the form of QR codes on the panels, in addition to many others (Figure 4.6).

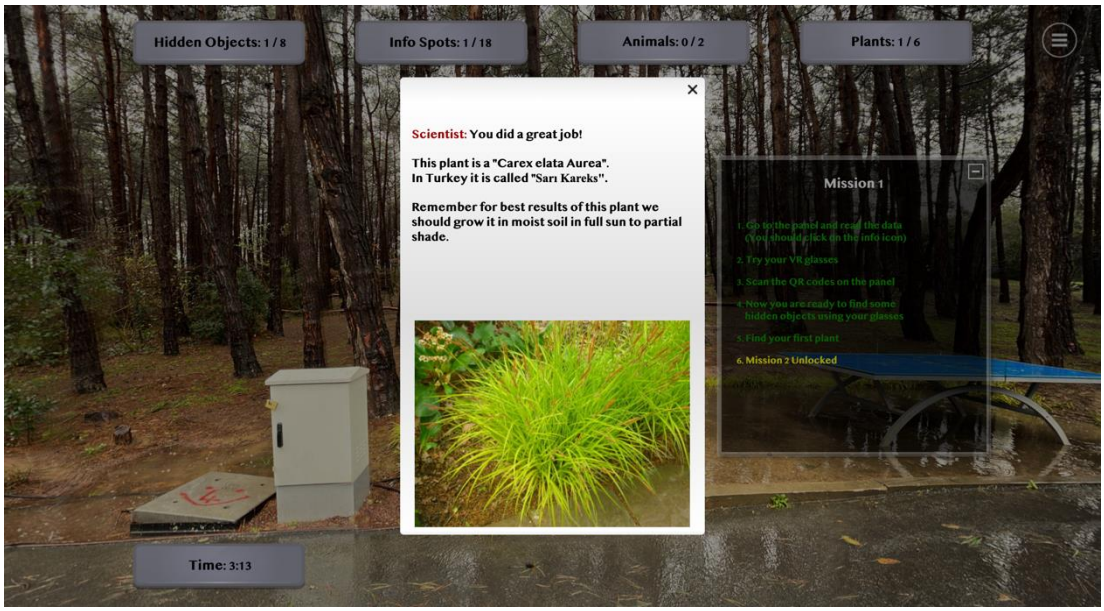


**Figure 4.6 :** The provided flora-related data.


**Figure 4.7 :** The dramatic mood in the game scenes.

*ApocalyptiCity* also stirs up people's emotions by demonstrating the living paradoxes regarding the now and the future. It temporally occurs in the current day's future, and

the scenes have a rainy and dramatic mood, empty of any people and emotion (Figure 4.7). However, via a radar feature enabled through a VR glass, the player is able to see the current scene differently. This difference is shown by visually enhancing and editing the captured photos. While in some conditions, the glass displays the communities' relations regarding the past, combined with emotion triggering audio (Figure 4.8), in some cases, it may reveal some hidden objects conveying behavior framing advice or fauna-related data (Figure 4.9).

