ID2209 Distributed Artificial Intelligence and Intelligent Agents

Assignment 3 – Coordination & Utility

Assignment‘s theme

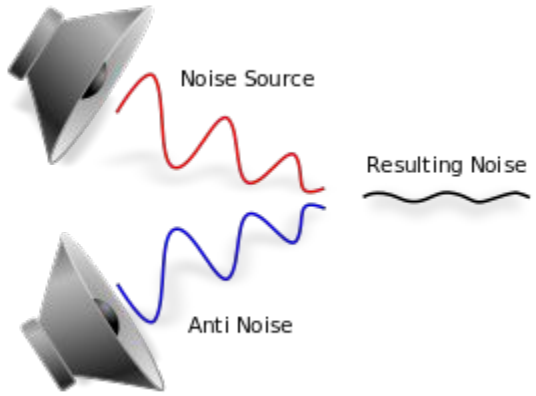
Festival

Assignment 1 – GAMA and agents
- Introduction to GAMA
- Festival map, guests seeking information

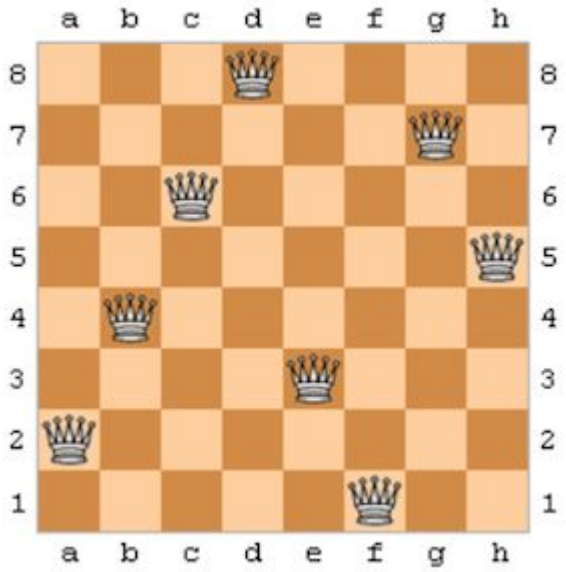
- Assignment 2 – Negotiation and Communication (FIPA)
  - Dutch auctions on merch
  - Communicating through FIPA protocol

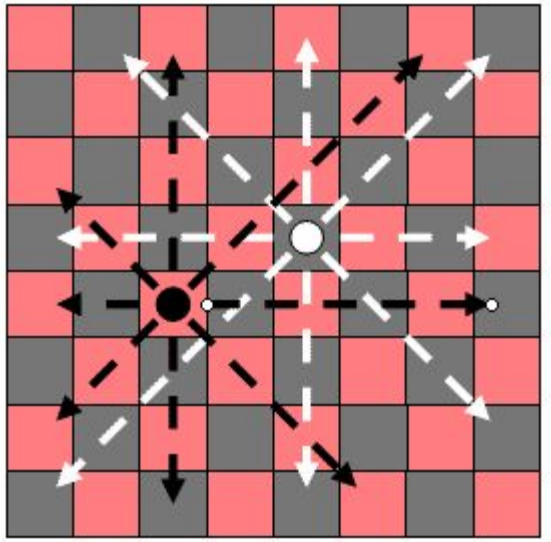
- **Assignment 3 - Coordination**
  - **Positioning speakers at main stage (N Queen problem)**
  - **Visit all acts (Minimize travelling time + crowd at acts)**

Task 1 – Positioning speakers at main stage



- The aim of this task is to understand how agents communicate and cooperate to achieve their goal using the N Queens problem





Rules of the game

Create a NxN size chessboard, placing N queens on it

- No two queens can share the same row
- No two queens can share the same column
- No two queens can share the same diagonal line

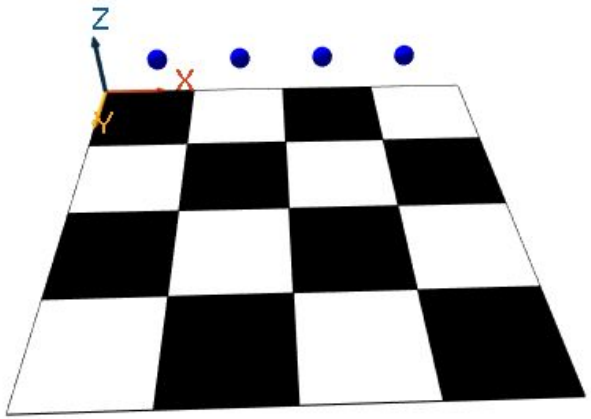
Provide multiple arrangements for your queens

