ANGELINA versus Terry Cavanaugh

Or "Mechanic Discovery through Simulation"

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www.gamesbyangelina.org
Can you automatically design games?
Arcade Games

Play Revenge at www.gamesbyangelina.org/games
Arcade Games
Grammar-based Rule Generation
• Define rule templates, e.g.
  \(<\text{TYPE},\text{TYPE},\text{EFFECT},\text{EFFECT},\text{SCORE}>\)

• Define a set of possibilities, e.g.
  \(\text{TYPE} = \text{Player, Red, Blue, Green}\)
Arcade Games
Grammar-based Rule Generation

• Define rule templates, e.g.
  <TYPE, TYPE, EFFECT, EFFECT, SCORE>

• Define a set of possibilities, e.g.
  TYPE = Player, Red, Blue, Green

• Good ratio of “good rules” : “rules”.

• Rationalisation: designer involvement.
Platform Games

Play *The Conservation of Emily* at www.gamesbyangelina.org/games

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Platform Games
Simulation-Assisted Parameter Search
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- Define candidate game variables to target, e.g. `player.jumpVelocity`
- Evolutionary search optimises powerups for e.g. reachability gain, level flow
Platform Games
Simulation-Assisted Parameter Search

- Define candidate game variables to target, e.g. player.jumpVelocity
- Evolutionary search optimises powerups for e.g. reachability gain, level flow
- Reliant yet again on human assistance
- One-time powerup use a bit boring? We can do better!
What Do We Want?

- Reduce reliance on humans
What Do We Want?

• Reduce reliance on humans

• Generate true ‘mechanics’
What Do We Want?

• Reduce reliance on humans
• Generate true ‘mechanics’
• Surprise us!
Mechanic Miner

Generation

Tuesday, 23 October 2012
Mechanic Miner
Generation

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e.g. FlxSprite.getClass().getFields();
Mechanic Miner

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• Pick a field, attach a modifier (e.g. HALVE, INVERTSIGN) and you’re good to go.

• Can reason about instance and static fields (after a headache)
Mechanic Miner

Evaluation

Take an ‘unsolvable’ level, and simulate playing it.
Mechanic Miner

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Mechanic Miner
Example Mechanics (hot off the press!)

(as well as 1000 game-breaking, exception-throwing, programmer-hating mistakes)
Mechanic Miner
Example Mechanics (hot off the press!)

INVERTSIGN Player.acceleration.y

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Mechanic Miner
Example Mechanics (hot off the press!)

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HALVE Player.y

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Mechanic Miner
Example Mechanics (hot off the press!)

INVERTSIGN Player.acceleration.y

HALVE Player.y

HALVE FlxGame.timescale

(as well as 1000 game-breaking, exception-throwing, programmer-hating mistakes)
Mechanic Miner
Level Design
Puzzle Platformers
Sample Levels
Puzzle Platformers
Sample Levels
Puzzle Platformers
Sample Levels
**Mechanic Miner**

Exciting things!

- Levels that are solvable using mechanic A, but *not* using mechanic B.
- Levels that are solvable only by using mechanics A *and* B.
- Levels that require $x$ steps of planning from the player.
Puzzle Platformers

Future areas...

• Richer code synthesis (component creation, mechanical constraints)
• Better fitness functions for mechanics and levels
• Integration into non-puzzle contexts, e.g. ANGELINA’s Metroidvania games
• More game engines, more genres, more more.
Questions!

More on ANGELINA and play games:
http://www.gamesbyangelina.org

@mtrc @angelinasgames

More on Computational Creativity at Imperial:
http://ccg.doc.ic.ac.uk