

CITM Game Development - Midterm 2 (test) - solution Examination 2015

- You have 1 hour and 30 minutes to complete the assignment.
- Be clear and concise on your explanations.
- You can only use the square below to answer each question.
- If you take assumptions, explain them and be specific and explain your reasoning.

1. **(3 points)** Adapt the A* algorithm to accept creatures with size of 2x2. Paths that including tight spaces of 1 square should be rejected. Explain your reasoning to solve the problem. Assume you cannot move in diagonals. *E. g.: Our Ogre is 2x2 and needs to reach the destination X.*

A 10x10 grid with the following shaded cells:

- Light gray: (1,1), (1,2), (2,1), (2,2)
- Medium gray: (2,4), (2,5), (3,4), (3,5), (3,6), (3,7), (4,5), (4,6)
- Black 'X': (2,9)

The only change that we would need to make the A* would be the generation of adjacent and walkable squares around us:

	A	B	
H	X		C
G			D
	F	E	

- We use a reference position X
- We iterate in pairs of AB(north), CD(east), FE(south), HG(west):
 - To be considered walkable **both** have to be walkable
 - The $F = G + H$ is calculated from both pairs F added up

2. **(2 points)** Write down the step-by-step internal process of a A* algorithm in the map, taking in account that this map contains variable costs for squares: **river squares cost double to cross**. Assume that you cannot move in diagonals.

Map Legend: S: Start E: path end R: River W: Wall

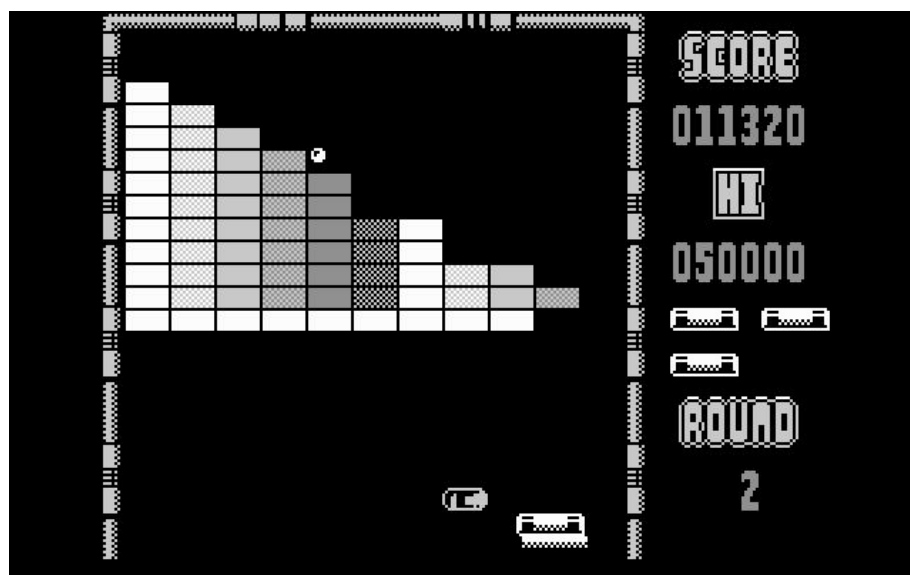
We assume manhattan distance counting the starting node and clockwise square selection starting north.

S closed! G	F H	12 closed! 1 11	R 13 closed! 3 10	13 closed! 4 9	13 closed! 5 8	13 closed! 6 7	13 closed! 7 6	13 closed! 8 5	13 closed! 9 4	13 closed! 10 3
12 1 11	12 closed! 2 10	R 14 5 9	R 15 7 8	13 6 7	14 8 6	W	13 9 4	12 9 3	13 closed! 11 2	
14 4 10	12 closed! 3 9	12 closed! 4 8	R 13 closed! 6 7	13 closed! 7 6	13 closed! 8 5	W				E closed!

