CE810 - Game Design 2

Procedural Generation

Joseph Walton-Rivers & Piers Williams

Tuesday, 15 May 2018

University of Essex

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Exercise

Question

What do we mean by procedural generation?

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A definition

The act of **creating** content for games using **algorithms** as opposed to being **hand-crafted** by a human creator.

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ok... maybe not that one.

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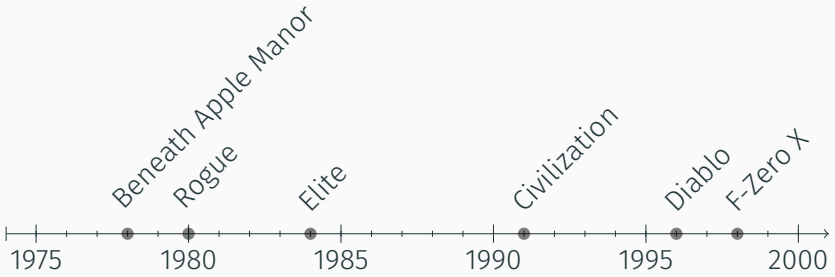
Early Procedural Generation



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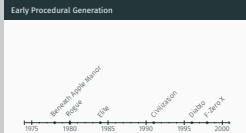


BeneathAppleManor First Roguelike

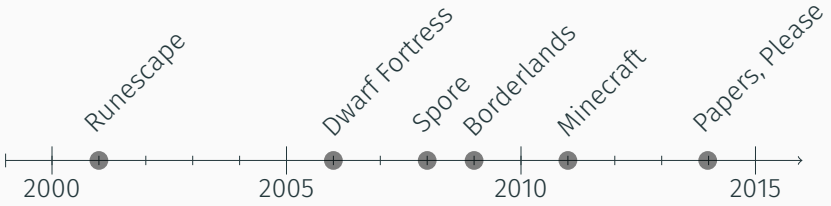
Rogue Dungeon generation

Elite Galaxy generation

Civilization 4X TBS Map Generation

F-Zero X Racing track generation

History of Procedural Generation



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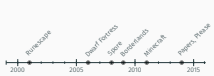

- Procedural Generation used to be used due to space constraints
- Nowadays it tends to be to provide more content
- The games used PCG for:

Runescape	Dungeons
Dwarf Fortress	Everything
Spore	Music, Animation, and World
Borderlands	Guns from loot
Minecraft	Environment
Papers, Please	Immigrants

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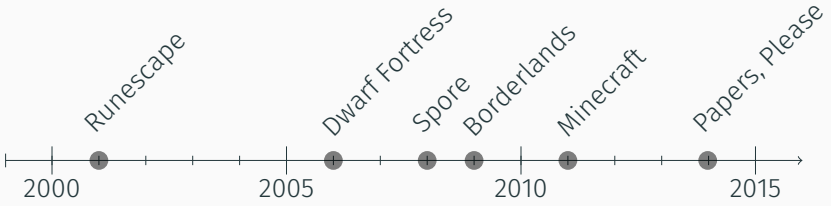

One of the most common uses for procedural generation is levels

History of Procedural Generation
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Spore
Borderlands
Minecraft
Papers, Please
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2005
2010
2015
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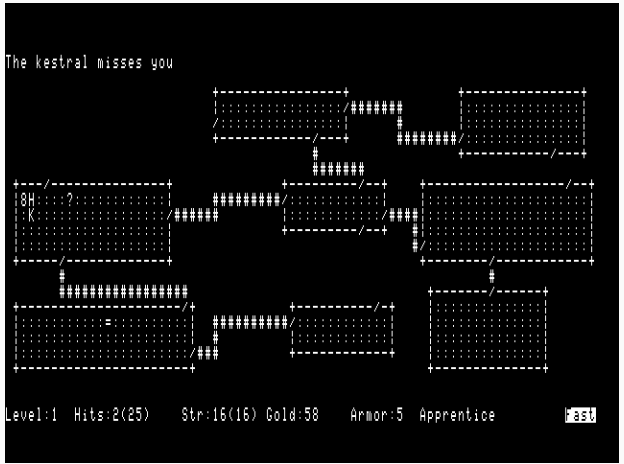
Level Generation

Rogue

- Spawned an entire genre based on procedural generation.
- Randomly generated dungeons



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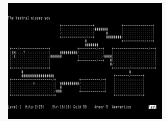

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- Binary Space Partitioning
- Random walks
- Cellular Automata
- Answer Set Programming
- Noise-based
- Grid Based

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Cellular Automata

- Some states (2 or more)
- You need a rule (eg, if at least 4 of your neighbours are alive, then return alive, else return dead.)

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for tile in grid:
        neighbors = get_alive_neighbours(tile)
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Demo

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- Pick (or generate) a template for each block
- Place template on grid

Examples: *UFO: Enemy Unknown*, *Spelunky*

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Assets

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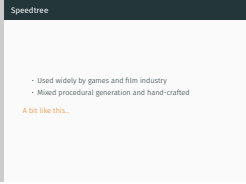
Speedtree

- Used widely by games and film industry
- Mixed procedural generation and hand-crafted

A bit like this...



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- Generate Weapons based on particle systems
- Based on NEAT evolutionary algorithm
- Choices based on what the player does
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Demo on their website

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