EMYS: A SOCIAL ROBOT THAT PLAYS “SUECA”

OUTLINE

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

MOTIVATION

MOTIVATION

MOTIVATION

2. GOALS

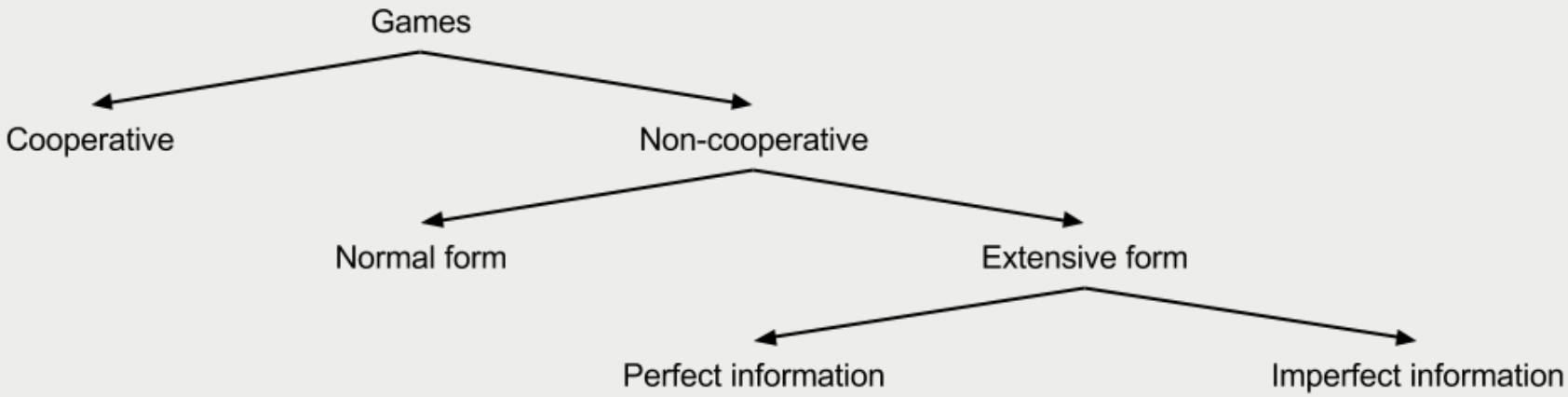
GOALS

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

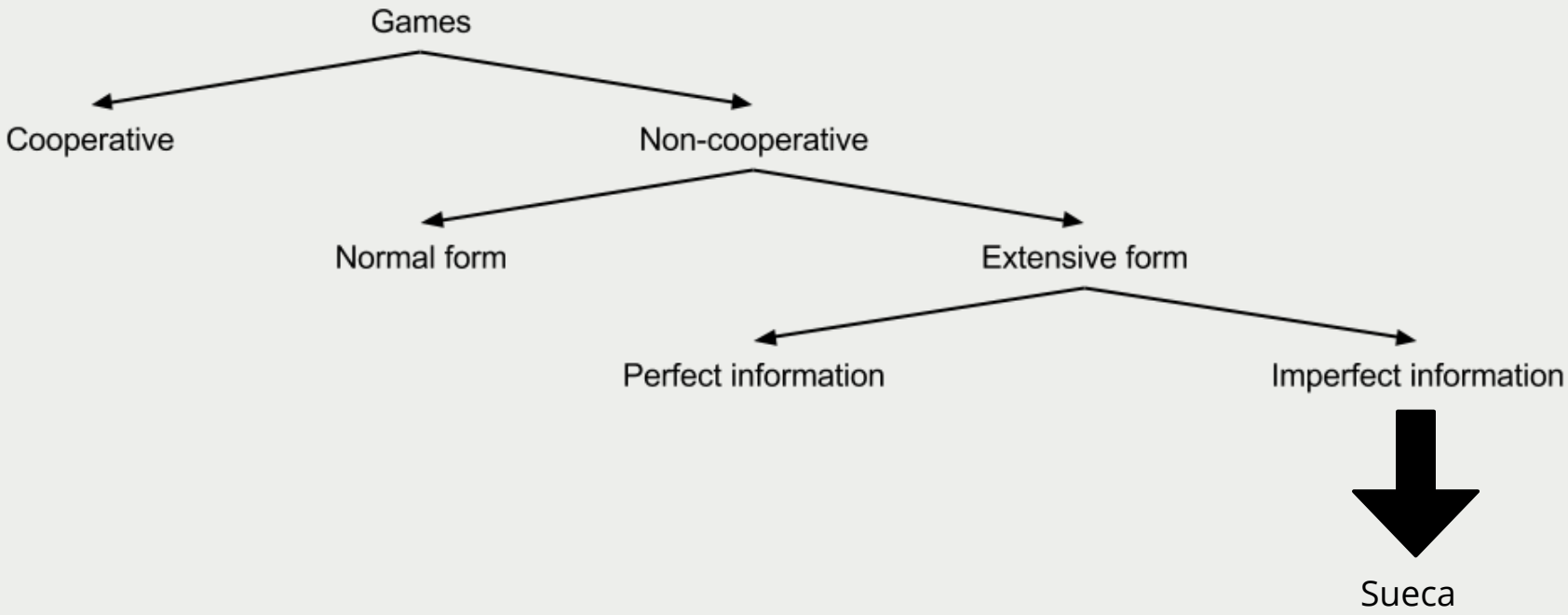
- Develop an agent that plays competently *Sueca*
- Develop a socially present embodied agent
- Evaluate the correctness of the system

