Handmade Detail in a Procedural World

Dr Mark R Johnson (@UltimaRegum)
Postdoctoral Fellow in Game Studies
Independent Game Developer
Retired Professional Gamer

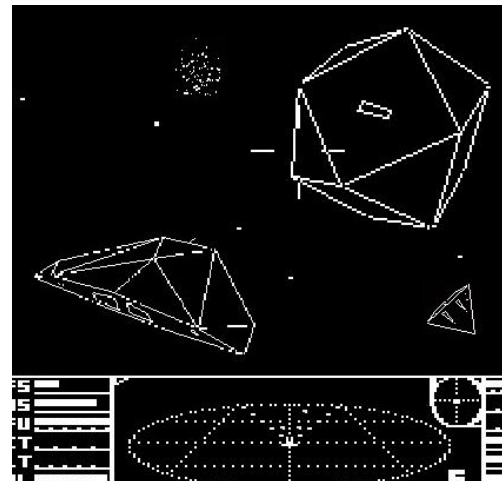INDEPENDENT GAMES
SUMMIT

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Outline

- Introduction
- Benefits of procedural (PCG) & hand-made (HM)
- Attempted Integrations
- Hiding Integration?
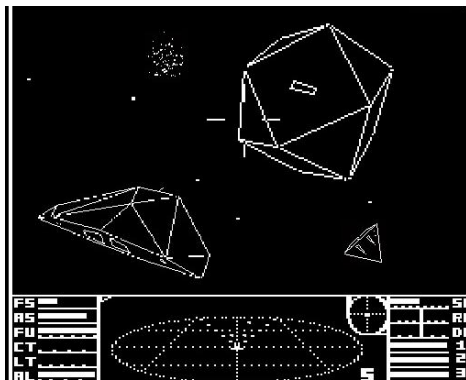- Conclusion

Background

- PCG has a long history in many genres

- Various kinds of PCG:
  - Solar systems
  - World map
  - Dungeon levels
  - Platforming levels

Elite (1984)

Civilization (1991)
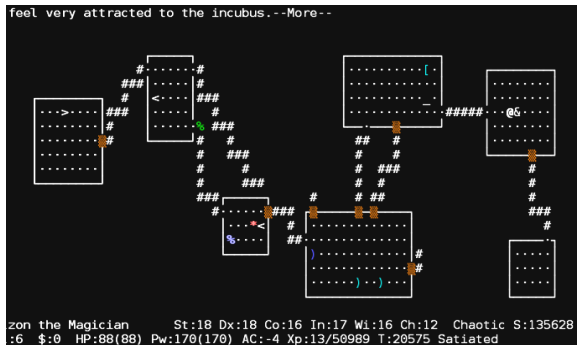
TES: Daggerfall (1996)

Spelunky (2008-2014)

Roguelikes

- The potential of procedural gen

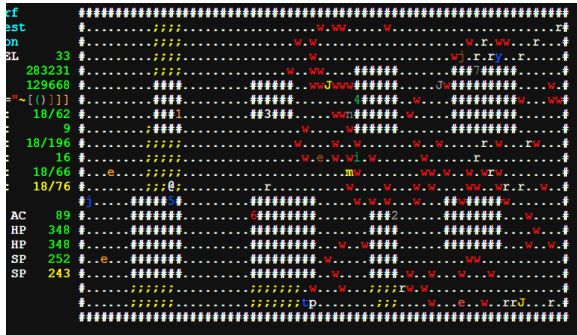- Replay value, challenge, and complexity

- Roguelites? Roguelikelikes? PDLs?

NetHack (1987-2003?)

