



Game research
for training and
entertainment

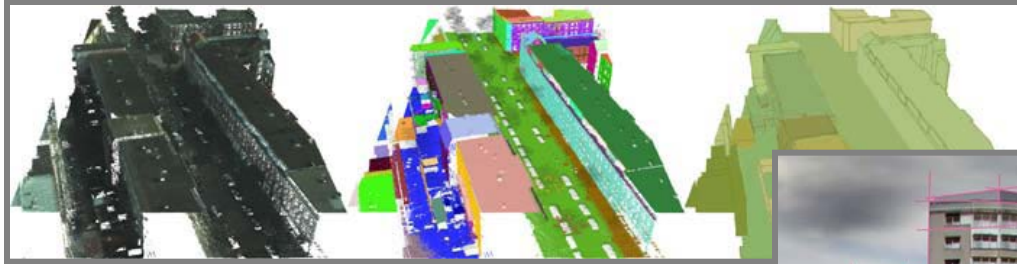
A Vision for the Future

Theme 1 – Modelling the Virtual World



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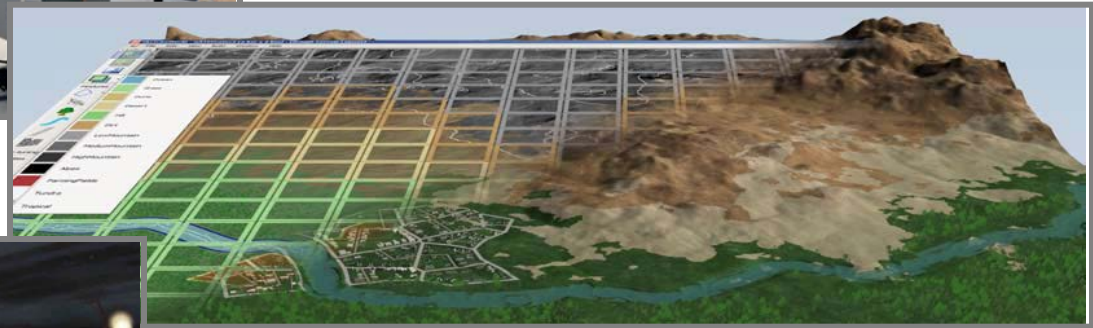
Theme 1 Work Packages



WP 1.1



WP 1.2



WP 1.3



Work Packages

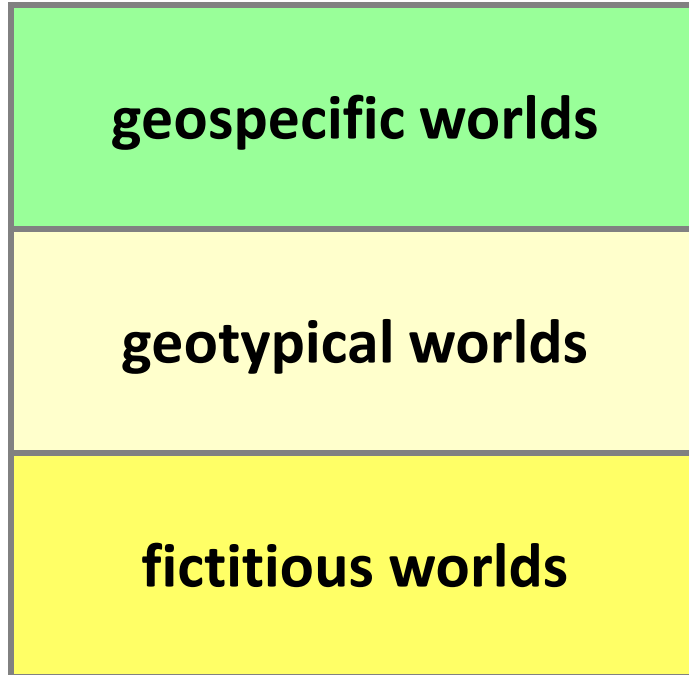
- **1.1 Automatic World Generation Based on Real Data** UU, TNO
- **1.2 Automatic Generation of Imaginary Worlds** TUD, TNO
- **1.3 Creating Ambience by Visual and Auditory Means** UU, TNO

