A Cognitive Science Model of Playing Ms. Pac-Man

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My Task

- Learn About Cognitive Modeling
- Create a Soar Agent

The Game of Ms. Pac-Man

- 1981 arcade game
- Ghosts have unique "personalities" (patterns of behavior)
- Non-deterministic

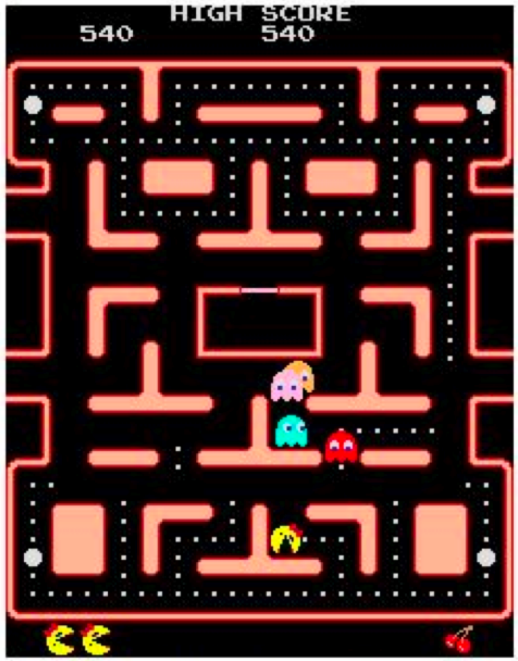
The Ms. Pac-Man Competition

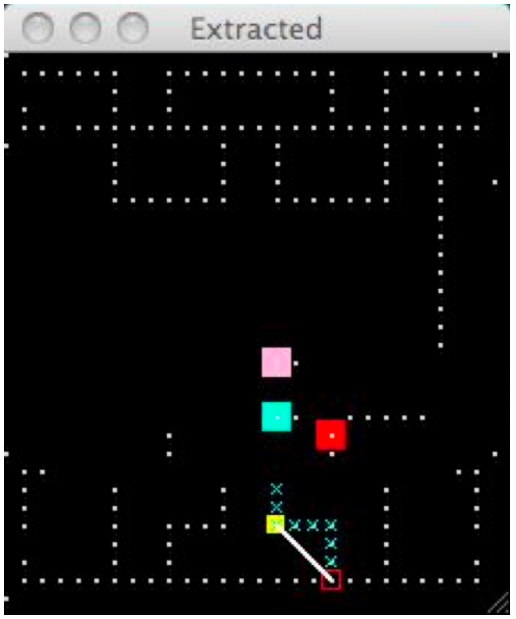
- World Congress on Computational Intelligence (WCCI) 2008
- The Task: An Agent to Play Ms. Pac-Man
- Game and Agent are Distinct Programs
- Human-like Inputs and Outputs to the Agent
  - Screen Shots
  - Joystick Directions

Game Setup

- Game is represented as a graph.
- Decisions are made only at intersections.