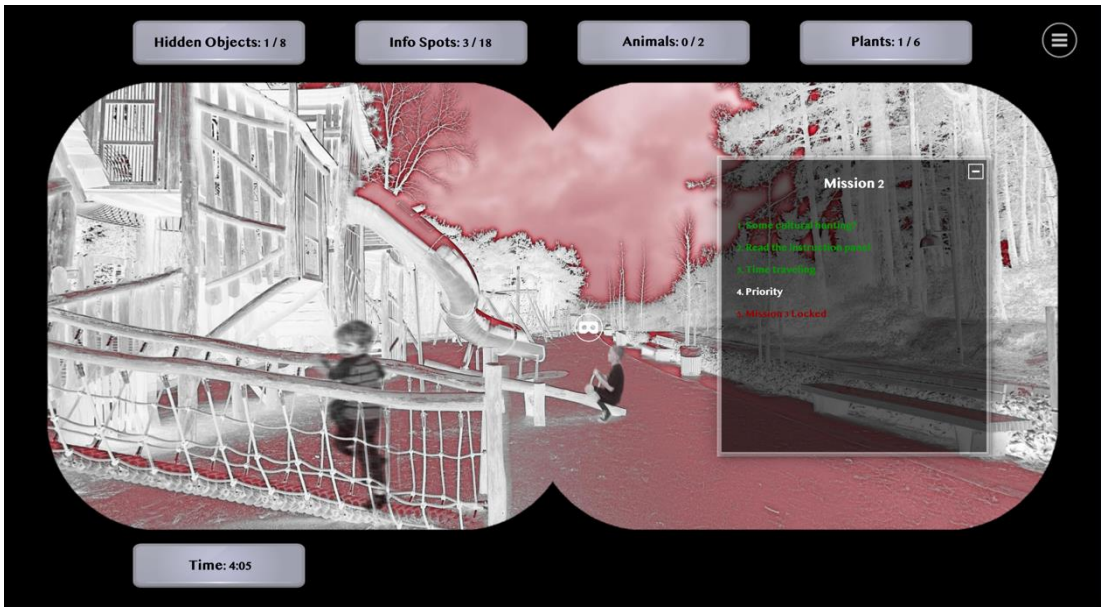


**Figure 4.8 :** The VR glass with the radar feature showing the past.


**Figure 4.9 :** The provided fauna-related information.

Thanks to the scoring, reporting, and elapsed time viewing capability of the software, the player can monitor his/her performance. Since *ApocalyptiCity* has a treasure hunt

concept, the player, with the guidance of the hints shown on the screen, tries to find hidden game elements: plants, animals, information spots, and educational points, to do the given tasks for proceeding further in the game. However, the players may experience various destinations based on their starting point and non-linear decisions. Hence, the scoring part placed on top of the scene demonstrates their achievements during the gameplay. Also, the elapsed time shown on the left bottom of the screen shows the time the player spent in the game or walked in the park in the case of onsite playing.

*3dvista Virtual Tour PRO* provides HTML-based exports, which can be launched as a web page and run in any web browser. As a web page, the users can play the game both on desktop and laptop devices remotely at home and on their smartphones at the park. It is also compatible with virtual reality devices, providing immersive gameplay to the user. In both versions, *ApocalyptiCity* tries to frame the players' behavior in park usage, leading to its preservation and increasing their tendency to visit the park by enriching their experience in mobile version.

The game's alpha version is available at the following link: https://drweeb.com/game/ApocalyptiCity/. The current version of the game (1.1) is responsive for desktop browsers and the landscape mode of smartphone browsers.

# 5. FINDINGS

## 5.1 Survey

To evaluate *ApocalyptiCity*'s success, the thesis conducted an online survey consisting of gameplay, followed by a Google form questionnaire. However, as mentioned about the pandemic situation, inspired by the occurred conditions, the thesis conducted the survey based on the remotely played version to evaluate players' virtual park visit experience for similarly limited periods of physical visits or for disabled people.

To do so, the game and the Google form links were spread out on social media accounts of the school and faculty and shared with other acquaintances asked to fill out the form after the gameplay. The survey questionnaire includes two main parts. The first part contains questions related to the general information and the park usage pattern of the participants. The park usage questions differ for those who visited the park before and those who did not. The second part of the form asks the participants' perception after gameplay, which again provides various sets of questions for two different groups, visited the park or not.

In the general information part, the form asks the age range, gender, education level, paternity or maternity condition, the possibility of having any disabilities, and whether the participant visited the park before or not. Afterward, the attendant encounters related questions based on the response to the last question. If he/she previously visited the park, the form asks the reason for the visit, the frequency, and the spent time limit. On the other hand, if the answer was no, it asks if they heard about the Atatürk forest urban park, did they planned to visit, and if not, what is the reason.

The second part of the questionnaire related to the perception after gameplay asks the first group whether they realized the panels and the QR codes in their previous visits or not and if they will pay more attention in their next visit. Additionally, they are asked whether they got aware of the park's natural assets and are interested in visiting the park again. The other question is the players' curiosity about figuring out the plants and animals in the park. Finally, they had been asked if the game was more immersive than a simple virtual tour, whether they may play it onsite if the mobile version of the game was available, and its possible effect on their visit frequency and period.

Regarding the second group, it asks the players does the game interest them to visit the park, and if they are not capable of visiting, does the game make them fill in the park? The same questions about the QR codes, panels, natural assets, and animals had been asked to them regarding their possible visit to the park. The immersion level of the game and the question about the mobile version were amongst the questions again.

### 5.2 Results

Regarding the study results, a total number of 60 attendees participated in the survey. Among the participants, while 40% were male, 60% were female. Approximately all of the participants were in the age range of 18 to 40. Except for one high school student, the rest consisted of 15% Ph.D. students, and an approximate percentage of 82 had college studies degrees. Apart from two attendees with children, the rest had no children, and non of each suffered from any disabilities. Additionally, while 77.5% of the participants did not visit the park before, 22.5% previously visited the Atatürk urban forest park (Table 5.1).

