Geometry [Polygon, Multi-polygon] Bug Report

Subject: Incorrect Polygon Intersection

Issue Description:

When using the polygon and multi-polygon intersection functionality of Geometry [*import org.locationtech.jts.geom.*;*] in [GSS] our application, we have encountered a bug where sometimes the intersection results are incorrect. The polygons involved in the intersection operation are not producing the expected output.

Environment:

- Java version 17
- LocationTech version: 1.19.0
- Operating System: Mac & Windows

Steps to Reproduce:

1. Open GSS application and read the polygon provided as a String.

String geo = "Polygon ((126.571 85.7775,118.301 85.744,110.244 85.6289,102.694 85.4315,95.861 85.1616,89.8368 84.8316,84.5893 84.4523,80.005 84.0299,76.0986 83.5765,72.6917 83.0975,69.7189 82.6072,67.1501 82.0923,64.8905 81.5619,62.8857 81.0138,61.126 80.4638,59.5544 79.9045,58.1772 79.3458,56.9093 78.7746,55.7804 78.2008,54.7323 77.6184,65.6436 76.4581,74.6519 74.909,81.9123 73.0788,87.7505 71.0486,89.2708 71.4332,90.8389 71.8052,92.4749 72.1622,94.1494 72.5026,95.9134 72.8308,97.7378 73.1423,99.6535 73.4428,101.613 73.7206,103.629 73.9789,105.706 74.2098,107.854 74.4294,110.049 74.6293,112.334 74.806,114.636 74.9585,116.984 75.0874,119.354 75.1914,121.765 75.2711,124.209 75.3257,126.612 75.3593,126.356 77.9663,126.174 80.5725,126.149 83.1781,126.571 85.7775))";

2. Read the provided polygon as well-known text.
   a. Geometry geometry = new WKTReader().read(geo);
3. Get the second polygon and read it as WKT [well known text]
4. Perform the intersection operation between Polygon1 and Polygon2.

a. if (Polygon1.intersects(polygon2)) {

        print the polygon.

    }

5. Confirm the resulting intersection polygon.
   a. Website to check the polygon, multi-polygon, and intersections: https://arthur-e.github.io/Wicket/sandbox-gmaps3.html

Expected Result:

The intersection operation should accurately calculate the overlapping areas between Polygon1 and Polygon2, resulting in a polygon that correctly represents the common region.

- [Please, check the provided website to map the polygon geographically]
  https://arthur-e.github.io/Wicket/sandbox-gmaps3.html

Actual Result:

Sometimes, the resulting intersection polygon does not accurately represent the overlapping area between Polygon1 and Polygon2. It either includes areas that should not be part of the intersection or excludes areas that should be included.

Additional Information:

- We have tried various combinations of polygons with different shapes and sizes of different continents, but the incorrect intersection issue persists.
- We don't know if the locationTech previously worked correctly in earlier versions, we have encountered the bug in the latest version [1.19.0].
- No error messages or warnings are displayed during the intersection operation.

Attachments:

