VizDoom
Pathfinding AI

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Problem

The goal was to explore different pathfinding and navigation techniques within the game of VizDoom. The new approach must replace the older q-learning agent that exists now.

- Make pathfinding efficient and scalable
- Allow pathfinding to be interfaced from a higher module
Approach

Agent has access to the coordinates of the walls.
- Ended up defining rooms and doorways, then pathfinding from doorway to doorway
- Requires no training, very flexible with new rooms and maps
Approach

Step 1: Define doorways

- Find parallel lines that point to each other and draw a doorway between them
Step 2: Define rooms

- Find the areas bounded by walls and doorways and define them as a room
Approach

Step 3: Find a path of doorways we must navigate through

- Find a path of rooms from the starting room to the destination room (i.e. \{C, B, A\})
- Convert this into a path of doorways we must navigate through (i.e. \{(C,B), (B,A)\})
Approach

Step 4: Navigate to the next doorway

- Find a path from the current location to the midpoint of the next doorway.
- Once we’re past the last doorway, pathfind to the destination.
Evaluation

New technique was evaluated based on two criteria: interfacing ability and performance

- Navigation skill is controlled by a higher module, which will decide where to move and when to divert attention to another skill, makes difficult decisions
- Pathfinding must be efficient, both in move count and real processing time
  - Consider performance in new maps it has never seen
Results

Approach uses breadth-first search, which should find an optimal path. Additionally, every next move is retrieved manually

- Easily able to control when to start, stop, continue, and cancel the navigation
- Performance is similar no matter how many times the agent has seen a map, non-optimal algorithms in areas of the code
Conclusions

- Impacts
  - Smarter bots in video games, with less dependence on the current maps and faster pathfinding times.
  - Possible applications to real life robotics i.e. search and rescue, delivery

- Next steps
  - Implement diagonal smoothing, improve hitbox detection, keep squashing bugs
  - Grey out areas of map, improve complexity of algorithms
Thank You

- Thank you for attending our presentations
- Questions?