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Serious Gaming
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Serious Games: Gamification for Social Change

1. Light Play: An example of a serious game

Light Play is a serious game that contributes to the already robust bicycle culture of Amsterdam. Life expectancy of the general population is high in Amsterdam due to the city's walkability and bike integration as the main form of transportation (Gilderbloom et al., 2009) This also means that there is lower dependency on automobiles. If cars dominate American mobility culture, the bicycle dominates the Dutch mobility culture. The Dutch bicycle culture shapes the national identity that greatly influences social practice and behavior (Pelzer, 2010). As positive as the social practice of bicycling as the main transportation system can be, there are areas that can be improved. There are many dangers and problems that pedestrians, cyclists, and automobile drivers face together on the roads. Accidents often occur between all three parties, even with enforcement driving and cycling laws. Bike lights are important for the safety of all those on the road at night. Front and back lights both have to be on for all bicycles in Amsterdam at night. Without the lights, accidents happen when the bicycles are not recognized by the passing cars due to the darkness. To improve traffic safety for all, Light Play proposes the cyclists to join in a game that reward them for having bike lights. This also would reduce financial burden, for cyclists would not have to be fined.

To be a part of Light Play, cyclists would need to have bicycles with front and back lights that have sensors within the lights so that the passing bikes can detect one another with the sensors. Every time the bicycles with lights that contain sensors pass one another, a point is rewarded to each cyclist. The collected points can be accessed through an online site with a login name and password. This can also be accessed as a mobile application that automatically updates the cyclist's points and connects them to their friends who also use Light Play. The collected points can be reimbursed as free . Bicycle shops in return can advertise for free on the Light Play website and on the mobile applications. The cyclists would purchase the lights for the game via online through the Light Play website or at participating bicycle shops.

2. Definition of serious games

Light play is a serious game because it is meant to promote social change. There are many such games that promote entertainment and fun for the purpose of education and/or social change. According to Michael and Chen, a " serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment" (Michael, Chen., 2006). What they mean by "education (in its various forms)" can be understood to include promotion of social change with the game as an educational platform. A more broader definition of serious games is that they are "games for purposes other than entertainment" (Backlund et al., 2007). So, serious games is meant to go beyond just providing entertainment or enjoyment. This does not mean that it must not be in a form of entertainment, but have a greater underlying intention beyond the surface-level entertainment. To further elaborate on that, Zyda discusses that serious games must go beyond solely story, art, and software by providing additional pedagogy (Zyda, 2005). Pedagogy is here used as some kind of

activities that give knowledge or skill through education and/or instruction (Backlund et al., 2007). Simply put, serious games uses story, art, software, and entertainment for the purpose of providing pedagogy.

3. Interaction in serious games

For serious games, interaction in this paper will be defined as "technological attributes of mediated environments that enable reciprocal communication or information exchange, which afford interaction between communication technology and users or between users through technology" (Bucy et al., 2007). Light Play would be categorized as a game that brings interaction between users through technology. In relation to this definition of interactivity, the strength of bringing interactivity in any game would be measured quantitatively and qualitatively. Quantitatively interactivity would be measured by how many different modalities or functionalities a game can bring to the users. Qualitatively it would be measured by how much the users would be engaged in playing the game and the capacity for the users to be captivated by the game (Bucy et al., 2007).

3. Technology

Serious games do not need to use the latest technology to be considered as such. Yet, often 3D elements make up a large part of how the users want to experience the gaming world. The benefit of 3D technology is the enjoyment of the real-time gaming environment that mimics the real world (Backlund et al., 2007) This enhances the gaming experience for the users who want to be immersed in a believable, life-life, or surreal environment. Yet, not all 3D based games are serious games and not all serious games are 3D based games. This is because the content of the game is more important than the technology that was used to build the game. For example, the popular multi-player game *Halo* is not a serious game even though it uses 3D technology (halo.xbox.com). But, *Tempest in Crescent City* is a serious game about Hurricane Katrina disaster that does not use 3D technology (tempestincrescentcity.ning.com). A serious game that uses 3D technology is *Global Conflicts* that teaches about global geography, social science, and current events (globalconflicts.eu).

The gaming engine called Unity is often used to build 3D gaming environment unity3d.com). It was used to create *Global Conflicts*. Unity is written in C ++, Javascript, Boo, and C#. Launched in 2005, Unity is one of the most affordable ways to create games in a 3D environment. It also supports seamless asset integration with other 3D modeling and animation software packages such as Autodesk Maya, Autodesk 3ds Max, Maxon Cinema 4D, and Blender. This allows for wide range of users, from very beginners to experienced professionals to contribute to the greater gaming world without having to use softwares that can be financially burdensome. For instance, anyone can create a sharable game online for free by using an integration of Blender for 3D modeling and animation and Unity as an extension of 3D building space as well as a gaming engine. Unity as a standalone software can also be used to create complex environments. Unity as a development environment works with variety of platforms. Its games can be delivered on the web, Flash, Apple iOS, Android, Nintendo Wii, PS3, Xbox, and it is compatible with both Mac and PC computers. Such flexibility in creating and distributing games brings forth an egalitarian gaming culture that allows gamers as users to be game creators.

