Dungeons and DQNs
Toward Reinforcement Learning Agents that Play Tabletop Roleplaying Games

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It’s an exciting time for AI
How do we push the limits of AI?

I’m sorry, Dave. I’m afraid I can’t do that.
Games!

- Chess - 1997
- Atari Games - 2015
- Go - 2016
- Doom - 2016
- DOTA 2 - 2018
What about Dungeons & Dragons?

- Players create characters to play & describe their character’s actions
- Characters exist in a shared imaginary world
- Game/Dungeon Master (GM/DM) mediates and sets up scenarios—or campaigns
Why Dungeons and Dragons?

- Unlimited actions (discourse)
- Actions can have unexpected consequences and/or DM can get unexpected player actions
- Actions cannot cleanly map to states (model of the world changes as game progresses)
- Distributed game world (across players and DM)
- Players receive intrinsic reward for actions (unclear win condition)
- Collaborative
Outline

- TRPGs compared to:
  - Interactive Fiction
  - Experience Management
  - Automated Story Generation

- Our starting point:
  - Genre Expectation Model + Commonsense Rules Model
  - Deep Q-Learning
# TRPGs vs the World

<table>
<thead>
<tr>
<th>Medium</th>
<th>Comparison to TRPGs</th>
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<tbody>
<tr>
<td>Interactive Fiction (IF) Playing</td>
<td>• Use puzzles to uncovers pre-existing story</td>
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<td></td>
<td>• Often simplified grammar</td>
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<tr>
<td>Experience Management (Used in Interactive Narrative)</td>
<td>• Intervenes in storyline to keep things “on track” for quality</td>
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<td>• Often fixed set of actions</td>
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<td>Automatic Story Generation</td>
<td>• Generates new story</td>
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<td>• Uses planners to create actions for characters for well-defined domains</td>
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</tbody>
</table>
Outline

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Assumptions

- No dice rolling (i.e. no combat, etc.)
- Agent is always in character
- GMs aren’t refereeing
1. Genre Expectation Model
   ▶ Seq2Seq network generates next event in the story
   ▶ Trained on relevant genre

2. Commonsense Rules Model
   ▶ Things that aren’t mentioned in stories (see: Principle of Minimal Departure)
   ▶ Temporal & physical rules
The Proposed System Pipeline

- Human Player’s Turn
  - Natural Language to Event
    - Event to Natural Language
      - TRPG Agent
        - Selected Next Event
          - Current State
            - Update State
              - Event
                - Agent’s Turn
                  - Natural Language to Event
                    - Human Player’s Turn

Dungeons & DQNs – Martin, Sood, & Riedl – AAAI Intelligent Narrative Technologies Workshop
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Back to Games!

Atari Games - 2015
Go - 2016
Doom - 2016
DOTA 2 - 2018
Conclusion

TRPGs are the next AlphaGo
Thank you!

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