TERHEGGE GETALTER ERES

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UBC Forestry

GIS Day 2022

FINERLERE

- Teaching GIS online, remotely was challenging during the pandemic
- Minecraft is popular, but proprietary, pay-to-play game
- Two game play modes: survival and creative
- Many educators use creative mode to teach chemistry, biodiversity, ecology, geography and computer science at all levels Pre-K to PhD



FINERE

Minetest

- Free and Open Source Software
- Voxel-based sandbox video game engine
- New mods can add functionality, tools, textures or even new games
- Supports multiplayer online play



"Earth" by Lentbriesje and sofar



Lidar

Point Classification

Points are converted to voxels and each voxel is assigned a node type based on the classification. Ground returns are typed based on elevation/depth.

eneral	Statistics							
tatistics	Classification Codes Attributes Returns Classification Flags							
LAS Files	Classification	Point Count	%	7 Min	7 Max	Min In	Max In	Synthe
rface Constraints	1 Unassigned	235 171	2.85	337.52	524.22	0	65535	0
/ramid	2 Ground	187.358	2.27	339.16	476.70	0	65535	0
Coordinate System	3 Low Vegetation	307,288	3.72	339.40	480.35	0	65535	0
	4 Medium Vegetation	3,779,266	45.81	344.38	501.43	0	65535	0
	5 High Vegetation	3,609,673	43.75	364.41	522.06	0	65535	0
	7 Noise	130,837	1.59	338.63	476.57	0	65535	0
	18 High Noise	216	0.00	426.50	482.98	0	65535	0
	Update Force recalculate Statistics up to date.							



Top of Terrain

errain Deep Fill

Near Sea Level

Sea Level

Anderson, K., Hancock, S., Casalegno, S., Griffiths, A., Griffiths, D., Sargent, F., McCallum, D., Cox, D.T.C., and Gaston, K.J. 2017. Visualising the urban green volume: Exploring LiDAR voxels with tangible technologies and virtual models. Landscape and Urban Planning, 178: 248-260.

Lidar

- Point Classification
- Digital Elevation Model

The DEM provides the base terrain for the world. Use elevation/depth to determine the block type to place.



Lidar

- Point Classification
- Digital Elevation Model
- Canopy Height Model

The CHM provides elevations for the tree canopy. We use the LiDAR classification to assign a leafy node type.



Lidar

- Point Classification
- Digital Elevation Model
- Canopy Height Model

A maximum filter is passed over the CHM to identify approximate locations of the tree stems. A tree stem node type is repeated from the elevation of the DEM to the elevation of the CHM.



offel the heres

Lidar

- Point Classification
- Digital Elevation Model
- Canopy Height Model

The CHM (high vegetation) is typed with a pine tree foliage. Low and medium elevation classified vegetation is typed with a fern/plant node block.



High Vegetation



Tree Stem



Low/Medium Vegetation



UBC Wreck Beach



DEFEL THE HELLE

ColorBrewer4Minetest



ColorBrewer and Slope



ColorBrewer and Hillshade



DEFEL THE HULLE

OpenStreetMap

- Point of interest nodes
- Street ways

OSM ways and nodes are extracted for the study area via the Overpass API. Ways are buffered and "painted" on the top of the terrain. POIs are placed with custom 3D models.



Downtown Vancouver



Real Coordinates

- UTM coordinate is stored in the world configuration file
- Latitude/Longitude calculated on-the-fly
- Coordinates and elevation displayed in real-time player movement

Elevation: 507 m Lat: 49.30452 Long: -122.54073 Realm 2 : MKRF_Block_B5



Real Compass

- Minetest supports in-game azimuths, so the world just needs to be oriented
- Set local declination
- Use UTM coordinates to define geographic north
- Set/get azimuths



IN THE ELEPTION

Lesson Plans

- Terrain modelling and spatial interpolation algorithms
- Find the steepest slope, slope with given aspect, highest/lowest elevations
- Identify sinks, peaks, saddles, plane/profile curvature
- Raster focal functions
- Symbology, extrusion, cartography
- Orienteering with compass and real-world map

<u>Chillenge</u>

- Minetest mods are written in Lua
- No geospatial libraries in Lua (e.g., GDAL, Proj, etc.)
- Setting up and managing a multiplayer server is not simple
- Minetest coordinate system is cartesian (x,y,z), geographic and projected coordinate systems must be simulated or converted
- Total Minetest world space is limited to 61,840³ nodes or about 3,824 km² in x-y planar coordinates



KIRLIGE AND

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Jocelynn Bachmann Game Developer

> Nanjou Olsen Game Developer

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Lukas Olson Game Developer

Daniel Aghda Game Developer

-• Jiho Kim 3D Artist

> Not Pictured **Vita Chan** Pixel Artist





github.com/ubc-minetest-classroom



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