GEO-GAMING: THE MOBILE MONOPOLY EXPERIENCE

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Abstract: Advances in mobile computing technologies have proved an unheralded boon to mobile games developers. Increasingly, position-sensing technologies such as GPS and cellular techniques can be harnessed. This offers exciting opportunities for novel game development. However, classic board games can also be refined and extended, leading to, amongst other things, alternative modalities of interaction. The popular game of monopoly is one example. In this paper, a prototype game, termed Mobile Monopoly, is introduced. This game can be modelled on any arbitrary urban environment. Gamers participate by roaming about the environment, acquiring properties and paying rents as they proceed.

1 INTRODUCTION

A common criticism of computer gaming concerns it perceived sedentary and solitary nature. Parents especially worry about the emotional and physical welfare of their children, and frequently view computer gaming activity with reservation. This reaction is understandable, and it beholds the gaming community to address it and to identify innovative and creative ways of mitigating these concerns. One method of achieving this is to introduce a necessity for physical activity. Geo-gaming is one interpretation of how this might be achieved.

Two key technologies enable geo-gaming: the ubiquitous availability of mobile phones; and the deployment of GPS. The mobile phone represents a common platform, for the most part, for gaming developers to design and implement for. And the availability of cheap GPS devices ensures that accurate positions are available in practically all outdoor environments. The challenge facing the gaming community is to effectively harness these technologies to develop new and stimulating games. Another approach is to consider traditional board games and augment these with new modalities of engagement. In this paper, this latter approach is adopted. The classic game of monopoly, a game with an implicit geospatial component, is extended into the physical realm.

The paper is structured as follows: Section 2 describes some related research. The design and implementation of Mobile Monopoly are described in sections 3 and 4 respectively. Future work is outlined in section 5 and the paper is concluded in section 6.

2 RELATED RESEARCH

A number of pervasive games have been described in the literature. However, the ones of most relevance to this discussion concern those that utilise GPS and/or another position sensing mechanism. Perhaps, the must successful game that utilises GPS is Geocaching (Geocaching, 2007). In essence, this is a treasure hunting game, of which there a number of varieties. Geodashing (Geodashing, 2007) is a game in which participants compete to get to the most dash points. In all these cases, a GPS receiver is essential. A useful overview of location-based games that use cellular phones may be found in (Rashid et al., 2006).

In the case of monopoly, various implementations of the classic game have been ported to mobile phones. However, examples that utilise the physical geographical environment are rare. Live Monopoly (Live, 2007) is one interesting example. This uses

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18 taxis, all fitted with GPS devices, as the playing pieces. The city of London is divided up between the players and a London cabbie is assigned to each player. Rent is paid when a player's cabbie stops outside the property of another player. Though similar in principle but within the spirit of geo-gaming, Mobile Monopoly adopts an approach that forces players to become physically active if they wish to participate and compete in a game.

3 DESIGN

Mobile Monopoly is designed to be played in the outdoor environment. It assumes the player is equipped with a mobile phone or PDA of suitable specification - an approximate screen size of 1/4 VGA being one essential characteristic. A model of the environment in which the game is being played must be constructed. This does not have to be that sophisticated, primarily due to the limitations of GPS. Recall that GPS supports an accuracy of 20 meters approximately. Thus a property can be approximated with a central geographic point in GPS coordinates and a radius in meters. Properties must be chosen such that there is an adequate distance between them that accounts for the inherent inaccuracy of GPS. Most of this information can be gleaned from a standard map, although the datum used must be converted to WGS84.

To play the game, the player must explore their environment. As they enter zones that define business premises, they have the following options, as per the classic monopoly game:

1. Acquiring or purchasing a property, when physically in the geographic zone that defines that property.

2. Upgrading a property that the player already owns, after physically re-entering the geographic zone that defines the property.

3. Paying rent to the owner of a property, after entering the geographic zone that defines that property.

A detailed design for each of these activities is now described in the following sections.

3.1 Acquiring a Property

As the player roams about the environment, their location is continuously tracked and compared against the list of premises in the property model. On detecting that the player has entered a zone that defines a property, the ownership is then determined. If the property is not *owned*, the player has the option of buying it. If they already own it, they may upgrade it (see section 3.2). If it is owned by another, they must pay rent (see section 3.3).

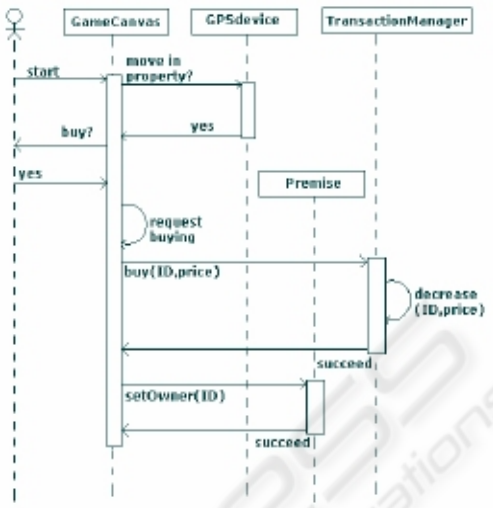

Figure 1: Acquiring a property.

Assuming the player has the funds to complete the purchase and agrees to do so, the transaction manager then decreases the player's balance by the cost of the premises. The property model is then updated and the player is registered as the owner of the property (Figure 1).

3.2 Upgrading a Property

When a player enters the geographic zone that defines a property that they already own, they have the option of upgrading that property, assuming they have adequate funds. If they agree, the Transaction Manager reduces their balance by the corresponding amount, and the property model is updated (Figure 2).