Knowledge Transfer Projects

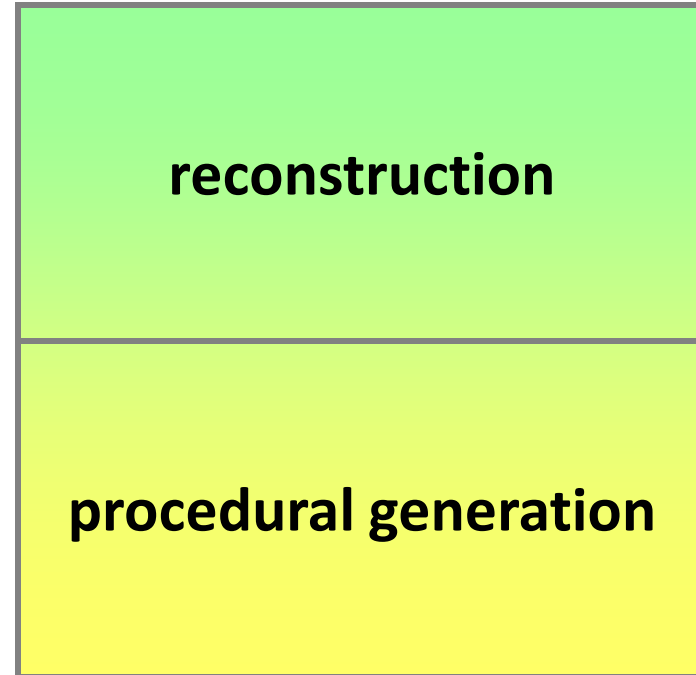
- **CycART - Cyclorama-based Automatic 3D Reconstruction Tools** Cyclomedia, UU
- **Enriching Geo-Specific Terrain with Procedural Details** Deltares, TUD
- **Semantic Building Blocks for Declarative Virtual World Creation** re-lion, TUD
- **Sound Design in Serious Games** VSTEP, UU

Virtual Worlds for Serious Games

world type



modelling technique





How do we build and use virtual worlds?

2007

reconstruction chain

- multi-stage via GIS
- mostly manual
- slow (years)

crowd sourcing

- 3D models

world =

- terrain only
- geometry + visual

game world development

- loose integration of tools
- loose coupling to game AI
- mainly manual modelling

game world =

- predefined

2012

reconstruction chain

- mixed processing
- partly automatic
- frequent updates (months)

crowd sourcing

- 3D models

world =

- terrain only
- raw data visualization

game world development

- loose integration of tools
- loose coupling to game AI
- partly procedural generation

game world =

- predefined / adaptive

2017

reconstruction chain

- direct from sensor data
- automatically
- rapid (days)