Mobile game development also has such accessible and affordable ways for the gamers to become creators for egalitarian development. Yet, since mobile game development requires programming skills, it is not as welcoming to beginners to become creators as Unity since Unity's visual interface is more intuitive to learn than a programming language. Even though programming can

be difficult to begin, there are myriad of resources that are available for free for anyone to contribute to mobile game or application development. For example, Apple actively supports individual developers to broaden their selection of games and applications for Apple products such as the iPhone and the iPad. The iOS is the operating system for Apple devices such as the iPhone and the iPad.
The developer would create applications for Apple iOS products with the iOS software development kit (SDK) by using Xcode, the integrated development environment. Users would access the iOS environment as frameworks, which are packages containing dynamic library of shared folders. The frameworks help to organize projects and manage the relevant resources (developer.apple.com/library/ios/navigation).

An iOS framework

An example of a serious game for the iOS platform is *Words with Friends*.(wordswithfriends.com). It helps the user learn new words with friends or by him/herself whenever there is spare time. The game can be played asynchronously in that letters that one user chooses can be used by his or her friends whenever it is convenient. Both users can access the game at different times, but still play the same game. Another serious game on an iOS is *Intro to Math* by Montessorium(www.itunes.apple.com/us/app/intro-to-math-by-montessorium/id381064973?mt=8). It teaches basic math concepts in a very simple way to children just learning about numbers.

5. Applications

There are a multitude excellent serious games that educate and bring awareness to the game players. The *Third World Farmer* demonstrates the difficulties of growing crops and sustainable farming in the developing countries (3rdworldfarmer.com). *Darfur is Dying* shows the seriousness of the regional conflict in the Darfur region of Africa (darfurisdying.com). These two games share global issues and brings awareness to the game players by putting the conflicts or events in a first-person perspective, just like the aforementioned *Global Conflicts* and *Tempest in Crescent City*. These are all examples of serious games because they impart knowledge about the world with the games as educational entertainment experiences. Mobile-based serious games focus more on imparting knowledge as skill sets. The previously mentioned *Words with Friends* and *Intro to Math* is a direct skill set teaching games that deals with vocabulary building and math concepts. There are mobile games that teach in a more implicit way. *Cut the Rope* is based on physics, but presents itself more as an entertainment for users of all ages (cuttherope.ie).

Both Unity and iOS development environments are suitable for creating interactive serious games that can qualitatively and quantitatively satisfy the users. They are incomparable in some ways because they are meant for serious games with different purposes. iOS development has mobile interaction as the main focus while Unity has mobile interaction as a part of its gamification, but not as the main focus. In terms of the likelihood of having the game player become a game developer, Unity is more transparent in how the user can make a game through a visual interface game building environment. Yet, the professional version of Unity that has all of the high-end features costs $1500 (store.unity3d.com). Even though the free version has robust features for game building, it still

separates the professional developers from the amateur developers in terms of monetary classification. The iOS platform might be less accessible in terms of having to learn how to program instead of visually constructing something, but it is financially more accessible for everyone. It does not implicitly or explicitly differentiate between professional or amateur developers.

6. Future Works

Currently, the main frame of serious games and games in general deal with computer-based or mobile based gaming environments. These platforms will continue to dominate the modes of gaming experience. However, the sphere of how games will be played will change along with technological developments. Wireless sensor networks can be used in many ways to physically involve the users in a game. Games like Light Play that encompasses the tangible, physical world with an online or mobile platform will become more common. There are variety of different ways in which this could happen. Sensors that link physical bodies to a technological platform for bilateral game play experience are common even now. For example, the Microsoft Wii brings such experience for game players. But there will be more games like Light Play that integrates everyday life into a game instead of having to be in front of a gaming platform to play. Embedded sensor networks will be of great help in making this possible. Tiny OS is an example of a wireless sensor network that has flexible capabilities for being manipulated for variety of serious games (www.tinyos.net). For instance, the touch of the user's fingers on the palm of another user can trigger an event within a game sphere, provided that sensors are used. Games have the possibility of growing beyond textual or graphical representations or direct manipulation buttons. They can become embedded into our daily lives.

The future serious games must always contain the same principle of pedagogically engaging the audience through games for education as well as entertainment. Entertainment as an experience for serious games contains physiological, cognitive, and affective aspects (Klimmt et al., 2004). What this means is that humans are emotionally more engaged when approaching the same pedagogical topic as a game rather than through a traditional approach, such as a classroom lecture. Pedagogy for the 21st century has the possibility to reinvent itself through serious games, for humans as media users are hedonistically oriented beings (Zillmann, 1988). Methods in which a gamer can become a game creator should also be transparent and egalitarian. Serious games has the potential to widen our scope of epistemology, or how we can find new ways to gain and share knowledge. Learning as an enjoyable experience that uses serious games as opportunities for entertainment and education respects humans as curious pleasure-seekers and knowledge-seekers.

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