

Sub-track-tion

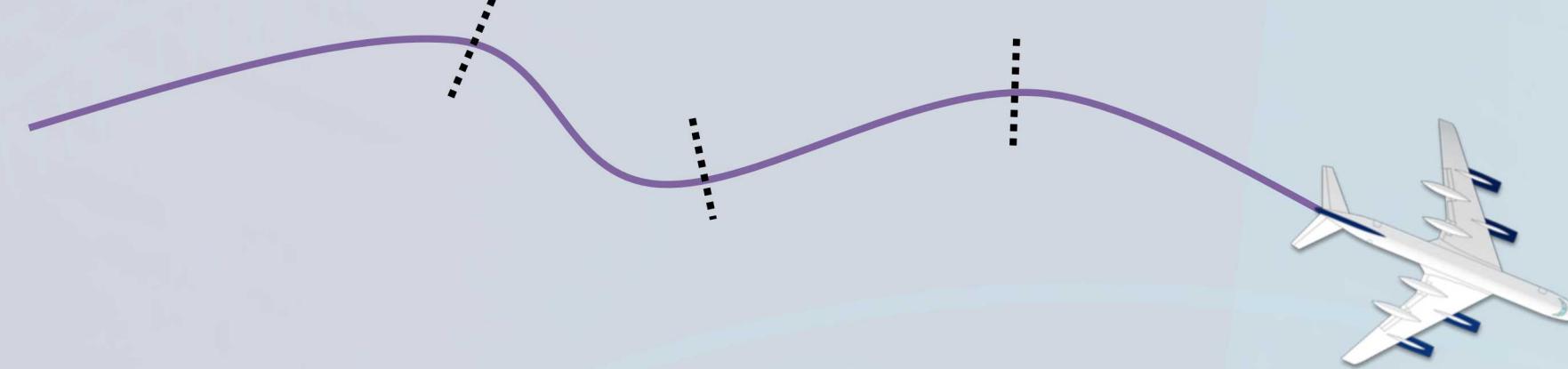
Efficiently Sub-dividing the Paths of Moving Objects for Better Analysis

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Problem

Tracktable enables complex data analytics for **national security applications** that include tracks or trajectories (the paths of moving objects). Additional insights can be gained by dividing whole trajectories into smaller segments or “sub-tracks” to which semantic information can be attached. **But how and where should a trajectory be split?**