3. BACKGROUND

BACKGROUND

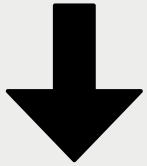

Games
Cooperative
Non-cooperative
Normal form
Extensive form
Perfect information
Imperfect information

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

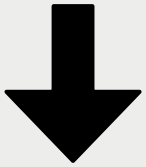
Solving hidden information games...

- Monte-Carlo Methods
- ~~Nash-Equilibrium Strategy~~
- Belief distributions

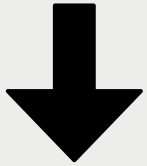
AI IN GAMES

MONTE-CARLO METHODS

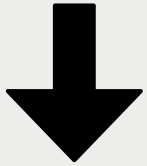
How to deal with hidden information?



PIMC



ISMCTS



IIMC

AI IN GAMES

MONTE-CARLO METHODS

PIMC

Domains	Pros / Cons	Hidden Information
Bridge Skat	• Simpler to implement • Strategy fusion • Non-locality	Determinization

AI IN GAMES

MONTE-CARLO METHODS

ISMCTS

Domains	Pros / Cons	Hidden Information
Dou Dizhu	• Computational Budget • Strategy fusion (less) • Non-locality • Harder to implement	Information Set

AI IN GAMES

MONTE-CARLO METHODS

IIMC

Domains	Pros / Cons	Hidden Information
Skat	• Player Module • Strategy fusion (less) • Non-locality • Harder to implement	Recursive Determ.

AI IN GAMES

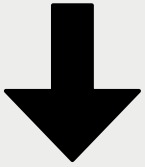
BELIEF DISTRIBUTIONS

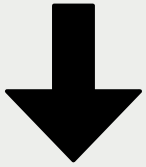
Domain	Technique	Goal	Suitable
Skat	Determine the winning probability of a hand	Improve the bidding	N
Skat	Fastest-cut-first heuristic	Order moves	Y
Skat	Considering similar states equally	Reduce tree exploration	Y
Skat	Calculate the mistake rate of each player	Improve the bidding	~
Poker	Opponent model	Improve MCTS policies	Y

