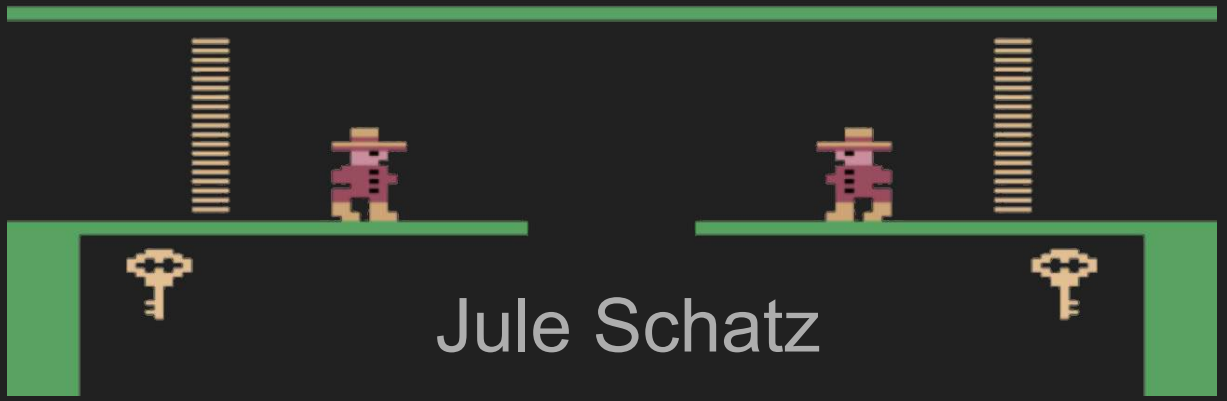
Learning to Play Atari Games

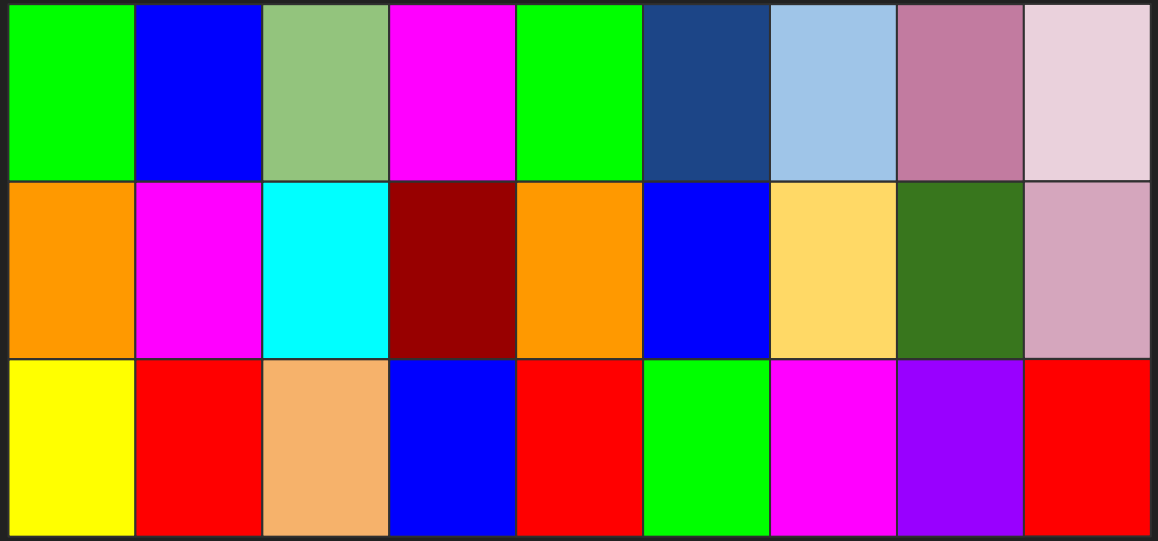


Jule Schatz

Outline

- Motivation
  - Intuition behind the idea
- Previous Research
- Rough New Idea

