Comp 251 Assignment 1

## Description of algorithm

The algorithm is looping the x and y coordinates from to then for all radius between and . Then it’s calling with the current x, y position and radius.

The function first checking for the cardinal point to be of the good color, then for the cardinal point at and (This accelerate the process of finding potential intersections, the intersections functions won’t be called, especially for all the white circle that can be detected when the background is white). Then the function is looping using the Bresenham’s algorithm. If the function return then we call the intersect function for and to check for any touching circle.

If the intersect both return false then we can consider there is a circle and so we can add it into the array (ArrayList of array of size 3 (x, y, r))

## Question 2

#### Question 2.a

As the Bresenham’s algorithm takes time . The findCircle and intersect functions function also take . Then 0as we are calling findCircle once and intersect twice we have. Then we have

This gives us

#### Question 2.b

The best case is when the return false just by checking the cardinal point. Then the is. Then as were looping twice the time depends on which is

#### Question 2.c

The time of the algorithm is

Let solve the derivative for

Solving to 0 gives us either

* Minimum is reach, for all the time is 0
* Is the maximum.

Then the maximum is reach for

## Question 3

#### Question 3.a

As we can see the time is depending on which again validate the previously found complexity of

#### Question 3.b

As we can see the function depends on r^3 which validate the previously found complexity if it depends on r:

## Question 4

The current algorithm is only detecting circle traced using the Bresenham’s algorithm. We can add an around the expected position of the pixel. We can check for all pixel touching the one we are currently checking if any of those have to good colors then we can consider the test to work.

We also need to remove the inner intersection so it includes discs.

Alternatively we can use a loop with a going from to and by taking the cosines and sinus for x and y then by checking first for a circle then for possible ellipsis with of radius.

## Annexe

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| --- | --- |
| Graph 1 | Graph 2 |
| |  |  |  |  | | --- | --- | --- | --- | | Radius | Time | Radius | Time | | 4 | 2386 | 104 | 2120 | | 8 | 2454 | 108 | 2151 | | 12 | 2359 | 112 | 2126 | | 16 | 2254 | 116 | 2038 | | 20 | 2324 | 120 | 2037 | | 24 | 2417 | 124 | 2041 | | 28 | 2429 | 128 | 2012 | | 32 | 2503 | 132 | 2022 | | 36 | 2443 | 136 | 2034 | | 40 | 2556 | 140 | 2002 | | 44 | 2569 | 144 | 1994 | | 48 | 2385 | 148 | 1997 | | 52 | 2442 | 152 | 2046 | | 56 | 2406 | 156 | 1946 | | 60 | 2292 | 160 | 1883 | | 64 | 2354 | 164 | 1814 | | 68 | 2323 | 168 | 1813 | | 72 | 2260 | 172 | 1842 | | 76 | 2289 | 176 | 1782 | | 80 | 2417 | 180 | 1809 | | 84 | 2218 | 184 | 1803 | | 88 | 2172 | 188 | 1763 | | 92 | 2179 | 192 | 1762 | | 96 | 2178 | 196 | 1720 | | 100 | 2185 | | |  |  |  |  | | --- | --- | --- | --- | | Size | Time | Size | Time | | 50 | 0 | 1050 | 623 | | 100 | 22 | 1100 | 684 | | 150 | 17 | 1150 | 759 | | 200 | 23 | 1200 | 754 | | 250 | 22 | 1250 | 870 | | 300 | 33 | 1300 | 858 | | 350 | 64 | 1350 | 979 | | 400 | 63 | 1400 | 1196 | | 450 | 119 | 1450 | 1156 | | 500 | 124 | 1500 | 1295 | | 550 | 143 | 1550 | 1374 | | 600 | 162 | 1600 | 1465 | | 650 | 224 | 1650 | 1607 | | 700 | 247 | 1700 | 1729 | | 750 | 264 | 1750 | 1848 | | 800 | 285 | 1800 | 1983 | | 850 | 348 | 1850 | 2132 | | 900 | 425 | 1900 | 2155 | | 950 | 490 | 1950 | 2318 | | 1000 | 521 | 2000 | 2529 | |