EMYS: A SOCIAL ROBOT THAT PLAYS “SUECA”
1. Motivation
2. Goals
3. Background
4. Related Work
   a. AI in Games
   b. HRI
5. Proposed Architecture
6. Evaluation
7. Conclusion
1. MOTIVATION
MOTIVATION
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2. GOALS
GOALS

Integrate a social robot with aged humans in a card game scenario

- Develop an agent that plays competently Sueca
- Develop a socially present embodied agent
- Evaluate the correctness of the system
3. BACKGROUND
BACKGROUND

Games
- Cooperative
- Non-cooperative
  - Normal form
  - Extensive form
    - Perfect information
    - Imperfect information

Sueca
BACKGROUND

Hidden information?

Information Set!
BACKGROUND

Monte-Carlo Tree Search
1. Selection
2. Expansion
3. Simulation
4. Backpropagation
4. RELATED WORK
4.1. AI IN GAMES
AI IN GAMES

Solving hidden information games...

- Monte-Carlo Methods
- Nash-Equilibrium Strategy
- Belief distributions
AI IN GAMES

Solving hidden information games...

- Monte-Carlo Methods
- Nash Equilibrium Strategy
- Belief distributions
AI IN GAMES

MONTE-CARLO METHODS

How to deal with hidden information?

- PIMC
- ISMCTS
- IIMC
## AI IN GAMES

### MONTE-CARLO METHODS

## PIMC

<table>
<thead>
<tr>
<th>Domains</th>
<th>Pros / Cons</th>
<th>Hidden Information</th>
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| Bridge Skat | - Simpler to implement  
- Strategy fusion  
- Non-locality | Determinization |
# AI IN GAMES

## MONTE-CARLO METHODS

### ISMCTS

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<td>Dou Dizhu</td>
<td>- Computational Budget&lt;br&gt;- Strategy fusion (less)&lt;br&gt;- Non-locality&lt;br&gt;- Harder to implement</td>
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# AI IN GAMES

## MONTE-CARLO METHODS

### IIMC

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<td>Recursive Determ.</td>
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<td>Technique</td>
<td>Goal</td>
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<td>Skat</td>
<td>Determine the winning probability of a hand</td>
<td>Improve the bidding</td>
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<td>Skat</td>
<td>Fastest-cut-first heuristic</td>
<td>Order moves</td>
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<tr>
<td>Skat</td>
<td>Considering similar states equally</td>
<td>Reduce tree exploration</td>
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<td>Skat</td>
<td>Calculate the mistake rate of each player</td>
<td>Improve the bidding</td>
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<td>Poker</td>
<td>Opponent model</td>
<td>Improve MCTS policies</td>
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4.2. HRI
Integrate a social robot with aged humans in a card game scenario

Robots in elderly care  Social robots in games
HRI

ROBOTS IN ELDERLY CARE

Assistive robots for elderly

Rehabilitation robots

Assistive social robots

Service type

Companion type
HRI

ROBOTS IN ELDERLY CARE
HRI

ROBOTS IN ELDERLY CARE
HRI

SOCIAL ROBOTS IN GAMES

- Children tutor
- Careful advices
- Long-term interactions
Improved social presence:

- Topology of speeches
- Relevance value of a move
- Power of a player
- Simulation of roles
- Luck perception
5. PROPOSED ARCHITECTURE
PROPOSED ARCHITECTURE

AI MODULE

- PIMC
- Opponent model
  - Cards' predictions
  - Actions' predictions

How to collect data?

- Ask for it
- Collect it! (it requires a platform)
6. EVALUATION
EVALUATION

*Develop an agent that plays competently Sueca*

Performance measures
- Game points
- Offline pre-computation time

- These measures will be compared to different parametrizations and a naive approach
- University community will test it
EVALUATION

*Develop a socially present embodied agent*

Two conditions
- Few or nonexisting social behaviours
- Several behaviours from the game state

- The elderly will test it
- Godspeed - participants’ perception of the robot
- Networked Minds - presence perception
THANK YOU!