

Generating Levels That Teach Mechanics

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Roadmap

Tutorial Types and Tutorial Generation

Mario AI Framework

Generating Levels

Results

Conclusions



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Types of Tutorials

1. Teaching using Instruction
2. Teaching using Demonstration
3. Teaching using a Carefully-Designed Experience

Types of Tutorials

Civilization VI



Teaching using Instruction

Teaching using Demonstration

Teaching using a Carefully
Designed Experience

Types of Tutorials

Megaman X



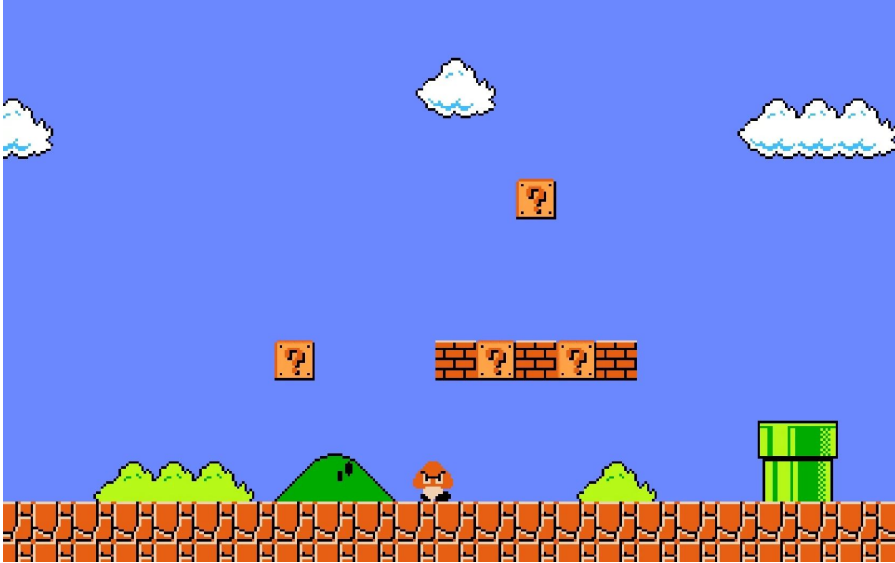
Teaching using Instruction

Teaching using Demonstration

Teaching using a Carefully
Designed Experience

Types of Tutorials

Super Mario Bros



Teaching using Instruction

Teaching using Demonstration

Teaching using a Carefully
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Mario AI Framework

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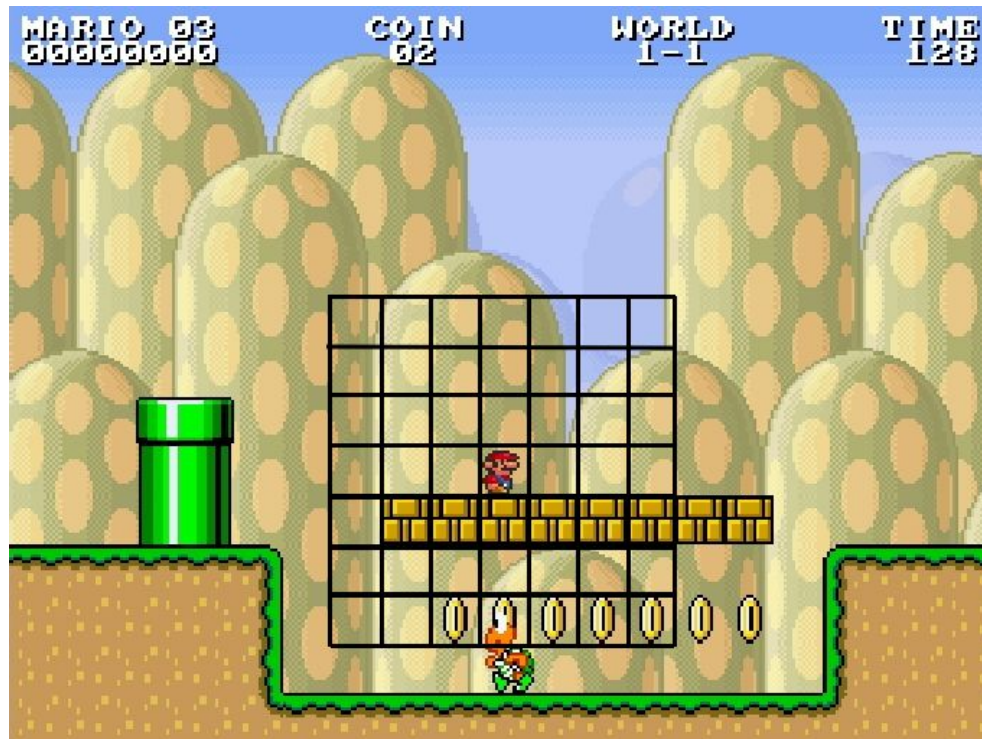
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Mario AI Framework

