Multi-modal exploration of rugged digital terrain on mobile devices
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Overview

- Mobile devices are becoming dominant in digital map display (tablets too)
  - Challenges of small map display, storage / processing limitations
  - Dominance of Google Maps / Earth

What about terrain?

- What do they not communicate?
  - The look of a surface?
  - The feel of a surface?
  - Really?

What about balls?

- Actively engaged with the data
- "Energy" spent to roll the ball
  - Gravity, momentum, force
- Sense of presence
  - A spherical avatar
- Haptic (and sound) feedback

Rolling ball examples
Minimal Requirements

- OpenGL ES 2.0 (graphics language)
- Accelerometer / Gyroscope
- Magnetic sensor
- Supported on modern Android/iOS smartphone & tablets

Development environment:
software and hardware

- Android HTC Desire (2.3.7)
- Galaxy Nexus (4.1.1)
- Eclipse
- Android SDK and NDK
- GitHub version control (public version coming soon)

What goes on behind the scene

- Sensors feed data to the scene manager (C++)
- Scene Manager
  - prepares the scene objects
  - sets data for renderer in OpenGL rendering engine
  - sends data to renderer in OpenGL rendering engine
- Renderer (mixed C and C++ code and Graphical Library Shader Language, GLSL)
  - Dynamically binds vertex and fragment shaders
  - renders the scene with given perspective and lighting arrangements
  - Performs internally perform
  - Lighting setup is already provided.
- Processors
  - Internally perform
  - Matrix manipulation, matrix algebra and geometry manipulation to create the scene out of triangles.
  - Lighting setup is already provided.
- Application
  - Managed from Java through Android Activity, which
  - Sets the initial graphical context
  - Textures and additional effects currently under development.

Architecture Diagram

Data

Screen shots
Summary

- Richness of elevation not communicated?
- TerrainBall is tilting / twisting the terrain (the device) to roll the ball
- Haptic feedback to add to the visual
- Future testing on usability
- Where would you use this?
- Learning of terrain data – retention enhanced? (outdoor types, kids)
- Adding game like elements?

Presented at ICA: Meteorolgy Cartography Workshop, Taupo, NZ, 1 – 5 September 2012