Experimentation

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Introduction:

This assignment is playing a game called pacman with AI. Using simulation to simulate the next several steps for pacman, and choose moving direction by Max score path or Average score path two propagation types.

I am solving this problem using tree structure with linked list to find the average or max score path, and then make the best next move to achieve as high as possible score and the less calculation time. Here, I using move to determine the direction for every node, and let the nodes (depths is larger than one) move direction the same as node's parent node which is easy to calculate the max and avg score. It could simply detects the first move of the node and classify the node to that move direction.

Test Results:

Level 1	Budget 10		Budget 100		Budget 1000		Budget 2000	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Score	484	236	487	266	725	470	323	396
Max depth	10	9	36	28	40	37	36	40
Total time (seconds)	0.15	0.20	2.4	2.01	38.59	23.75	35.78	43.77
Expanded/Second	48364	49365	46692	47093	39929	39643	41658	41621

Level 3	Budget 10		Budget 100		Budget 1000		Budget 2000	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Score	488	362	560	498	830	650	903	558
Max depth	10	10	23	25	56	33	34	34
Total time (seconds)	0.23	0.28	1.97	3.96	43.83	40.73	81.12	67.08
Expanded/Second	49911	48396	47835	46881	36375	38533	41556	40446

Level 5	Budget 10		Budget 100		Budget 1000		Budget 2000	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Score	290	275	383	287	385	346	330	422
Max depth	10	8	14	18	21	20	22	26
Total time (seconds)	0.11	0.12	1.48	1.20	14.47	18.86	20.16	37.14
Expanded/Second	50315	50287	48250	47982	40980	41011	44853	43017