ADOM (1994-Present)
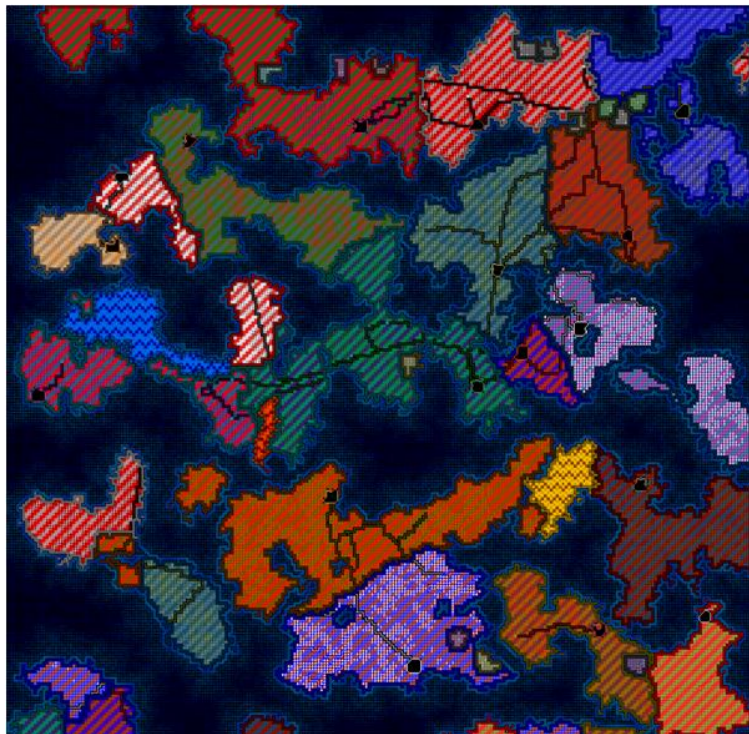

Angband (1990-Present(ish))
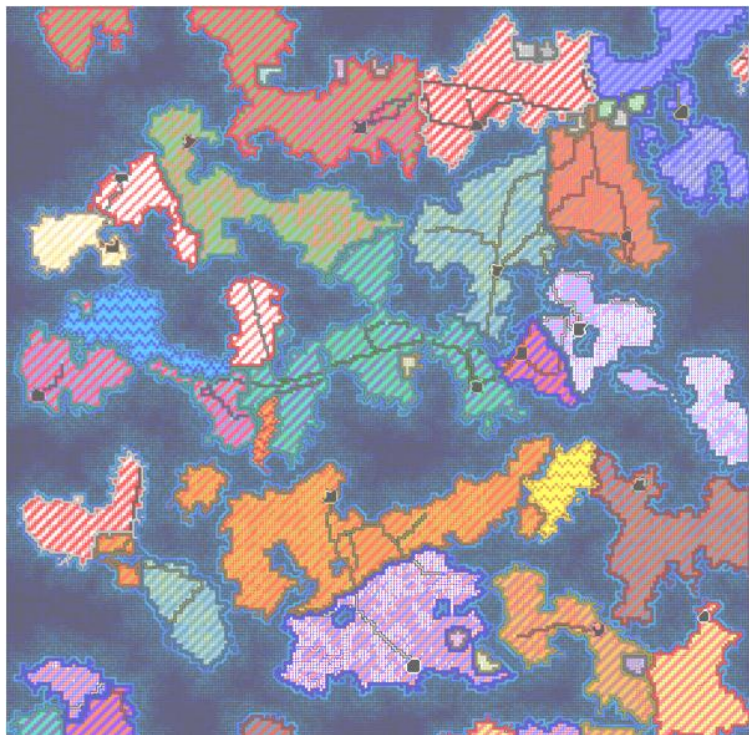

DCSS(1997/2006-Present)
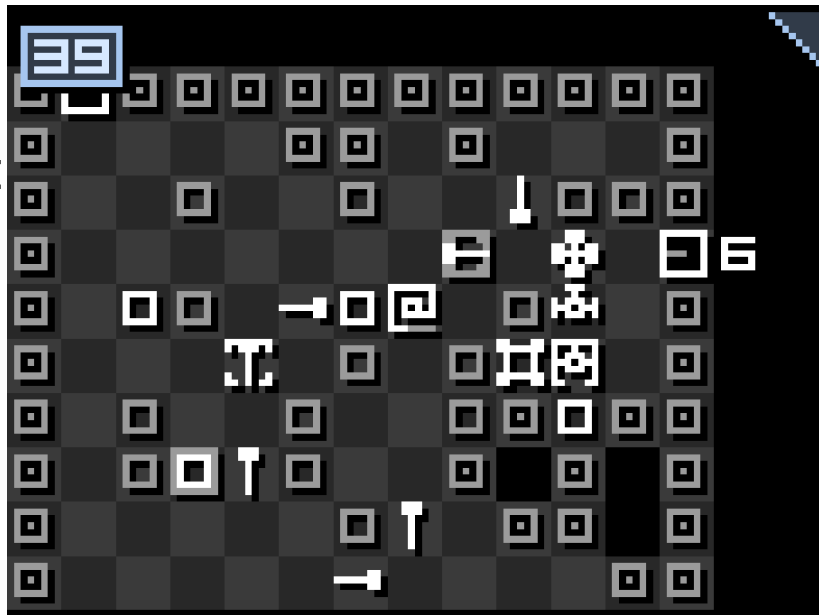
Procedural or Hand-Made?