crowd sourcing

- data

world =

- broad and dynamic
- semantic objects

game world development

- integrated tools
- semantic object library
- low-skill productivity

game world =

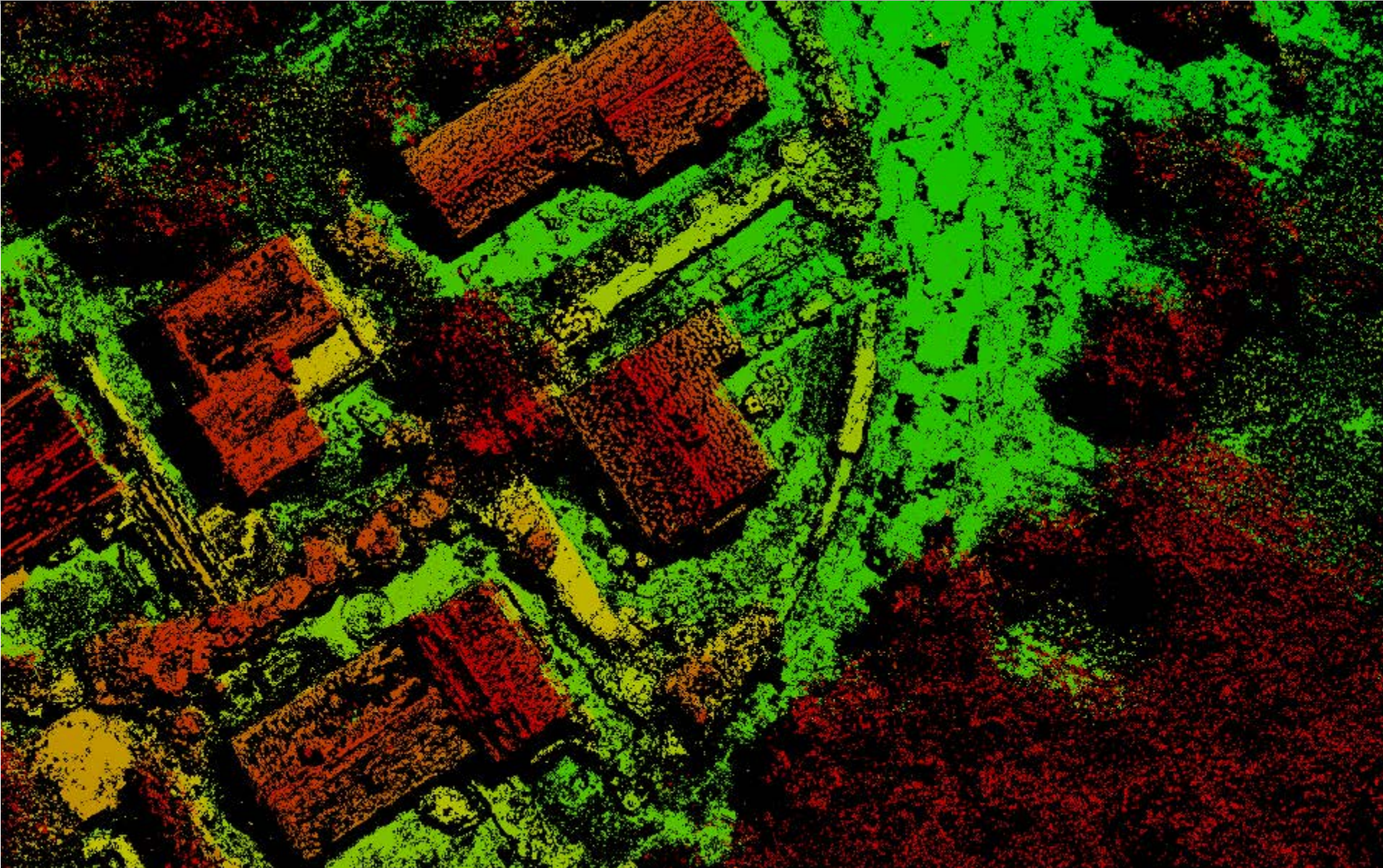
- large adaptive worlds

2022



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Innovation – What techniques are required?





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Innovation – What techniques are required?



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Innovation – What techniques are required?



