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CSC380: Artificial Intelligence

Dr. Salgian

Project 2: Wargame Write-up

Following are the stats for each player combination for each board:

Random vs. Random (Numbers displayed are averages from 50 games)

|  |  |  |  |
| --- | --- | --- | --- |
| Kalamazoo | | | |
| Name - Type | Score | Number of Moves | Average move time  (microseconds) |
| B - Random | 18 | 13 | 20 |
| G - Random | 17 | 12 | 13 |
| B - Random | 17 | 12 | 14 |
| G - Random | 18 | 13 | 13 |

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| Peoria | | | |
| Name - Type | Score | Number of Moves | Average move time  (microseconds) |
| B - Random | 655 | 13 | 17 |
| G - Random | 643 | 12 | 17 |
| B - Random | 643 | 12 | 16 |
| G - Random | 655 | 13 | 15 |

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| --- | --- | --- | --- |
| Piqua | | | |
| Name - Type | Score | Number of Moves | Average move time  (microseconds) |
| B - Random | 13 | 13 | 17 |
| G - Random | 11 | 12 | 19 |
| B - Random | 11 | 12 | 13 |
| G - Random | 13 | 13 | 19 |

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| --- | --- | --- | --- |
| Punxsutawney | | | |
| Name - Type | Score | Number of Moves | Average move time  (microseconds) |
| B - Random | 53 | 13 | 15 |
| G - Random | 41 | 12 | 15 |
| B - Random | 42 | 12 | 15 |
| G - Random | 52 | 13 | 20 |

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| --- | --- | --- | --- |
| Wallawalla | | | |
| Name - Type | Score | Number of Moves | Average move time  (microseconds) |
| B - Random | 41 | 13 | 18 |
| G - Random | 34 | 12 | 15 |
| B - Random | 34 | 12 | 17 |
| G - Random | 41 | 13 | 16 |

Minimax vs. Minimax

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| --- | --- | --- | --- |
| Kalamazoo | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 19 | 13 | 110944 |
| G – Minimax | 16 | 12 | 106580 |
| B – Minimax | 16 | 12 | 96049 |
| G – Minimax | 19 | 13 | 110784 |

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| --- | --- | --- | --- |
| Peoria | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 699 | 13 | 106582 |
| G – Minimax | 600 | 12 | 102445 |
| B – Minimax | 600 | 12 | 96388 |
| G – Minimax | 699 | 13 | 104036 |

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| --- | --- | --- | --- |
| Piqua | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 13 | 13 | 104901 |
| G – Minimax | 12 | 12 | 92006 |
| B – Minimax | 12 | 12 | 93018 |
| G – Minimax | 13 | 13 | 104666 |

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| --- | --- | --- | --- |
| Punxsutawney | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 51 | 13 | 97547 |
| G – Minimax | 44 | 12 | 92704 |
| B – Minimax | 44 | 12 | 92929 |
| G – Minimax | 51 | 13 | 100323 |

|  |  |  |  |
| --- | --- | --- | --- |
| Wallawalla | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 40 | 13 | 102938 |
| G – Minimax | 36 | 12 | 99076 |
| B – Minimax | 36 | 12 | 96687 |
| G – Minimax | 40 | 13 | 104276 |

AlphaBeta vs. AlphaBeta

|  |  |  |  |
| --- | --- | --- | --- |
| Kalamazoo | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – AlphaBeta | 16 | 13 | 9557 |
| G - AlphaBeta | 19 | 12 | 8710 |
| B - AlphaBeta | 19 | 12 | 9265 |
| G - AlphaBeta | 16 | 13 | 10192 |

|  |  |  |  |
| --- | --- | --- | --- |
| Peoria | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – AlphaBeta | 699 | 13 | 8887 |
| G - AlphaBeta | 600 | 12 | 8957 |
| B - AlphaBeta | 600 | 12 | 9143 |
| G - AlphaBeta | 699 | 13 | 8939 |

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| --- | --- | --- | --- |
| Piqua | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – AlphaBeta | 13 | 13 | 6354 |
| G - AlphaBeta | 12 | 12 | 6479 |
| B - AlphaBeta | 12 | 12 | 5683 |
| G - AlphaBeta | 13 | 13 | 5321 |

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| --- | --- | --- | --- |
| Punxsutawney | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – AlphaBeta | 54 | 13 | 10705 |
| G - AlphaBeta | 41 | 12 | 10644 |
| B - AlphaBeta | 41 | 12 | 9716 |
| G - AlphaBeta | 54 | 13 | 9774 |

