# Base Station Path Planning

## Preliminaries

The Base Station will represent the planned path as a weighted directed graph. The final values of the weights will be determined through testing, but possible weights are distance and expected travel time. The nodes of the graph will be locations. These nodes will be translated into a Command Packet to be put into a queue for continued execution.

## Shortest Cost Path Algorithm

Our path planning algorithm should be based on the need to prioritize speed of planning over absolute shortest path. The algorithm will focus on the short term least cost path, rather than attempting to construct a path from the starting area to delivering every block. It will have knowledge that we would like to collect and deliver all ground level blocks before proceeding to the delivering the air blocks.

The expected algorithm will be based on the A\* search algorithm. Below is a link for reference.

[http://en.wikipedia.org/wiki/A\*\_search\_algorithm](http://en.wikipedia.org/wiki/A*_search_algorithm)

## Startup

After communications begin between Base and the mobile unit, the base station will send the mobile unit commands to pick up the two closest blocks that will go to ground level locations (either the rail or sea locations, whichever has the closest two blocks from the starting area). The main path planning routine will begin after these commands are sent.

## Path planning

After the commands to get the mobile unit to its first two drop offs are constructed and sent (or queued), the main routine beings. Path planning should begin from the location of the second block dropped off. Ideally, the Base Station will have enough time to determine it's complete shortest cost path before the mobile unit drops off the second block. In the event the mobile unit finishes with no errors prior to the path being finished, the base station should send commands for at least the next two blocks.

## Maintenance

The maintenance phase is to ensure that, should any errors occur on the mobile unit side, the base will recover from it. If some failure occurs on the mobile side (e.g., failed to reach destination, dropped a block into the wrong area, etc), the base station will recalculate the optimal path.

In minor cases, this should be able to be accomplished by inserting commands into the front of the command queue that will result in returning to the desired optimal path.

In the vent of a major error, the base station will have to re-plan the rest of the route. The base station will follow a similar procedure to startup phase while taking into account what load the mobile unit currently has.