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How Mobile Devices Could Change the Face of Serious Gaming

Calm Gaming

Serious Games_Mobile Games_Smartphones

Zusammenfassung. Der Erfolg von Smartphones und Tablet-PCs hat den Markt der mobile digitalen Spiele nachhaltig beeinflusst, sowohl auf Hardware- als auch auf Softwareebene. Aktuell findet ein Verdrängungsprozess statt, in dessen Rahmen Smartphones andere Geräte für mobiles Spielen vom Markt drängen. Gleichzeitig ermöglichen Smartphones aber auch eine ganz neue Art von digitalen Spielen. In diesem Beitrag betrachten wir die möglichen Implikationen dieser Tatsache auf den Bereich des Serious Gaming.

Summary. The rise of smartphones and tablet computers has changed the landscape of mobile gaming, both hardware and software-wise. Smartphones are squeezing other mobile gaming devices out of the market and their specific characteristics enable entirely new types of games and interfaces. In this contribution, we investigate the possible effects of these developments on the field of serious gaming.

1. A Short History of Mobile Gaming

The history of mobile gaming is fundamentally split into the years before, and after 2007 (Noyons, et al., 2011). The forefathers of today's mobile games emerged in the late 1970s, when creative users wrote simple games for their programmable calculators. At about the same time, the first handheld electronic games entered the market, small and comparably cheap portable devices that were made for playing a single game and a single game only. In the years to come, the market niche of programmable calculators spawned the more sophisticated PDAs that came packed with multiple software applications (and games), and dedicated portable gaming devices such as Nintendo's immensely popular Game Boy brought the concept of mobile gaming to the backseats of family cars all over the world. Indeed, it was not until 1994 that a first game appeared on an actual mobile phone, when an employee of German manufacturer Hagenuk implemented a Tetris clone during his spare time and convinced the company's leadership team to have it preinstalled on their upcoming MT-2000 device (Kraft, 2012). Over the years, mobile phones became cheaper and more widespread, slowly moving out of the "strictly business" niche they had previously occupied. Mobile phone manufacturers such as Nokia preinstalled various games (among them the famous Snake series) on their products and it can safely be assumed that a good number of users found these games quite entertaining while they spend time waiting at a bus station. However, when Apple introduced the first iPhone in 2007 and established the App Store in 2008, the market for mobile gaming was radically changed.

The first iPhone defined our notion of what a smartphone is: a mobile phone with a multi-touch screen, oftentimes with less than a handful of hardware buttons, but with significant computing capabilities and (somewhat less obvious) a multitude of integrated sensors that make it a great all-around tool. However, Apple's true accomplishment did not lie in the development of the iPhone, but rather in the establishment of a new business model that accompanied this innovative device. The opening of the online software distribution platform named App Store in mid-2008 had two effects: first, it enabled the general public to comfortably adapt their smartphones to their personal needs by downloading additional software from the online store. Second, it empowered software developers to distribute their own applications through this unified marketplace to where, at the time, basically each and every smartphone user came looking for new applications. In a mere nine months, Apple distributed more than a billion applications through the App Store (Apple Press Info, 2009) and thus created a "gold rush" effect among developers (Hiner, 2009), resulting in an even broader range of available applications. Recently, Apple has announced that a total of 50 billion apps have been downloaded from the App Store (Apple Press Info, 2013), and this despite the fact that the market situation has changed a great deal since 2007. Today, about a handful of companies and consortiums compete for their share of the smartphone and application market, most notably (in the order of their respective market shares)

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Google, Apple, and Microsoft. This competitive market has led to a wide range of available smartphone models and consequently, almost all of the new mobile phones sold in western countries today are smartphones (Bitkom Press Info, 2013).

The fact that games account for roughly two thirds of the revenues made with smartphone applications (Sprienssma, 2012) implies that mobile gaming owes an immense popularity boost to smartphones. Indeed, a trend is apparent that may ultimately result in a unification of all mobile gaming device production lines in favor of smartphones and table computers. This process can already be considered complete for PDAs and it is nearing its completion for non-smartphone mobile phones, at least in western countries. The single exception to this trend are the handheld game consoles, as the two main manufactures of these devices, Nintendo and Sony, are still supporting and promoting their respective products. Nevertheless, the market of handheld video game consoles suffers from the success of smartphones as well (App Annie & IDC Portable Gaming Report Q1 2013, 2013). Consequently, Nintendo's CEO identified Apple and its products as the "enemy of the future" (Bosker, 2010).