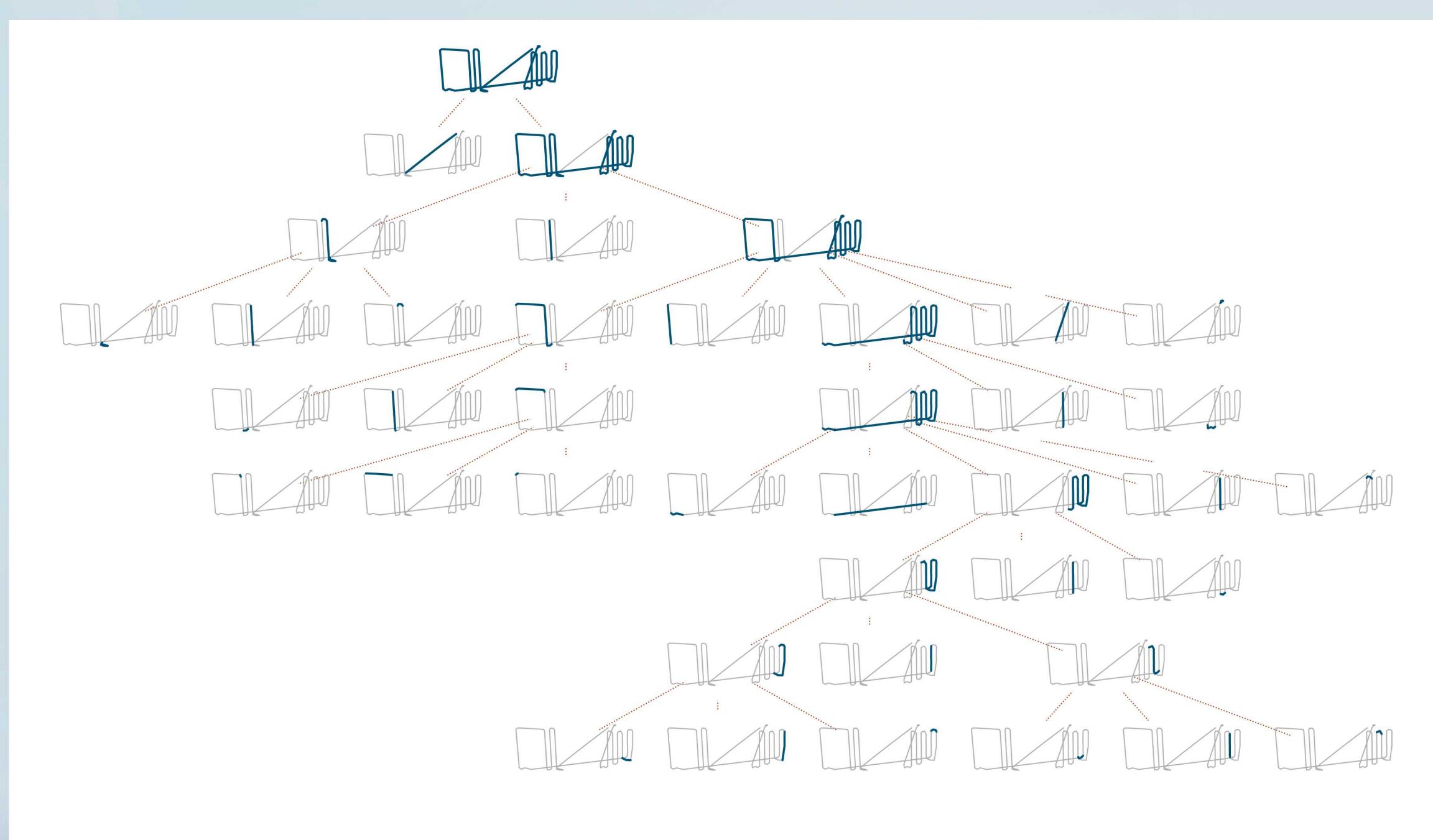
Approach

Straightness = the ratio of the length of a trajectory segment (along the path) to the Euclidean distance from the starting point to the ending point of the segment

“Sub-track-tion” Algorithm:

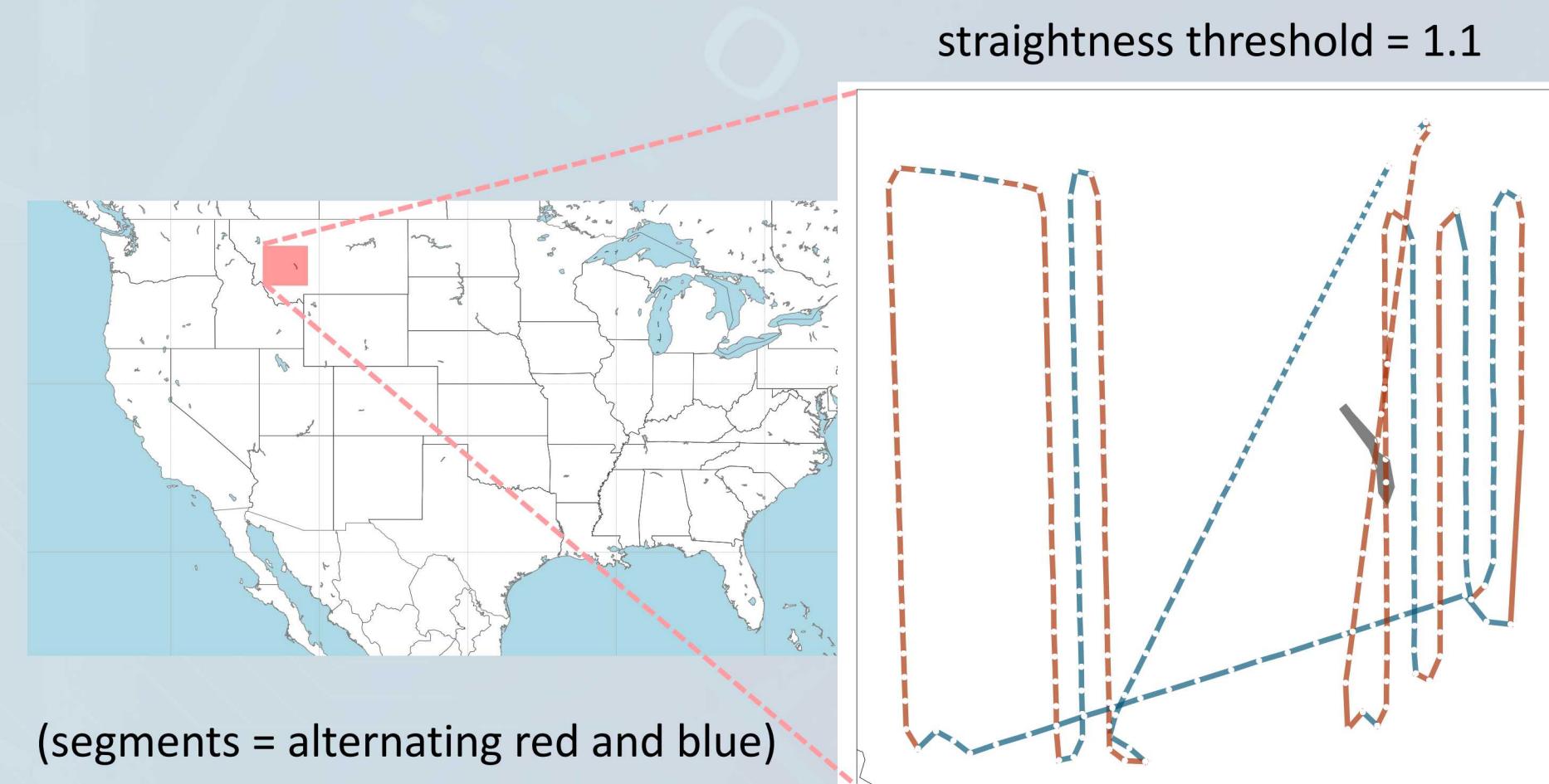
- Find the longest segment (in numbers of samples) which has a **straightness** below a given straightness threshold
- Slice the segment from the trajectory, and recurse on the remaining pieces (as long as they have more than a given number of samples – if the length threshold is used).

Hierarchical decomposition into segments:



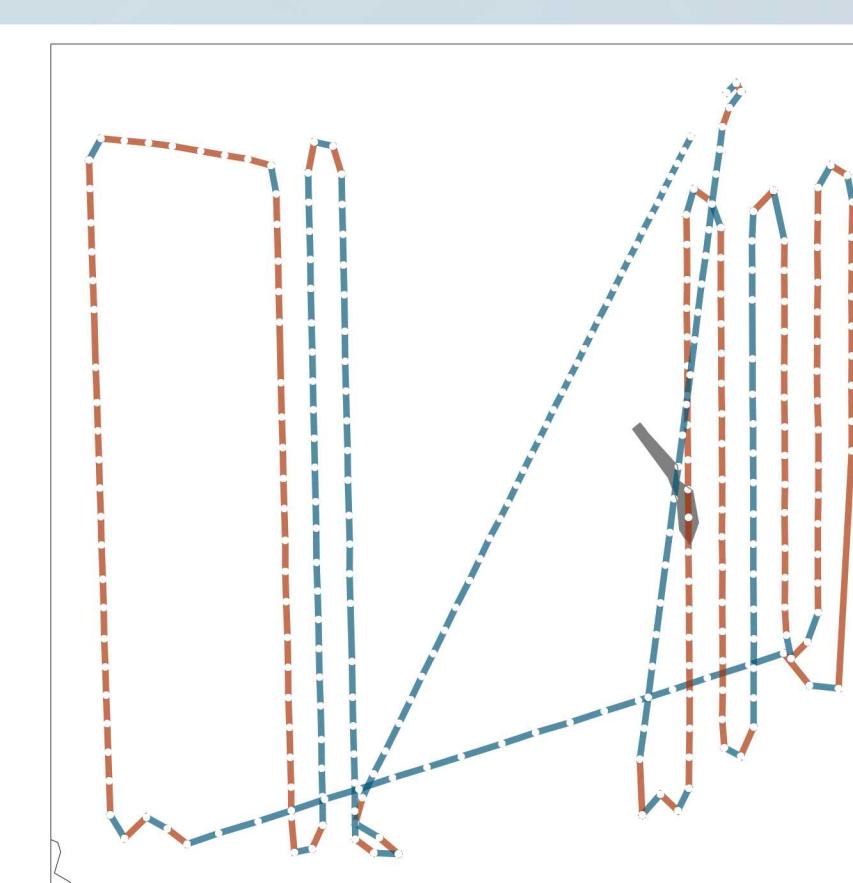
Results

Parameter Selection – Mapping Flight Example

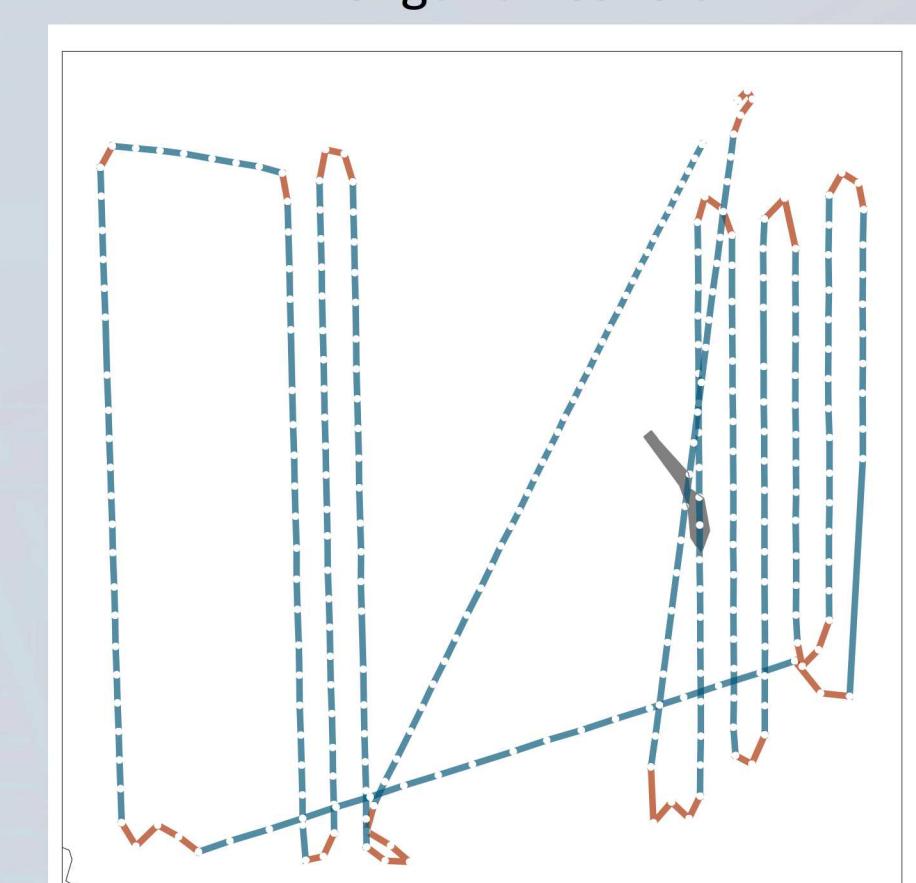


Above: straightness threshold is too small, parts of the turns are included with straight segments

straightness threshold = 1.001



straightness threshold = 1.001
length threshold = 7



Above left: reduced straightness threshold, curve segments now sequences of straight segments. **Above Right:** Stopping the recursion whenever a segment length becomes smaller than a length threshold yields desired results

Significance

Rather than working exclusively with whole trajectories, segments of trajectories can now be analyzed. For example, searching for ordered sets of segments types (a U-turn followed by a straight segment) or reporting the percentage of each segment type in a trajectory (90% straight segments, 10% turns), etc.

Once integrated into Tracktable these enhancements will increase our ability to analyze, categorize, and organize trajectories.