Learning a New Video Game



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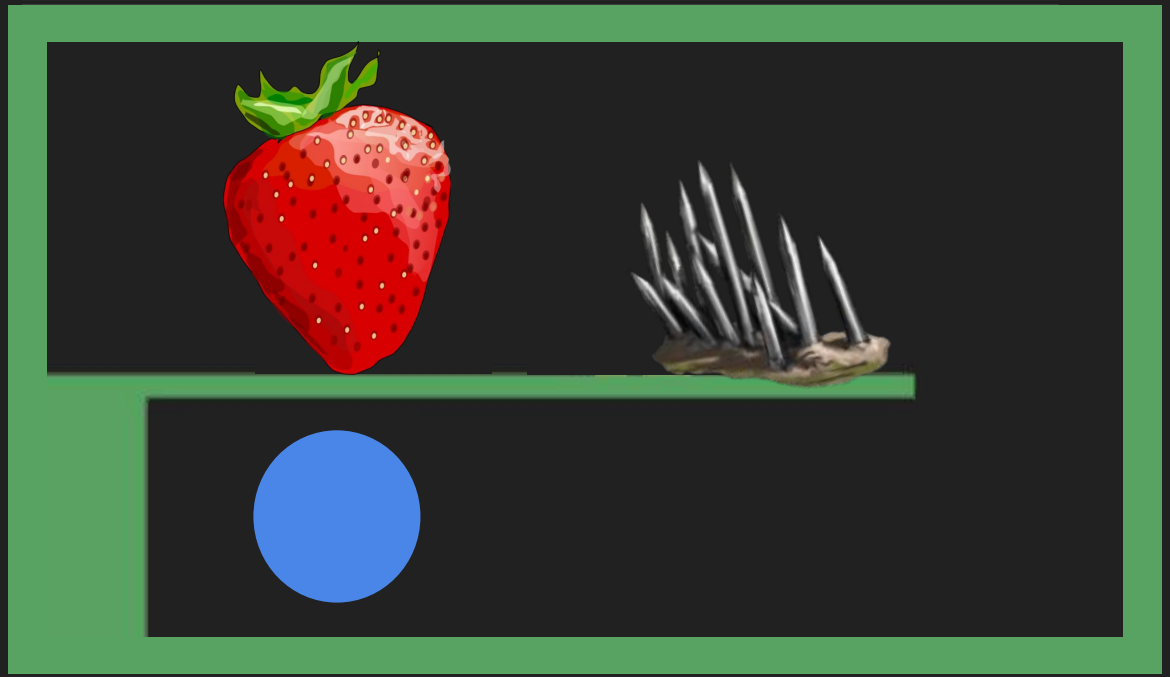

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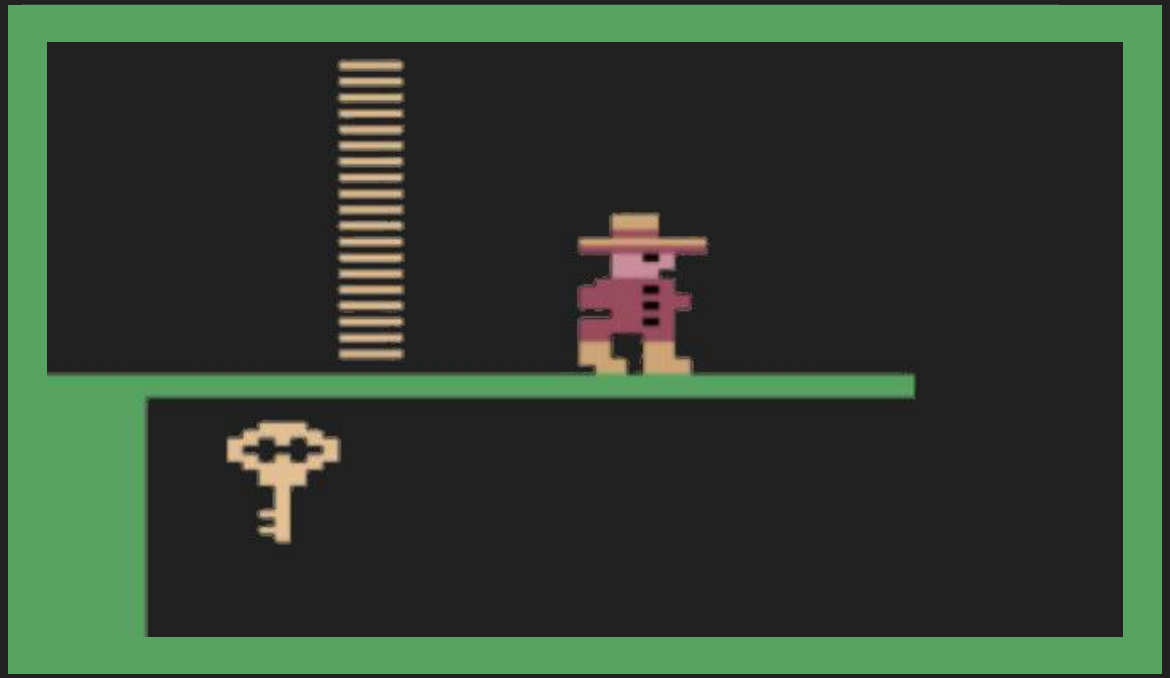