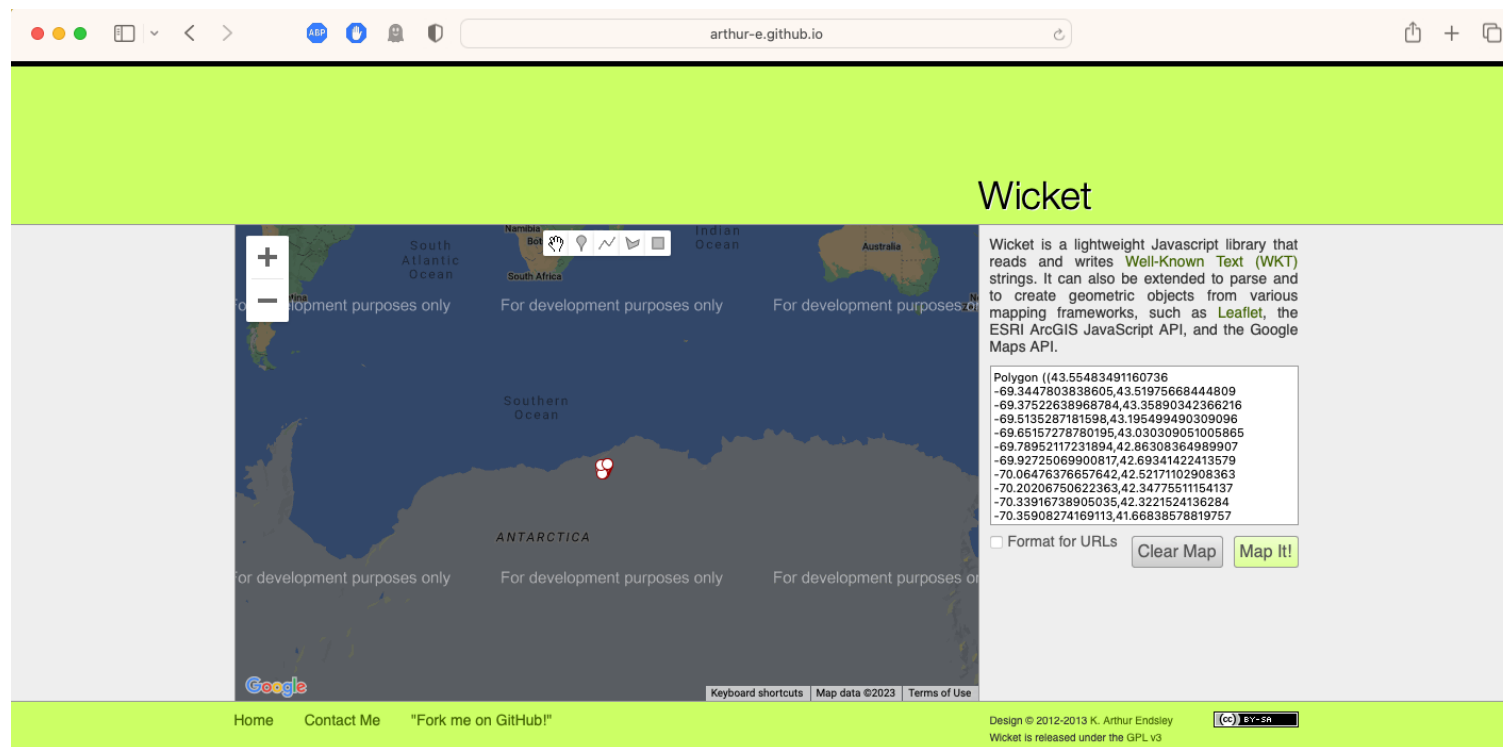- Screenshots demonstrating the incorrect intersection result.

Severity:

This bug significantly affects the functionality of our [GSS] application as it compromises the accuracy of polygon intersection operations. Therefore, we would classify it as a high-severity issue.

Please address this bug promptly as it hinders the proper functioning of our application's polygon intersection feature. Let us know if you require any further information or assistance in resolving this issue.

Polygon ((43.55483491160736 -69.3447803838605,43.51975668444809 -69.37522638968784,43.35890342366216 -69.5135287181598,43.195499490309096 -69.65157278780195,43.030309051005865 -69.78952117231894,42.86308364989907 -69.92725069900817,42.69341422413579 -70.06476376657642,42.52171102908363 -70.20206750622363,42.34775511154137 -70.33916738905035,42.3221524136284 -70.35908274169113,41.66838578819757 -70.37404182995314,41.54620252503365 -69.3904475344478,43.55483491160736 -69.3447803838605))