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| --- | --- | --- | --- |
| Wallawalla | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – AlphaBeta | 38 | 13 | 12054 |
| G - AlphaBeta | 38 | 12 | 13017 |
| B - AlphaBeta | 38 | 12 | 13194 |
| G - AlphaBeta | 38 | 13 | 12090 |

Random vs. Minimax (Numbers displayed are averages from 50 games)

|  |  |  |  |
| --- | --- | --- | --- |
| Kalamazoo | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 13 | 13 | 33 |
| G – Minimax | 22 | 12 | 91958 |
| B – Minimax | 24 | 13 | 84736 |
| G – Random | 11 | 12 | 23 |

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| --- | --- | --- | --- |
| Peoria | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 595 | 13 | 24 |
| G – Minimax | 703 | 12 | 75047 |
| B – Minimax | 791 | 13 | 80448 |
| G – Random | 507 | 12 | 21 |

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| --- | --- | --- | --- |
| Piqua | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 8 | 13 | 24 |
| G – Minimax | 17 | 12 | 76849 |
| B – Minimax | 18 | 13 | 82991 |
| G – Random | 7 | 12 | 21 |

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| --- | --- | --- | --- |
| Punxsutawney | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 19 | 13 | 22 |
| G – Minimax | 76 | 12 | 85657 |
| B – Minimax | 81 | 13 | 82500 |
| G – Random | 14 | 12 | 23 |

|  |  |  |  |
| --- | --- | --- | --- |
| Wallawalla | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 31 | 13 | 23 |
| G – Minimax | 44 | 12 | 77348 |
| B – Minimax | 49 | 13 | 85818 |
| G – Random | 26 | 12 | 20 |

Random vs. AlphaBeta (Numbers displayed are averages from 50 games)

|  |  |  |  |
| --- | --- | --- | --- |
| Kalamazoo | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 13 | 13 | 22 |
| G – AlphaBeta | 22 | 12 | 11699 |
| B – AlphaBeta | 24 | 13 | 13436 |
| G – Random | 11 | 12 | 18 |

|  |  |  |  |
| --- | --- | --- | --- |
| Peoria | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 583 | 13 | 19 |
| G – AlphaBeta | 715 | 12 | 10770 |
| B – AlphaBeta | 813 | 13 | 12106 |
| G – Random | 485 | 12 | 25 |

|  |  |  |  |
| --- | --- | --- | --- |
| Piqua | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 9 | 13 | 25 |
| G – AlphaBeta | 16 | 12 | 7088 |
| B – AlphaBeta | 18 | 13 | 6724 |
| G – Random | 7 | 12 | 20 |

|  |  |  |  |
| --- | --- | --- | --- |
| Punxsutawney | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 17 | 13 | 21 |
| G – AlphaBeta | 78 | 12 | 12136 |
| B – AlphaBeta | 80 | 13 | 14999 |
| G – Random | 15 | 12 | 24 |

|  |  |  |  |
| --- | --- | --- | --- |
| Wallawalla | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Random | 30 | 13 | 18 |
| G – AlphaBeta | 45 | 12 | 14851 |
| B – AlphaBeta | 49 | 13 | 15125 |
| G – Random | 26 | 12 | 23 |

Minimax vs. AlphaBeta

|  |  |  |  |
| --- | --- | --- | --- |
| Kalamazoo | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 16 | 13 | 80136 |
| G – AlphaBeta | 19 | 12 | 8500 |
| B – AlphaBeta | 16 | 13 | 9006 |
| G – Minimax | 19 | 12 | 79604 |

|  |  |  |  |
| --- | --- | --- | --- |
| Peoria | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 699 | 13 | 72854 |
| G – AlphaBeta | 600 | 12 | 8216 |
| B – AlphaBeta | 600 | 13 | 8278 |
| G – Minimax | 699 | 12 | 69944 |

|  |  |  |  |
| --- | --- | --- | --- |
| Piqua | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 13 | 13 | 83265 |
| G – AlphaBeta | 12 | 12 | 6083 |
| B – AlphaBeta | 13 | 13 | 6353 |
| G – Minimax | 12 | 12 | 85729 |

|  |  |  |  |
| --- | --- | --- | --- |
| Punxsutawney | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 54 | 13 | 78707 |
| G – AlphaBeta | 41 | 12 | 10087 |
| B – AlphaBeta | 41 | 13 | 9697 |
| G – Minimax | 54 | 12 | 75441 |

|  |  |  |  |
| --- | --- | --- | --- |
| Wallawalla | | | |
| Name - Type | Score | Number of Moves | Average move time (microseconds) |
| B – Minimax | 38 | 13 | 90917 |
| G – AlphaBeta | 38 | 12 | 14113 |
| B – AlphaBeta | 38 | 13 | 11436 |
| G – Minimax | 38 | 12 | 77244 |