Міністерство освіти і науки України

Національний технічний університет України
«Київський політехнічний інститут імені Ігоря Сікорського»
Факультет інформатики та обчислювальної техніки
Кафедра обчислювальної техніки

Лабораторна робота №3
з дисципліни
«ООП»

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Варіант завдання

"Гумовий" слід суцільна лінія чорного кольору

Прямокутник - по двом протилежним кутам, чорний контур з білим заповненням

Еліпс - від центру до одного з кутів, чорний контур без заповнення

MainActivity

```
class MainActivity : AppCompatActivity() {

    private lateinit var binding: ActivityMainBinding
    private lateinit var drawingBoard: DrawingBoard
    private lateinit var popupMenu: PopupMenu

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        binding = ActivityMainBinding.inflate(LayoutInflater.from(this))
        setContentView(binding.root)
        initDrawingBoard()
        initPopupMenu()
        initListeners()
    }

    private fun initDrawingBoard() {
        drawingBoard = DrawingBoard(this)
        drawingBoard.layoutParams = LinearLayout.LayoutParams(
            LinearLayout.LayoutParams.MATCH_PARENT,
            LinearLayout.LayoutParams.MATCH_PARENT
        )
        binding.boardLayout.addView(drawingBoard)
    }

    private fun initPopupMenu() {
        popupMenu = PopupMenu(this, binding.moreBtn)
        popupMenu.menu.add(getString(R.string.point))
        popupMenu.menu.add(getString(R.string.line))
        popupMenu.menu.add(getString(R.string.rect))
        popupMenu.menu.add(getString(R.string.ellipse))
        popupMenu.setOnMenuItemClickListener {
            when (it.title) {
                getString(R.string.point) ->
setSelectedShape(ShapeType.POINT)
                getString(R.string.line) -> setSelectedShape(ShapeType.LINE)
                getString(R.string.rect) ->
setSelectedShape(ShapeType.RECTANGLE)
                getString(R.string.ellipse) ->
setSelectedShape(ShapeType.ELLIPSE)
            }
            true
        }
    }

    private fun setSelectedShape(shapeType: ShapeType) {
        drawingBoard.setDrawingShape(shapeType)
        binding.pointBtn.setBackgroundColor(
            if (shapeType == ShapeType.POINT) Color.WHITE else
Color.TRANSPARENT)
        binding.lineBtn.setBackgroundColor(
            if (shapeType == ShapeType.LINE) Color.WHITE else
Color.TRANSPARENT)
        binding.rectBtn.setBackgroundColor(
            if (shapeType == ShapeType.RECTANGLE) Color.WHITE else
Color.TRANSPARENT)
        binding.ellipseBtn.setBackgroundColor(
            if (shapeType == ShapeType.ELLIPSE) Color.WHITE else
Color.TRANSPARENT)
    }

    private fun initListeners() {
```

```
        binding.moreBtn.setOnClickListener {
            popupMenu.show()
        }
        binding.pointBtn.setOnClickListener {
            setSelectedShape(ShapeType.POINT)
        }
        binding.lineBtn.setOnClickListener {
            setSelectedShape(ShapeType.LINE)
        }
        binding.rectBtn.setOnClickListener {
            setSelectedShape(ShapeType.RECTANGLE)
        }
        binding.ellipseBtn.setOnClickListener {
            setSelectedShape(ShapeType.ELLIPSE)
        }
    }
}
```

