Playing Clue

A Computer Player for the
Classic Board Game

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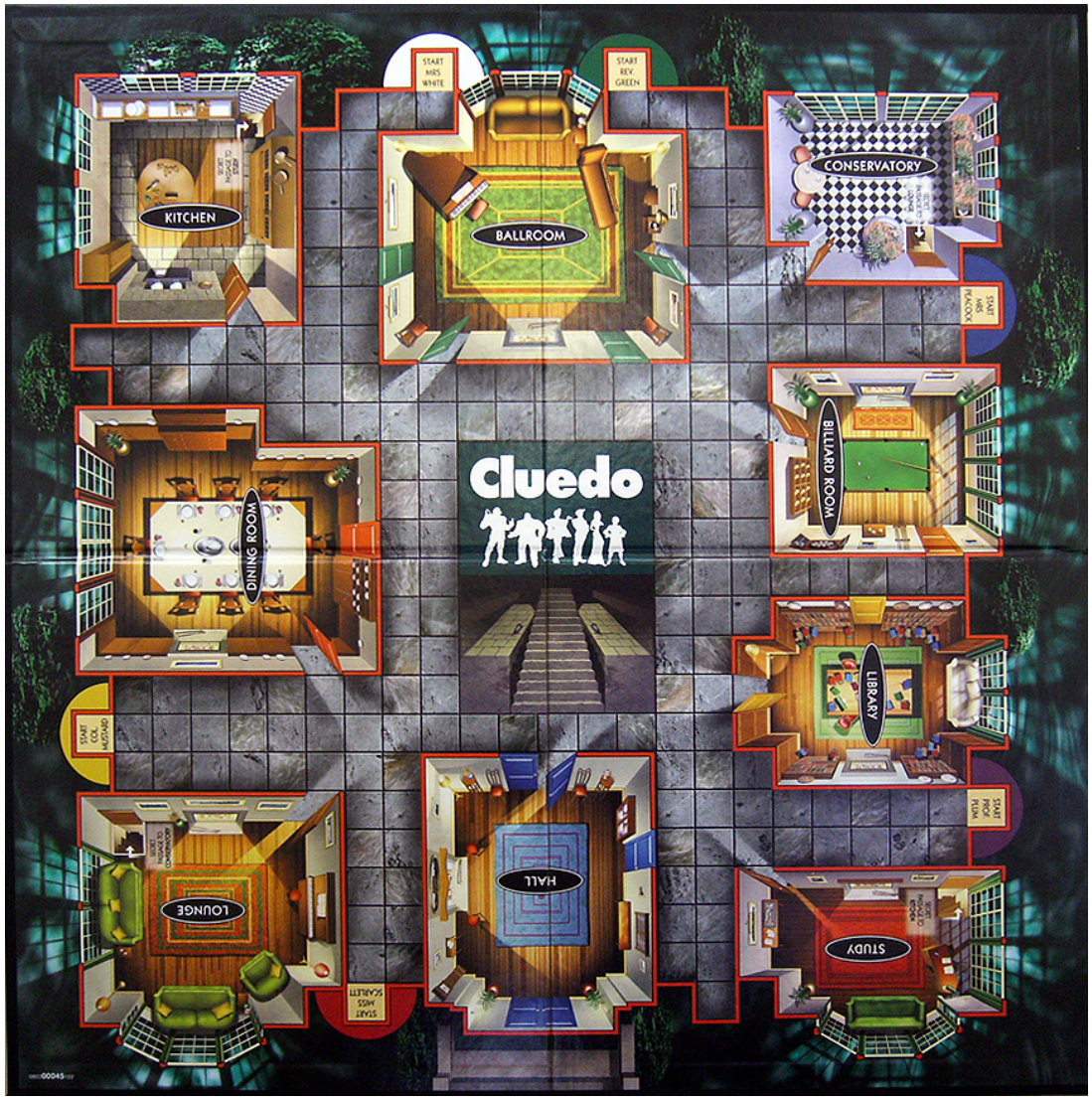
Clue

