Perfect, Immortal Machines

Continuous Creativity and the Future of Automated Game Design

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Part I

All Futures
Computational Creativity

Generative Software
“Exhibit behaviours that unbiased observers would deem to be creative”

— Colton & Wiggins, 2012
Generative Software

“There are no good quotes about procedural generation.”

— Me, this week, making these slides
Can a computer automatically design games?
Procedural Generation
ABOUT THIS GAME

Help Madeline survive her inner demons on her journey to the top of Celeste Mountain, in this super-tight, hand-crafted platformer from the creators of multiplayer classic TowerFall.
What would it take to generate games?
What is game design?
It’s About Rules

Figure 2: Example piece movements.

MOVEMENT
    HOP BEFORE [X >= 0]
    OVER [X = 2]
    AFTER [X <= 2]
    HOP_OVER [opponent any piece]
    (1,2) SYMMETRY {side}
END MOVEMENT
Figure 2: Example piece movements.

MOVEMENT

HOP BEFORE [X >= 0]
OVER [X = 2]
AFTER [X <= 2]
HOP_OVER [opponent any piece]
\langle 1,2 \rangle SYMMETRY \{side\}

END MOVEMENT

METAGAME
Ludi
(game Teiglith
  (players White Black)
  (board (tiling square) (size 7 7))
  (pieces
    (Stone All
     (moves
      (move
       (pre
        (and
         (> (group-size to) (phase to))
         (connected)
        )
       )
      )
      (action (pop) (push))
     )
     )
   )
  )
  (start (place (Stone White) home))
  (end (All win (no-move)))
)
Automated Game Design
1st Generation

Rules Generator

Static Game Context
Automated Game Design
1st Generation

“Automated game design is rule generation”
AI has a long history with games-as-rules
But games go beyond rules
But games go beyond rules
But games go beyond rules

I can't breathe.
What is game design? 
Take 2
It’s About Context
Create Story Diagram

Step one

Follow the guidelines to translate the news article into a diagram of nouns and verbs.

Gameplay is automatically generated from your map when you click to continue.

Nouns:
Add: Click anywhere
Move: Click and drag the noun
Redelete: Click on the noun
Delete: Drag bubble to trash

Verbs:
Add: Drag one noun onto another
Delete: Drag arrow to trash

Rep Party destroys Legislation

Legislation attacks Rich Donors

Rich Donors needs Politician

Politician protects Rep Party

Game-O-Matic
ANGELINA
The Conservation Of Emily

Press Space To Begin
ANGELINA

**PREDEsign**
- e.g. Gathering web data, analysing theme input, configuring tasks

**POSTDEsign**
- e.g. Writing commentary, compiling final version, exporting to the web

**Design Task**

**Coevolution System**
Ruleset Design

Evolved sets of mechanics from a corpus of well-known rules

Item Design

Chose and tuned parameters for items to suit specific level goals

Level Design

Evolved levels with accessibility, vision or playability constraints.

‘Art Direction’

Optimised for visibility, coherence, and contextual meaning.
Automated Game Design
2nd Generation

Generator

Generator

Rest of Game

Rest of Game
Automated Game Design
2nd Generation

“Automated game design is the generation of multiple types of game content in a way that is responsive to the changing game design.”
Which bits of context are important?
Games can be emotional
Games can be beautiful
Games can be social
Games can be political

<table>
<thead>
<tr>
<th>NATIVES</th>
<th>COLONISERS</th>
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<tbody>
<tr>
<td>They are: vegetarian</td>
<td>Fast learners</td>
</tr>
<tr>
<td>Craftsmen</td>
<td>Obsessed with 'Justice'</td>
</tr>
<tr>
<td>Natural swimmers</td>
<td>Soft-spoken</td>
</tr>
<tr>
<td>Strict/Disciplinarian</td>
<td>Smell great</td>
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</table>
Games can be a lot of things

- Art
- Sound
- Music
- Writing
- Systems
- Feel
- Metagame
- Interface
- Social
- Difficulty
- Discovery
- Self-Expression
- Juice
- Oil
- Progression
- Co-operation
- Culture
- Context
- Meaning
- Balance
- Emergence
- Subversion
- Expansion
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• …
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<td>Feel</td>
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<tr>
<td>Self-Expression</td>
<td>…</td>
</tr>
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</table>
“Which future of games is correct? All of them.”

- - George Buckenham
Which future of automated game design is correct?
A better question: Why bother?
Part II

A Different Kind Of Question
Why generate games?
“Because it’s there”

Helping Developers

Helping Everyone

Changing Games
People
Artificial intelligence project builds A Puzzling Present

AI system called ANGELINA is back with a very playable Android/PC game.