DrawingBoard

```
class DrawingBoard(context: Context) : SurfaceView(context) {

    private var selectedShapeType = ShapeType.POINT
    private var selectedShape: Shape? = null
    fun setDrawingShape(shape: ShapeType) {
        selectedShapeType = shape
    }

    fun clearPreviousFigures() {
        shapes.clear()
        val canvas = holder.lockCanvas()
        drawPreviousShapes(canvas)
        holder.unlockCanvasAndPost(canvas)
    }

    private val shapes = mutableListOf<Shape>()
    private fun drawPreviousShapes(canvas: Canvas) {
        canvas.drawColor(Color.WHITE)
        for(shape in shapes) { shape.draw(canvas) }
    }

    @SuppressLint("ClickableViewAccessibility")
    override fun onTouchEvent(event: MotionEvent): Boolean {
        val canvas = holder.lockCanvas()
        drawPreviousShapes(canvas)
        when (event.action) {
            MotionEvent.ACTION_DOWN -> {
                onActionDown(canvas, event)
            }
            MotionEvent.ACTION_MOVE -> {
                onActionMove(canvas, event)
            }
            MotionEvent.ACTION_UP -> {
                onActionUp(canvas)
            }
        }
        holder.unlockCanvasAndPost(canvas)
        return true
    }

    private fun onActionDown(canvas: Canvas, event: MotionEvent) {
        selectedShape = Shape.createShape(selectedShapeType, event.x,
event.y)
        selectedShape?.preDraw(canvas)
    }

    private fun onActionMove(canvas: Canvas, event: MotionEvent) {
        selectedShape?.moveX(event.x)
        selectedShape?.moveY(event.y)
        selectedShape?.preDraw(canvas)
    }

    private fun onActionUp(canvas: Canvas) {
        selectedShape?.let {
            it.draw(canvas)
            shapes.add(it)
        }
        selectedShape = null
    }
}
```

Shape

```
package com.example.lab3.shapes

import android.graphics.Canvas
import android.graphics.Color
import android.graphics.Paint


abstract class Shape {

    val preDrawPaint = Paint(Paint.ANTI_ALIAS_FLAG)
    val strokePaint = Paint(Paint.ANTI_ALIAS_FLAG)
    val fillPaint = Paint(Paint.ANTI_ALIAS_FLAG)
    init {
        preDrawPaint.color = Color.BLACK
        preDrawPaint.style = Paint.Style.STROKE
    }

    abstract fun moveX(x: Float)

    abstract fun moveY(y: Float)

    abstract fun preDraw(canvas: Canvas)

    abstract fun draw(canvas: Canvas)

    companion object {
        fun createShape(shapeType: ShapeType, startX: Float, startY: Float):
Shape {
            return when (shapeType) {
                ShapeType.POINT -> {
                    Point(startX, startY)
                }
                ShapeType.LINE -> {
                    Line(startX, startY)
                }
                ShapeType.RECTANGLE -> {
                    Rectangle(startX, startY)
                }
                ShapeType.ELLIPSE -> {
                    Ellipse(startX, startY)
                }
            }
        }
    }
}
```

Point

```
package com.example.lab3.shapes

import android.graphics.Canvas
import android.graphics.Color
import android.graphics.Paint

class Point(private var x: Float, private var y: Float) : Shape() {

    companion object {
        private const val radius = 16f
    }

    private var paint = Paint(Paint.ANTI_ALIAS_FLAG)
    init {
        paint.color = Color.BLACK
    }

    override fun moveX(x: Float) {
        this.x = x
    }

    override fun moveY(y: Float) {
        this.y = y
    }

    override fun preDraw(canvas: Canvas) {
        canvas.drawCircle(x, y, radius, preDrawPaint)
    }

    override fun draw(canvas: Canvas) {
        canvas.drawCircle(x, y, radius, paint)
    }
}
```

Line

```
package com.example.lab3.shapes

import android.graphics.Canvas
import android.graphics.Color
import android.graphics.Paint

class Line(private val startX: Float, private val startY: Float) : Shape() {

    companion object {
        private const val strokeWidth = 4f
    }

    private var endX = startX
    private var endY = startY

    private var paint = Paint(Paint.ANTI_ALIAS_FLAG)
    init {
        paint.color = Color.BLACK
        paint.strokeWidth = strokeWidth
    }

    override fun moveX(x: Float) {
        endX = x
    }

    override fun moveY(y: Float) {
        endY = y
    }

    override fun preDraw(canvas: Canvas) {
        canvas.drawLine(startX, startY, endX, endY, preDrawPaint)
    }

    override fun draw(canvas: Canvas) {
        canvas.drawLine(startX, startY, endX, endY, paint)
    }
}
```