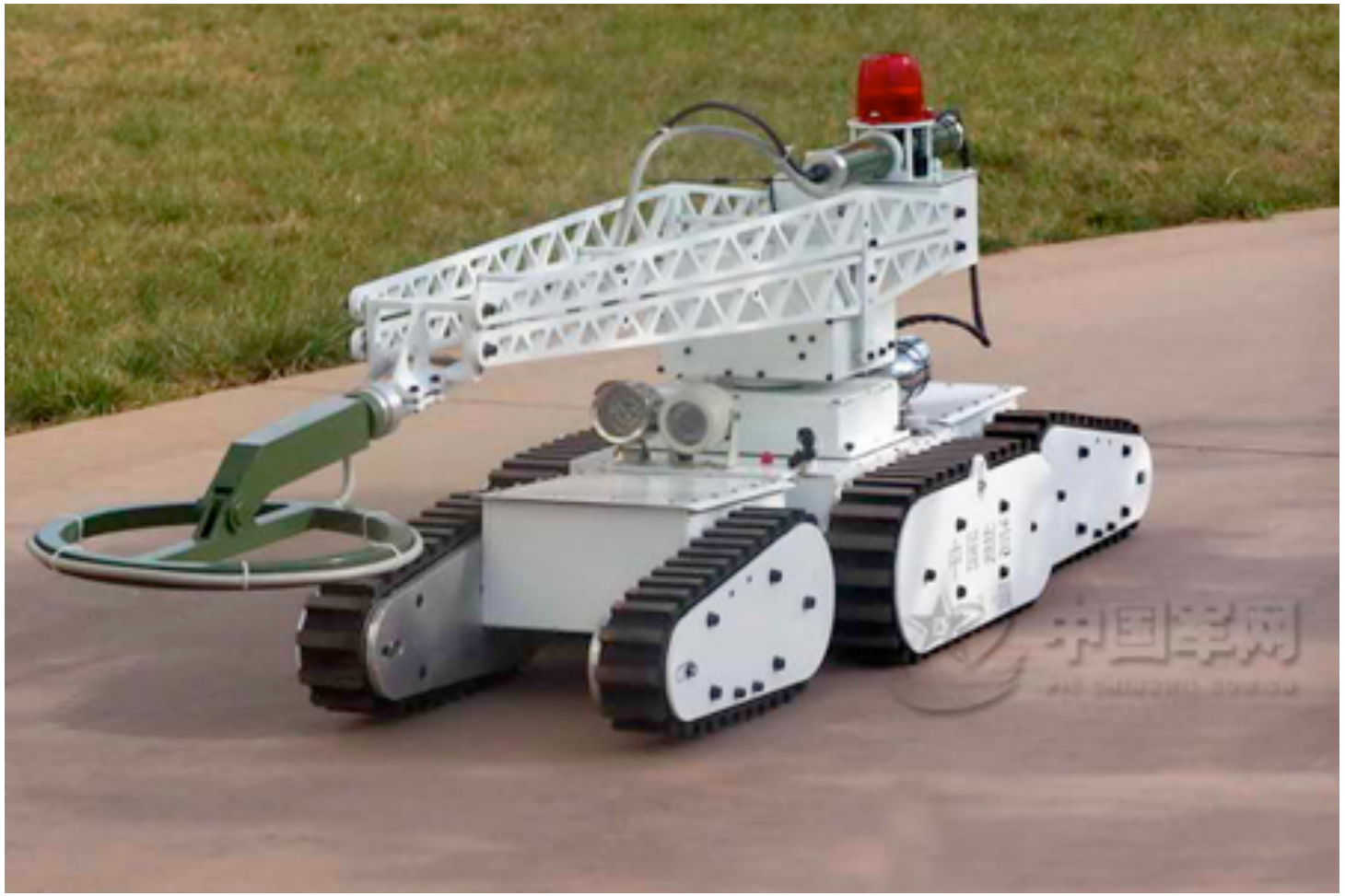

KITCHEN
BALLROOM
CONSERVATORY
BILLIARD ROOM
DINING ROOM
Cluedo
LIBRARY
LOUNGE
HALL
STUDY

Treasure Hunts

- Treasure
  - Case file, Gold
- Clues
  - Refutations, Rainbows
- Information is Location Dependent