2. The Branches of Gaming

In the previous section, we have identified smartphones and tablet computers as being the main device type used for mobile gaming. Smartphones have practically squeezed other hardware that was formerly used for mobile gaming out of the market, especially PDAs and feature phones and, to a lesser extent, also handheld game consoles. In this section, we focus our attention on the different types of software that one encounters in the world of (mobile) gaming. To begin with, we will group video games into three categories: first the group of games whose concepts work both on mobile devices and on "classic" gaming devices (such as the PC or video game consoles), second, the group of games whose concepts do not work on mobile devices and finally, the group of games whose concepts will exclusively work on mobile devices.

The first category of games, games that can be played both on classic gaming devices and on smartphones, are so-called "casual games". As the name implies, these games are made to be played only a few minutes every now and then. They usually do not rely on impressive graphics or complex game mechanics, but rather on simple-to-learn but hard-to-master concepts – although the question of what exactly makes a casual game is not being discussed without controversy (Kuittinen, Kultima, Niemelä, & Paavilainen, 2007). The first games to become popular at all, such as Pong, Pac-Man and Tetris, were casual games, even if not regarded as such at the time (in absence of other types of games). Casual games can be found on all types of gaming devices, but they work especially well on smartphones, as their "simple fun for short breaks" attitude is supported by the smartphones' "out of the pocket, into the pocket" interaction paradigm. Furthermore, casual games do not suffer from the technical limitations of mobile devices (as detailed in the next paragraph). The simplicity of these games makes their development process manageable even for the smallest of teams and consequently, the App Store and its counterparts abound with casual games. Casual games are what we call the "branch one games" – the first type of video game to be around and a type of game that is currently enjoying a huge popularity boost thanks to the rise of smartphones and their associated direct-to-market software distribution platforms such as Apple's App Store.

Video games that will not work on contemporary smartphones are usually those games that the video game industry itself refers to as being "hardcore games" (Boyes, 2008). These hardcore games are complex titles and oftentimes very expensive in their development – production costs of up to 100 million U.S. dollars have been reported (Schiesel, Way Down Deep in the Wild, Wild West, 2010). Hardcore games come from various genres such as shooters, role playing games, strategy games, and simulations, but they (almost) all share the similarity of being played in front of a large screen and for several hours straight. For multiple reasons, smartphones and tablet computers are not suited for running such hardcore games, among them being the small screen size of the devices, the absence of physical controllers, and the fact that mobile devices usually lack powerful graphic processors. Despite the few hardcore games available for smartphones (such as the role playing game Baldur's Gate), we are inclined to say that the set of games that will not work on smartphones is roughly equivalent to the set of hardcore games and we will refer to these games as being the "branch two games" – games that rose to popularity in the 1980s when home computers, PCs and video game consoles became more and more widespread.

A few years ago, a new type of video game has emerged. Games of this new type mandatorily require a mobile device to be played, and since smartphones have now become the main device type used for mobile gaming, today most of these games are being played on a smartphone or a tablet computer. Different to casual and hardcore games, these novel games build their game concepts around one or multiple of the specific characteristics of smartphones that differentiate these devices from PCs or video game consoles. These are:

- Mobility: Smartphones are small and lightweight which makes them easy to carry around and handle. When carried in a bag or pocket, smartphones will not hinder physical activity and even young children find no difficulties in holding such a device upright or in pointing it into a specific direction.
- Availability: A consequence of mobility, smartphones can and often do accompany their users almost always and anywhere. They rest on the desk next to the user during work hours, in their pockets when they travel, and they lie on the bedside table when the user sleeps, rarely ever more than an arm's length away.
- Sensitivity: Smartphones come packed with various sensors such as a GPS receiver, a three-axis accelerometer, a microphone, and the like. Most of these components are accessible to application developers and can be

used to create context-sensitive applications that react to the (changing) state of the smartphone's environment.

In recent years, various games have been created that utilize these traits and thus fall into the category of "mobile-only" games, as they cannot reasonably be made available on a PC or a video game console. Examples for such games include the games Zombies, Run! by British software developer Six to Start and the game Ingress by Google (we will get back to these later). Indeed, the first of these mobile-only digital games actually existed quite a bit before the era of modern-day smartphones, such as ARQuake (Thomas, et al., 2000) and Geocaching (Kinkaid, Wiley, McPeake, & Daniels, 2001). Terms like location-based games and augmented-reality games refer to game concepts that usually require a mobile device for playing. For the whole of these games, we suggest the term "branch three games", as these games are neither clearly casual nor hardcore games, but rather belong to a new, third category of gaming.

