Connor Taylor

Project 2 Report

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| Circle | | | |
|  | Running Time | | |
| n\* | Graham Scan | Jarvis March | QuickHull |
| 10 | 0.045 | 0.044 | 0.042 |
| 100 | 0.049 | 0.038 | 0.041 |
| 1000 | 0.035 | 0.042 | 0.036 |
| 10000 | 0.054 | 0.058 | 0.067 |
| 100000 | 0.185 | 0.185 | 0.225 |
| 1000000 | 1.289 | 1.809 | 2.401 |

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| On Circle | | | |
|  | Running Time | | |
| n\* | Graham Scan | Jarvis March | QuickHull |
| 10 | 0.034 | 0.045 | 0.058 |
| 100 | 0.04 | 0.041 | 0.04 |
| 1000 | 0.04 | 0.057 | 0.051 |
| 10000 | 0.058 | 0.082 | 0.092 |
| 100000 | 0.204 | 0.359 | 0.396 |
| 1000000 | 5.896 | 3.083 | 3.642 |

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| Rectangle | | | |
|  | Running Time | | |
| n\* | Graham Scan | Jarvis March | QuickHull |
| 10 | 0.04 | 0.05 | 0.033 |
| 100 | 0.047 | 0.03 | 0.038 |
| 1000 | 0.048 | 0.033 | 0.034 |
| 10000 | 0.068 | 0.056 | 0.057 |
| 100000 | 0.173 | 0.162 | 0.144 |
| 1000000 | 1.279 | 1.238 | 0.973 |

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| Triangle | | | |
|  | Running Time | | |
| n\* | Graham Scan | Jarvis March | QuickHull |
| 10 | 0.034 | 0.04 | 0.041 |
| 100 | 0.04 | 0.031 | 0.03 |
| 1000 | 0.06 | 0.042 | 0.039 |
| 10000 | 0.065 | 0.045 | 0.04 |
| 100000 | 0.167 | 0.143 | 0.173 |
| 1000000 | 1.448 | 0.953 | 1.408 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Graham Scan | Jarvis March | QuickHull |
| Best Case | O(Nlog(N)) | O(Nlog(N)) | O(Nlog(N)) |
| Average Case | O(Nlog(N)) | O(Nlog(N)) | O(Nlog(N)) |
| Worst Case | O(Nlog(N)) | O(N2) | O(N2) |

The empirical times follow the theoretical times well, not seeing any growth until there is lots of data input. The average and best case for all algorithms is the same, with the worst-case being O(N2) for the Jarvis March and QuickHull and O(Nlog(N)) for the Graham Scan. In theory, this would mean the algorithms would perform the same, but that is not always the case. Each algorithm has a shape that it performs at better in with larger amounts of points.