**Software Engineering Project1**

**Name: Joe Wang（王科翔）**

**Student ID: U201517026**

**Class: SE1502**

**Introduction:**

In a box bounded by [-1, 1], given m balloons (they cannot overlap) with variable radius r and position mu, find the optimal value of r and mu which maximize sum of r^2.

**Algorithm:**

Use heuristic algorithm. Seek randomly to find the optimal values of each radius and position. Use gradient descent to optimize the program. Check the data every time when getting a new circle. If legal, print it.

**Test Results:**

|  |  |
| --- | --- |
| INPUT | OUTPUT(radius x-coordinate y-coordinate) |
| 1 | 1.00447549893 -0.0153138853604 0.0117075698215 |
| 3 | 0.913159544479 -0.00234597659597 -0.00963837811408  0.240463448229 0.409284557227 0.0762828077495  8.26446280992e-07 -0.255440357085 0.320493868095 |
| 4 | 0.913159544479 -0.0122448453108 -0.0157077953223  0.218603134754 0.411560088644 0.70500075679  8.26446280992e-07 0.419916983082 0.455383298221  8.26446280992e-07 0.235125353814 -0.0466345712436 |
| 5 | 0.913159544479 0.0135552827143 -0.0126702645369  0.198730122503 0.152353753286 -0.299558686855  8.26446280992e-07 -0.199199888599 -0.704536472734  8.26446280992e-07 -0.503774878041 -0.648411456589  8.26446280992e-07 -0.406977151267 -0.783697198979 |
| 6 | 0.913159544479 0.00790470389594 -0.0611664309497  0.18066374773 -0.0042602406217 0.59588702284  8.26446280992e-07 -0.31881776632 -0.222185160625  8.26446280992e-07 0.464727308792 -0.263838517261  8.26446280992e-07 0.297855558931 -0.248971926732  8.26446280992e-07 0.714169287323 -1.40392442789 |
| 7 | 0.913159544479 0.0154213766108 0.0131520548659  0.18066374773 -0.753201399735 -0.30331042981  8.26446280992e-07 0.450366417487 0.560160929865  8.26446280992e-07 -0.479245872978 -0.0561850904931  8.26446280992e-07 -0.201980942287 0.182231272054  8.26446280992e-07 -0.731702536752 1.17783753143  8.26446280992e-07 1.01667754229 4.65133670596 |
| 8 | 0.913159544479 0.0334447318811 -0.014384881691  0.164239770664 -0.563462458229 -0.580705673164  8.26446280992e-07 0.547576744194 0.548847206321  8.26446280992e-07 0.486336882715 0.470705929491  8.26446280992e-07 0.591360422477 0.568459696808  8.26446280992e-07 1.53496270679 1.63685207718  8.26446280992e-07 3.86355647867 4.43769546426  8.26446280992e-07 5.57835224908 13.288840737 |

**Appendix:**

https://github.com/WKX121/wangkexiang