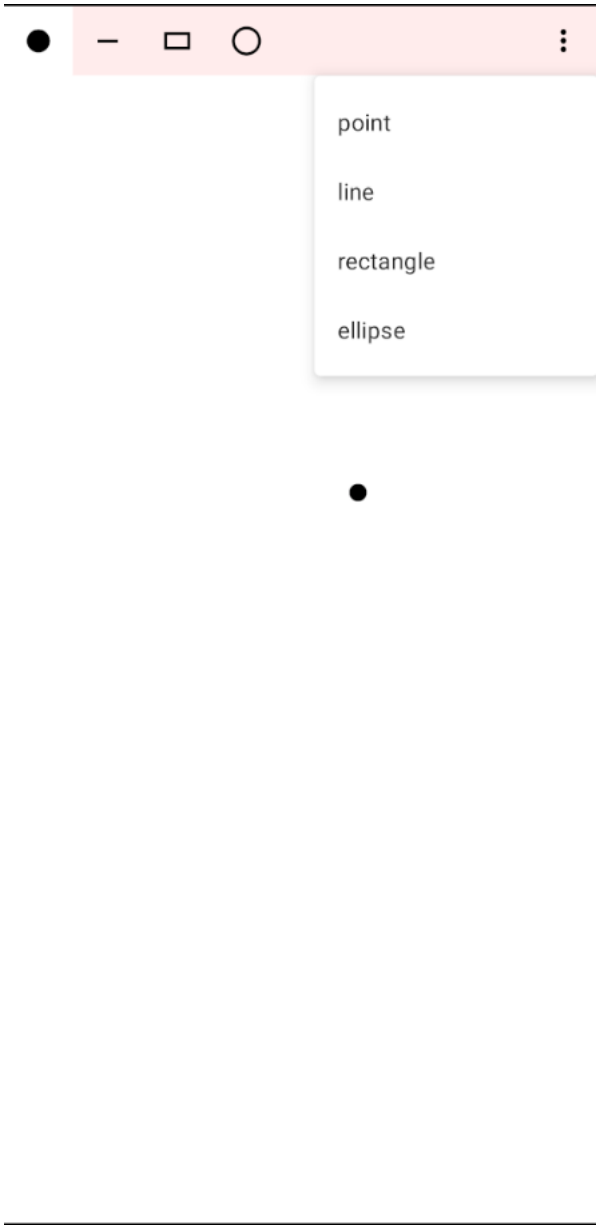
Rectangle

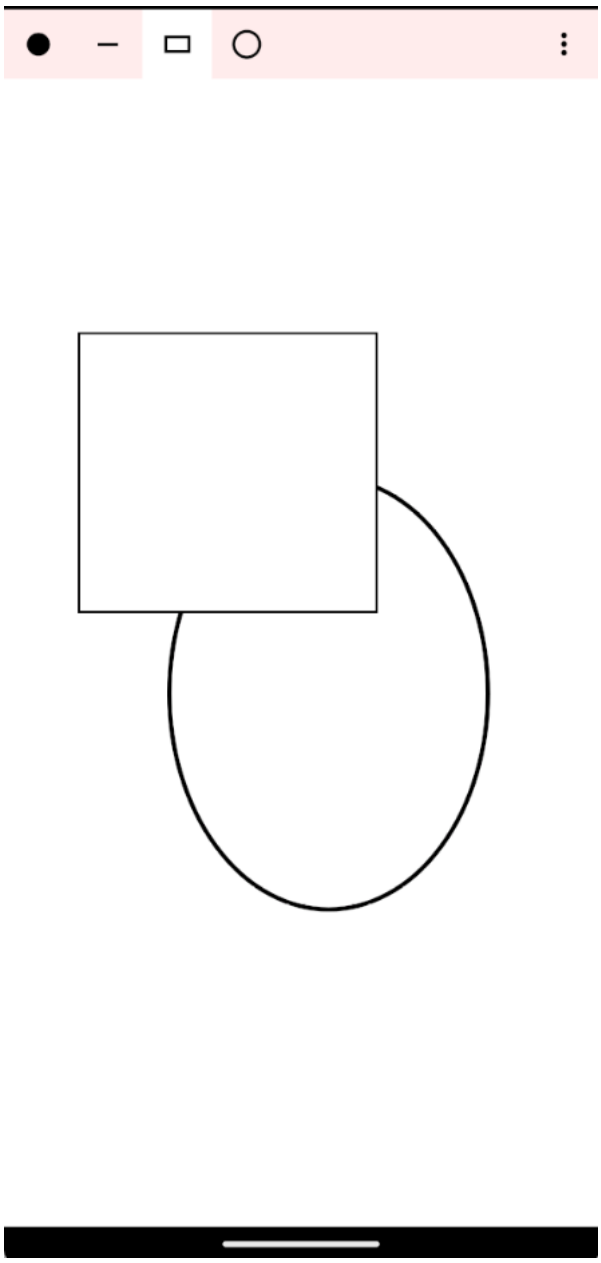
```
package com.example.lab3.shapes

import android.graphics.Canvas
import android.graphics.Color
import android.graphics.Paint

class Rectangle(private val centerX: Float, private val centerY: Float):
Shape() {

    companion object {
        private const val strokeWidth = 8f
    }

    private var startX = centerX
    private var startY = centerY

    private var endX = centerX
    private var endY = centerY

    init {
        strokePaint.style = Paint.Style.STROKE
        strokePaint.color = Color.BLACK
        strokePaint.strokeWidth = strokeWidth

        fillPaint.style = Paint.Style.FILL
        fillPaint.color = Color.WHITE
    }

    override fun moveX(x: Float) {
        endX = x
    }

    override fun moveY(y: Float) {
        endY = y
    }

    override fun preDraw(canvas: Canvas) {
        canvas.drawRect(startX, startY, endX, endY, preDrawPaint)
    }

    override fun draw(canvas: Canvas) {
        canvas.drawRect(startX, startY, endX, endY, strokePaint)
        canvas.drawRect(startX, startY, endX, endY, fillPaint)
    }
}
```