Procedural or Hand-Made?

Benefits of Procedural (Dev)

- PCG as a time saving system
- "Have the game make the levels!"
- Quicker than making a large set of hand-made levels?
- The effort needed in interesting procedural generation algorithms
- Ensuring level solvability…

Benefits of Procedural (Dev)

- PCG systems can create emergent gameplay
- Challenges or situations the developers could not have anticipated
- "Simulationism" in PCG (e.g. NetHack)
- Allows for player discovery…
- …but risks imbalance?

Benefits of Procedural (Dev)

- Historically, PCG was also used to handle memory issues and technical constraints

- Less relevant these days… or is it?

- *No Man's Sky, URR,* etc

- Low saved content, *replicability*, seeds…

Benefits of Procedural (Player)

• Replay value: the game is "the same" on a meta-level, but the specifics vary each playthrough

• The player doesn't learn a level or enemy or item location, but the possibility space

• Game feels fresh and new…

Benefits of Procedural (Player)

- …but the player can still *learn*
- Many PCG games have very high skill ceilings
- Challenging and compelling to master, and *cannot* simply be rote-learned
- However, some players struggle with this learning process (e.g. FTL)
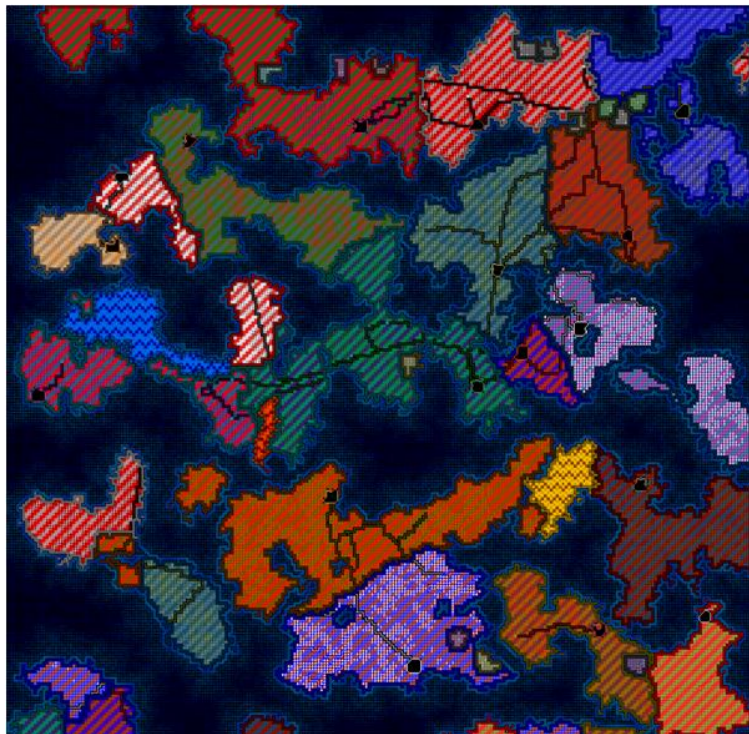- Tactical and strategic failure

Benefits of Procedural (Player)

- PCG games are well-suited to *exploration*

- *No Man's Sky, Elite, Ultima Ratio Regum, Dwarf Fortress, Civilization (?), Minecraft, etc*