POLYGON ((13.6778 -71.0308, 14.1909 -70.9833, 15.5198 -70.8639, 16.8646 -70.7237, 18.157 -70.5808, 19.4609 -70.4305, 20.7107 -70.2685, 21.9751 -70.0989, 23.1909 -69.9159, 24.4056 -69.73, 25.5805 -69.5288, 26.7411 -69.3275, 27.9044 -69.1137, 29.0045 -68.8981, 30.1238 -68.6691, 31.1844 -68.4362, 32.2409 -68.1926, 33.2706 -67.9509, 34.2785 -67.7, 35.2579 -67.4327, 36.2147 -67.1726, 37.1715 -66.9022, 38.1033 -66.6226, 38.9836 -66.3414, 39.8671 -66.0557, 40.7321 -65.7663, 41.5729 -65.4645, 42.4128 -65.1707, 43.1901 -64.8568, 44.0038 -64.5535, 44.765 -64.2374, 49.3187 -66.1023, 54.6614 -67.837, 60.8115 -69.3681, 67.796 -70.6435, 67.8208 -70.6472, 67.2432 -71.0615, 66.6457 -71.472, 65.9889 -71.881, 65.337 -72.2953, 64.588 -72.6991, 63.8547 -73.101, 63.1275 -73.5036, 62.301 -73.8976, 61.4772 -74.2936, 60.5704 -74.6872, 59.6591 -75.0662, 58.6809 -75.4505, 57.6466 -75.8276, 56.5559 -76.2079, 55.4352 -76.5754, 54.218 -76.9425, 52.9571 -77.2981, 51.6042 -77.6494, 50.1808 -77.9911, 48.6497 -78.3303, 47.0561 -78.6553, 45.3931 -78.9781, 43.5805 -79.2902, 41.7367 -79.586, 39.718 -79.8728, 37.6171 -80.151, 35.4195 -80.4098, 33.077 -80.6585, 30.6321 -80.8827, 29.6577 -80.9666, 29.5807 -80.963, 23.2552 -78.5667, 19.0119 -76.0807, 15.9533 -73.5494, 13.6778 -71.0308))

