A Mobile Location-Based Game Framework

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Presentation Content

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Location-based Game

• Game + Location
  • Location is useful for distinct results:
    • Accessing maps, weather, nearest points of interest, etc
    • Input controller
  • Unique gaming experiences
  • Unpredictable and dynamic gameplay
  • Physical interaction with the surrounding world
Anatomy of LBGs
Successful Location-Based Games

- Geocaching
- Shutterspot
- GeoPoker
- ZOMBIES
- MinuteWar
Issues in Location-Based Games

Most issues are due to the game being location-based:

- Unavailability / Inaccuracy of location-awareness
  - GPS signal unavailable

- Location-based content available but...
  - Maybe nobody’s playing in that location (Multi-Player)
  - Maybe the area is not ideal for playing the game

- Location-based content unavailable
  - Map/Weather/Geo-references not available for the given position
Issues in Location-Based Games
(Fit vs Unfit)

Consider two players, one being a potato-couch, the other a fitness fan, playing the same game, which consists of running around for about 5 minutes in order to pursue the goal:

• The unfit player will probably consider the game too challenging to bother with...
• ... While the physically apt player will consider the game too easy and will consider it boring.
Solution:

• For location issues:

  • **GPS is unavailable** =>
    • use cached data
    • allow the player to play the game as if he were elsewhere

  • **GPS is available but location-related data isn’t** =>
    • allow the game to be played as if elsewhere while controlling player movement via GPS

  • **Neither GPS nor location-related data is available** =>
    • play using cached data and controlling the game with other means of input.
Solution:

• For **difficulty issues:**

  • **Automatically scale the game difficulty** using some heuristic
    • Possibly even pausing the game if the player has halted

  • **Allow the player to tweak and adjust manually game settings** so as to fit his liking

  • **Provide some tutorials** to easy the learning curve.
Framework for LBGs
Framework for LBGs

This design allows to:

• **Use both GPS and available location-based services content** for the game

• **Use only location-based service content** (providing some false location data)

• **Use only GPS** (raw gps data converted to screen-coordinates)

• **Use neither** (classic game, no location used or emulated)
Framework for LBGs
Framework: Binarization

Google maps image  Game logic used image (depicting nodes)
Geo Wars: The Concept of a LBG

- Geo Wars is a **Tower-Defense** Location-Based Game
  - *Player is a General* at the center of the map

- **The game uses the players real location** (or any other if desired) to:
  - Get the game’s map
  - Get weather
  - Move the General around
Geo Wars: Architecture
Geo Wars: AI Routines

- Every unit in game (except player avatar) has the same basic AI routines:
  - Target acquisition
  - Moving
  - Firing sequence

...However, each game unit implements it differently...
Geo-Wars: A Location-Based Game
Interesting results: Geo Wars

• Development thread (in xda-developers.com) has more than 7000 views
  • Comments in that thread show positive feedback
• All version of Geo Wars have altogether more than 500 downloads
• Video in Youtube has more than 700 views
  • Shows that 90% of the viewers are males
  • Most viewers are from Germany, USA, France and Great Britain
  • Viewers’ age follows a normal distribution with the mean at the 25-34 interval
  • 68% of the viewers came from external links (from the developers thread
Interesting results: Framework

- **Performance** for a somewhat complex 2D game is around 25 fps (frames per second)
  - Thanks to texture and cosine/sine caching.
- **Location-based service** retrieval of data works
- **Easier access to GPS** data
  - Easily managed with a couple of lines of code vs. A few dozens
- **Easily expandable Sprite Class**
  - Some basic features such as rotations, drawing routines untuched
  - Collision handling and A.I change per subclass
Conclusions

• Many issues difficult to solve, easy to work around
  • Usually hardware related
• Definitely made the development of Geo Wars easier and faster
  • However, one game isn’t good enough
• Still misses some sought-after features
  • Multiplayer capabilities
  • Decent 3D performance
  • Easy development of game GUI’s
• Addresses some location-based issues for the game itself
  • But not all games will benefit from this
  • Some games have to use their own solutions (automatic balance of difficulty)
Future Work: Framework 3D leads to Geo Wars 3D
Future Work

• Indoor
• Android
• Multiplayer
• Serious games
• 3D (via OpenGL)
• More User-Given Feedback
• Other Location-Based Games
Questions