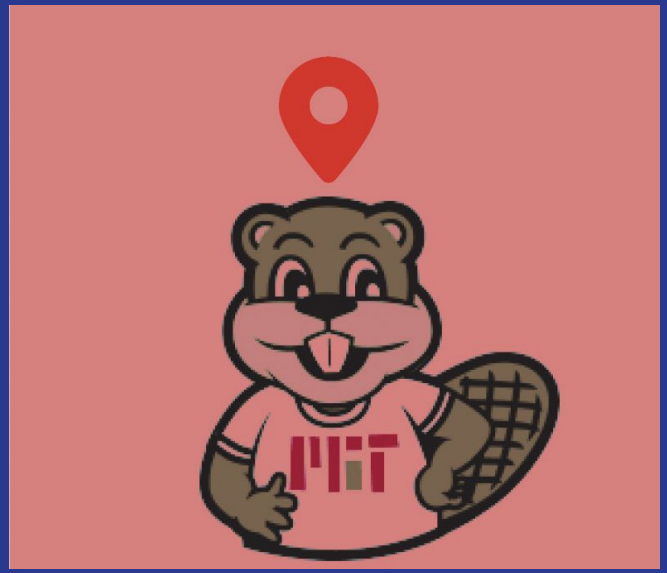
FindMyWay!



By: Vasu Kaker, Yajvan Ravan, Kevin Wen, Michael Wong, Revanth Pothukuchi

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Problem

- MIT is a large campus with thousands of rooms/hallways/buildings/staircases/elevators. Finding one's way around campus can be difficult and daunting.

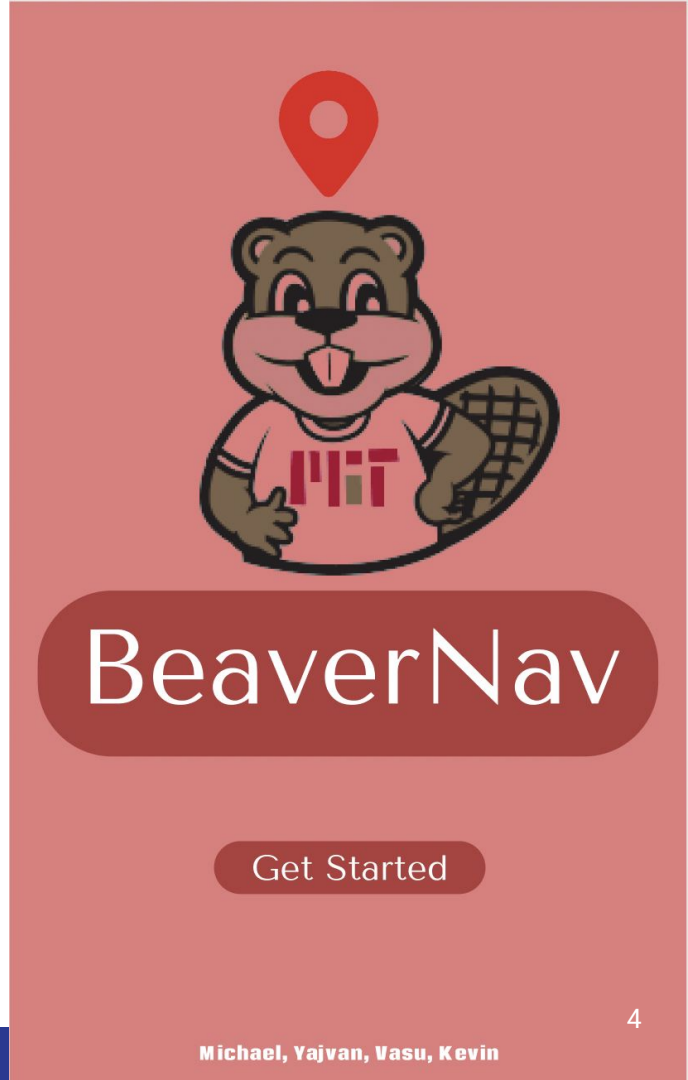
- Market Research: 95% of freshmen we surveyed report getting lost at some point during their first week of classes.

