public interface State extends Cloneable {
    void step();
    void undo();
    double energy();
    Object clone();
}

public class Rastrigin implements State{
    public static final double STDDEV = 0.05;
    public static java.util.Random random = new java.util.Random();

    //instance variables
    public double x;
    public double y;
    public double prevX;
    public double prevY;

    public Rastrigin() {
        this(10, 10);
    }
    //end constructor

    public Rastrigin(double x, double y){
        this.x = x;
        this.y = y;
        prevX = x;
        prevY = y;
    }
    //end constructor (x, y)

    public void step(){
        prevX = x;
        prevY = y;
        x += STDDEV * random.nextDouble();
        y += STDDEV * random.nextDouble();
    }
    //end step method

    public void undo(){
        x = prevX;
        y = prevY;
    }
    //end method undo

    public double energy(){
        return x * x + y * y - Math.cos(18 * x) - Math.cos(18 * y) + 2;
    }
    //end method energy
}
public Object clone() {
    Rastrigin copy = new Rastrigin(x, y);
    copy.prevX = prevX;
    copy.prevY = prevY;
    return copy;
} // end method clone

public String toString() {
    return String.format("%f, %f", x, y);
} // end method toString