A Handcrafted Feel: 'Unexplored' Explores Cyclic Dungeon Generation

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D o r m a n ☰ e c h

Stop creating branching paths, start using cyclic dungeon generation. Your levels will feel so much more hand crafted.

The most common strategy to generate dungeons in roguelike games is to keep adding generated or pre-designed dungeon pieces to the map. This way a dungeon is grown from a starting point much like a tree. However, trees end in branches and this creates a lot of dead-ends. To get around this problem most dungeon generators look for places to randomly reconnect the branches so that the player might actually wander in circles instead of having to backtrack all the time.

The dungeon crawler *Unexplored* changes this fundamentally (see figure 1). Instead of taking linear paths as its most basic structure, it generates everything in cycles from the get go. The differences are striking: where good cycles and interesting cycles might randomly appear using the old technique, in Unexplored they a planned feature of the generator's output.

Paths are the base structure of most level generators.
They create tree like levels, often with only one solution.

In Unexplored cycles are used to create better flow
and to present players with alternative solutions.

Figure 1 – Cycles versus trees.

So how does this work? When Unexplored starts generating a dungeon it starts from an arbitrary starting point somewhere on the map. But instead of simply creating a branch to a target point it creates a cycle consisting of two paths connecting to the entrance to the goal. These cycles accommodate basic level design patterns far better than linear paths do.

Each cycle has a path 'a' that leads from the entry point towards the goal, and a path 'b' that leads back. Depending on the absolute and relative lengths of 'a' and 'b' you can change each cycle into a design pattern (see figure 2). For example when 'a' is short and 'b' is long, you can place a locked door at the cycles goal, and place the key at the end of 'b' just before you can cut back to the main path. This creates a level where players first encounter the locked door, and when they do find the right key they do not have to go far to reach the door it unlocks. Obviously, this requires that the player cannot reach 'b' from the cycle's entrance straight away, although it might be interesting if they can already see 'b' and the key.

Another example that works well with a long 'a' and a short 'b' is to put a secret door between the entrance and 'b', creating a hidden shortcut. Or maybe 'b' is simply a more dangerous route then 'a', taking the player past a dangerous foe or requiring the player to navigate a trap infested room. There are many possibilities, figure 2 lists a couple more.
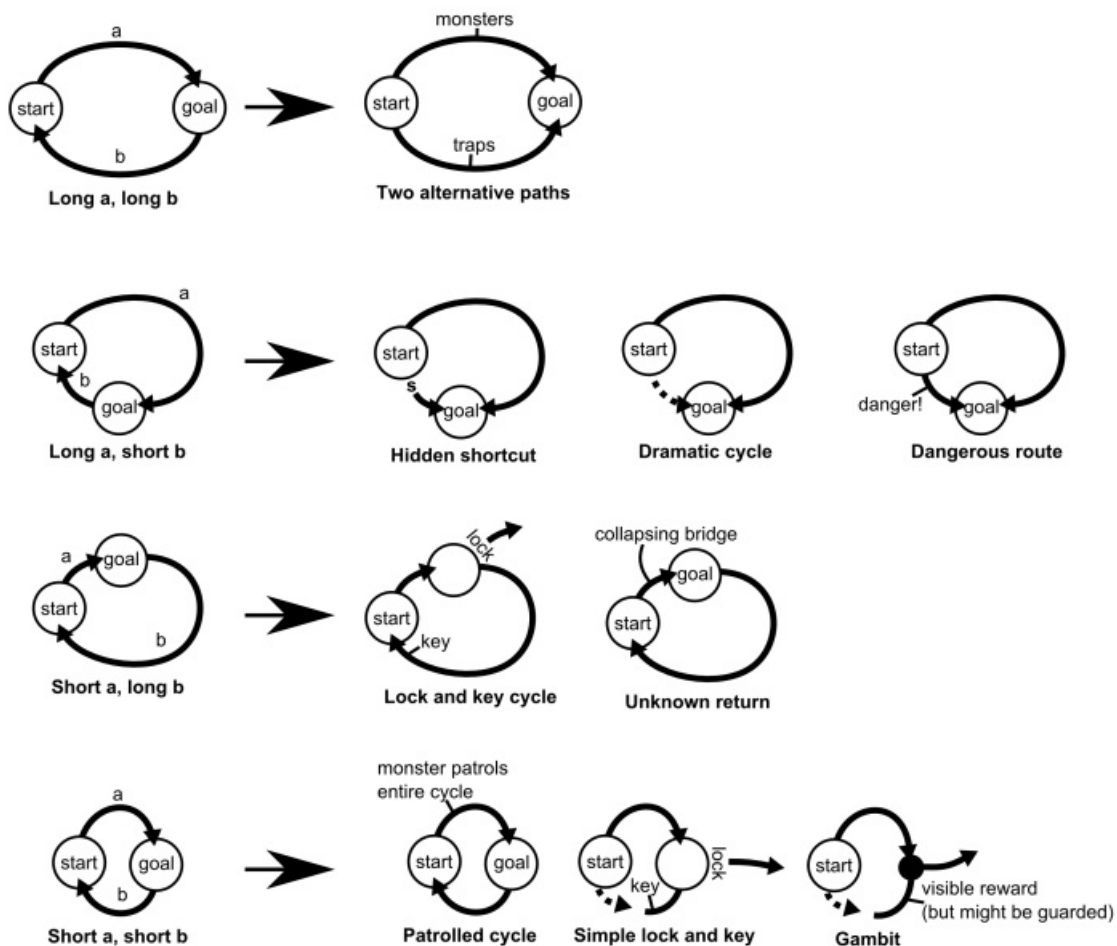
Figure 2 – a couple of cyclic design patterns.