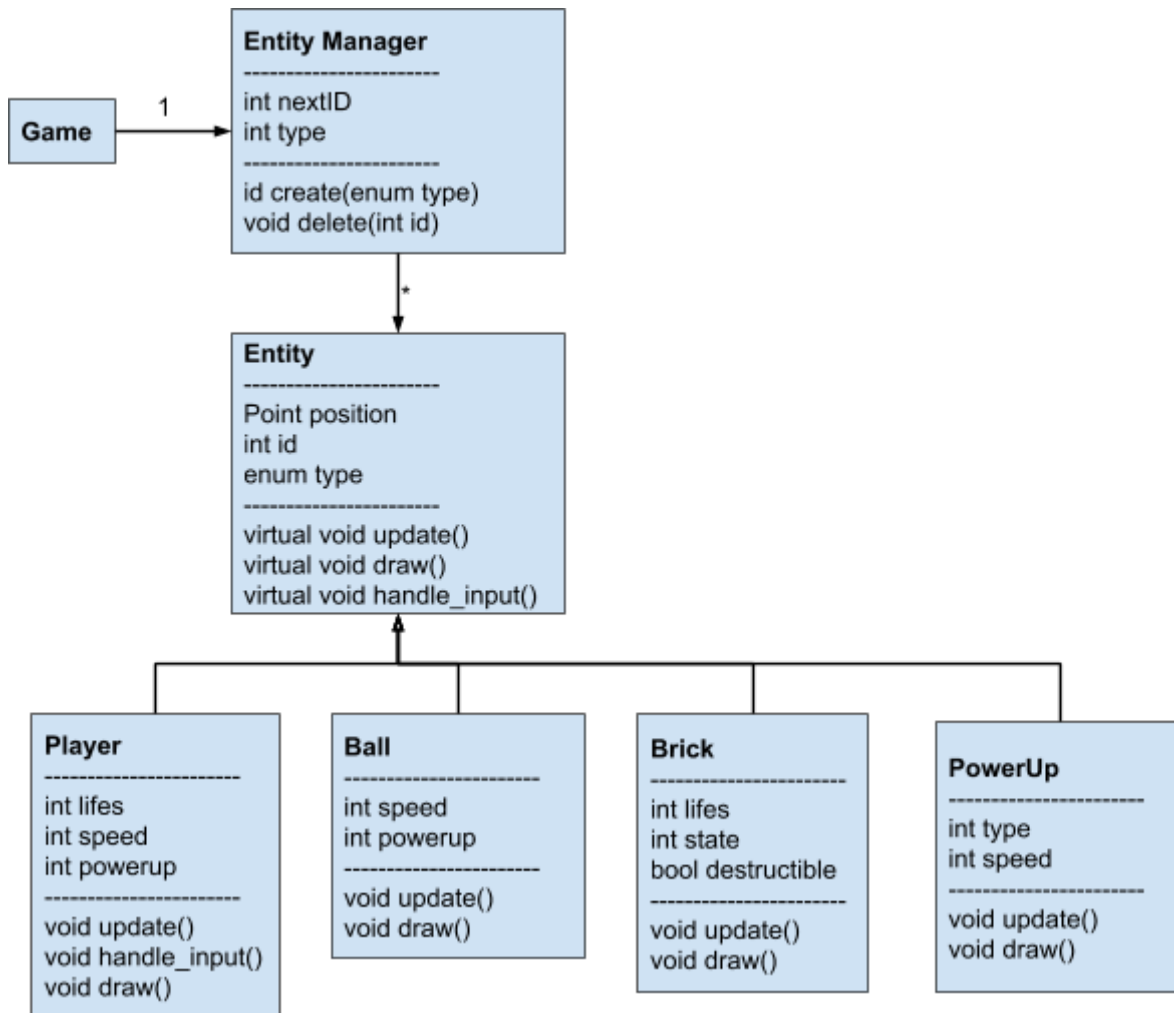
“closed!” means is is added to the close list. “**closed!**” if it actual part of the final path.

Take in account that some squares get re-evaluated and their weight changes.

3. **(3 points)** Describe your strategy and the UML of each of the classes (including methods and attributes) of an entity manager for Arkanoid. Remember that Arkanoid features power ups for the player and the ball.



Play the game at: <http://www.officegamespot.com/arcade/arkanoid.htm>



Assumptions: Bricks have state of blinking before removal. Walls are made of indestructible bricks. We have an enum with all entity types.

4. **(2 points)** If we have a game where the logic runs at 45 frames per second with vsync turned on (monitor refresh rate of 60 Hz) and our main character moves at 200 pixels per second. How much, in average, is he moving each frame taking in account that we have variable time step ?

Even if our logic frame rate is at 45 FPS, we will go down to 30 FPS with vsync activates due to time wasted in vsync. This means that our average frame will have a time differential of 0.033 seconds

*Knowing this, in an average frame the main character will move $200 * 0.033 = 6.6$ pixels.*