4.2. HRI

HRI

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



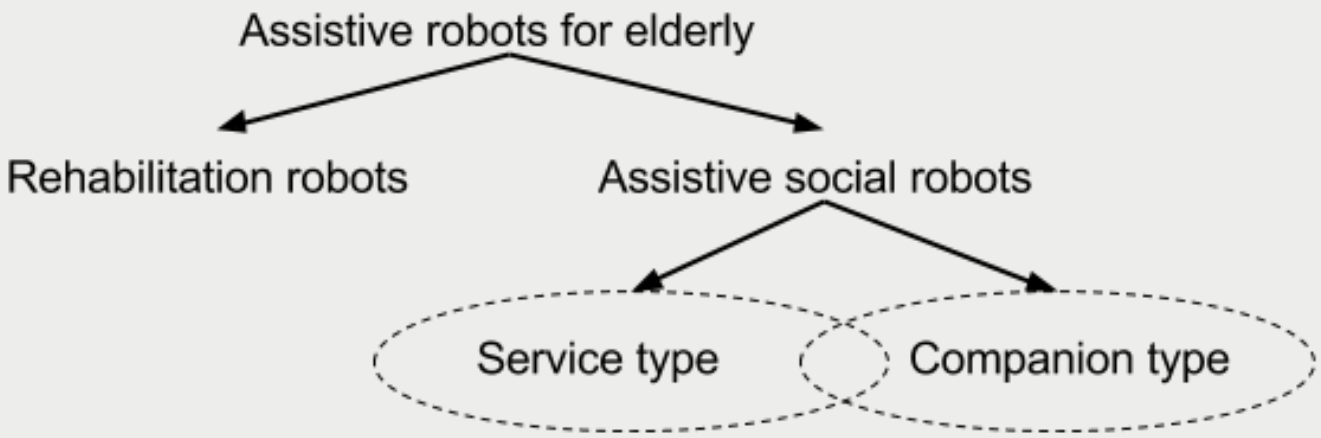


Robots in elderly care

Social robots in games

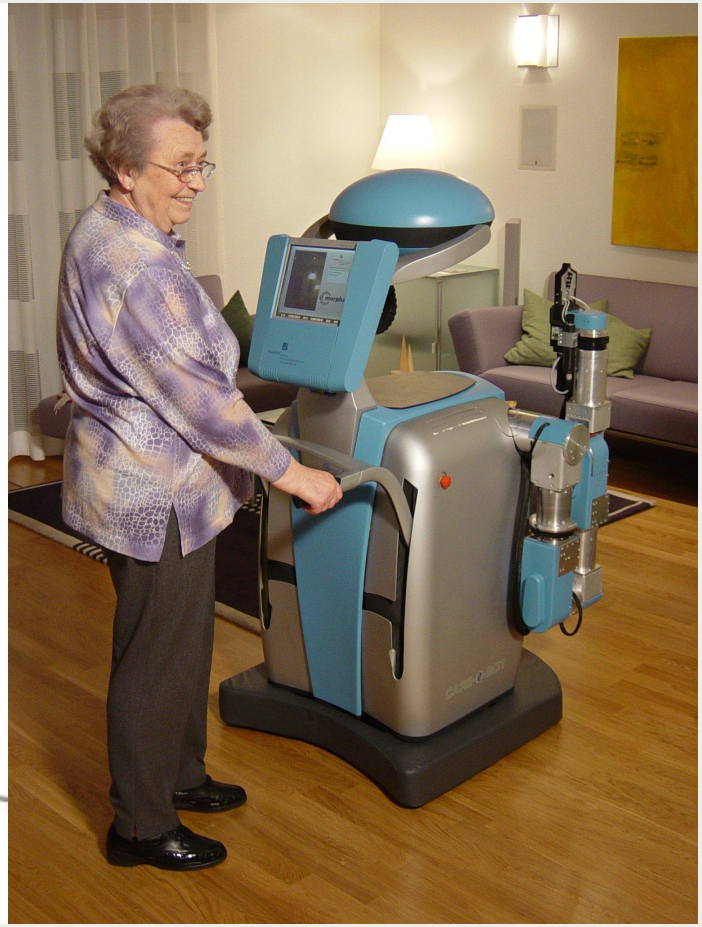
HRI

ROBOTS IN ELDERLY CARE



HRI

ROBOTS IN ELDERLY CARE



HRI