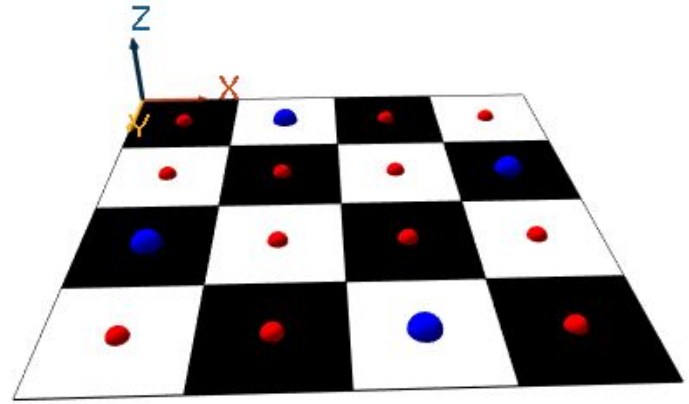
Your solution must work for N <- [4,5,.. 19,20]

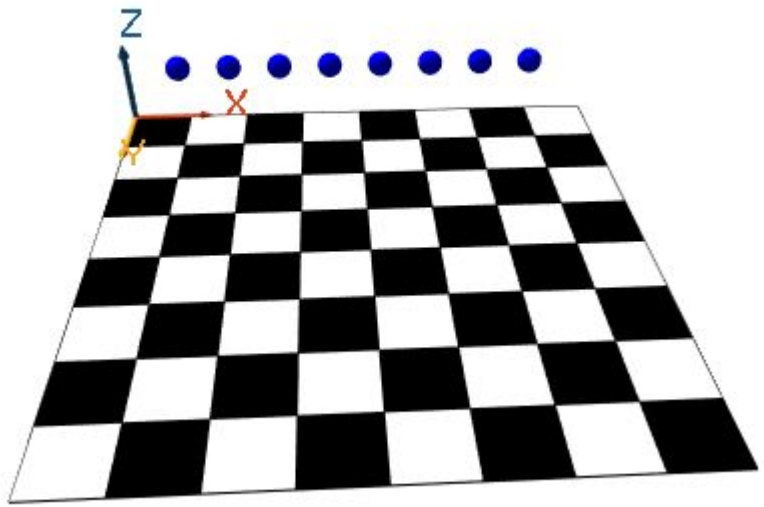
Setup

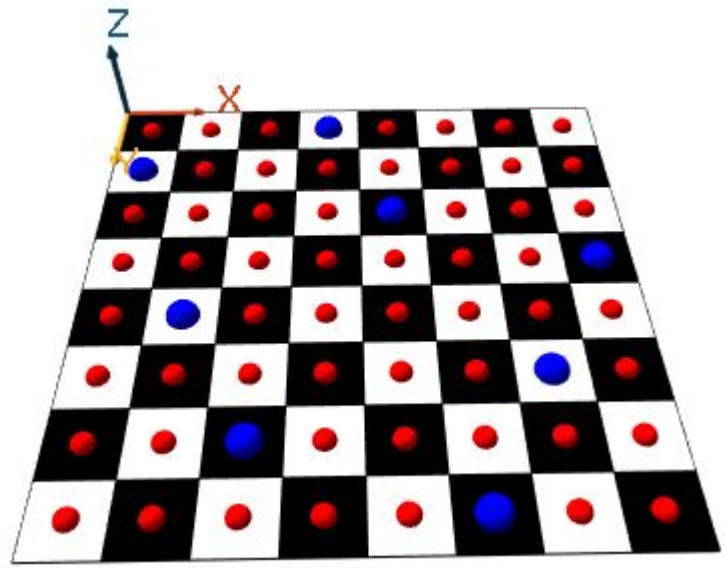
- Each queen is an agent.
- Queens communicate with messages
- Queens can only talk to their predecessor and their successor
- If a queen has no available position, she must let her predecessor know and ask her to reposition her
- If the predecessor has no available positions left, she must message her predecessor and so on and on…
- Stop when all queens are correctly positioned

