The iTron Family of Geocast Games (Extended Abstract)

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Abstract—Geocast games are a new class of digital multi-player games, inherently involving vigorous physical activity in outdoor natural settings such as parks, camps, or athletic fields. They are designed for commercial location-aware smartphones carried or worn by players, without requiring consoles or internet connections. The iTron Family of geocast games illustrates how physical athletic play can be combined with real-time strategic, imaginative, and creative cognitive play from the domain of digital games to produce sports of the future appealing to a wide range of ever more sophisticated players.

I. INTRODUCTION

Digital games attract players by providing rich virtual worlds that foster imaginative and creative play, require logical and strategic thinking, and encourage various types of social interaction from individual competition to full cooperation and points in between. On the other hand, while physical activity and motor skill development are inherent in athletic and sports games, they are nonexistent or severely limited in digital games that tie players to a couch or internet connection. This can lead to problems with physical health, childhood development, and repetitive stress injuries.

The Geocast Games Project (see www.research.att.com/projects/Geocast/) seeks to meld the best features of these two previously separate worlds to create sports of the future: real-world (RW) physical activities are blended with virtual world (VW) events computed and presented via carried or worn smartphones. Geocast games are built using two fundamental principles. (a) field communications use a scalable ad hoc geocast protocol (cf. www.computer.org/portal/web/csdl/doi/10.1109/TMC.2010.56) not requiring infrastructure support, and (b) game control is fully distributed among players’ smartphones, rather than requiring an extra console or laptop.

This paper presents the iTron Family of geocast games. Inspired by venerable early games like Snake (en.wikipedia.org/wiki/Snake_(video_game)) and the lightcycle competition from Tron (en.wikipedia.org/wiki/Tron_(film)), all members of the family are based on the idea of players moving in RW and leaving a growing trail of walls behind themselves along their path in VW. While the idea of leaving a trail is not new, its embodiment in multi-player outdoor games is. Furthermore, while some iTron variants are competitive, involving athleticism and real-time strategy, others are relaxed, cooperative, and artistic. Still others combine competition with creativity, or randomness with strategy.

II. THE iTRON FAMILY

The Base Game. In iTron, players must keep moving in RW within a defined VW boundary established at game start. As they move, a dot represents their current position, and they leave a trail of walls in VW. Player position, boundary walls, and trails are displayed relative to an image, map, or other visual representation of the RW play area surrounding the player on the screen of the smartphone. The game enforces a minimum, nonzero average rate of movement.

The object of the game is to last as long as possible before virtually contacting a wall or trail. Figure 1 shows both RW and VW views of a 3-player game in progress. One player, whose trail ends in a black square, has intersected the trail of another and so is out. Another player, checking his wrist-worn smartphone, is plotting his next movement.

A common iTron strategy is to wall off one’s opponents from open areas and then to move into one of those areas, slowly following a relatively dense area-filling path to give one’s opponents time to crash in their more cramped areas. However, this base strategy is affected by many real world and real-time factors, such as speed and agility of the players, presence of terrain obstacles like fences or vegetation, as well as speed and accuracy of the device’s location system.

Figure 2 shows a 6.5-minute, 6-player game. Played over a large area, terrain features such as fence lines, hill drop-offs, and forests played significant roles in the outcome. Some players moved through forests or hopped fences to avoid trails, while others were unwilling or unable to do so. Note that the size and structure of the terrain require both robust multihop peer-to-peer communications and distributed control to support the intended game experience; competing game architectures do not suffice in such terrain.
**iTron:Sketch** is a cooperative variant where groups work together to sketch figures in VW. There is no time limit, and players may move through walls and trails without penalty. Each player in a game chooses a trail color, the group plans a coordinated set of movements, and then they execute them in RW. Figure 3 shows a sketch of a sailboat. One device used brown to draw the body of the boat, one used blue for the water, one red for the sails, and one yellow for the flag.

**iTron:SketchRace** is a timed variant of iTron:Sketch in which teams compete to plan and draw a given figure fastest. Judging the winner involves both best time and an artistic assessment of whether a team successfully drew the figure.

**iTron:POD!** ("Pits of Doom") is a richer variant of base-iTron that adds new virtual elements and randomness to make the player’s task successively more difficult over time.

Essentially, iTron:POD! proceeds like base-iTron, including boundaries and multiple players leaving trails, except that over time *pits of doom* (*pods*) begin to appear in VW. These are rectangular areas that act like boundaries; the player may not be within them. There is a 15-second warning as a pod appears, during which it appears drawn faintly. This gives a player who happens to be located in it a chance to run out of it. As more and more pods finalize, the allowed area becomes a random maze further complicated by trails and boundaries. Later in the game, pods *move* as well, further complicating real time planning. Each game’s pod positions and movements are generated pseudorandomly, seeded by game time, so each game is different in detail.

**Other Family Members** are described in the full paper.

### III. Evaluation

The iTron Family members described above have all been implemented in the GC1 prototype for the Apple iPhone 3G(s), with some initial porting to the Android platform as well. They have proven popular among over 200 players over several trial days. The full paper will discuss evaluation in detail; however, a few observations are worth relating here. *Slow and inaccurate sensors available in commercial smartphones impact game play.* For example, a common pitfall is running close to a boundary, stopping short, and watching one’s GPS position slowly drift across it, due to the slow rate (= 0.5 Hz) of fix computations. Successful players learn to compensate for this, and I have added an on-screen reminder zone to help. *Different types of terrain and sizes of play areas have a big impact on game play.* Small, clear-field games tend to be fast-action "sprints", while larger games with complex terrain are more strategic and gymnastic, reminiscent of parkour (en.wikipedia.org/wiki/Parkour).