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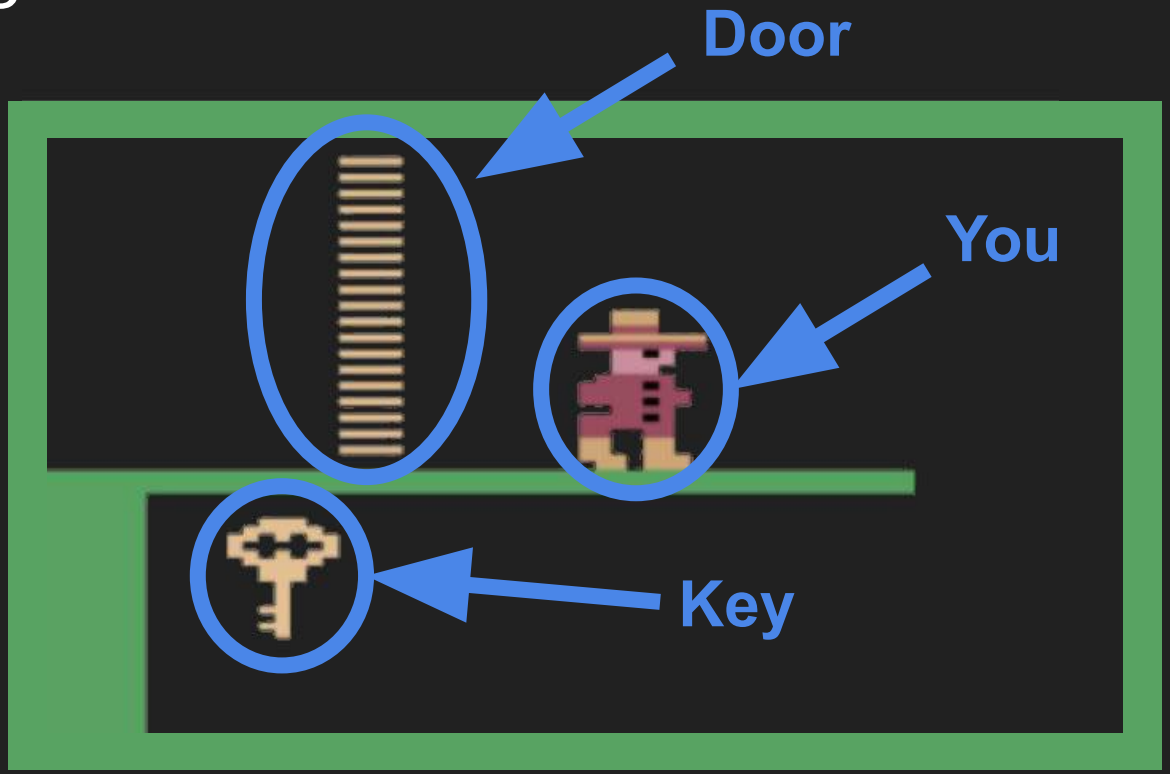
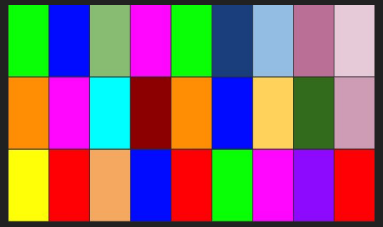
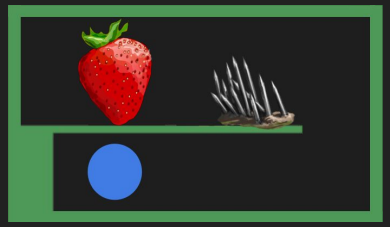


