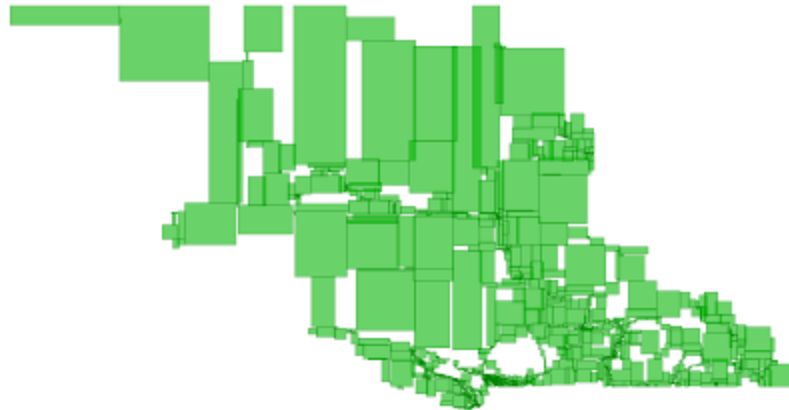


Assignment

Instructions

In the world of GIS we frequently have questions about whether a given point is inside, on the boundary of or outside of a given shape or area. Also, we are often interested in whether the given point is near the area (usually defined as within a given distance; visualize buffering the shape). Since this is such a common request in GIS, a lot of thought has been put into answering the question quickly.

The problem you have been given is based on common method of quickly eliminating 95% of the features from a given problem by first determining whether the feature is near or disjoint with the Minimum Bounding Rectangle (MBR) of a more complex feature. The MBR is the smallest possible rectangle that contains/encloses a complex shape. The following sketch illustrates the relationship between MBR a complex shape and a point of interest:



An MBR (AKA extent or envelope) can be represented by 2 points: the lower left corner and the upper right corner. This is often expressed as 4 numeric values: xmin, ymin xmax and ymax. If we know the point is disjoint with the MBR then no further processing or comparison between the shapes is needed.

	<p>Some systems allow for a tolerance (fuzzy distance) or even a specified distance from the object (think of this as a buffered version of the MBR --> bigger rectangle). This bigger MBR is then used for testing the relationship. For this assignment we will have 5 possible relationships:</p> <ul style="list-style-type: none"> • The point falls inside the MBR (small rectangle) • The point falls on the boundary of the MBR • The point falls inside the buffered MBR • The point falls on the boundary of the buffered MBR • The point and MBR are disjoint <p>Remember, the "buffered MBR" is simply a bigger rectangle.</p>
STEP 01	<p>Open IntelliJ</p> <p>Create a new java project</p> <p>Use the template</p> <p>Set the project name to: m04_SpatialRelationship</p> <p>Ensure the project location is: H:\var\gist\7010\wksp_dt\m04_SpatialRelationship</p> <p>Set the base package to: bcit.gist7010</p>
STEP 02	<p>Add an enumeration between Main (class) and main (method)</p> <pre>enum SpatialRelationship {INSIDE, LEFT, RIGHT, TOP, BOTTOM, INSIDE_BUFFER, LEFT_BUFFER, RIGHT_BUFFER, TOP_BUFFER, BOTTOM_BUFFER, DISJOINT};</pre>
STEP 03	<p>Add the Scanner snippet</p>

STEP 04	Declare several data buckets (double) for the following variables <ul style="list-style-type: none"> • xmin • ymin • xmax • ymax • bufferedDistance • xcoord • ycoord
STEP 05	Prompt the user for the data in the following order: xmin ymin xmax ymax buffered_distance xcoord ycoord Set the above variables using the Scanner's nextDouble method
STEP 06	Declare more data buckets (double) and set more double variables: <ul style="list-style-type: none"> • bufferedXmin = xmin - bufferedDistance • bufferedYmin = ymin - bufferedDistance • bufferedXmax = xmax + bufferedDistance • bufferedYmax = ymax + bufferedDistance
STEP 07	Declare a data bucket for the relationship SpatialRelationship spatialRelationship; Assume the point and MBR are Disjoint spatialRelationship = SpatialRelationship.DISJOINT;
STEP 08	Determining INSIDE A point can only be inside the MBR if 4 conditions are true: xcoord is greater than xmin AND (&&) xcoord is less than xmax AND (&&) ycoord is greater than ymin AND (&&) ycoord is less than ymax If all of those conditions are true then set the spatial relationship spatialRelationship = SpatialRelationship.INSIDE;

<p>STEP 09</p>	<p>Determining Left</p> <p>For a point to fall on the left side of the MBR, 3 conditions have to be true xcoord is equal to xmin AND (&& ycoord is less than or equal to ymax AND (&& ycoord is greater than or equal to ymin</p> <p>If all of those conditions are true then set the spatial relationship spatialRelationship = SpatialRelationship.LEFT;</p> <p>However! Link the left-logic to the inside-logic using an else if (...)</p>
<p>STEP 10</p>	<p>Determining Right, Top and bottom</p> <p>Repeat the previous logic for right, top and bottom. xcoord is equal to xmax AND (&& ycoord is less than or equal to ymax AND (&& ycoord is greater than or equal to ymin</p> <p>For top and bottom swap x-values for y-values and y-values for x-values</p> <p>Each test will be an additional “else if” branch in your main multi-path selection statement.</p> <p>Remember to set the spatialRelationship accordingly</p>

<p>STEP 11</p>	<p>Repeat the inside and on boundary tests for the buffered MBR</p> <p>How?</p> <p>Repeat the previous tests using the buffered values.</p> <p>A point can only be inside the buffered MBR if 4 conditions are true: xcoord is greater than buffered-xmin AND (&& xcoord is less than buffered-xmax AND (&& ycoord is greater than buffered-ymin AND (&& ycoord is less than buffered-ymax</p> <p>However! Link this logic to the bottom-logic using an else if (...)</p> <p>Using the above suggestions the instructor's main selection statement had:</p> <pre> 1 if () 9 else if () </pre> <p>Although the problem could be solved with fewer selections your program will be more readable by yourself if you follow these suggestions.</p>
<p>STEP 12</p>	<p>Report the relationship to the user.</p>

Marking Guide

Item	Value
The tutorial works	2
The program works	5
Indentation is correct and consistent	1
Comments	2
Total	10