Demonstration









Task 2 – Visit highest utility stage

- The guest knows at any given time where all stages are
- For every stage, the guest picks act based on his preferences
- The music/band is not the deciding factor. There are more things that the agent considers before choosing which act he would like to see
- Some stages have better light shows, other have better visuals, some have really good sound systems … and so on

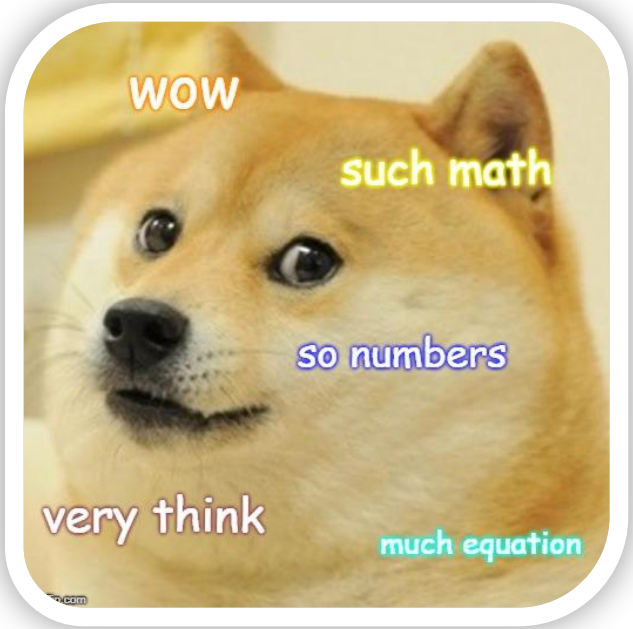
- Each time an agent selects an act to see, make his decision based on some sort of an utility function

Task 2, continued

- Create stages that the agent can travel to
- When each stage is hosting an act that last for a fixed time, give each act some attributes with different values
- Agents communicate with stages via FIPA to know the attribute value
- Agent calculates his utility for each stage
- The stage with the highest utility is picked!

Demonstration

- Agent1 preferences are
  - Lightshow = 0.1
  - Speakers = 0.3
  - Band = 0.2



- Stage1
  - Lightshow = 0.4
  - Speakers = 0.8
  - Band = 0.9
  - 0.1 * 0.4 + 0.3*0.8 + 0.2 * 0.9 = 0.46

- Stage2
  - Lightshow = 0.2
  - Speakers = 0.1
  - Band = 0.4
  - 0.1 * 0.2 + 0.3*0.1 + 0.2 * 0.4 = 0.13

Agent1 picks Stage1 !

Goals

- Hands on experience with agents working together to find a solution to a problem.
- Agent utility function to control behaviour
- More parameters used in FIPA service

Deliverables

- Task 1
  - Demonstrate the solution having 4, 8 and 12 queens.
- Task 2
  - Create 4 stages with different attributes for each act
  - Make more complex utility function (at least 6 variables)
    - For every concert, change the stage variable values
    - For every guest, his variables values stays the same
  - Display clearly that agents pick the selection based on their utility.

- Deliver both solutions and a short report (1-2 pages max)
- The solutions can be built on top of the former assignments or as stand alones.


ARE YOU UP FOR THE
CHALLENGE?

Global utility

Introduce a new attribute value, **crowd mass**.

Some agents prefer being a part of a huge crowd, while others prefer having it nice and quiet with enough space around them

VS

Global utility, continued

- As soon as all agents have picked their acts, they must communicate to know where everyone is going.
  - Hint: To simplify things, make one guest a „leader“ that tells everyone where to go for an optimal solution (for SEDS students, be aware that this is not a fault tolerant solution. You are free to use some fault-tolerant approach but not required to)
- Make the crowd mass a valuable attribute, which can be a deciding factor
- If an agent picks an act and prefers less crowd, but realizes most agents are going to his pick, he might want to pick another act.
- However, if only two agents are at an act and one of them prefers a crowd while the other one prefers less crowd, the former one should switch acts to maximize both agent‘s utility value.

Global utility, continued

- Do this for all agents, so at every selection the agents work together by sacrifing own utility to maximize the total utility of all agents.
- The agents should of course talk together using the FIPA protocol
- That is, show the initial pick of agents and their global utility at that point.
- Change picks of agents to increase global utility.
- When max global utility has been reached, the agents can enjoy their show!

Questions?