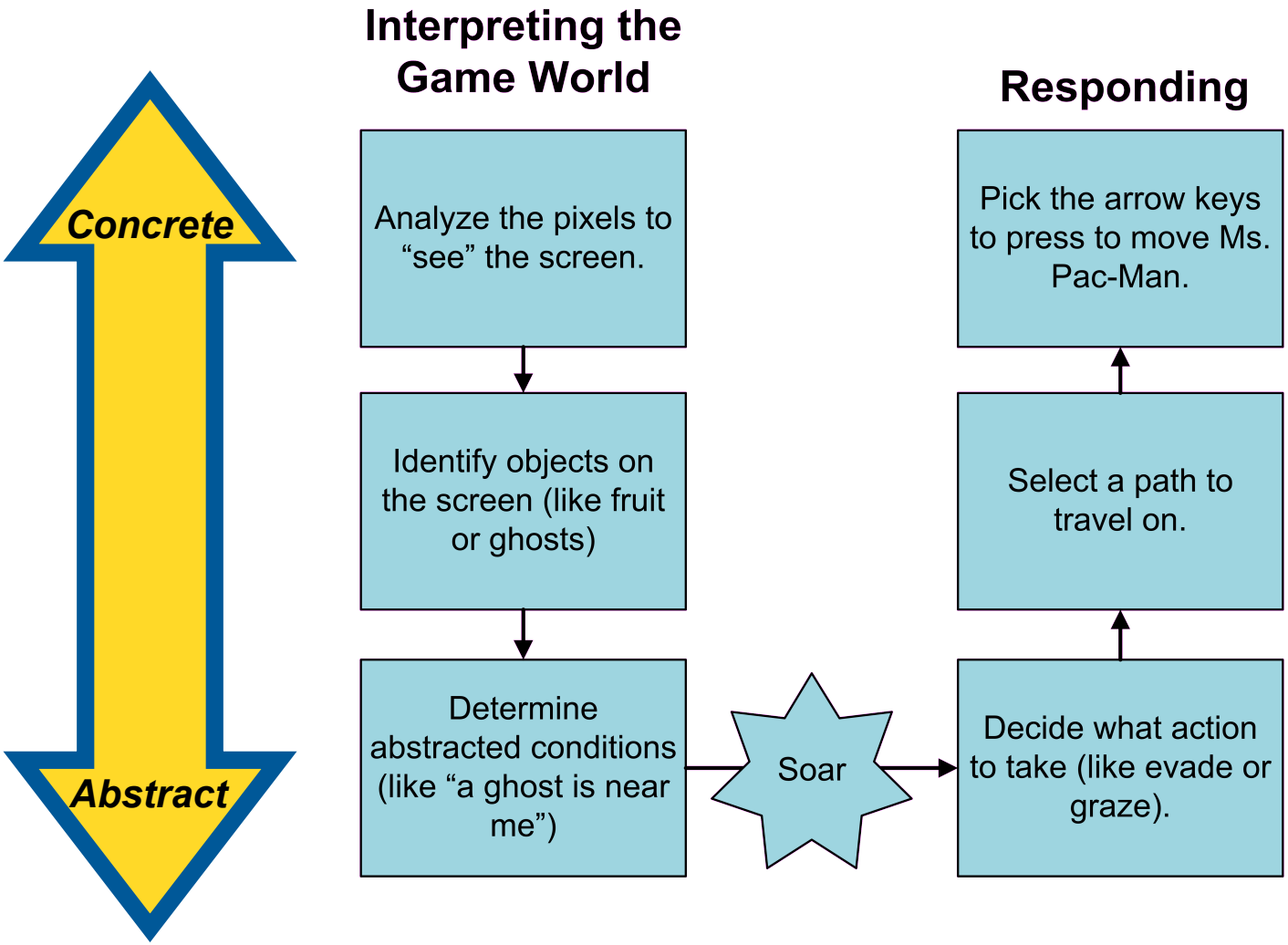
Game





Abstraction

My Agent


Interpreting the Game World
Responding
Concrete
Abstract
Analyze the pixels to "see" the screen.
Identify objects on the screen (like fruit or ghosts)
Determine abstracted conditions (like "a ghost is near me")
Soar
Decide what action to take (like evade or graze).
Select a path to travel on.
Pick the arrow keys to press to move Ms. Pac-Man.

My Challenges Learning Soar

- Decision-Making Time
  - ~70 ms
  - ~1 ms without Soar
- String Input Only
- DYLD_LIBRARY_PATH Environment Variable

Rules

- Decisions Based on Condition-Actions
  - "***If*** there is a ghost next to me, ***then*** move away from it."
  - "***If*** there is a power pill available *and* a ghost next to me, ***then*** move towards the power pill."

Where To Next

- Replace more of the java code with Soar productions to make simpler agent
  - Eat food
  - Runs from ghosts
- Study humans at play at this game

And Now For A Demonstration...

Thank you