- Infinite Mario Bros
 - Simplified clone of Super Mario Bros
- Popular AI research benchmark
 - Play levels
 - Generate levels





Generating Levels

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~~Mario AI Framework~~

Generating Levels

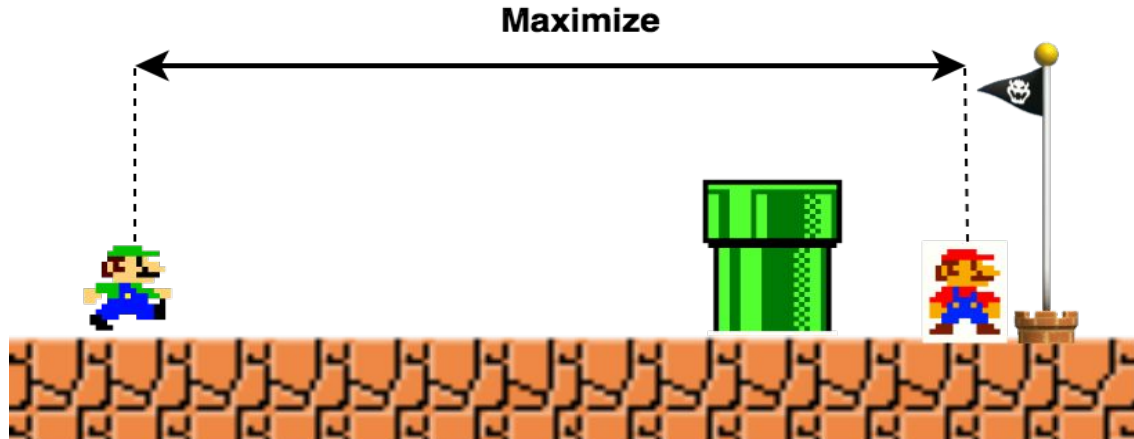
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Theory

1. Pick out a mechanic to teach
2. Make an agent that knows this mechanic, and one that does not
3. Evolve - maximize difference between agent performance



Our Mechanics

- High Jump (hold down A)
- Running (hold down B)
- Enemies (know that they hurt you)



Evolution Stats

- Feasible-Infeasible 2-Population
 - Aesthetic (no half-pipes)
 - Agent performance difference
- Scenes of IMB = 18 slices wide
- 3 experiments - 120 generations





Results

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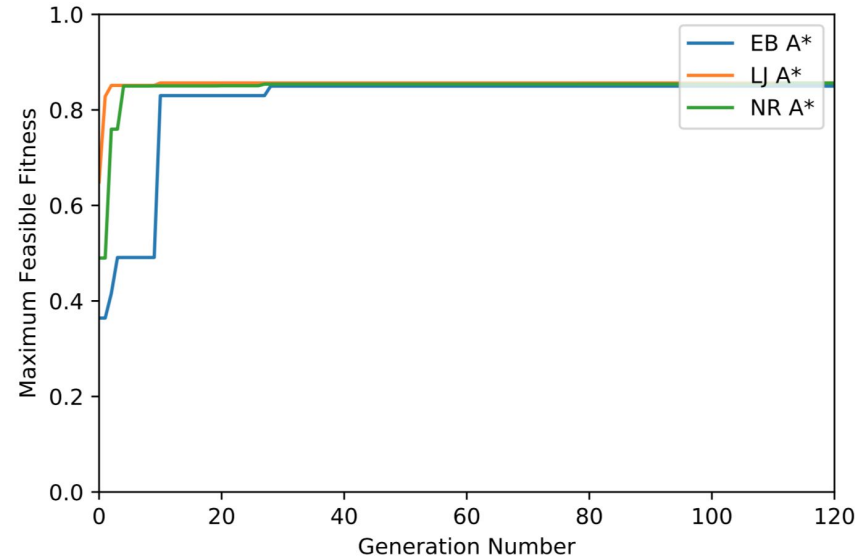
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Statistics

- Convergence within 15 generations
- Highest fitness = 0.8
 - Limited agent completed 20%



Limited Jump Scene



Enemy Blind Scene



No Running Scene





Conclusions

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Conclusions

Original Goals...Accomplished?

- Search for maps that require a mechanic mastery
 - An AI does need mechanic mastery to win
- BUT humans aren't good enough to play these...
 - Or would never find themselves in the same scenario'
- Future work, need more human perspective

Future Work

- Full-levels built from evolved scenes
- Simplify scenes, use cascading fitness
- Human-like agents
- Automatically discover mechanics and agents
- Co-creation?