3.3 Renting a Property

When a player enters the zone that defines a property owned by another player, they must pay the appropriate rent or compensation. The Transaction Manager proceeds to decrease the player's balance by the appropriate amount and transfer this to the balance of the player that owns the property.

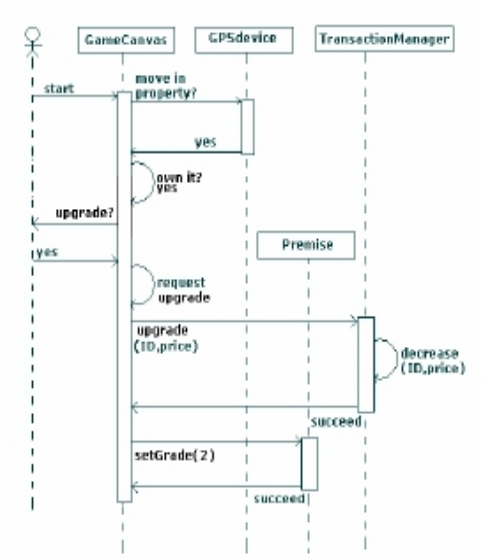

Figure 2: Renting a property.

3.4 The Game Loop

For the purposes of this initial prototype of Mobile Monopoly, the player plays against a *virtual player* (Figure 3). In this way, a number of problems are eliminated such as the latency due to data communications, the need for a centralised model for maintaining the status of the game and so on.

A further variable introduced into the game design concerns the strength of the player. This is based on the speed of the player as they roam about. The faster the player operates, the more strength they expend. Hence, to conserve strength, they must move at a slower pace. If their strength is entirely depleted, the player must pay a financial penalty so as to replenish it. In this way, the advantage that a fitter person would have is somewhat compensated for.

4 IMPLEMENTATION

Mobile Monopoly has been implemented using J2ME. Hence, it will run on any device that supports J2ME, and that has access to GPS, either via a serial port or through Bluetooth. This latter point may become less of an issue over time as it envisaged that a new generation of mobile devices will come with GPS chips already embedded within them. The current prototype has been successfully demonstrated on a HP IPAQ device. For the forthcoming illustration, a phone emulator from one of the major telecommunications manufacturers was used.

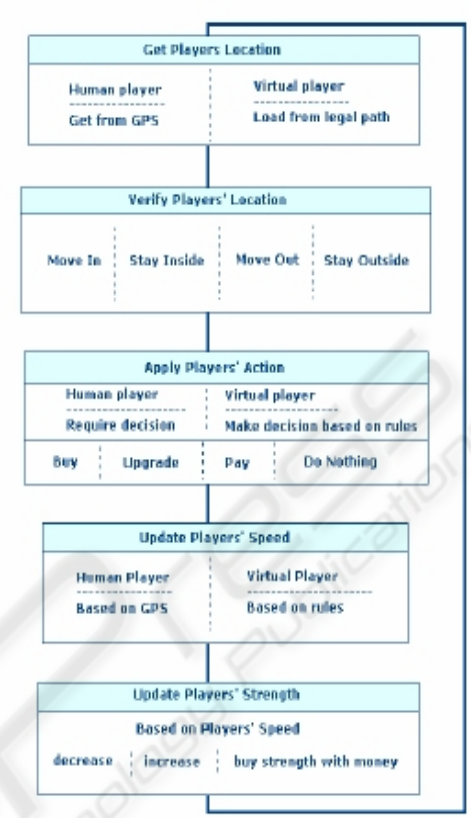

Figure 3: The Game Loop of Mobile Monopoly.

Figure 4: Commencing a game of Mobile Monopoly.

1. Figure 4 illustrates the situation at the start of the game. The player has a 15000 euro in their account and the virtual player has 20000 euro. The player is positioned at the centre of the map.
2. On entering a zone that defines a property, the

Figure 5: Player is prompted to buy a property.

Figure 6: Rent must be paid when in a property owned by another player.

player is asked if they wish to buy it (figure 5). Note that the virtual player has acquired a property for 700 euro resulting in a balance of 16300 euro.

3. On entering the zone of a property owned by another player, it is necessary to pay rent (figure 6). This amount is automatically deducted from the player's balance and accredited to the owner's balance.

5 FUTURE WORK

Have developed an initial working prototype, there is plenty scope for improving its performance. Initially, there are two issues that of particular interest. The first concerns the realism of the virtual player's behavior, which is currently very primitive. It is intended to model the virtual player as an intelligent agent, as it is increasingly feasible to deploy agents on mobile devices (O'Hare et al., 2006). In this way, more sophisticated strategies can be adopted through the specification of rules, resulting in more dynamic and less predictable behavior. In addition, strategies for motivating and encouraging individual players may be adapted.

A second issue concerns the introduction of additional players. This introduces a number of difficulties from a interface and data management perspective, though none insurmountable. However, one key issue concerns the performance of TCP/IP. This has been investigated already in real-time games (Chen et al., 2006). However, the latency introduced by the essential incorporation of wireless networks, including WiFi and 3G, could well have performance implications. It is intended to investigate this and attempt to identify and quantify the pertinent issues.

6 CONCLUSIONS

Geo-gaming can combine fun and activity. It is not necessary in all cases to conceive new strategies for games. Rather, traditional games can be enhanced and extended with new interaction modalities. An example of this is Mobile Monopoly. The rules of the game are well understood. However, by combining cellular phone and satellite positioning technologies, new possibilities are available for enhancing and extending the core game both to new environments and new audiences.

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