- This results in significant time wastage, inefficiency, and frustration

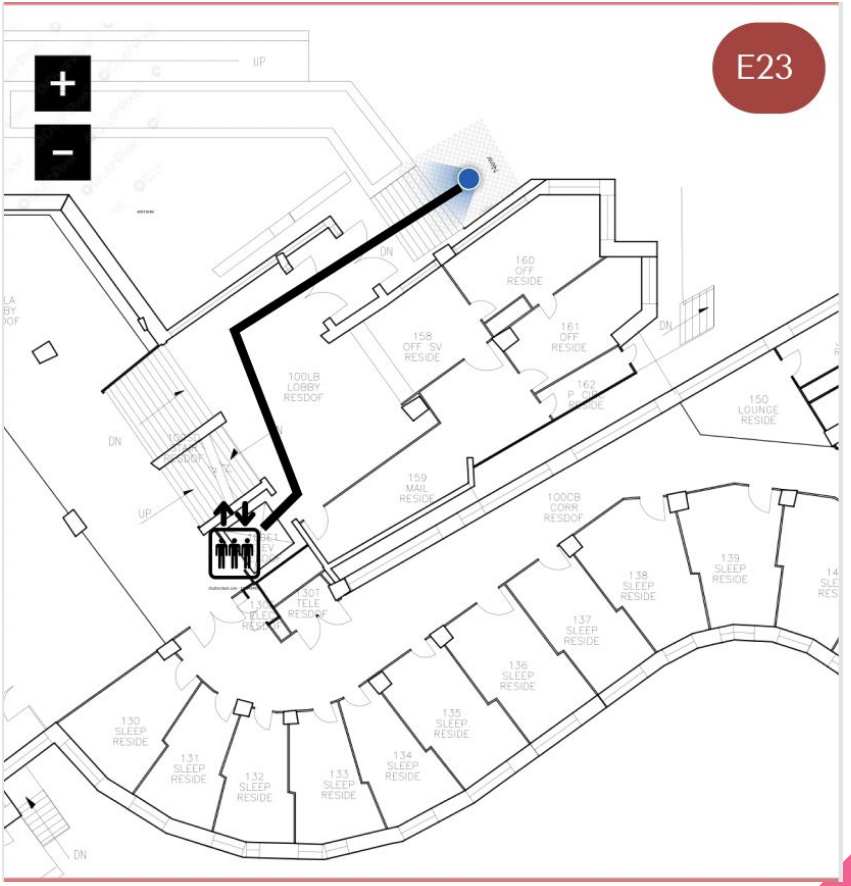
- **Similar problems in other industries (airports, hospitals, university campuses, malls)**

Our Solution

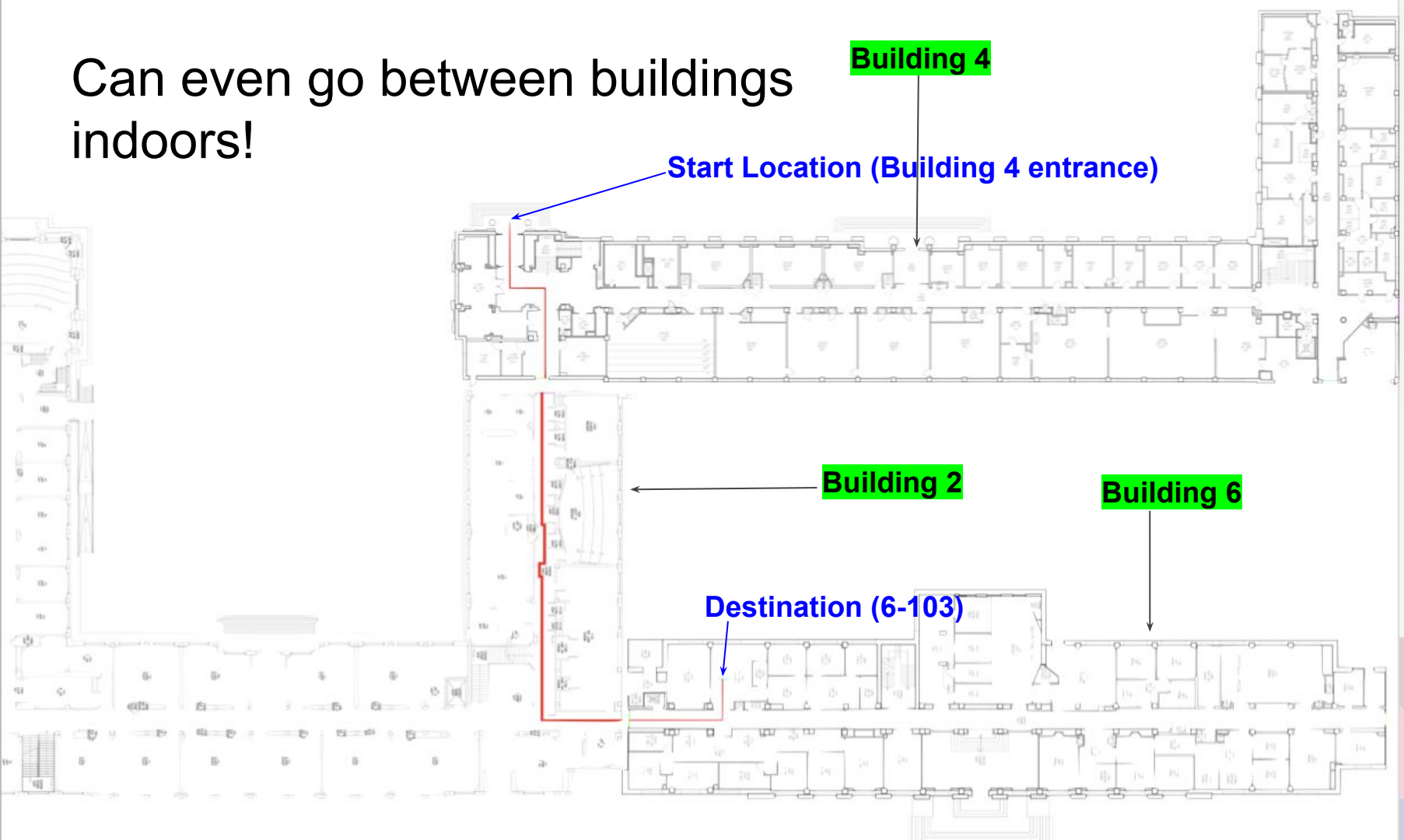
- FindMyWay! (previously BeaverNav)
- Indoor navigation for MIT's campus!
- Enables users to navigate between rooms, provides routes from start destination to end destination