POLYGON ((157.135 -68.0606, 157.875 -68.4287, 158.64 -68.7848, 159.418 -69.1468, 160.254 -69.4996, 161.075 -69.864, 161.943 -70.2114, 162.849 -70.5509, 163.773 -70.8864, 164.727 -71.2174, 165.728 -71.5534, 166.765 -71.8717, 167.826 -72.187, 168.914 -72.4977, 170.073 -72.8053, 171.229 -73.1048, 172.464 -73.4002, 173.724 -73.6843, 175.033 -73.9631, 176.377 -74.2319, 177.779 -74.4854, 179.211 -74.7383, -179.304 -74.9833, -177.771 -75.2097, -176.222 -75.4335, -174.577 -75.6415, -172.896 -75.8464, -171.19 -76.0315, -169.437 -76.2065, -167.632 -76.3612, -166.953 -76.4215, -163.777 -73.9401, -161.35 -71.3845, -159.422 -68.8094, -157.838 -66.2294, -157.855 -66.2188, -158.273 -66.1807, -159.355 -66.0701, -160.449 -65.9557, -161.517 -65.8339, -162.591 -65.7056, -163.652 -65.5629, -164.705 -65.4207, -165.727 -65.2652, -166.745 -65.1022, -167.753 -64.942, -168.739 -64.7681, -169.735 -64.5831, -170.705 -64.3951, -171.654 -64.2046, -172.588 -64.0104, -173.528 -63.804, -174.429 -63.5946, -175.354 -63.3749, -176.242 -63.1531, -177.097 -62.9308, -177.963 -62.6926, -178.812 -62.4605, -179.651 -62.2148, 179.526 -61.9611, 178.721 -61.7068, 177.932 -61.4498, 177.152 -61.1943, 176.391 -60.9238, 175.626 -60.6561, 174.885 -60.3801, 174.874 -60.3872, 171.324 -62.4965, 167.228 -64.5058, 162.499 -66.3809, 157.135 -68.0606))
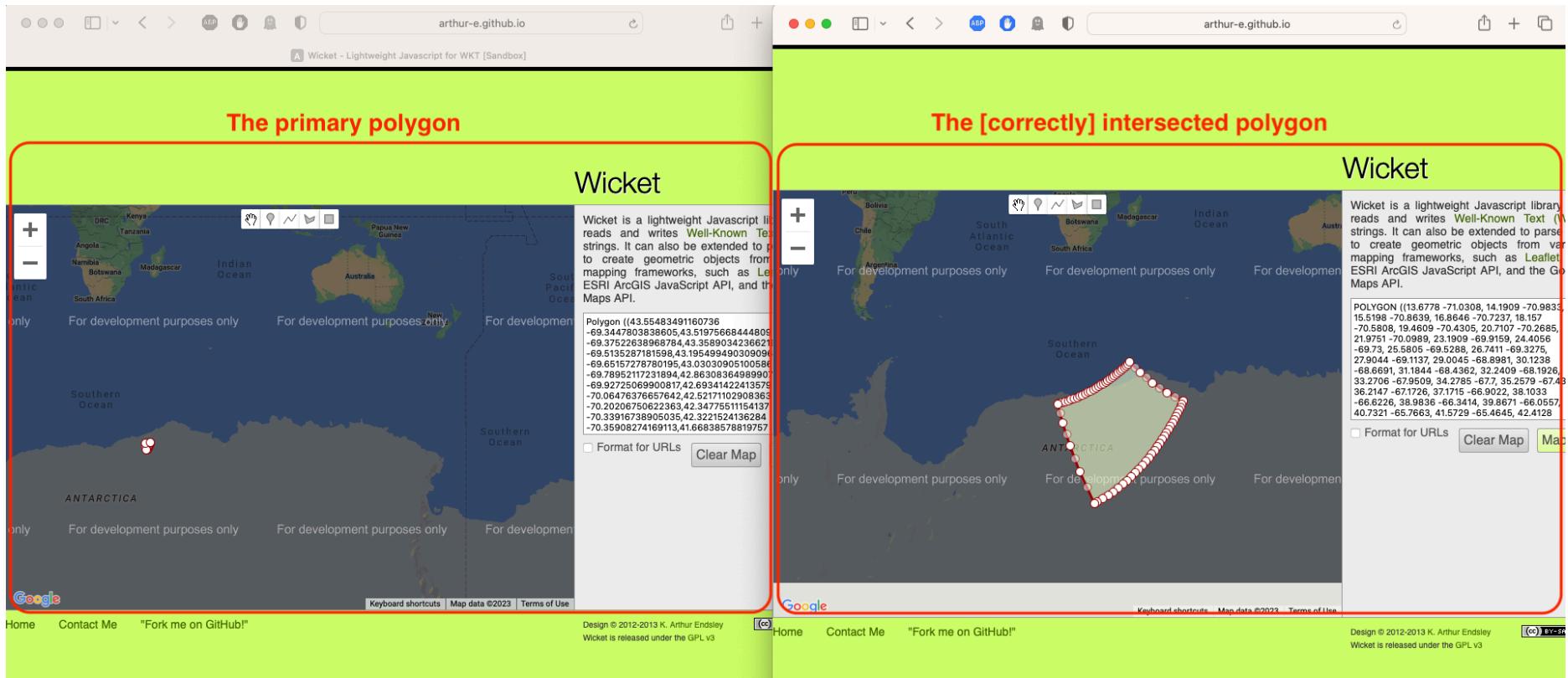
We will summarize the correct screenshots by placing them individually and in transparency mode.