Treasure Hunts

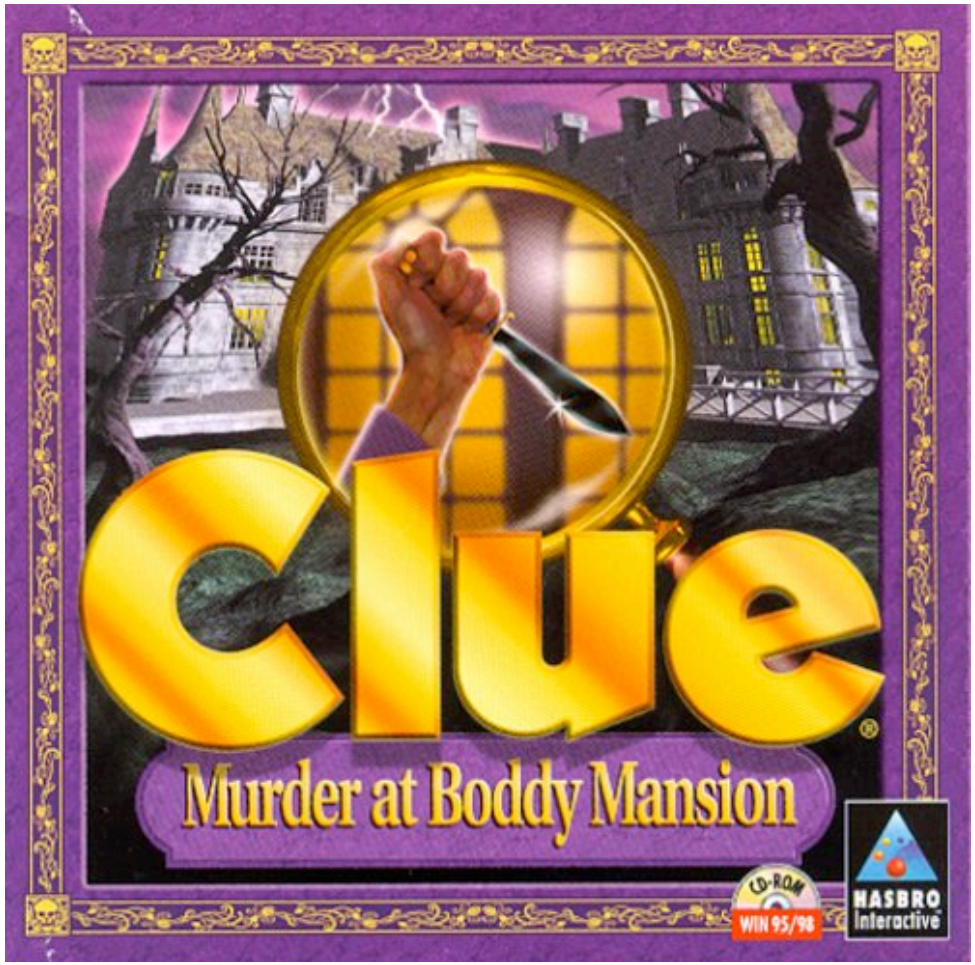
Treasure Hunts



Framework

- POMDP
  - States
  - Actions
  - Belief Distribution
  - Observations
  - Reward Function