**Table 5.1 :** General information.

| Age | | Gender | | Education | | Visited | |
|---|---|---|---|---|---|---|---|
| 18-40 | 97.5% | Female | 60% | College | 82.5% | No | 77.5% |
| 40-60 | 2.5% | Male | 40% | Ph.D. | 15% | Yes | 22.5% |
| | | | | High School | 2.5% | | |

Those who visited the park mentioned walking, relaxing, picnic, being in nature, and physical activity as their reason for their visit. However, walking with 78% and relaxing with 67% were the most mentioned reasons. Regarding their frequency of visit, while more than half of them, around 56%, visited only once, 34% declared they visit the park once a month or less, and the rest mentioned once a week or less. Finally, more than three out of four participants stated they spent more than one hour on their park visits (Table 5.2).

**Table 5.2 :** The usage pattern for people who visited the park before.

| | Question | Top Two Answers | | | |
|---|---|---|---|---|---|
| | | 1st | | 2nd | |
| Visited | Purpose of Visit | Walking | 78% | Relaxing | 67% |
| | Frequency of Visit | Only Once | 56% | 1/Month | 34% |
| | Spent Time | > 1 Hour | 78% | < 1 Hour | 22% |

While more than half of the people who did not visit the Atatürk urban forest park yet, even did not hear about it, 78% of them had planned to make a visit. However, those who do not want to visit mentioned that they assume it is a typical park (Table 5.3).

**Table 5.3 :** The usage pattern for people who did not visit the park before.

| | Question | Yes | No |
|---|---|---|---|
| Not Visited | Heared Before | 49% | 51% |
| | Planned to Visit | 78% | 22% |

In the first group who visited the park previously, 45% of the attendees answered that they did not realize the panels and the QR codes in their previous visit. Additionally, 78% of them stated that the game helped them become aware of the park's natural assets and made them interested for a next visit. Furthermore, 89% of the participants declared they got curious to look for the plants and the animals the game introduced to them. Finally, 67% of the people who participated in the survey found the game more immersive than a simple virtual tour, and they said that the mobile version of the game would raise their tendency to visit the park and play it on site (Table 5.4).

**Table 5.4 :** The perception after gameplay for visited people.

| | Question | Yes | No |
|---|---|---|---|
| Visited | Realized panels and QR codes? | 55% | 45% |
| | Help to be aware of the natural assets? | 78% | 22% |
| | Interest you to visit the park again? | 78% | 22% |
| | Curious about figuring out plants and animals? | 89% | 11% |
| | Immersive more than a simple virtual tour? | 67% | 33% |
| | Play mobile version onsite ? | 67% | 33% |
| | Mobile version raise your tendency to visit? | 67% | 33% |

On the other hand, a great percentage, 97% of the people who did not visit the park prior to playing the game, announced that, while it made them feel they were in the park while playing remotely, it also interested them in visiting the park. 88% of the participants mentioned that they would pay attention to the panels and the QR codes if they visit the park. Additionally, respectively 97% and 91% of the attendees said the game made them aware of natural assets, and they are curious to figure out the plants and the animals in the park. Furthermore, while 84% of people found the game more immersive than a simple virtual tour, only 74% convey their eagerness to play the mobile version of the game on site. They also note that this will motivate them to visit the park (Table 5.5).

**Table 5.5 :** The perception after gameplay for not visited people.

| | Question | Yes | No |
|---|---|---|---|
| Not Visited | Interest you to visit the park? | 97% | 3% |
| | Induce you the feeling of being in park? | 97% | 3% |
| | Pay attention to panels and QR codes? | 88% | 12% |
| | Help to be aware of the natural assets? | 97% | 3% |
| | Curious about figuring out plants and animals? | 91% | 9% |
| | Immersive more than a simple virtual tour? | 84% | 16% |
| | Play mobile version onsite? | 74% | 26% |

The survey results show that the game heightens the people's interest in visiting the park and physically encountering what the game makes them aware of. It is obvious in the answers of the people who did not visit the park before. While only 78% of them had planned to visit the park prior to playing the game, this number raised to 97% after the gameplay, proving the game's effect on the behavior farming and motivation to interact with the urban green areas.

Additionally, the high portion of answers to the questions concerning the awareness regarding the panels, natural assets, plants, and animals depict that most people who even visited the park were not aware of these kinds of information, which highlights the game's influence on the development of public awareness. The given information to the players in the game and on the panels, which the game catches the attention towards, changes the visitors' bahevior leading to the preservation of the natural environment. Furthermore, the outcomes declare that the mobile version of the game simultaneously would raise the people's tendency to visit and increase their visit frequency.

