On balls in a Hilbert polygonal geometry

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We describe how to run the script-based and interactive Java demos that we implemented to prepare our video.[1]

List of JARs

After unzippping the file `HilbertBallDemo.zip`, one gets the following JARs:

```
demo.jar
innerTangencyTriangle.jar
noIntersectionInsideTriangle.jar
noIntersectionTriangle.jar
quadrangleNumberOfEdges.jar
quadrangleVaryingRadius.jar
squareNumberOfEdges.jar
squareOuterTangency.jar
triangleDemo.jar
varyingRadius.jar
varyingRadiusQuadrangleCenter.jar
varyingRadiusQuadrangle.jar
```

Launching script-based demos

Choose a Jar file, and type in the command line:

```
$ java -jar <filename>.jar
```

For Windows users, we created a corresponding `.bat` file that one needs to double click. For all Jars except `demo.jar`, this will launch an animation demonstrating a property of Hilbert balls in a polygonal domain without user interaction.

Interactive demo

The execution of `demo.jar` will launch an applet with a panel of buttons on the top row described from left to right as follows:

- "Change to mode:UNIT_BALL/DRAW_CONTOUR": Allows the user to switch between "UNIT_BALL" mode to define the center of Hilbert balls, and "DRAW_CONTOUR" mode to edit the Hilbert convex domain.

[1] `https://www.youtube.com/watch?v=dOu3sROSrFY`

- "Change to mode: RED/GREY/NORMAL" : In UNIT_BALL mode, changes the color of the selected Hilbert ball — useful for visualization purpose.
- "Reinitialize": In UNIT_BALL mode, erases all center points. In DRAW_CONTOUR mode: Reinitializes the Hilbert domain and the center points.
- "+" / "-": In UNIT_BALL mode: allows the user to change the radius of the selected Hilbert ball. (step is 0.1).
- "Activate rays": In UNIT_BALL mode, allows the user to visualize the rays for the selected Hilbert ball.

User input:

- In DRAW_CONTOUR mode: The user can define the Hilbert domain by:
  - left clicking on the screen to add a vertex to the domain - the convex domain is computed as the convex hull of all points.
  - left clicking on an existing vertex and dragging it to another location.
- In UNIT_BALL mode: The user can define a Hilbert ball by:
  - left clicking inside the domain to define a center point - by default the radius is 1.0.
  - left clicking on an existing center point and dragging it to another location to move it.
  - left clicking on an existing center point to select it. A selected center point is displayed in red instead of in black. Information regarding a selected ball will be displayed on screen (coordinates of the center point, number of edges and radius).
  - right-clicking on an existing center point to delete it.

The Jar `demo.jar` accepts one optional argument: - [optional] path to an input file that encodes information about a convex domain and a Hilbert ball. When not provided, the user can define everything by hand following the previous instructions.

The input file should be written with the following syntax:

```
N //number of vertices for the convex domain
X0 Y0
X1 Y1
.
X(N-1) Y(N-1) //coordinates of the vertices
M //number of center points
X0 Y0 R0
X1 Y1 R1
//coordinates of the center points and radius of the Hilbert ball
X(N-1) Y(N-1) R(N-1)
```

See file `squareAndBalls.in` for an example.