

Procedural Content Generation

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By User:SolKoll - Own work, Public Domain,
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Announcements

- Trajectory update
 - Meta: Game AI vs Academic, Graphs + Search
 - Physical Acts: Movement, Steering
 - Decide: FSMs, Plans, D&B Trees, RBS, BBs, Fuzzy
 - PCG: Model, Learn and Generate
- HW7 due Sunday, April 8
- EC due by Sunday, April 22 (same as hw8)
- Extra credit
 - We've posted an optional assignment that is worth up to 3 points of extra credit. It is due by April 22, 11:55PM.
 - Assignment: competition with your fellow classmates using the MOBA format from homework 5, with the addition of hero agents.
 - Like homework 5 (and unlike homework 6), the goal is to destroy the enemy base.
 - Note that **this is a different due date than homework 7.**
 - **Remember to check which assignment you are submitting to so that you do not accidentally submit to the wrong assignment**

N-1: PCG intro

1. PCG can be used to p_____ or a_____ game aspects
2. What are some reasons to use PCG?
3. What are some risks / concerns of PCG?
4. Design-time vs run-time PCG?
5. How does the use of a random seed in PCG effect development and gameplay?
6. What is flow theory? How does it relate to dynamic difficulty adjustment & drama management?
7. How do you know you are generating something interesting?

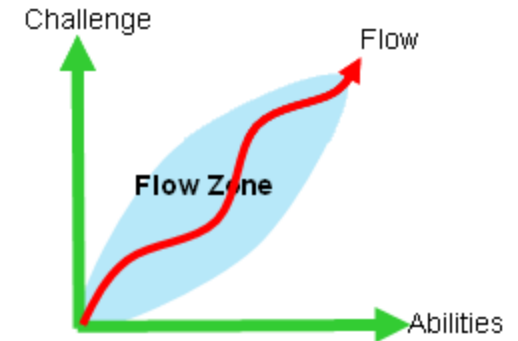


Figure 2 Player in-game Flow experience
Challenge

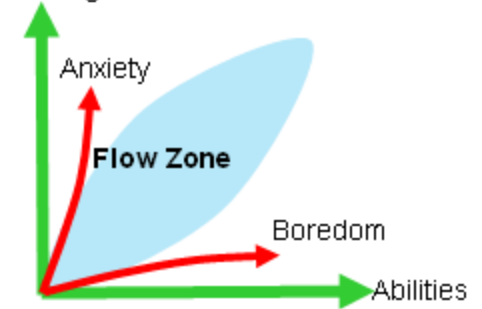


Figure 3 Player encounters psychic entropies

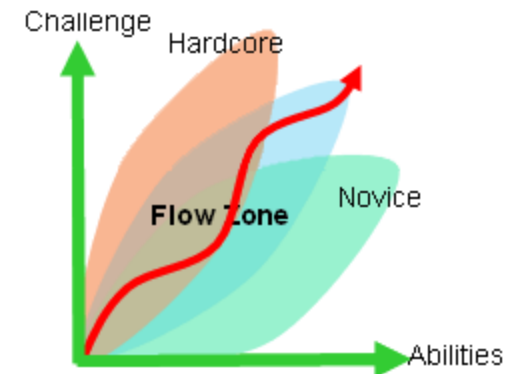


Figure 4 Different players and Flow Zones

PCG Concerns

Efficiency and Reliability tend to be a core concern.

- Speed (real-time/design time)
- Reliability (catastrophic failures/crashes)
- Controllability (wrt constraints and goals)
- Diversity (variations on a theme)
- Creativity (looks “computer-generated”)