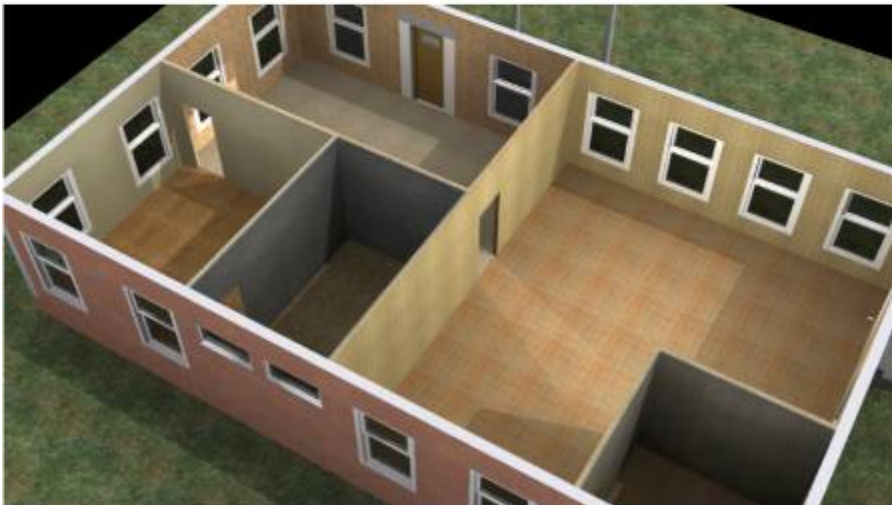
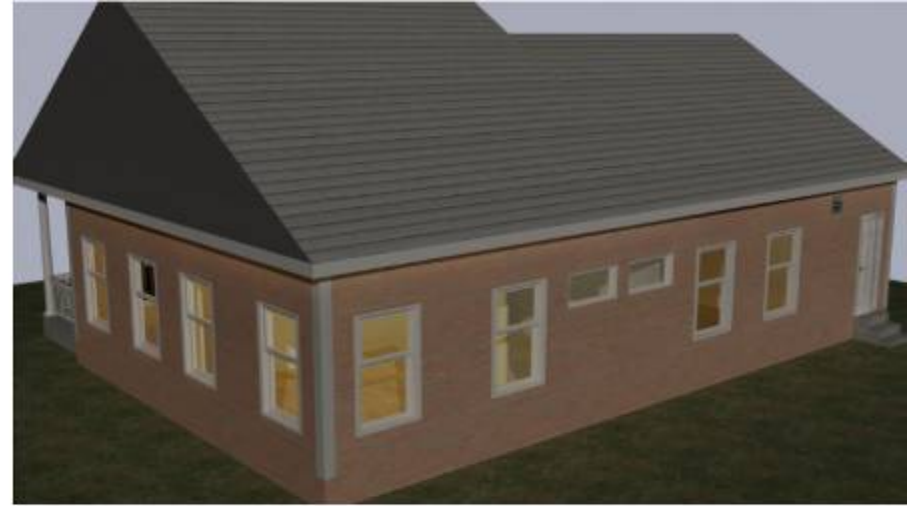
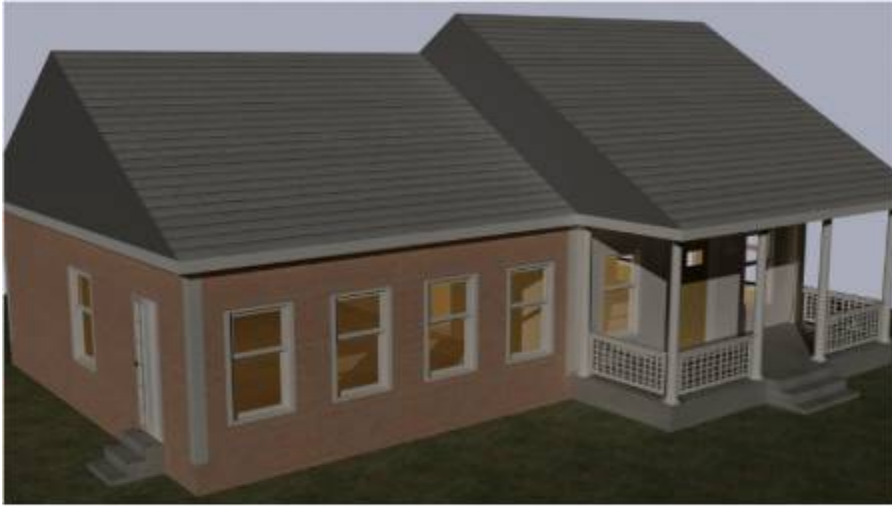
Reconstruction techniques

- **automatic geometric reconstruction**
 - point cloud generation and processing
- **automatic semantic analysis**
 - semantic data model required
 - matching techniques required
- **deal with (and exploit)**
 - sensor fusion
 - explosive amounts of data



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Innovation – What techniques are required?