The Knowledge We Use On a “New” Game

- Physics



VS



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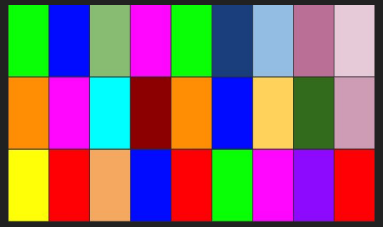

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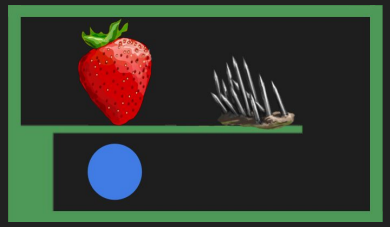
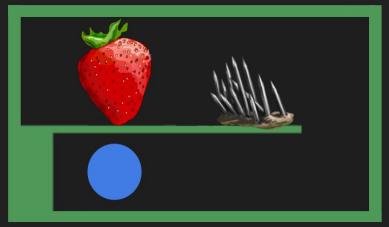


- Semantics



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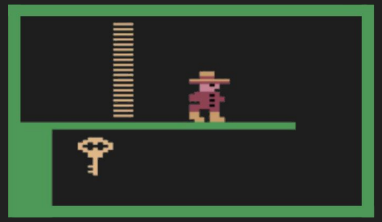
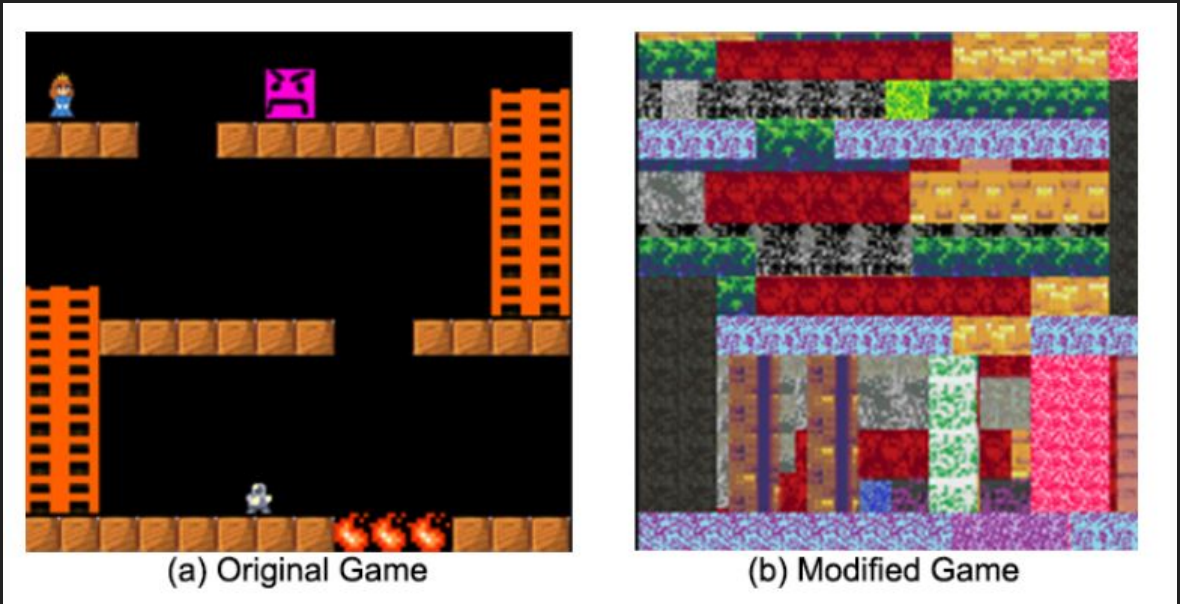
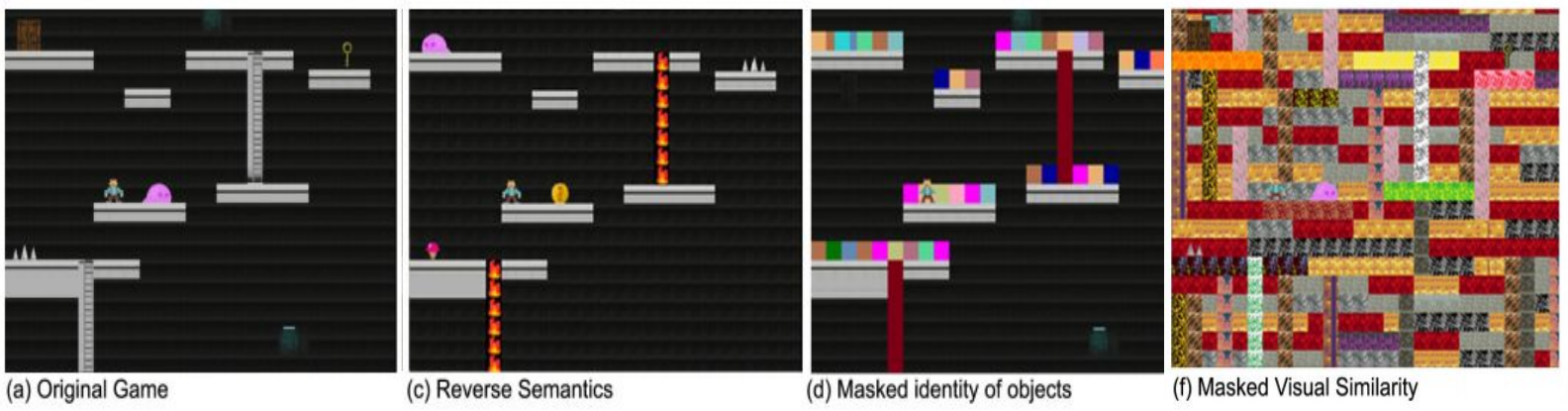