The results are awesome. Figure 3 shows a level generated by Unexplored. It consists of a large lock and key cycle with the cycle filled by a large chasm. A smaller gambit cycle was added to create more spice. The construction is simple but effective. In fact, we've come to realize that just a couple of cycles often is enough for most levels; with just a couple of cycles the levels end up with a distinct shape and character.
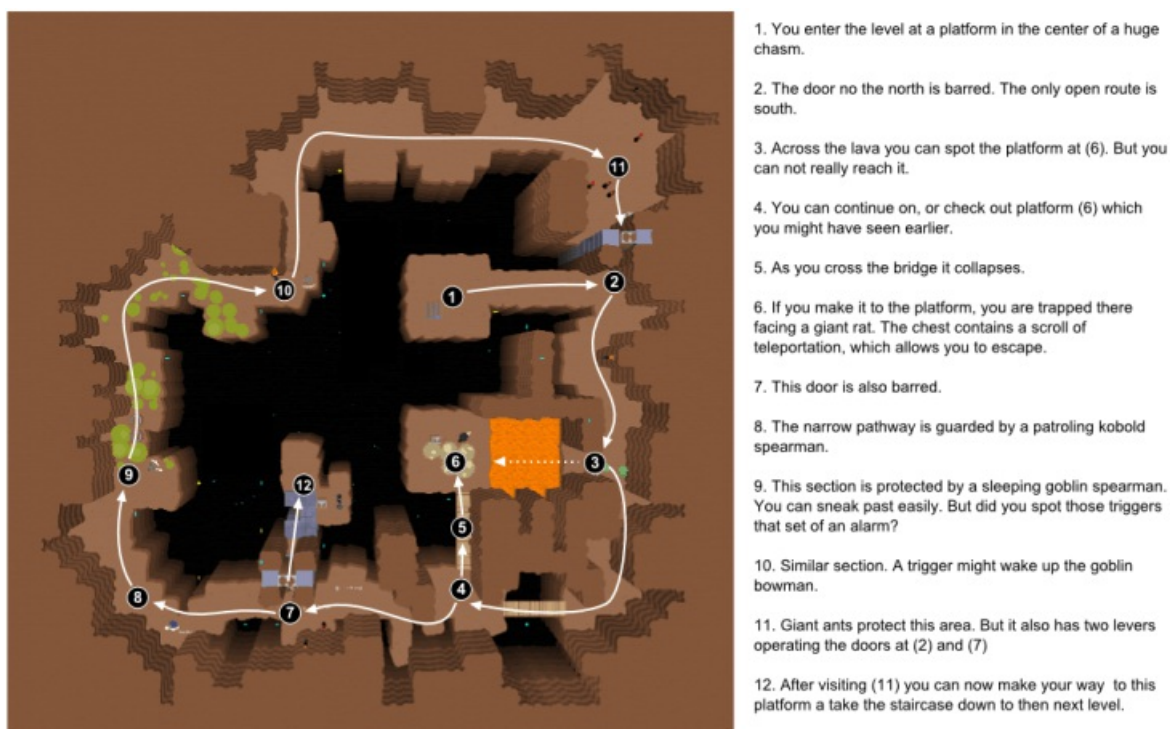

1. You enter the level at a platform in the center of a huge chasm.

2. The door no the north is barred. The only open route is south.

3. Across the lava you can spot the platform at (6). But you can not really reach it.

4. You can continue on, or check out platform (6) which you might have seen earlier.

5. As you cross the bridge it collapses.

6. If you make it to the platform, you are trapped there facing a giant rat. The chest contains a scroll of teleportation, which allows you to escape.

7. This door is also barred.

8. The narrow pathway is guarded by a patroling kobold spearman.

9. This section is protected by a sleeping goblin spearman. You can sneak past easily. But did you spot those triggers that set of an alarm?

10. Similar section. A trigger might wake up the goblin bowman.

11. Giant ants protect this area. But it also has two levers operating the doors at (2) and (7)

12. After visiting (11) you can now make your way to this platform a take the staircase down to then next level.

Figure 3 – a level walkthrough.

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Joris Dormans, PhD. is well known within the game science and development community. He created the popular development tool **Machinations** and authored several influential papers. Together with IGDA founder Ernest Adams he's written game design books. Dormans **featured** in several editions of the GDC. His previous game project, numbers game Sumico, received critical acclaim from The Guardian, Pocket Gamer, Nintendo Life and many others. It moved over half a million copies.

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