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**“Education through self help is our motto”-KARMVEER**

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**CERTIFICATE**

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This is certified that Ashish Shankar Patil has satisfactorily carried out required practical work, prescribed by the SavitribaiPhule University, Pune T.Y.B.sc course in Computer Science and this certificate represented his/her bonafide work in the year 2020-2021

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Computer Science

COMPUTER GRAPHICS

PROJECT NAME: Rotation of an ellipse over a circle”

* INTRODUCTION

graphics.h library is used to include and facilitate graphical operations in the program. graphics.h functions can be used to draw different shapes, display text in different fonts, change colours and many more. Using functions of graphics.h you can make graphics programs, animations, projects and games. You can draw circles, lines, rectangles, bars and many other geometrical figures. You can change their colours using the available functions and fill them.

Approach:

The idea is to decrease the angle(through which ellipse is going to slide) by an integral value and calculating the corresponding angle swiped by the circle’s radius using the ratio of their perimeters.

**#include<graphics.h>**

The **graphics**.**h** header file provides access to a simple **graphics** library that makes it possible to draw lines, rectangles, ovals, arcs, polygons, images, and strings on a graphical window. The second step is initialize the **graphics** drivers on the computer using initgraph method of **graphics**.

**#include<stdio.h>**

The C programming language provides many standard library functions for file input and output. These functions make up the bulk of the C standard library header <**stdio**. **h**>.The file is called a header file and you will find several different header files on the source disks that came with your C compiler.

**#include<conio.h>**

**conio**. **h** stands for console input and output header file. It is a header file used in old MS-DOS compilers to create text user interfaces. This is a library function which is used for output and input functions.

**#include<dos.h>**

Dos.h in C: Dos.h header file of C language contains functions for handling interrupts, producing sound, date and time functions etc. It is Borland specific and works in Turbo C compiler.

code

#include <conio.h>

#include <graphics.h>

#include <iostream>

#include <math.h>

#include <stdio.h>

#include <stdlib.h>

using namespace std;

// Ellipse drawing function

void drawEllipse(int xc, int yc, int a, int b,

float alpha, int color)

{

float t = 3.14 / 180;

alpha = 360 - alpha;

setcolor(color);

int theta;

// Filling each pixel corresponding

// to every angle from 0 to 360

for (int i = 0; i < 360; i += 1) {

theta = i;

int x = a \* cos(t \* theta) \* cos(t \* alpha)

+ b \* sin(t \* theta) \* sin(t \* alpha);

int y = b \* sin(t \* theta) \* cos(t \* alpha)

- a \* cos(t \* theta) \* sin(t \* alpha);

putpixel(xc + x, yc - y, color);

}

}

// Function to calculate the position

// of ellipse after each rotation

void slidePattern(int xc, int yc, int r, int a, int b,

int alpha, float p, int color)

{

setcolor(color);

float t = 3.14 / 180;

float t1, t2, d;

float angle = (p \* alpha);

// Calculation for center of Ellipse

t1 = cos(t \* fmod(angle, 360));

t2 = sin(t \* fmod(angle, 360));

t1 \*= t1;

t2 \*= t2;

t1 = t1 / (a \* a);

t2 = t2 / (b \* b);

d = sqrt(t1 + t2);

d = 1 / d;

int draw\_x = xc + (r + d) \* cos(t \* alpha);

int draw\_y = yc - (r + d) \* sin(t \* alpha);

int draw\_ang = angle + alpha;

drawEllipse(draw\_x, draw\_y, a,

b, draw\_ang, color);

}

// Function to increment the angle

// of rotation

void ellipseovercircle(int xc, int yc,

int r, int a, int b)

{

float theta = 0;

double h, p1;

// Calculating the ratio of

// perimeters of Ellipse and Circle

h = (a \* a) + (b \* b);

h /= 2;

p1 = sqrt(h);

p1 /= r;

p1 = 1 / (p1);

// by decreasing theta we can

// move Ellipse clockwise

for (;; theta -= 1) {

// Draw Ellipse at new location

// using White color

slidePattern(xc, yc, r, a, b,

theta, p1, WHITE);

circle(xc, yc, r); // Drawing Circle

delay(25); // Introducing delay

// Erase the existing Ellipse

slidePattern(xc, yc, r, a, b,

theta, p1, BLACK);

}

}

// Driver code

int main()

{

// Initialize graphics function

int gd = DETECT, gm;

initgraph(&gd, &gm, "");

// maximum X-coordinate for the window

int maxx = getmaxx();

// maximum Y-coordinate for the window

int maxy = getmaxy();

// Start drawing from the mid of the screen

ellipseovercircle(maxx / 2, maxy / 2,

100, 40, 28);

closegraph();

return 0;

}