- Player rarely knows if everything has been seen…
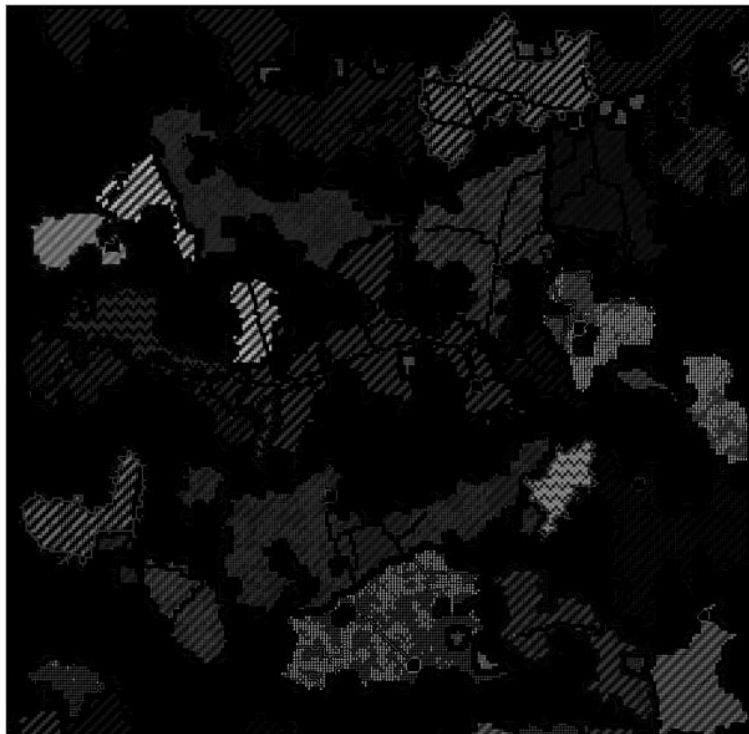
- …or if something new lies around the corner

Procedural or Hand-Made?
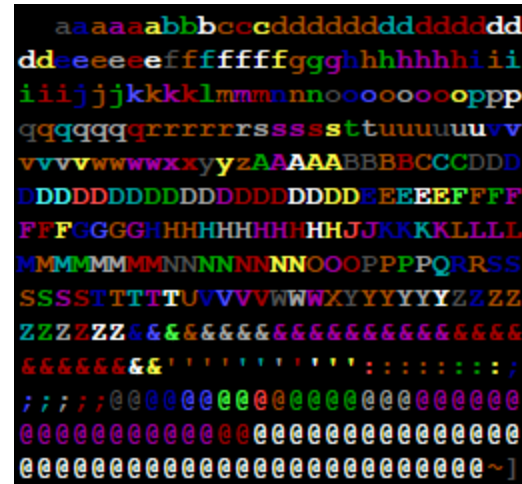
Procedural or Hand-Made?

Benefits of Hand-Made (P&D)

• Hand-made levels allow for the careful crafting of *specific* gameplay instances

• Well suited to narrative-focused games

• Well suited to *teaching* the player?

• Walkthroughs are easier to write!

• PCG merits wiki, not walkthrough

The NetHack wiki's useful "diagram" of all possible monsters in the game…

Benefits of Hand-Made (Dev)

- PCG tends to struggle with certain games
- Generating *puzzles* is challenging
    - Multiple steps
    - One or many solutions?
    - Parity between solutions
    - Predicting player thought processes
- As are more "abstract" concepts –
narratives, ideas, beliefs, etc

Attempts at Integration

- *Faster Than Light* (2012-2014)

- *Dungeon Crawl Stone Soup* (1997/2006-Present)

- *Spelunky* (2008-2014)

- *Ultima Ratio Regum* (2011-Present)

Faster Than Light

- Handmade quests are distributed to procedural waypoints through procedural systems

- If the player reaches each checkpoint in the questline, placed quasi-randomly, a reward is given
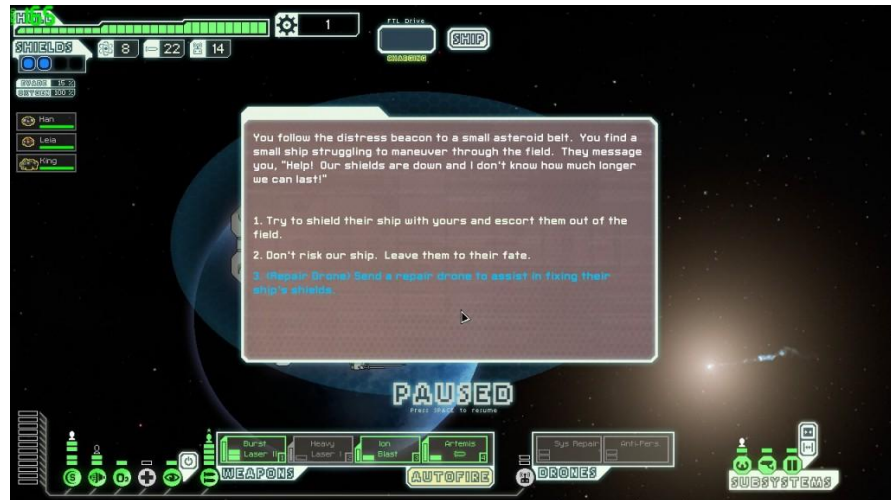
Faster Than Light

