Planning a military airstrike requires calculating many possible flight paths that navigate around threats. We needed a fast and accurate method for solving this subproblem.

We present a method to find the shortest path between two points on the surface of a sphere that does not intersect a set of spherical polygons.

**Solution**

A visibility graph connects vertices of obstacles, source, and destination if a straight line doesn’t intersect any obstacle [1].

In the Gnomonic Projection, the shortest path between any two points on the sphere is projected as a straight line in the plane [2].

We combine these two pieces in our method:
1. Map the points to a plane using the Gnomonic Projection.
2. Create a visibility graph from the points on the plane.
3. Search the visibility graph using A* with great circle distance* as the cost and heuristic.

* shortest direct path between two points on a sphere

**Evaluation**

We benchmarked random scenarios, varying the numbers of polygons (0 to 100) and sides per polygon (3 to 20).

**Conclusions**

- Runs relatively fast and can be further sped-up by choosing a faster algorithm to build the visibility graph.
- Average 20% runtime improvement over previous generative approach, which iteratively checks for obstacles and routes around them.
- Supports high resolution polygons.

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