“Investigating Human Priors For Playing Video Games”
Dubey et al. 2018

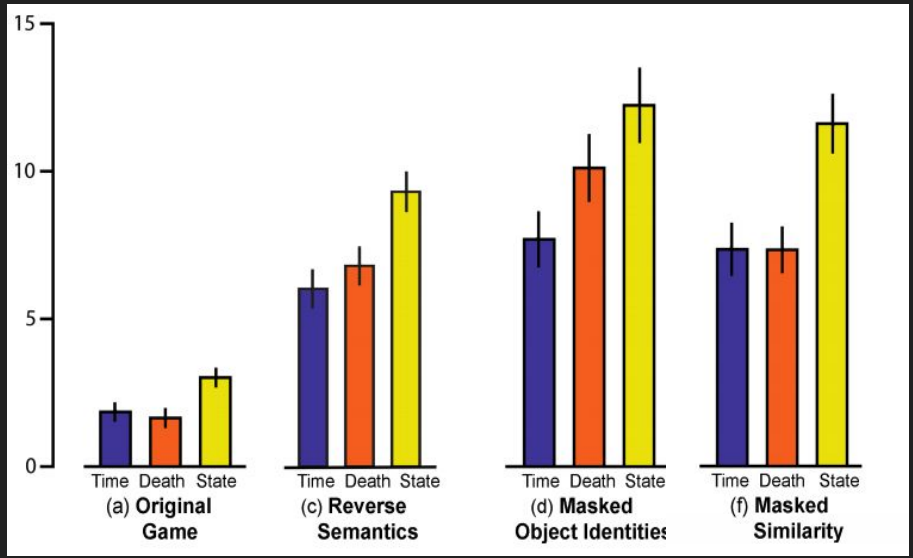




Blue -Average time to solve in minutes

Orange - Average number of deaths

Yellow - Average number of states



Reinforcement Learning

“Exploration By Random Network Distillation” Burda, Ewards, Storkey, Klimov (October 2018) Open AI

- 1.97 Billion frames of experience

	Montezuma’s Revenge
RND	**8,152**
Avg. Human	4,753

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- 17,949 expert transitions provided for five episodes
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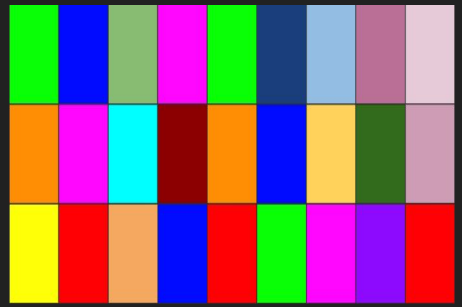
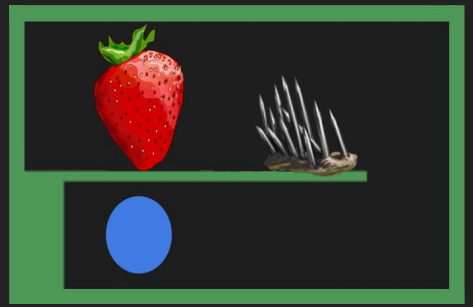
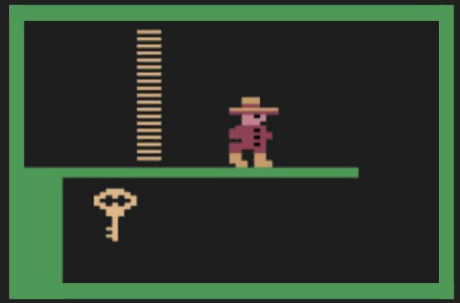
Can we speed up the learning by taking advantage of human priors?