1. **Two Individual Screenshot**

2. Transparent mode Screenshot

Wicket

Wicket is a lightweight Javascript lib
reads and writes Well-Known Tex
strings. It can also be extended to p
to create geometric objects from
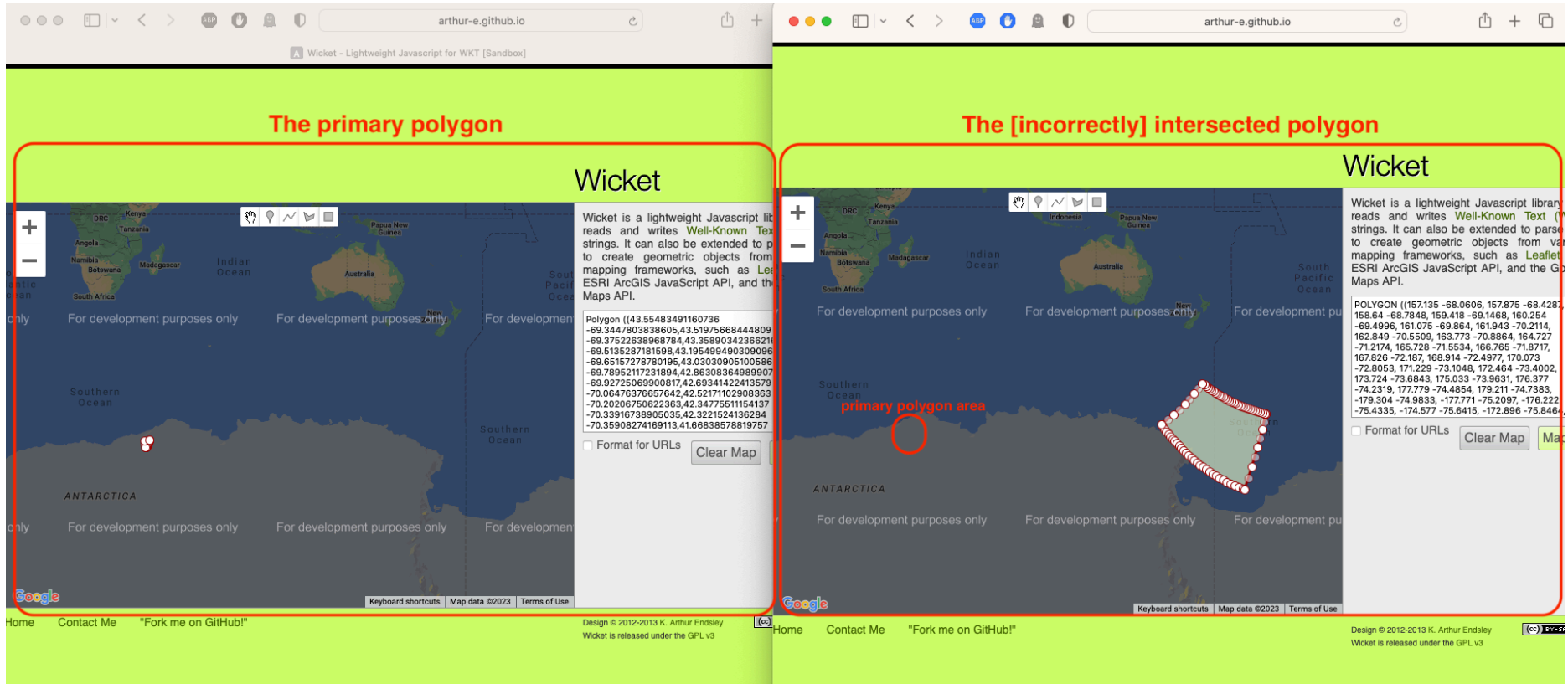mapping frameworks, such as Lea
ESRI ArcGIS JavaScript API, and th
Maps API.

Polygon((43.55483491160736
-69.3447803838605,43.51975668444809
-69.37522638968784,43.35890342366210
-69.5135287181598,43.195499490309096
-69.65157278780195,43.03030905100586
-69.78952117231894,42.86308364989907
-69.92725069900817,42.69341422413579
-70.06476376657642,42.52171102908363
-70.20206750622363,42.34775511154137
-70.33916738905035,42.3221524136284
-70.35908274169113,41.66838578819757

☐ Format for URLs   [Clear Map]

Summary of [*incorrectly*] intersected polygon:

We will summarize the incorrect screenshots by placing them individually and in transparency mode.

1. Two Individual Screenshot

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-69.8952117231894,42.86308364989907
-69.9_069900817,42.69341422413579
-70.0647_642,42.52171102908363
-70.202067506_2363,42.34775511154137
-70.339167389_5035,42.3221524136284
-70.3590827__59118,41.66838578819757

Format for URLs

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