Diagram 1: budget vs score

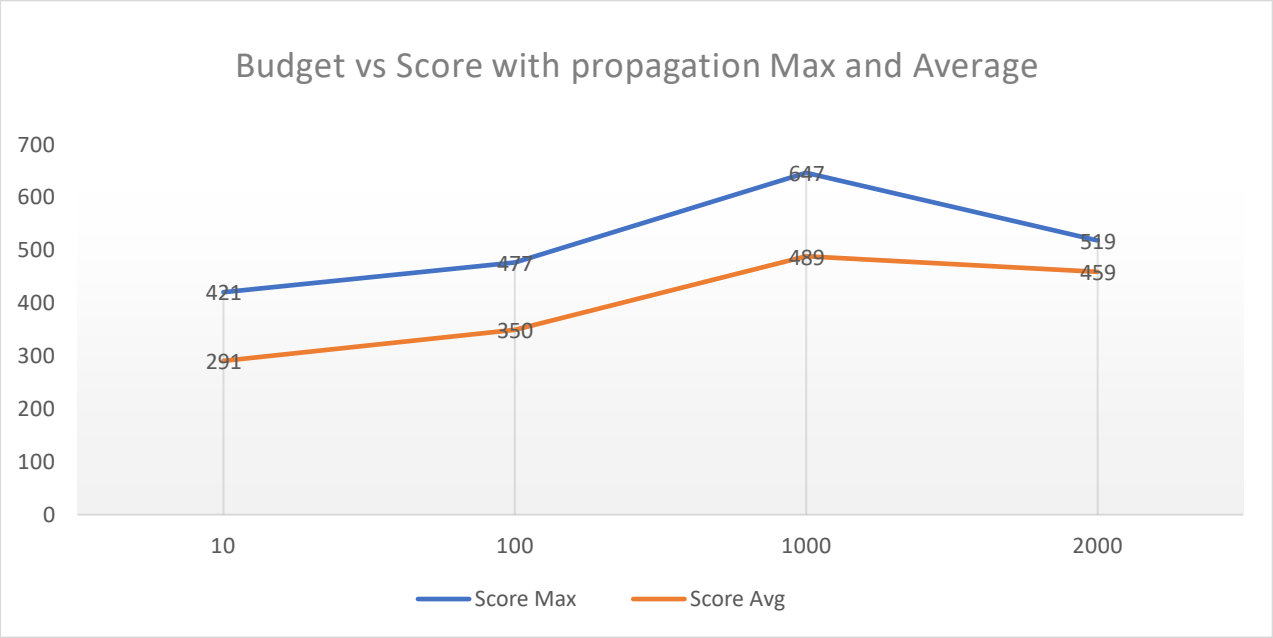
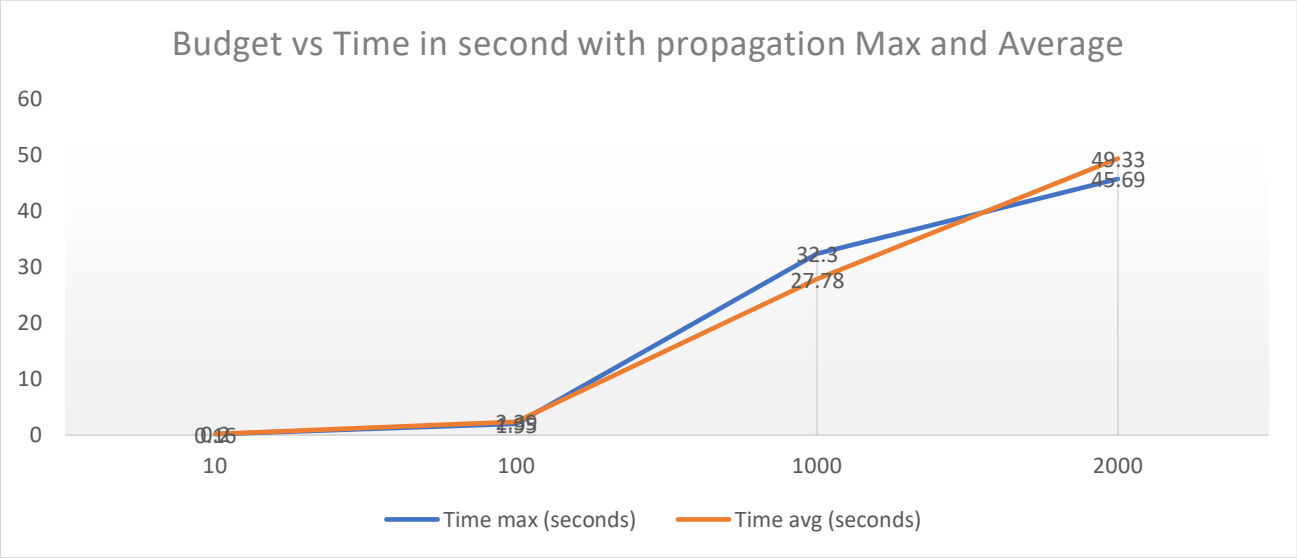


Diagram 2: budget vs time (seconds)



Problems:

In my opinion, the program should perform better when the budget is increasing. However, from the diagram 1, it can be seen that the score decreased when the budget increases from 1000 to 2000. It might be the problem about the test case problem and random move for the same score direction. From the test, when the pacman has eaten almost all normal food, there is only one or two normal food left, and the pacman is too far from the normal food that pacman cannot find the normal food (even 2000 budget is not enough). The pacman will lose almost all 3 lives to eat the last several normal food. When the pacman has luck to eat the normal to the next level, it will get high score. Therefore, random move and lack of test might be leading to this problem which is score not increasing when the budget is increasing.

Conclusion:

From the diagram 1 and diagram 2, it can be seen that the time cost in seconds for propagation max and average are really close. However for the score gains, propagation max is higher than average in the diagram 1 obviously. Thus, choosing propagation max is better than average. Furthermore, when the budget reaches to 2000, it will need more time than budget 1000 , but the score is lower than the budget 1000. Therefore, the best choose it propagation max with budget 1000.