



# Interoperable Polygons

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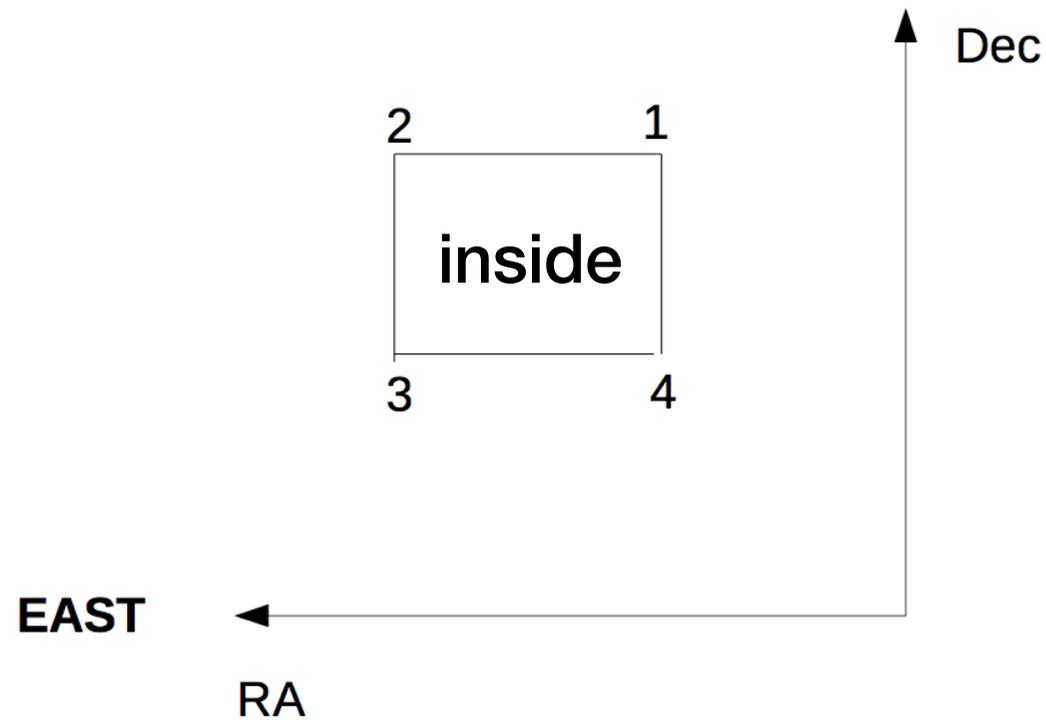
The screenshot displays the ALADIN web interface. At the top, it shows the version 'Aladin v10.0 \*\*\* BETA VERSION (based on v10.088) \*\*\*'. The main window features a star field with several overlapping cyan-colored polygons. The interface includes a top navigation bar with 'Command', 'Frame ICRSd', and 'Projection Aitoff'. A left sidebar shows 'Available data → 1 / 21538' and a list of astronomical surveys: DSS, SDSS, 2MASS, WISE, GALEX, PLANCK, AKARI, XMM, Fermi, Gaia, Simbad, NED. A right sidebar contains a 'Data discovery tree' and a list of collections including 'cds / P / DSS2', 'hips', and 'hips.png'. A bottom toolbar includes icons for 'grid', 'study', 'wink', 'north', 'hdr', 'multiview', and 'match'. A search bar is located at the bottom right. The bottom status bar shows '0 sel / 1000 src 694Mb'.



# Polygon: STC definition

CCW polygon

North



Looking from the Earth to the Sky



# Polygon implementations

➤ Very basic check performed:

I picked 1 random polygon from 5 different data centres

➤ 3 data centers: CCW polygons - compliant

➤ 2 data centers: CW polygons - not compliant

# Polygon interoperability issue

Scenario:

- Data Centre A uses CW polygons
- Data Centre B uses CCW polygons
- A user does not know that, and assumes they all polygons follow the STC standard
- The user queries data centre A and uploads the results to data centre B, with the following constraint:

WHERE contains(B.s\_region, A.s\_region) = 1

The intent is to find B footprints that lay inside the A footprint

Instead, the result set contains all the B footprints that do not cross the (real) A footprint.

# STC needs an errata 1/2

The formula in 4.5.1.4 states:

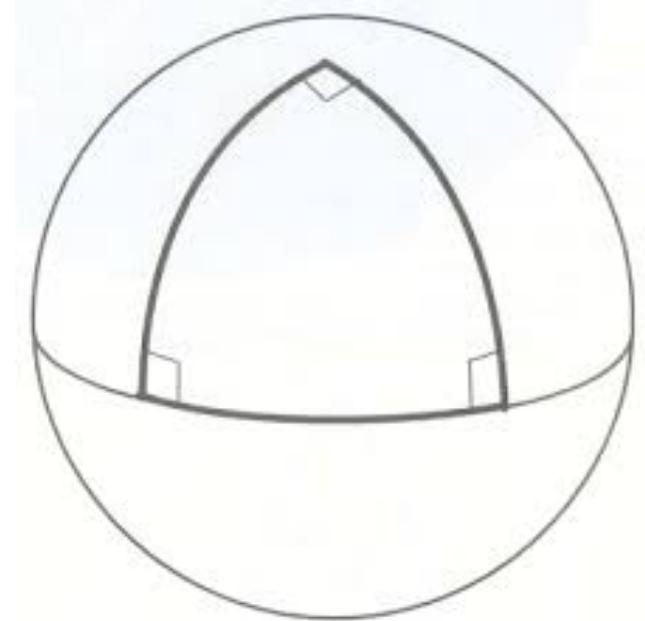
$$“A = - \text{SUM}[ A(i) ] - (n-2) * \pi”$$

but:

$$A = (\text{RA}, \text{DEC})[0] = (90, 0)$$

$$B = (\text{RA}, \text{DEC})[1] = (0, 0)$$

$$C = (\text{RA}, \text{DEC})[2] = (0, 90)$$



The three angles of the polygon are all 90 deg, or  $\pi/2$  rad by construction.

A in the above case is:  $-3 * \pi/2 - \pi = -5/2 \pi$ , while one expects an area of  $\pi/2$ .

Correct formula:  $A = +\text{SUM}[ A(i) ] - (n-2) * \pi$

# STC needs an errata 2/2

*“If  $A < 0$ , one used the “outside” angles of the polygon and the area is really  $4\pi - A$ .”*

That is also wrong because if  $A < 0$  then  $4\pi - A$  is  $> 4\pi$ , and that cannot be.