Research Plan - Using knowledge to speed learning

1. Create environment for a Soar agent to explore
2. Create a reinforcement learning Soar agent
3. Create a smarter Soar agent
    a. Uses interactive task learning
    b. Uses semantic memory
    c. Uses reinforcement learning

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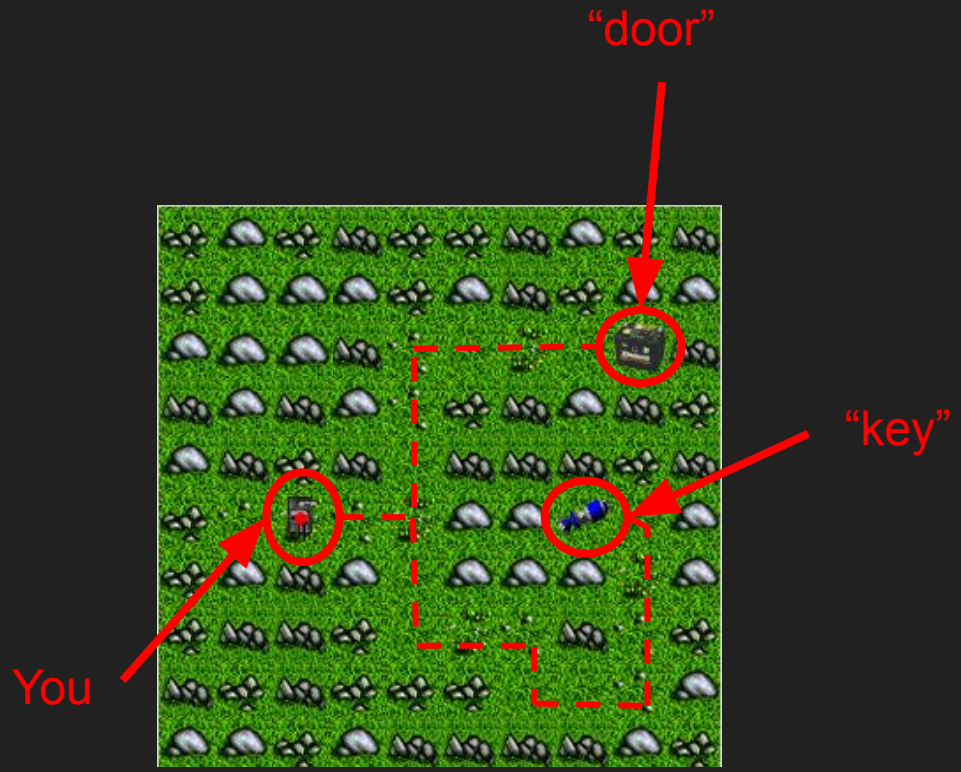
Repurposing Tank Soar

Actions

- Move Left
- Move Right
- Move Forward
- Move Backward

State

- Number of Missiles
- X coordinate
- Y coordinate



A Smarter Agent (rough idea)

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- “The goal is to get through the door”
- “How do I get through the door?”

Saves time of figuring out where the reward is.

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- “To get through the door you need to unlock the door”

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- “How do I get through the door?”
- “To get through the door you need to unlock the door”
- Retrieves the concept unlock from semantic memory “Where can I get a key to unlock the door?
- “To get the key, pick up the missles”

Saves time of figuring out where the reward is.

Doesn’t need to be taught what unlocking means.

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Saves time of figuring out where the reward is

Doesn’t need to be taught what unlocking means.

Has a general idea of how to play the game that isn’t dependent on the current map.

Can we speed up the learning of Atari like games by using semantic knowledge and interactive task learning?

Questions or Comments?