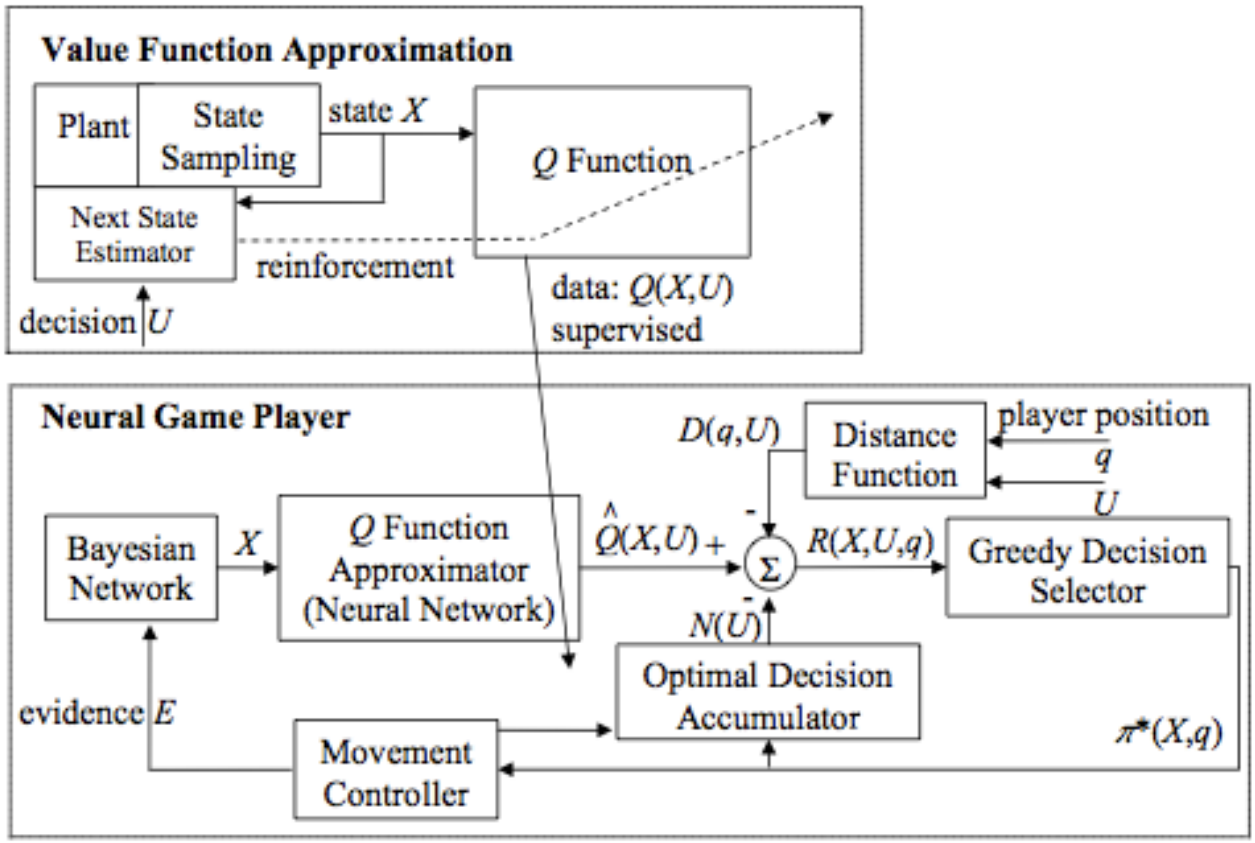
Commercial Approach



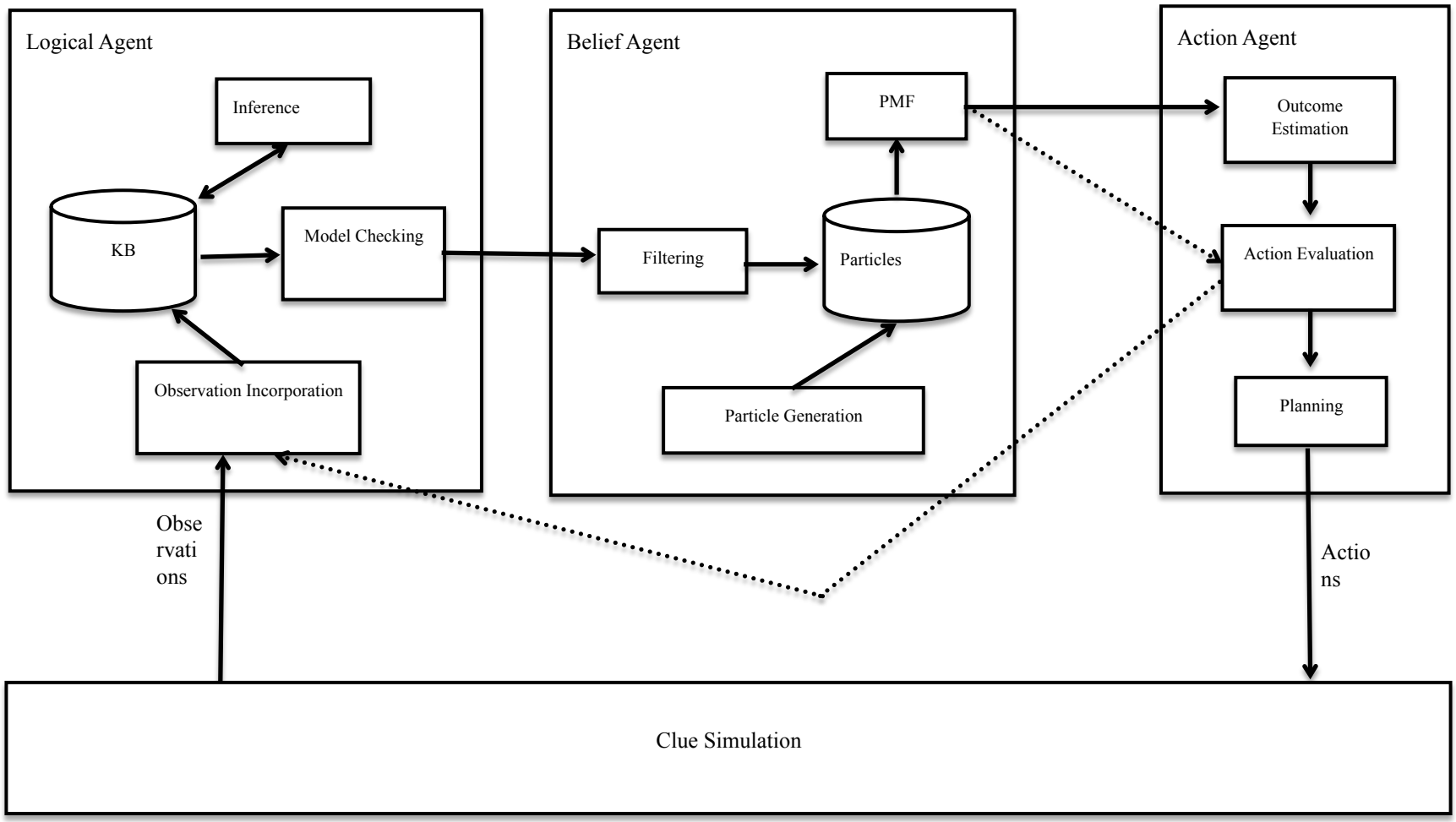
- AI used ‘notepad’
  - Modified
- Eliminates rooms first
  - A* search

Bayes Net Approach

- Chenghui Cae & Silvia Ferrari, Duke University, 2008



Propositional Logic Approach



Logical Agent

- Propositional Logic
  - Card ‘c’ is in place ‘p’ = Cp
- Prior Information
- Observations
- Inference
- Model Checking

Belief Agent

- Particle Filtering
- Particle Replacement
  - Partially-Random-Seed Mutation
  - Increasing Radius
- PMF

Decision Agent

- Outcome Estimation
  - Use PMF to estimate the probability of an observation given a suggestion
- Action Evaluation
  - Use probabilities calculated above to estimate expected value of suggestions
- Planning
  - Value Iteration, discounted present value of future information

Did it Work?

- Well, yes and no
  - It can evaluate and make suggestions, move around the board, etc.
  - Incorporating new information takes forever
    - Store particles in non-propositional format
      - Conversion for model-checking
    - Inefficient resolution algorithm
    - Particle Generation is actually pretty darn good

Conclusion

- Propositional Logic
- Particle Filtering
- Value Iteration