

# Navigating Across Piste Maps

MSc in Software Engineering

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## Introduction

Partnering with DOGFI.SH Mobile to redevelop one of their customers' applications. Originally developed in Titanium, it allowed users to manage their skiing holiday, as well as view piste maps and recommended routes.

I was tasked with creating native libraries to find a user's location and the shortest routes across the piste map.

## Shortest Path

To find the shortest path across the piste map, key points and routes must be known. These can be converted into a graph, where the nodes are key points and the edges are the routes. By adding weights to the edges we can define longer and shorter paths. The piste map is effectively a directional graph.

## Piste Maps

Piste maps are not made to scale. So converting geographic coordinates into piste map coordinates is not simple. Points are plotted on both maps creating corresponding triangles. If a user is inside a triangle on the geographic map then it can be said that the user must be inside the corresponding triangle on the piste map.

## Dijkstra

Dijkstra's algorithm solves the single source shortest path problem. The algorithm traverses the graph and creates a shortest path tree. The algorithm can be stopped when it reaches the destination node or it can continue and complete the tree. It is then possible, by working backwards, to construct the shortest path between the starting and destination nodes.

## Location

All triangles are affine, this means that there exists a transformation that will map the geographic triangle on to the piste map triangle. This transformation can be found by solving a system of linear equations. Then by applying the transformation to the user's latitude and longitude, it is possible to calculate their location on the piste map.

## Outcomes

The result was two native libraries that are showcased in two native apps. The libraries allow the pinpointing of a user's location on the piste map, and can find the shortest path across it. They can be used separately or together, and can be used with any type of map. The applications were built with an intuitive and user friendly interface.



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