3. About Serious Gaming

The so-called serious games are games with an agenda, an intention that goes beyond the mere entertainment of the player. The term can be traced back to at least the late 1960s, when social scientist Clark Abt published a book entitled "Serious Games" in which he details how (non-digital) games could be used to inform and educate (Abt, 1970). Today, the term "serious game" is usually associated with digital games that, besides being entertaining, also have an intended side-effect such as motivating the user to be physically active, or teaching her new skills. In this regard, serious games need to work well on two levels: just like regular games, they are supposed to entertain the player, as this is the reason why the games are being played in the first place. In addition to this, however, serious games must also have another positive (and ideally measurable) effect on the player. It seems reasonable that this dualistic challenge makes the creation of "good" serious games more difficult than the creation of "good" regular video games, because even though the development process of serious games is generally comparable to the development process of regular video games (in that it has certain stages and requires certain types of experts), it is complicated by the increased complexity of serious games and the fact that more stakeholders are involved in their design and production (Mehm, Reuter, & Göbel, Authoring of Serious Games for Education, 2013).

This observation raises the question, whether serious games should actually mimic regular video games in style and appearance, especially hardcore games, since these are already costly and complex productions in their own right. A serious game that looks and feels like a regular video game also raises the same expectations regarding game depth and production values and may disappoint players if these criteria are not met, leading to a lowered motivation for playing and thus, a lowered probability of achieving the desired positive side-effects. One could argue that this is only true for persons who are used to playing video games, but this group of "experienced gamers" is increasing rapidly. For example, 58 % of the U.S. citizens are known to be playing video games (Essential Facts About the Computer and Video Game Industry, 2013). Nevertheless, for some purposes the effort of creating a "high quality hardcore serious games" is indeed necessary and worthwhile. Good examples for this are the (amateur) flight simulators, such as Microsoft's Flight Simulator series or Laminar Research's X-Plane. While the first flight simulators available for home computers featured monochrome wireframe graphics that not even remotely resembled landscapes and planes, today's flight simulator use photorealistic textures for cockpits and terrain, and highly detailed plane models. Some players argue that in combination with the appropriate physical controllers, such as rudder pedals and a yoke, these games recreate the sensation of flying quite well and, besides being very entertaining, also manage to teach a great deal about actual aircraft operation (Krohn, 2009). We may assume that part of the reason why people are willing to learn the complex game mechanics of flight simulators is because it all looks so real. In this regard, it is hard to believe that a casual game could possibly create the same long-term motivation required for truly mastering all aspects of aircraft operation. It is rather a combination of two things that drives players of flight simulators: the knowledge that they eventually could fly a real plane with the skills acquired from playing the simulator – and the fact that, since most of them are unlikely to actually ever do so, the compensation of at least getting to fly a virtual plane that looks and behaves a lot like they imagine a real plane does.

Nevertheless, we find that for various other settings, casual serious games with comparably simple game mechanics and low production values will work just as well, if not better than hardcore serious games. For example, Göbel et al. introduced and evaluated a set of casual serious games for health that motivate their players to be physically active (Göbel, Hardy, Wendel, Mehm, & Steinmetz, 2010). Although the game mechanics of these so-called exergames are fairly simple, the results of the study conducted showed that they motivated the study participants. Consequently, Göbel et al. suggested the games' application in real world prevention and rehabilitation programs. While the same effects may also have been achieved by a hardcore game with more complex game mechanics and higher production values, it seems like the production of such would have been a needless waste of effort. Indeed, the question of what type of game works better for which area of application is difficult to answer. For instance, Baranowski et al. point out that a gripping story may increase the player's immersion into the game, which in turn may be an aspect of the player's intrinsic motivation to keep playing (Baranowski, Buday, Thompson, & Baranowsk, 2008). For some types of games, such as educational games, this may be important and consequently, hardcore games may work better here than casual games. In this regard, Mehm et al. have introduced the authoring tool StoryTec that supports interdisciplinary teams in the creation of story-driven educational games (Mehm, Göbel, & Steinmetz, An Authoring Tool

for Educational Adventure Games: Concept, Game Models and Authoring Processes, 2013). Sophisticated editors such as StoryTec and e-Adventure (Torrente, Vallejo-Pinto, Moreno-Ger, & Fernández-Manjon, 2011) may indeed be a way to reduce the workload that comes with the creation of hardcore games and also enable non-technical experts to participate in the process. However, the creation and maintenance of these authoring tools is a complex task in itself and it is unlikely that such editors will ever be available for every type of (hardcore) game that creative game designers can come up with.