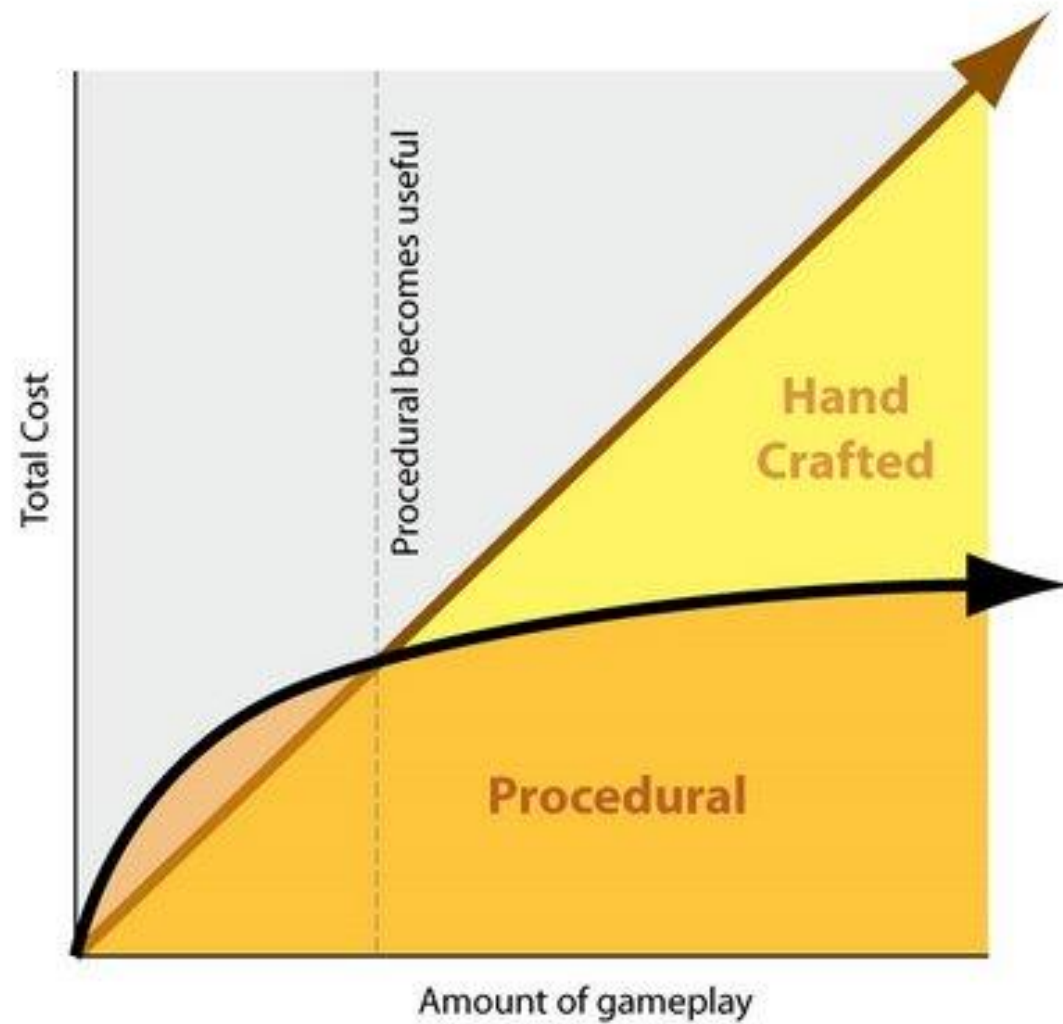
Run time PCG

- Players are different
- Preferences for pace and playstyle
 - Moderate challenge levels
 - Help avoid getting stuck
 - Adapt to player's tastes
 - Detecting player exploits
- When to use run-time PCG
 - When decisions can only be made at run-time
 - When you just can't pre-compute due to storage/memory limits
- Optimization problem
 - What is the set of content that delivers the optimal experience to the player given individual differences?
 - Example: rubber banding

Risks

- PCG can be NP-hard for anything non-trivial
 - But you can't always make players wait
- Thorough testing of run-time PCG is impossible
 - Best you can do is statistical sampling
- Offensive material
- Bad content
- Algorithm crash
- Meaningless activities
 - Easy to create quests, but if they don't connect to the larger game, no one cares

Economies of scale



- Stolen terms (bits, space, scenarios): Procedural Content Generation for Games: A Survey
 - https://course.ccs.neu.edu/cs5150f13/readings/hendrikx_pcgg.pdf
- Search-Based Procedural Content Generation: A Taxonomy and Survey
 - https://course.ccs.neu.edu/cs5150f13/readings/togelius_sbpcg.pdf
- PCG in Games: A textbook and an overview of current research (2016)
 - <http://pcgbook.com>
- <http://pcg.wikidot.com/>

About the book

Welcome to the Procedural Content Generation in Games book. This is, as far as we know, the first textbook about procedural content generation in games, aka PCG. As far as we know it is also the first book-length overview of the research field. We hope you find it useful, whether you are studying in a course, on your own, or are a researcher.

Content is king!

PROCEDURAL CONTENT GENERATION

PCG high-level Methods

- Search
- Rule systems
- Generative Grammars
- Constraint Solving

JUMPING INTO SEARCH (DIFFERENT DECK)