· However: sometimes not all the checkpoints can even spawn, since many have requirements…

· …and even if they *do* all spawn, the player must gamble on which are the right and wrong checkpoints to visit

Faster Than Light

· These quests add distinctiveness and structure to each playthrough…

· …but can be only partly spawned and are very chance-dependent

· Gathered significant negative player feedback

Faster Than Light

• What if a system ensured the *quest* could be *finished*, just like systems ensure that all the *rooms* in a PCG dungeon are *connected?*

• PCG quests are far newer and far rarer

• And, besides, how do we handle missing the right systems?
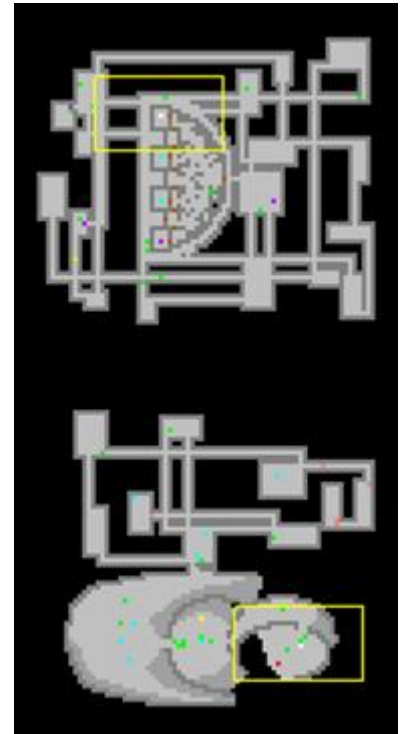
Dungeon Crawl Stone Soup

- Many levels contain special hand-made "vaults"

- These are linked up to the standard PCG floorplans
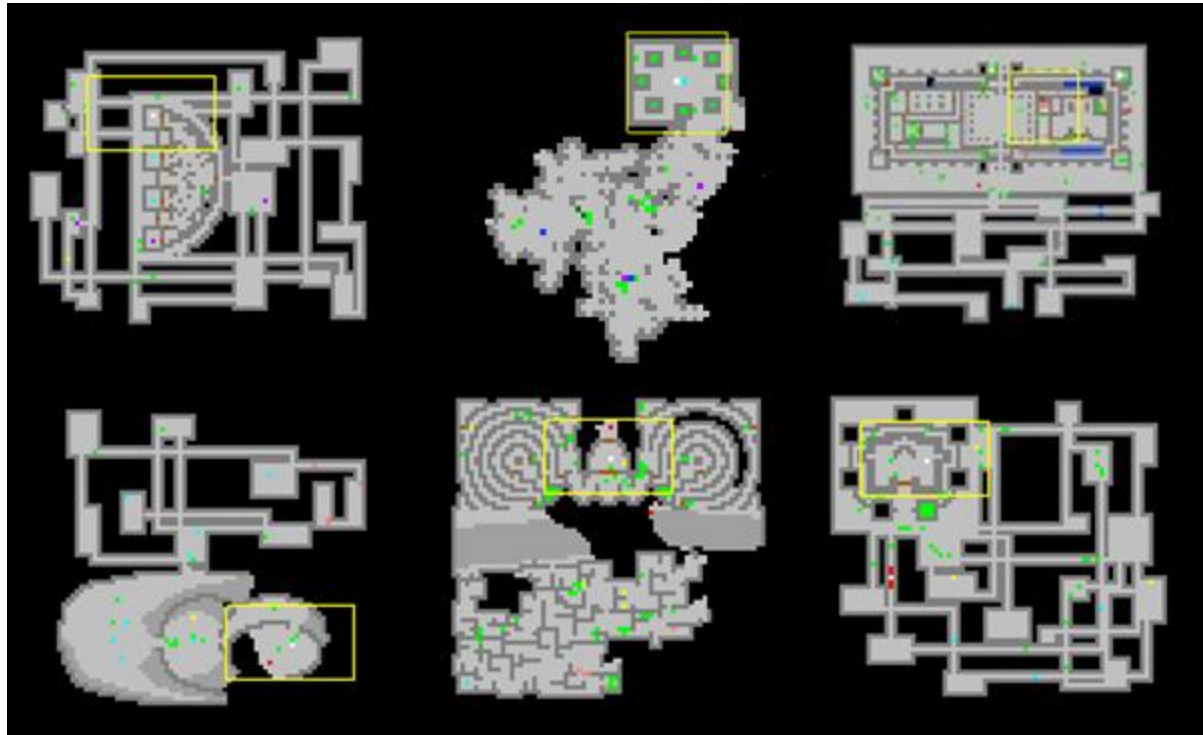
Dungeon Crawl Stone Soup

