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„Game Technology“
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Example Problems for Lecture 14 “Artificial Intelligence”

1. Important topics

Model of AI
Understand the different layers and associated systems and explain how their relationships are
Movement
Understand kinematic vs. dynamic
Behaviours (kinematic and dynamic)

- Seek, Flee
- Arrive
- Wander
- Pursue, Evade

Obstacle and wall avoidance – Problems, possible solutions
Combination of behaviours – Blending, Priorities
Problems → Equilibria
Pathfinding
Review basics of A* - no need to calculate
Methods for generating graphs: hand-made, tile-based, visibility points, nav-mesh
Hierarchical pathfinding
Decision Making
Decision Trees
State Machines
Hierarchical State Machines
Fuzzy logic, fuzzy rules
Goal-Oriented Behaviour, Goal-Oriented Planning
Tactical and Strategical AI
Understand the purpose
Execution Management
Frequency and phase of tasks
Wright’s method
Interruptible, Anytime algorithms
AI Level of Detail

2. Example Problems

2.1 AI Model

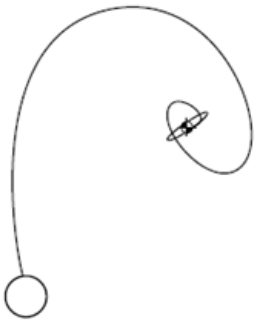
a) What are the three main levels of AI tasks that we looked at in the lecture?

b) Name one example of a method usually found on the tactical and strategic AI level.

2.2 Movement

a) What is the difference between a kinematic steering behavior and a dynamic steering behavior?

b) To which steering behavior can the diagram below belong? (Include kinematic or dynamic in your answer). The character is the circle in the lower left, the target is the point on the upper right. The line indicates the trajectory of the AI character. Explain your answer.

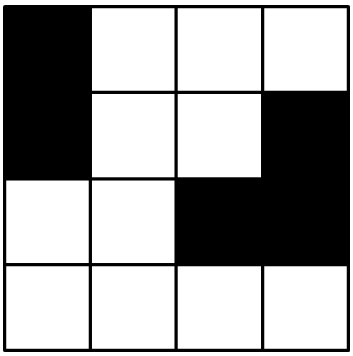


2.3 Movement

a) An AI uses blending for combining several steering behaviors. Construct a situation in which an equilibrium is found and the AI is in a deadlock (i.e. will be stuck unless the conditions around it change). You may draw or describe the situation.

2.5 Pathfinding

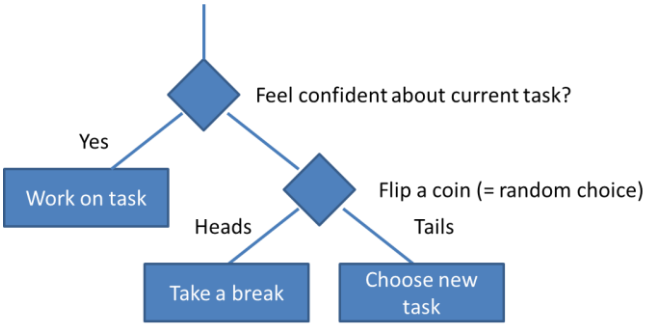
a) A game uses a tile-based map. Below, you can see a subset of this map. Explain how you could use the tile-based design of the map to find a navigation graph automatically. Black squares are blocked, white squares are walkable.



b) Explain the concept of hierarchical pathfinding.

2.6 Decision Making

a) The following decision tree describes the behavior of a student AI in an exam. If it were implemented in a game, what problem could arise? (The decision tree is evaluated often, e.g. every 5 frames).



2.7 Fuzzy Logic

In an RPG, a healing character has the following fuzzy state variables:

(A) self-injured: 0.2
(B) closest-teammate-injured: 0.8
(C) egoistic: 0.3

We want to derive the two following states:
cast-heal-on-self
cast-heal-on-teammate

The rules for this are:
self-injured AND egoistic THEN cast-heal-on-self
closest-teammate-injured AND NOT egoistic THEN cast-heal-on-teammate

a) How are the rules given above formulated using fuzzy logic?

cast-heal-on-self =

cast-heal-on-teammate =

b) What are the resulting state variables?

cast-heal-on-self =

cast-heal-on-teammate:

2.8 Goal-oriented behaviour

a) What is the advantage of a character that uses Goal-Oriented Action Planning over a character that chooses actions one at a time?

2.8 Execution management

a) What is the purpose of applying a phase to a recurring AI task?