RIGA TECHNICAL UNIVERSITY

FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Fundamentals of Computer Graphics and Image Processing

Course Work

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TASK OF WORK

Please input the task of work, including your variant!

```
import tkinter as ui
import numpy as np
import time

window = ui.Tk()
window.geometry("500x500")

#standart angle is 6
angle  = int(input('choose the angle: '))

def animation():
  minutes = int(time.strftime("%M"))
  seconds = int(time.strftime("%S"))

  #animate seconds hand
  seconds_x = 90 * np.sin(np.radians(seconds * angle)) + 250
  seconds_y = -1 * 90 * np.cos(np.radians(seconds * angle)) + 250
  canvas.coords(seconds_hand, 250, 250, seconds_x, seconds_y)
  #seconds triangle
  triangle_x = 90 * np.sin(np.radians(seconds * angle - 4)) + 250
  triangle_y = -1 * 90 * np.cos(np.radians(seconds * angle - 4)) + 250
  triangle_x1 = 90 * np.sin(np.radians(seconds * angle + 4)) + 250
  triangle_y1 = -1 * 90 * np.cos(np.radians(seconds * angle + 4)) +
250
  triangle_x2 = 105 * np.sin(np.radians(seconds * angle)) + 250
  triangle_y2 = -1 * 105 * np.cos(np.radians(seconds * angle)) + 250
  canvas.coords(triangle, triangle_x, triangle_y, triangle_x1,
triangle_y1, triangle_x2, triangle_y2)
```

```
  #animate minutes hand
  minutes_x = 80 * np.sin(np.radians(minutes * angle)) + 250
  minutes_y = -1 * 80 * np.cos(np.radians(minutes * angle)) + 250
  canvas.coords(minutes_hand, 250, 250, minutes_x, minutes_y)
  #minutess triangle
  triangle_x3 = 80 * np.sin(np.radians(minutes * angle - 4)) + 250
  triangle_y3 = -1 * 80 * np.cos(np.radians(minutes * angle - 4)) +
250
  triangle_x4 = 80 * np.sin(np.radians(minutes * angle + 4)) + 250
  triangle_y4 = -1 * 80 * np.cos(np.radians(minutes * angle + 4)) +
250
  triangle_x5 = 95 * np.sin(np.radians(minutes * angle)) + 250
  triangle_y5 = -1 * 95 * np.cos(np.radians(minutes * angle)) + 250
  canvas.coords(triangle1, triangle_x3, triangle_y3, triangle_x4,
triangle_y4, triangle_x5, triangle_y5)

  #animate hours hand
  hours_x = 60 * np.sin(np.radians(angle / 12 * minutes)) + 250
  hours_y = -1 * 60 * np.cos(np.radians( angle / 12 * minutes )) + 250
  canvas.coords(hours_hand, 250, 250, hours_x, hours_y)
  #hours triangle
  triangle_x6 = 60 * np.sin(np.radians(angle / 12 * minutes - 6)) +
250
  triangle_y6 = -1 * 60 * np.cos(np.radians(angle / 12 * minutes - 6))
+ 250
  triangle_x7 = 60 * np.sin(np.radians(angle / 12 * minutes + 6)) +
250
  triangle_y7 = -1 * 60 * np.cos(np.radians(angle / 12 * minutes + 6))
+ 250
  triangle_x8 = 75 * np.sin(np.radians(angle / 12 * minutes)) + 250
  triangle_y8 = -1 * 75 * np.cos(np.radians(angle / 12 * minutes)) +
250
  canvas.coords(triangle2, triangle_x6, triangle_y6, triangle_x7,
triangle_y7, triangle_x8, triangle_y8)

  window.after(1000, animation)

def RotateObject(degree):
  rotate1 = 250 + 110 * np.sin(np.radians(degree));
  rotate2 = 250 + 130 * np.sin(np.radians(degree));
  rotate3 = 250 + 110 * np.cos(np.radians(degree));
  rotate4 = 250 + 130 * np.cos(np.radians(degree));

  canvas.create_line(rotate1, rotate3, rotate2, rotate4, width = 4,
fill =
  "black")

def RotateSmall(degree):
  rotate1 = 250 + 110 * np.sin(np.radians(degree));
```

```
  rotate2 = 250 + 112 * np.sin(np.radians(degree));
  rotate3 = 250 + 110 * np.cos(np.radians(degree));
  rotate4 = 250 + 112 * np.cos(np.radians(degree));

  canvas.create_line(rotate1, rotate3, rotate2, rotate4, width = 2,
fill =
  "black")

canvas = ui.Canvas(window, width=500, height=500, bg="white")
canvas.pack(expand=True, fill='both')

#clock interface
twelve = canvas.create_line(250, 360, 250, 380, width = 4, fill =
"black")
six = canvas.create_line(250, 140, 250, 120, width = 4, fill =
"black")
three = canvas.create_line(360, 250, 380, 250, width = 4, fill =
"black")
nine = canvas.create_line(140, 250, 120, 250, width = 4, fill =
"black")

#clock hands

#seconds
seconds_hand = canvas.create_line(250, 250, 340, 340, width = 1.5,
fill = "black")
triangle = canvas.create_polygon(325, 335, 335, 325, 355, 355, width =
1.5, fill = "black")

#minutes
minutes_hand = canvas.create_line(250, 250, 330, 330, width = 1.5,
fill = "orange")
triangle1 = canvas.create_polygon(315, 325, 325, 315, 345, 345, width
= 1.5, fill = "orange")

#hours
hours_hand = canvas.create_line(250, 250, 310, 310, width = 2, fill =
"orange")
triangle2 = canvas.create_polygon(295, 315, 315, 295, 325, 325, width
= 1.5, fill = "orange")

animation()

#clock interface
RotateObject(30)
RotateObject(60)
RotateObject(120)
RotateObject(150)
RotateObject(210)
RotateObject(240)
```

```
RotateObject(300)
RotateObject(330)
RotateSmall(10)
RotateSmall(20)
RotateSmall(40)
RotateSmall(50)
RotateSmall(70)
RotateSmall(80)
RotateSmall(100)
RotateSmall(110)
RotateSmall(130)
RotateSmall(140)
RotateSmall(160)
RotateSmall(170)
RotateSmall(190)
RotateSmall(200)
RotateSmall(220)
RotateSmall(230)
RotateSmall(250)
RotateSmall(260)
RotateSmall(280)
RotateSmall(290)
RotateSmall(310)
RotateSmall(320)
RotateSmall(340)
RotateSmall(350)

window.mainloop()

#standart angle is 6

choose the angle: 6
```