ROBOTS IN ELDERLY CARE

HRI

SOCIAL ROBOTS IN GAMES

- Children tutor
- Careful advices
- Long-term interactions

HRI

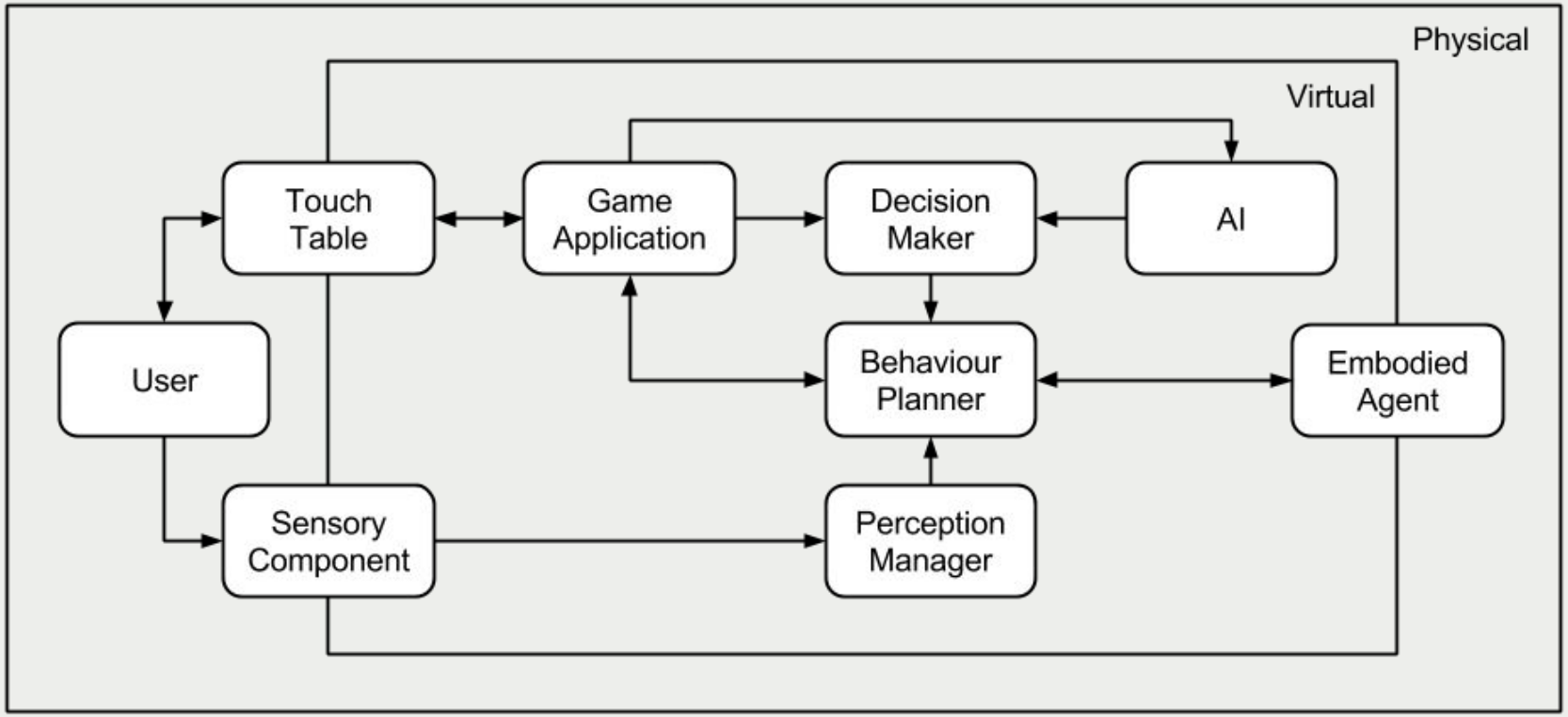
SOCIAL ROBOTS IN GAMES

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



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!