Regarding the participants' general feedback about the game, some critics like the complexity and difficulty of the game and the need for more enhancement in the visuals were valuable ideas worth to be considered in the continuation of the game's development.

# 6. CONCLUSION AND DISCUSSION

Due to the excessive population growth and the subsequent urbanization causing urban sprawl, the size and number of urban settlements are increasing. Hence, people seize the required land for this expansion by sacrificing the public open areas, most importantly urban green spaces. Urban parks, specifically urban forest parks, serving as recreational green public spaces are crucial for the humans and ecosystems' well-being. One of the initial steps for figuring an appropriate way to preserve these areas is being aware of the factors motivating people to visit them. Despite the different willingness factors amongst people, the thesis wonders whether it is possible to make people feel different than each other in the same park, which is acceptable enough in terms of general park features. Hence, the research refers to the concept of the sense of place to turn a specific space into the desired place capable of framing the users' behavior and transmitting cultural meaning.

According to the literature, ICTs augment the spaces, and augmentation generates a sense of place in specific spaces. While the space is a spatial location, the behavioral understandings, cultural intentions, and actions occurring in that space convey value and generate a sense of placeness. Gamification, as a sample of augmentation which makes the activities more game-like. It triggers people's motivation, induces new behaviors, and reshapes the existing ones in various fields. However, while gamification may involve any type of content, serious games transmit only serious educational content besides entertainment. They engage the player with the education of a certain topic or enhance a specific skill of them.

In the recent pandemic situation and its consequent confinement periods when people suddenly lost their freedom of being outdoor, experiencing new places, and interacting with each other, technology has rescued them. Virtual environments connect people, enable interaction, and provide new ways of experiencing their daily activities. However, gamification changes even the sense of their virtual places.

This thesis provides a serious locative game, *ApocalyptiCity*, to enrich the Atatürk urban forest park visitors' experience by entertainingly introducing the park, accompanied by educational content. The game reinforces public awareness for the sake of urban green space preservation. To do so, it generates a sense of placeness in

its in situ mobile version and desktop version, played remotely, and frames the players' behavior.

The adopted software for game development, *3dvista Virtual Tour PRO*, enables cost-effective development compared to the currently required interdisciplinarity in the digital game industry. It uses 360° images as its material for the game generation. This thesis used an application on a smartphone for assembling these media. Despite being feasible and reasonable with high-quality outcomes, it lacks capturing the sky and the ground for a fully 360° view. However, it is time-efficient at the same time in terms of not requiring post-editings. Benefiting from this method, a small group of non-professionals is capable of developing a digital game with a low budget. It is also efficient in terms of demanded gameplay hardware for the mass public. Its outcomes can be launched in the form of web pages, available for any smart device, either mobile devices or desktops. However, for having a more immersive experience, the developed game format is also compatible with existing virtual reality devices.

Since Atatürk urban forest park was inaugurated during the pandemia when people could not visit and experience it, therefore inspired by it the thesis focused its surveys on the desktop version for evaluating the effect and value of remote park visit experiences in the case of any disabilities or limitations for a physical visit. This desktop version delivers a fascinating virtual tour of the park besides entertainment. It enables a park experience for the users who are not able to visit the park in limited conditions or due to disabilities. However, played in situ, the mobile version can enhance people's visits by catching their attention to the available facilities and information in the park, making them aware of the natural environment while increasing their walking tendency.

The survey results prove the game's ability to increase people's interest to visit the park and physically encounter what they get aware of in the game. Due to the outcomes, the number of people planning to visit the park prior to playing the game raised remarkably after the gameplay, proving the game's effect on the behavior farming and motivation to interact with the urban green areas. Additionally, the survey shows that a considerable number of people who visited the park were not fully aware of the park's features and providing information. This highlights the game's influence on public awareness. With the provided information, the game catches the players' attention and changes their bahevior, leading to preserving the natural environment. Furthermore,

the outcomes declare that the mobile version of the game simultaneously would raise the people's tendency to visit and increase their visit frequency.

This study is unique in its approach towards its aim, used method, and location. While *Apocalypticity* is a pilot test, it can be implemented into the whole park. Additionally, other public spaces can take advantage of the proposed method for developing commercially viable games.

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**PUBLICATIONS ON THE THESIS:**

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