Ellipse

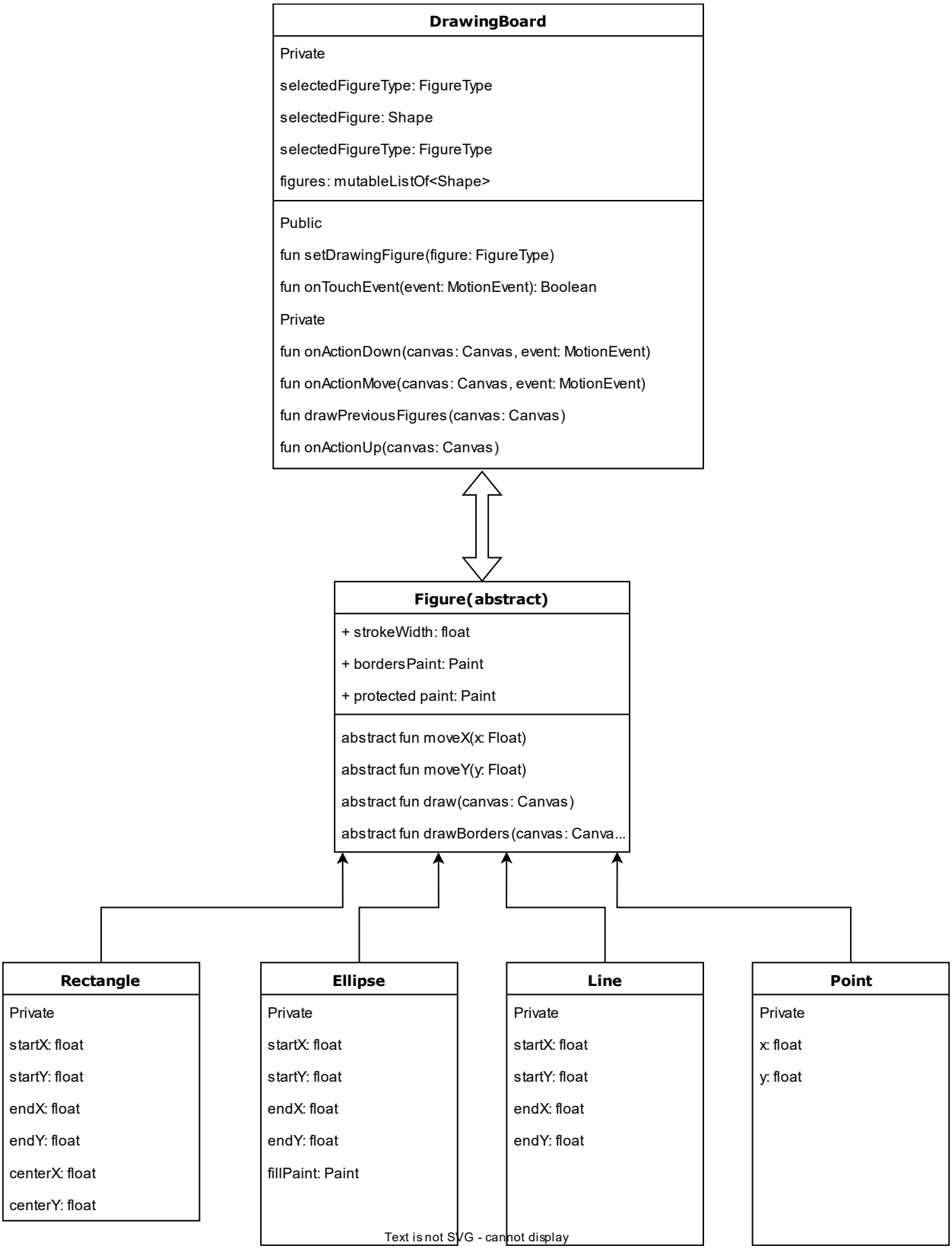
```
package com.example.lab3.shapes

import android.graphics.Canvas
import android.graphics.Color
import android.graphics.Paint

class Ellipse(private val startX: Float, private val startY: Float): Shape()
{

    companion object {
        private const val strokeWidth = 8f
    }

    private var endX = startX
    private var endY = startY

    init {
        strokePaint.style = Paint.Style.STROKE
        strokePaint.color = Color.BLACK
        strokePaint.strokeWidth = strokeWidth
    }

    override fun moveX(x: Float) {
        endX = x
    }

    override fun moveY(y: Float) {
        endY = y
    }

    override fun preDraw(canvas: Canvas) {
        canvas.drawOval(startX, startY, endX, endY, preDrawPaint)
    }

    override fun draw(canvas: Canvas) {
        canvas.drawOval(startX, startY, endX, endY, strokePaint)
    }
}
```

Скріншоти


point
line
rectangle
ellipse



Діаграма


DrawingBoard
Private
selectedFigureType: FigureType
selectedFigure: Shape
selectedFigureType: FigureType
figures: mutableListOf<Shape>
Public
fun setDrawingFigure(figure: FigureType)
fun onTouchEvent(event: MotionEvent): Boolean
Private
fun onActionDown(canvas: Canvas, event: MotionEvent)
fun onActionMove(canvas: Canvas, event: MotionEvent)
fun drawPreviousFigures(canvas: Canvas)
fun onActionUp(canvas: Canvas)
Figure(abstract)
+ strokeWidth: float
+ bordersPaint: Paint
+ protected paint: Paint
abstract fun moveX(x: Float)
abstract fun moveY(y: Float)
abstract fun draw(canvas: Canvas)
abstract fun drawBorders(canvas: Canva...
Rectangle
Private
startX: float
startY: float
endX: float
endY: float
centerX: float
centerY: float
Ellipse
Private
startX: float
startY: float
endX: float
endY: float
fillPaint: Paint
Line
Private
startX: float
startY: float
endX: float
endY: float
Point
Private
x: float
y: float
Text is not SVG - cannot display

Висновки:

У цій лабораторній роботі ми навчились застосовувати поліморфізм, наслідування та інкапсуляцію, працювали з розробкою графічного інтерфейсу для Android та відображенням геометричних фігур на канвасі.