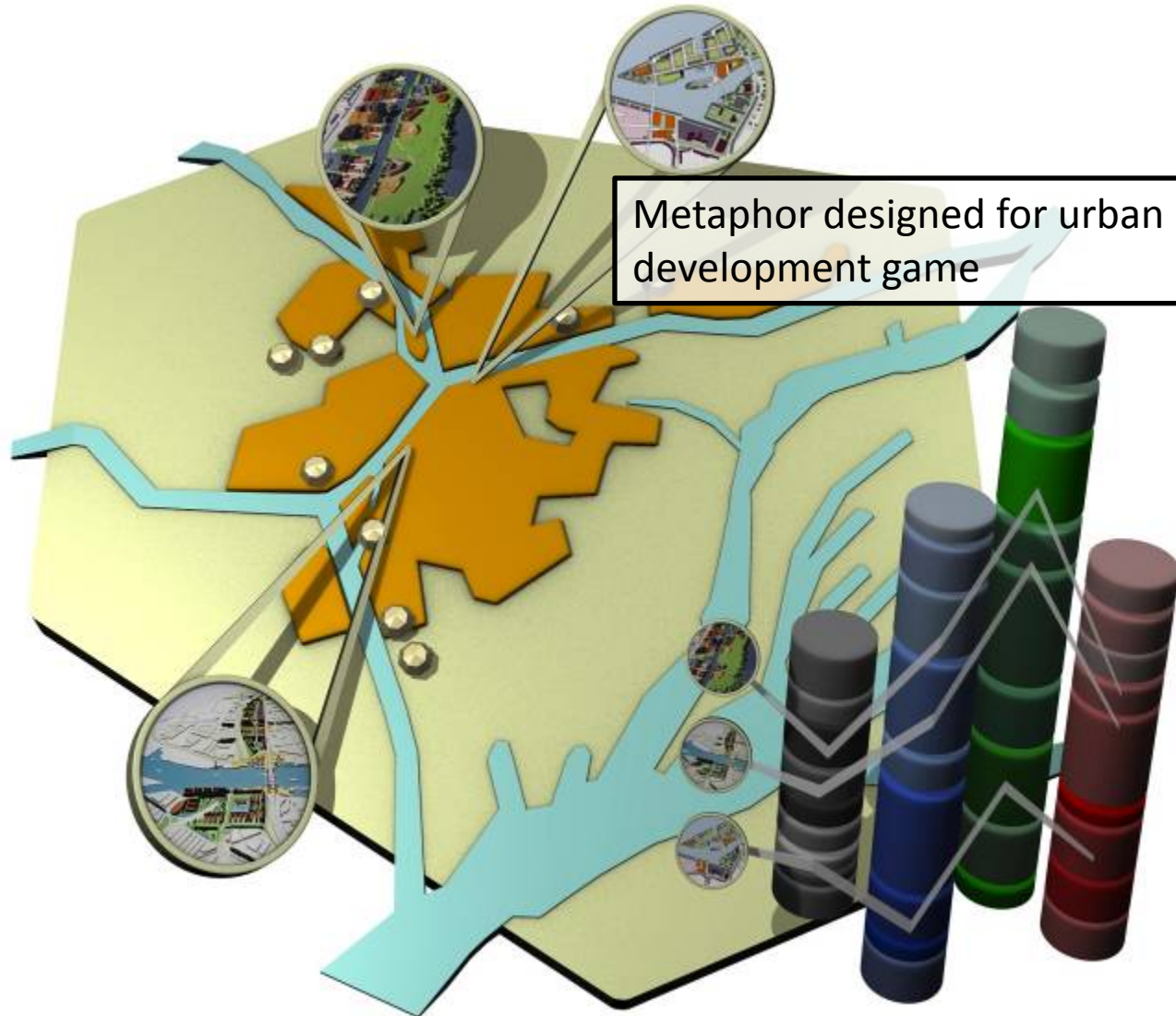


Innovation – What techniques are required?