We conclude this section with the observation that just as in the world of "regular" video games, one also encounters both casual and hardcore serious games. And although casual serious games seem to be generally preferable, because they are far less complex to create and because users will also have lowered expectations towards this type of game, the question of what type of game works better for which specific challenge is still open to further research. However, this aspect directs us towards another observation: when it comes to the design of serious games, the game itself is ultimately secondary. The focus rather lies on the positive side-effects that the game is supposed to bring forth, while the game only provides a frame into which the "serious core" of the application that produces this effect is being embedded.

4. Calm Serious Gaming

This fundamentally differentiates regular video games from serious games. Regular video games, both casual and hardcore, have the sole purpose of entertaining their players. They do this in different ways and as players are known to respond to different types of incentives (Bartle, 1996), some of these games may actually be based on concepts that blur the lines between a regular game and a serious game, as these games also have additional effects besides pure entertainment. Examples for this are the various popular dancing games that increase their player's level of physical activity or games that confront their players with difficult ethical questions (Schiesel, Choices in Infiltrating a Terrorist Cell, 2009). And still, because the primary goal of regular video games is to provide for a fun and diverting game experience, the production of any additional effects are subordinate to this intention. Usually, game designer still focus on entertainment and design video games in a way that they anticipate it will be entertaining to the intended audience. Serious games are in direct contrast to this, as the main purpose of serious games is indeed to stimulate a specific positive effect. As pointed out before, the game is just a shell that embeds the "serious core" of the application and consequently, the game itself is interchangeable, as long as it provides for a *sufficient* amount of "fun" and entertainment. In other words: serious games stimulate gameplay activities, which may or may not result in the intended positive side-effects. Using fun as the means to this end, the exact way of how this "fun" is produced is of secondary importance.

Already in 1994, the term mixed reality was coined. It refers to the concept of merging virtual objects with the real, physical world (Milgram & Kishino, 1994). In mixed-reality games, the virtual (game) world is somehow influenced by the state of the player's physical environment, for instance by the player's location (such as in location-based games). Smartphones have proven to be ideal for the creation of mixed-reality games, as their multiple integrated sensors enable them to perceive the player's contextual situation (where is the player at, what is she doing, and how is she feeling), at least to a certain extent. A recent example for a mixed-reality game is Ingress by Google. The game is played with a smartphone, but currently only available for Android-based devices. Initially, the player needs to decide for one of two fractions and is then given the task to find and conquer virtual "portals" for her team. These portals are associated to real-world locations, such as buildings and statues. The player conquers a portal by physically moving close to the respective location, where the game then gives her the option to take over the portal located there (provided the player brings the required virtual items and in-game skills). Although the game has not yet been officially released, it is already very popular among early adopters. It seems to draw much of its charm from the fact that players are referred to as being "agents" and given the idea that they are involved in some type of underground war between two competing secret societies. Ingress' slogan is "the world around you is not what it seems" and this, too, hints at the main concept that Ingress is based on: to make a digital game more interesting by integrating it into people's daily lives and surroundings.

Indeed, this is far from being a new concept. The European Union funded research project IPERG (short for Integrated Project on Pervasive Gaming) investigated from late 2004 to early 2008 so-called "pervasive games", games that are being played in the public and as part of people's everyday lives, ideally blending into the player's daily routine (Montola, Stenros, & Waern, 2009). Many of the games analyzed within the project have been using mobile technologies to deliver the game experience, and this years before the rise of smartphones really began. The concept of pervasive technology can be traced back to the American computer scientist Mark Weiser, who coined the term "Ubiquitous Computing" in the late 1980s. In the midst of the era of home computing, Weiser declared that in the future, computers would eventually move away from being literally "desk-top" machines and soon enough become very small, networked devices that would be unobtrusively integrated into people's everyday surroundings (Weiser, The computer for the 21st century, 1999). At the core of Weiser's vision was what he called "calm technology", which would not aggressively demand the user's permanent and undivided attention, but could easily move from the periphery of the user's attention to her full attention and back into the periphery when something else requires this attention (Weiser & Brown, Designing Calm Technology, 1996). Weiser's notion of calm technology therefore stands in large contrast to most video games being described in the first and second branch in this article. Particularly

