An Algorithm for Edge Generation in Graphs of Real World Vertex Fields for Travel with Momentum Constraints

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The use of Dijkstra's algorithm in finding the shortest distance between two points that can be represented by a graph is commonplace. Existing variants of the algorithm, while in some cases accounting for other constraints, fail to take into account constraints on movement in physical space by a vehicle's momentum and direction of travel at any given vertex, or if they do, are limited by angle limits that involve rigid movement. This is particularly needed in a field of vertices that represent a largely unrestricted travel area such as a body of water or airspace. Existing algorithms also do not perform realtime edge calculations based on previous travel conditions that affect edge distances. This research addresses these factors to create realistic shortest-path results by extending Dijkstra's algorithm. This algorithm has applications to both sea vessel and aircraft travel. The functionality of this algorithm is demonstrated using real world satellite imagery superimposed with calculated paths that represent likely applications.

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