• Each of these offers either a distinct mechanical challenge, or some carefully-crafted thematic content

• It is therefore a break from general monsters in the rest of the dungeon

• And, crucially, this break is obvious before the player walks into it

Dungeon Crawl Stone Soup

· These vaults offer the player a choice between the potentially greater risk the vault offers, and potential rewards

· The player can explore them whenever they want

· Vaults therefore break up both the level aesthetics, and the gameplay
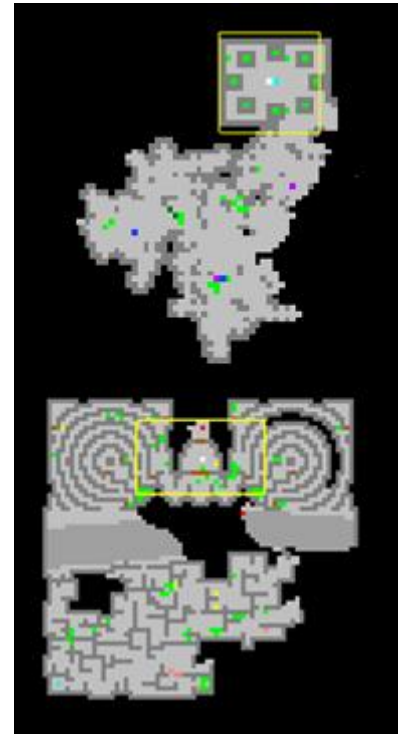
Dungeon Crawl Stone Soup

• Vaults are also a method for the player to track their progress

• One PCG level can look like another…

• …unless the player remembers the level with the challenging vault, the hidden unique enemy, the carefully-designed narrative area, etc
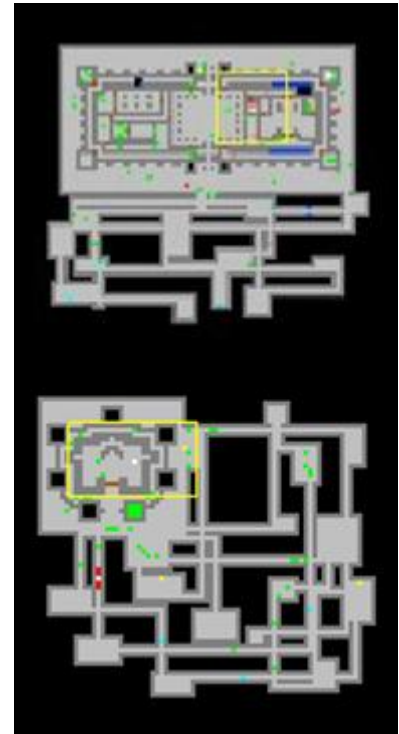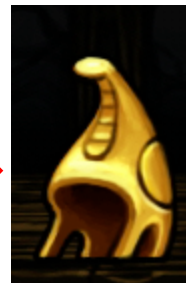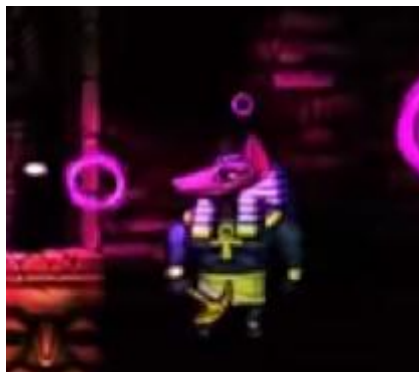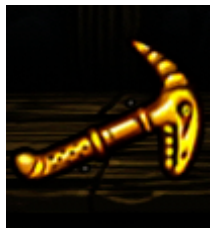
Spelunky

