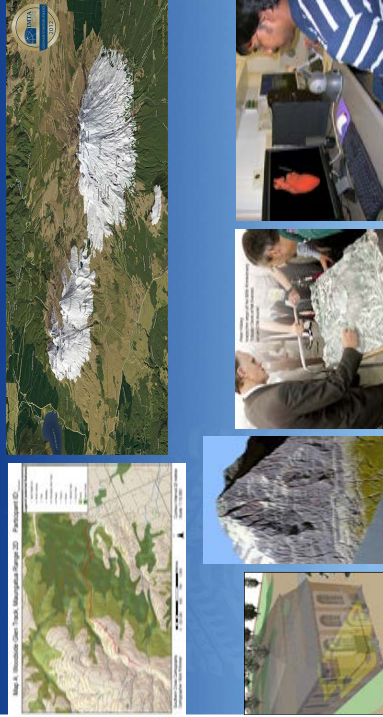




Multi-modal exploration of rugged digital terrain on mobile devices

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What about terrain?



Presented at ICA Mountain Cartography Workshop, Taurewa NZ, 1st – 5th September 2012

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



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What do they not communicate?

- The look of a surface?
 - 3D model of a building
 - 3D model of a mountain peak
 - 3D model of a mountain range
- The feel of a surface?



- Really?



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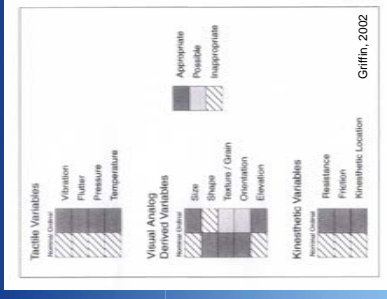
Rolling ball examples



Presented at ICA Mountain Cartography Workshop, Taurewa NZ, 1st – 5th September 2012

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



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Minimal Requirements

- Graphics**
 - OpenGL ES 2.0 (graphics language) provides direct access to vertex and fragment shaders
- Sensors**
 - Accelerometer / Gyroscope
 - Magnetic sensor supported on modern Android/iOS smartphone & tablets

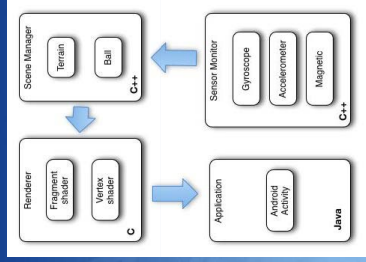
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Development environment: software and hardware

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

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Architecture Diagram



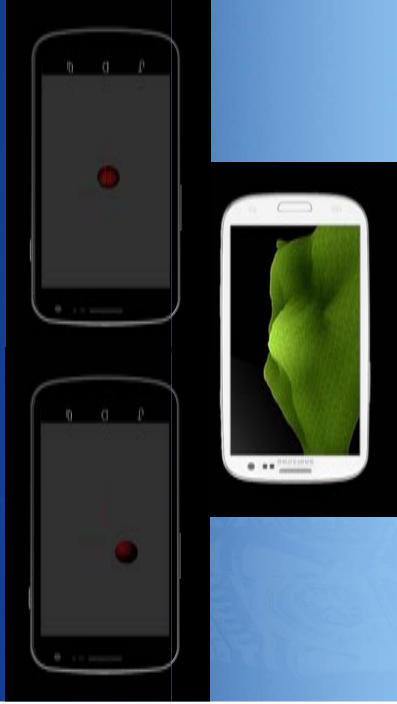
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What goes on behind the scene

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

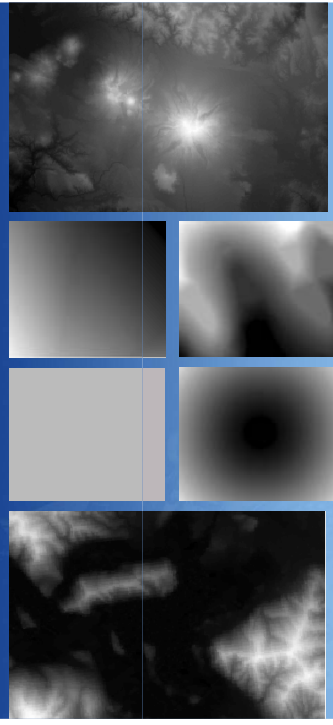
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Screen shots



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Data



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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?