Metaphor used in cooperative planning game

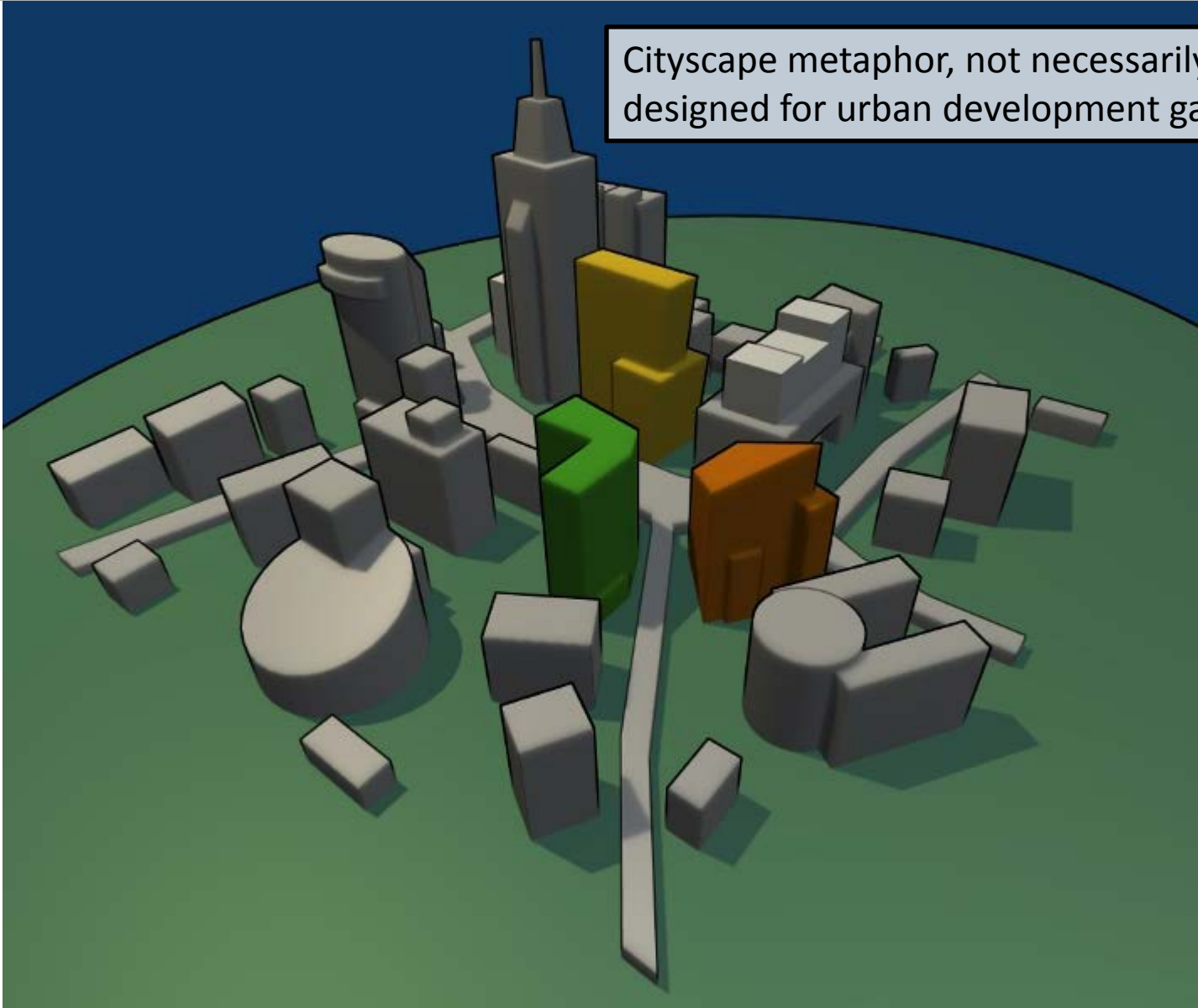


Innovation – What techniques are required?



Innovation – What techniques are required?

Cityscape metaphor, not necessarily designed for urban development game



Procedural generation techniques

- **seamless integration of design workflow**
 - procedural generation
 - manual editing
 - user control based on game designer intent
- **re-usable semantic object library**
 - semantic data model required
 - generation techniques required
- **metaphor worlds**
 - game designer creates an *experience-scape*
 - emphasizing key concepts, de-emphasizing irrelevant details
 - engaging and stimulating
- **adaptive worlds**
 - run-time generation
 - dynamic interaction
 - large worlds

Reconstruction

- **Sensor data availability (ever growing)**
- **Development of**
 - personal devices, game consoles, 3D media
 - global positioning systems
 - augmented reality
 - data networks
 - CPU/GPU power
- **Crowd sourcing opportunities**

Procedural generation

- **Development of**
 - CPU/GPU power
 - game consoles, 3D media
- **Big-games from big-game-companies**

Reconstruction

- **National**
 - Data (service) providers
 - Government and municipalities
 - Academia
- **International**
 - Google, Microsoft, Apple, etc
 - Data (service) providers
 - The crowd
 - Academia

Procedural generation

- **National**
 - Academia
 - Few companies
- **International**
 - Academia
 - Specialized companies: Houdini, Procedural, Speedtree
 - The bigger game engine developers

Reconstruction

- automatic matching of sensor data to semantically rich models

Procedural generation

- automatic generation of designer intent based worlds using semantically rich models
- transformation into metaphor worlds to achieve a better (serious) gaming experience



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A Vision for the Future of Virtual World Modelling Explore beyond!