• Although all levels are PCG, there is a hand-made thread of "secrets" which run throughout all levels and runs

• The sequence is identical, but the challenges of acquiring every part of the sequence are new to each playthrough
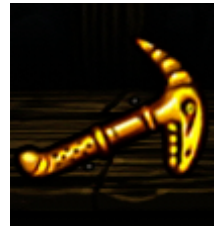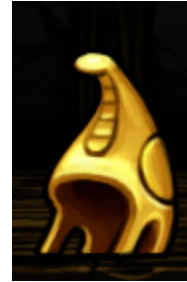
Spelunky

• Each component is distributed throughout the levels regardless of what the PCG algorithms decide

• Allows a hand-made quest to play out across procedural levels

• Gives meaning and pacing to the player's actions (like the DCSS vaults), and a hand-made challenge for the most skilled players

Ultima Ratio Regum

- Procedural generation of more qualitative concepts
  - Cultures, societies
  - Religions, heresies
  - Social norms, behaviour

- These types of generators are new and challenging to build

- So they are interspersed with hand-made unique versions

Ultima Ratio Regum

• Religious altars adhere to four major algorithms

• "Dystheistic" gods have a small set of hand-made altars (but are very rare)…

• …whilst "standard" and "pantheon" religions have massive sets of algorithmic altars (and are common)

Ultima Ratio Regum

• Some layouts are easier to generate algorithmically than others

• Mansions are predominantly hand-made with minor variation

• A huge range of requirements for rooms, layout, functions, housing, which is hard to write an algorithm for fitting into a small space
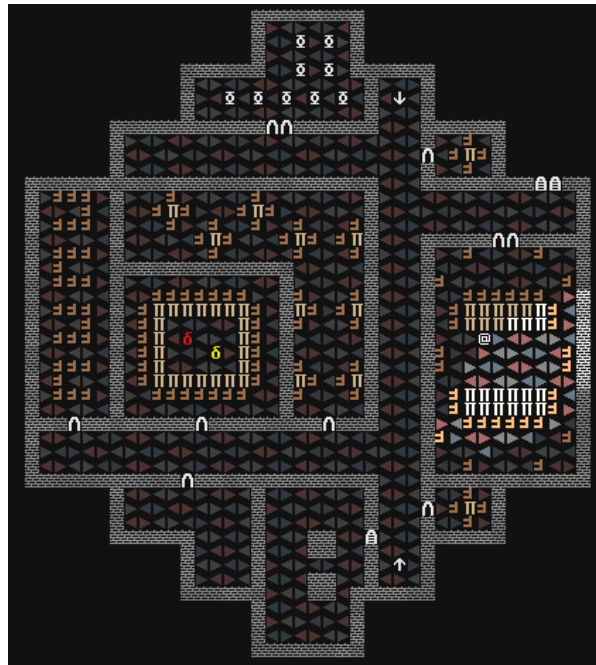
Ultima Ratio Regum

- Cathedrals, meanwhile, are primarily algorithmic

- Larger areas, fewer strict requirements, noteworthy for their grand architecture