action games, which run on a desktop computer are demanding constant attention by their user (Pias, 2002). Not to be confused with pervasive technologies are the so-called persuasive technologies. Social scientist Brian Fogg defines persuasive technologies as computer systems made to change people's life and behavior (Fogg, 2003). The concept of persuasive technologies was later adapted by video game researcher Ian Bogost to the area of video games. Bogost's concept of persuasive games is roughly comparable to the concept of serious games, although Bogost highlights their broader and more ambitious political and artistic context. He also speculates on persuasive games in mobile scenarios and points out the potentials that lie in the unique properties of mobile devices, especially regarding the user's ability to use them fluidly when and wherever desired (Bogost, 2007).

If we bring together the ideas of pervasive technologies and persuasive gaming, we end up with the concept for a new type of serious gaming that migrate almost unnoticeable into our everyday lives *and* motivate us to be physically active, learn and rehearse new skills and knowledge, or even help us to get rid of unwanted habits such as smoking. Smartphones are a great platform for this type of game, as their unique properties mobility, availability, and sensitivity strongly support the games' need for pervasiveness. For example, we can imagine a language learning game that, while walking home, lets us redo the short conversation we just had at the supermarket in the foreign language we intend to learn. Or we can envision games that help us adopt a certain behavior (such as going to bed early on a regular basis) by responding to our daily activities and to our progress in the game. In early 2013, the Technische Universität Darmstadt has established an interdisciplinary research group situated in-between the departments of architecture and computer science (www.stadtspiele.tu-darmstadt.de). The members of the group further develop and investigate "urban health games", a term Knöll has used to characterize games that seek to achieve specific health-related effects by interacting with their urban environment in various ways. Such urban health games would motivate their players to be physically active while they are moving through an urban environment for instance by responding to the topography of users' real world location. (Knöll, 2012). These urban health games are a perfect example for games that need to be both pervasive and persuasive: pervasive, because the player will oftentimes be preoccupied with something else (such as walking home from work) and persuasive, because most users' motivation for a short workout in between two other (non-optional) activities will be rather low. The best chances for such games lie in their subtleness, as the more smoothly they can integrate themselves into the users' daily routines, the less likely it is that they will be perceived as disruptive and be ignored.

Based on Weiser's principle of calm technology, we refer to this emerging new type of game as "calm games". Calm games require smartphones (or future mobile technology) to be played, as they rely on these devices' properties of mobility, availability and sensitivity to deliver their unique game experience. And while there will also be regular calm games with the sole purpose of entertaining their players, the main potential of calm games is within the field of serious gaming. The reason for this lies in the differing goals of the two types of gaming. A player that plays a regular hardcore game, for instance a role playing game, is usually looking for this specific gaming experience and is thus unlikely to find a substitute game, for example a casual puzzle game, to be satisfactory (and vice versa). For serious games, however, the game just serves as an enclosing frame that embeds the "serious core" of the application which is supposed to bring forth the desired effect, such as making the player learn a foreign language. Here, the game is not within the user's main interest, but rather a way of making a task that would otherwise be considered dull or uncomfortable more enjoyable. In this regard, we expect that many users will find calm games that do not require their player's sustained attention but that rather integrate themselves naturally into the user's daily routine to be an attractive alternative to traditional serious gaming, as such calm games will require less dedication and rather simply slip into people's daily routine. However, this aspect of pervasiveness also adds another layer of complexity to the game development process, as these games do not only need to entertain their users just like any other game, and to deliver the intended positive effects that characterize a serious game, they also need to be sensitive to the user and her environment.

5. Conclusion

The rise of smartphones has fundamentally changed the nature of mobile gaming. Due to their unique properties mobility, availability and sensitivity, these devices have also enabled a new type of serious games, games that can smoothly integrate themselves into our daily activities and that help us acquire new skills or stay physically active. The main difference to conventional serious games lies in the subtleness and calmness of these new games, as they do not require their players to sit down in front of a computer and to focus their full attention onto the screen for a prolonged period of time. Rather, calm serious games can adapt to the contextual situations of their users and can be played in the short breaks taken during regular activities, fluidly moving into and out of their player's attention. We are looking forward to be seeing many calm serious games to be available in the future and aim to contribute to their evolution with our research on urban health games and other types of mobile serious games.

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