Experimentation

Username: Kuoyuanl

Full name: Kuoyuan Li

Student ID:1072843

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Propagation  type | Budget | Score | | Expanded nodes/Second | | Total execution time (in secs) |
| Mean | Deviation | Mean | Deviation | Mean |
| Maximum | 10 | 387 | 6 | 109 | 12 | 78.1 |
| 100 | 476 | 20 | 1321 | 220 | 57.1 |
| 1000 | 478 | 45 | 10465 | 657 | 90.7 |
| 2000 | 546 | 50 | 19452 | 55 | 87.3 |
| Average | 10 | 291 | 23 | 100 | 0 | 49.4 |
| 100 | 394 | 14 | 1491 | 231 | 53.8 |
| 1000 | 455 | 70 | 14648 | 1877 | 52.5 |
| 2000 | 434 | 98 | 22333 | 2980 | 48.3 |

The following tables show the mean score and its deviation, mean expanded nodes per second and its deviation, and total execution time for each type of propagation and each budget size. These three tables show the information for 3 different pacman game levels.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Propagation  type | Budget | Score | | Expanded nodes/Second | | Total execution time (in secs) |
| Mean | Deviation | Mean | Deviation | Mean |
| Maximum | 10 | 230 | 34 | 99 | 0 | 71.3 |
| 100 | 349 | 36 | 990 | 7 | 76.8 |
| 1000 | 315 | 17 | 9971 | 71 | 67.0 |
| 2000 | 319 | 99 | 19703 | 199 | 61.3 |
| Average | 10 | 285 | 12 | 100 | 0 | 57.7 |
| 100 | 336 | 81 | 1009 | 1 | 56.7 |
| 1000 | 271 | 41 | 10036 | 34 | 66.2 |
| 2000 | 310 | 67 | 19673 | 177 | 82.0 |

Level A: Levels/level01.dat

Level B: Levels/level03.dat

Level C: Levels/level05.dat

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Propagation  type | Budget | Score | | Expanded nodes/Second | | Total execution time (in secs) |
| Mean | Deviation | Mean | Deviation |  |
| Maximum | 10 | 375 | 25 | 106 | 10 | 76.9 |
| 100 | 415 | 23 | 1282 | 133 | 51 |
| 1000 | 465 | 50 | 12265 | 1890 | 51.3 |
| 2000 | 558 | 79 | 19104 | 128 | 84.3 |
| Average | 10 | 326 | 39 | 101 | 0 | 62.0 |
| 100 | 391 | 16 | 1092 | 67 | 64.8 |
| 1000 | 455 | 77 | 10348 | 1697 | 63.2 |
| 2000 | 510 | 92 | 23608 | 620 | 78.1 |

Result analysis:

Budget size decides the score. It is more likely to get higher scores with the increasing of budget, but it will take longer time to run. For example, in the second table, for same propagation type max, when budget is 10, score is 387, running time is 78.1; when budget is 100, score is 476, running time is 57.1; when budget is 1000, score is 478, running time is 90.7; when budget is 2000, score is 546, running time is 87.3. Besides, according to my observation, when budget reached 1000 and 2000, pacman is more likely to eat all dots in the level and win.

Budget size decides the memory usage as well. Higher budget will generate more nodes and use more memory. For example, in the first table, for same propagation type max, when budget is 10, expanded nodes per second is 99; when budget is 100, expanded nodes per second is 990 when budget is 1000, expanded nodes per second is 9971; when budget is 2000, expanded nodes per second is 19703.

According to my data, most of time the maximum propagation works better. It is better to propagate max. AI with max propagation method is more likely to take higher score within less time. For example, in the third table, for same budget 100, max gets 415 points in 51 seconds, avg gets 391 points in 62 seconds, for budget 1000, max gets 465 points in 51.3 seconds, avg gets 455 points in 63.2 seconds, for budget 2000, max gets 558 points in 84.3 seconds, avg gets 510 points in 78.1 seconds. With the increasing of budget, max propagation shows a better performance. One possible reason for this case is the oscillation action performed by avg. Average propagation may lead to pacman moving between 2 points continuously.