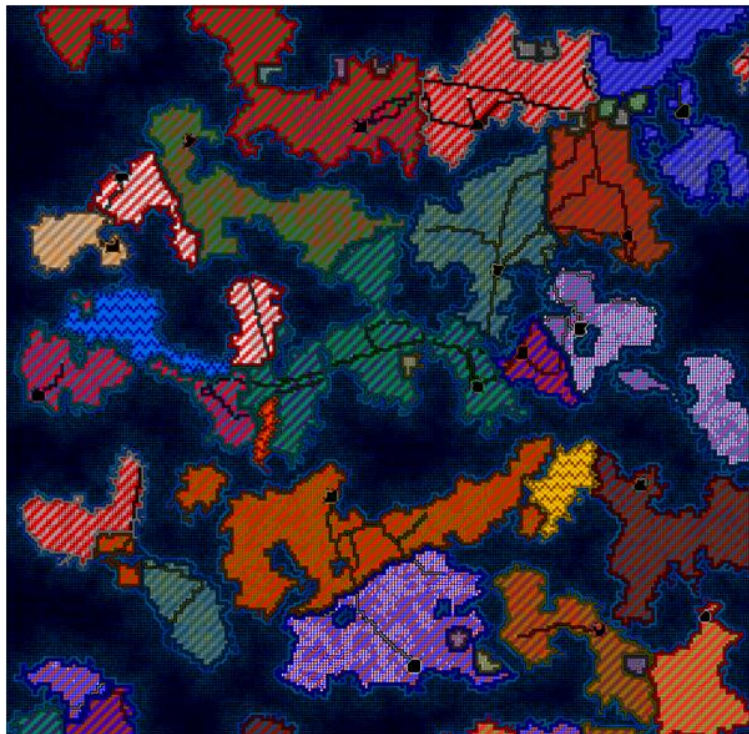- The algorithm is given free reign to design what it wants to!

Ultima Ratio Regum

• Interestingly, few if any players seem to be able to identify the difference

• The procedural areas are "good" enough that they can pass for hand-made

• Whilst players "read" algorithms into the hand-made areas without any
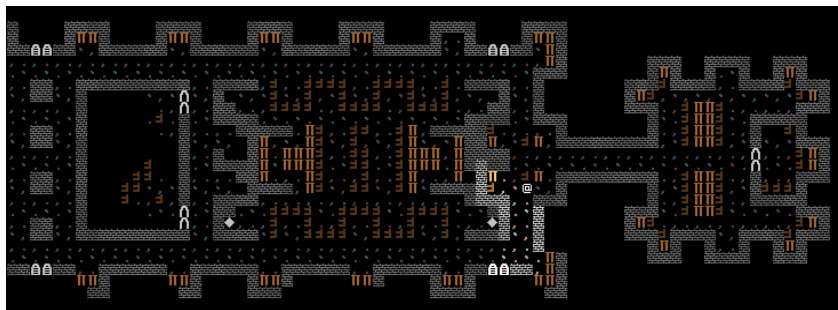
In Summary…

Combining PCG and HM

- Two primary methods of integration
  - "Overlaying"
  - "Integrating"

- *Overlaying* (vertical*)*: a thread of the hand-made runs throughout (*Spelunky, FTL*)

- *Integrating* (horizontal): PCG and HM are jumbled up and intertwined (*DCSS, URR*)

Hiding Integration?

- Therefore: do we want to deliberately hide the differences?
- In many cases, it is simply obvious…
- …in others, it helps pace the game…
- …but in some, it might give the player unintentional information
- An open question.

Progress to Date

- Many games have experimented with HM/PCG integration in these ways

- But lots more to be done: puzzles, narratives, quests…
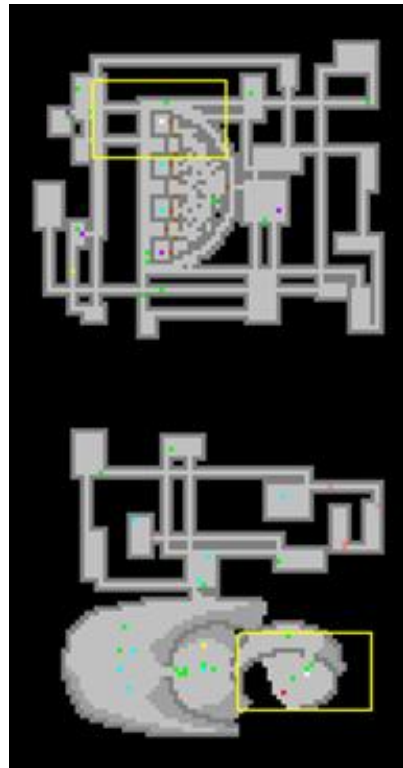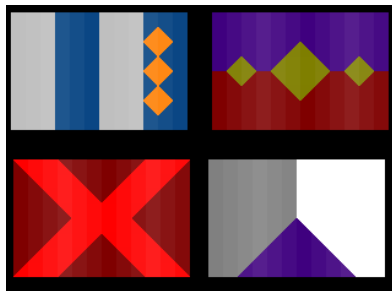
Thanks for listening!

- Any questions?

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