MEGAN GEUSS - 12/16/2012, 11:30 PM
December 13th–16th 2013 :: Theme: **You Only Get One**

[ Real World Gatherings | Ludum Deals | Warmup Weekend ]

Back to Browse Entries

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**To That Sect**

*Press Spacebar To Start*

*Collect*

by **gamesbyangelina** – *Jam Entry*

---

**Ratings**

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Medical Diagnosis

Task vs People

Machine Translation

Doctors

Translators
Tasks vs People

Style Transfer

Artists

Content Generation

Game Developers
Automating Game Design?

or

Automating Game Designers?
Do we care how games get made?
The Task, or the Person?
Bury me, my Love

The Task, or the Person?
The Task, or the Person?
The Task, or the Person?
Historically, games were problem domains
They were clean, mathematical, pure
But games have changed
How we make them has changed
And so has our relationship with the people who make them.
The future of games research is about people, not tasks.
Automated Game Design
2nd Generation

Generator

Generator

Rest of Game
Automated Game Design
2nd Generation

“Automated game design is context-aware content generation”
Automated Game Design
2nd Generation

Generator

Rest of Game

Generator
Automated Game Design
3rd Generation

Generator

Players
Society
Bosses
Other Generators

Peers
The Game

Itself

Other Generators
Automated Game Design
3rd Generation

“Automated game design is the generation of content in a way that is aware of the social, cultural and design context it exists in.”
Automated Game Design
2nd Generation

“Automated game design is context-aware procedural content generation”
But how do we get there?
Part III

Perfect, Immortal
ANGELINA, Before

**PREDESIGN**
- e.g. Gathering web data, analysing theme input, configuring tasks

**POSTDESIGN**
- e.g. Writing commentary, compiling final version, exporting to the web

Release Game

**Coevolution System**
- Design Task
Problems

• **Change:** ANGELINA didn’t grow, learn or change, no matter how many games it made.

• **Ownership:** ANGELINA only made games when told to, about what it was told to.

• **Time:** Games were made in a rush, in the space of 4-6 hours, which limited a lot of options.
ANGELINA 6
Continuous Automated
Game Design
Objectives

- **Continuous Design:** No start, no end - the system should always be running, moving between tasks and projects.

- **Comprehensive Logs:** In order to talk to people, we need things to talk about - the system must record its history.

- **Slower Development:** Faster is better for tasks, slower is better for people - leave gaps and slow work down.

- **Modular Design:** Simple interfaces and reused code make it easier for the system to rewire itself in the future.
ANGELINA, Now

- Game
- Game
- Game
- ...
- Game

Project Database

Design Levels For Game #12

Explore Ruleset For Game #4

Release Game #12

Task
- Task
- Task
- ...
- Task

Design Modules

...
ANGELINA 6

Games
Games

Version 0.45

{  
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  "filename": "before_venturing",
  "numplayers": 1,
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  ],
  "pieces": [
    
    
  ],
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Version 0.4

{  
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  "filename": "before_venturing",
  //continues

Cover

Seeking Mice
Games

"gamenname": "Before Venturing Forth",
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        "layer": 5,
        "sprite": "fighter",
    },
]
Games

{
  "trigger": "OVERLAP playerpiece enemy",
  "code": [
    "DESTROY $2",
    "SFX punch",
    "SCORE 1"
  ]
},
{
  "trigger": "OVERLAP any wall",
  "code": [
    "PUSHBACK $1"
  ]
},
Games

{
    "outcome": "1",
    "triggers": [
        "ALL_COVERING playerpiece goal"
    ],
}

{
    "outcome": "-1",
    "triggers": [
        "COUNTPIECE playerpiece 0"
    ],
}
Games

"levels" : [
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   "width": "5",
   "height": "5",
   "data": [0,4,4,0,3,
            1,0,0,0,2,
            0,0,0,0,0,
            1,0,0,0,0,
            0,0,4,0,3,
            0,0,4,0,3,
   ]
},
]
Language Tradeoffs

- More expressive than VGDL (I think)
- Easier to add new keywords to in future
- More readable/writeable for human designers
ANGELINA 6

Tasks
ANGELINA, Now

Design Levels For Game #12

Explore Ruleset For Game #4

Release Game #12

Project Database

Task

Task

Task

Design Modules

Game

Game

Game

...
Tasks make design more fluid
And are designed to be modified
Tasks also enable visualisation
Tasks also enable visualisation
Which we’ll soon be putting to the test!
Static Ruleset Analysis

Player Touches Exit

Enemy Moves

Player Moves

Enemy Touches Player
Knowledge Acquisition & Use
DEFINE:
SEES X Y
X.x == Y.x || X.y == Y.y
Part IV

A Different Kind Of Answer
AGD is messy, which is OK
Because games are messy, too
Early AGD saw games mostly as rules
But games are really about human beings
And that’s what AGD should be, too
There’s so much we haven’t tried to do yet...
And so much we don’t understand
Come and climb with us!
Thanks!

Ask me things: @mtrc on Twitter
Ask me longer things: mike@gamesbyangelina.org
Follow ANGELINA on Twitch: twitch.tv/gamesbyangelina

Writing about ANGELINA: gamesbyangelina.org
Procedural Generation Jam: procjam.com
دانش, a PCG analysis tool: danesh.procjam.com
I’m making a game, also? rogueprocess.run