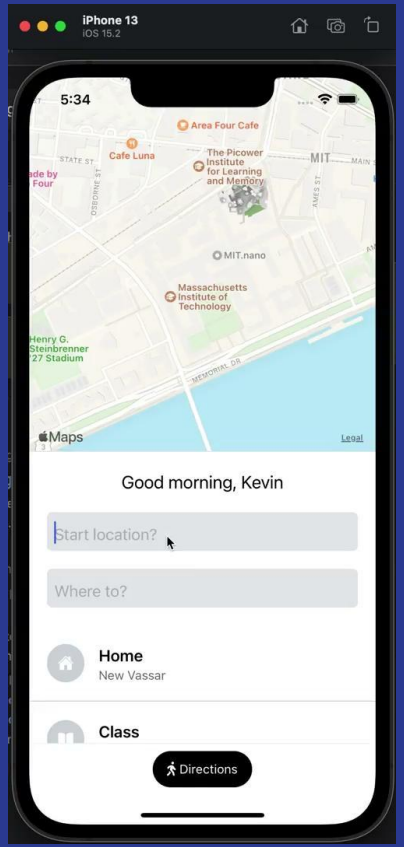
Indoor routing:



Can even go between buildings indoors!



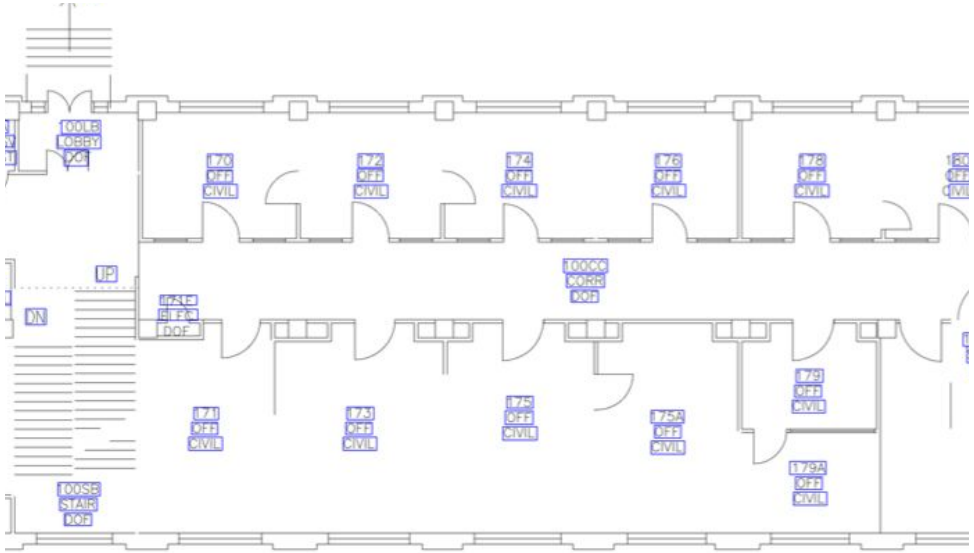
Demo!


iPhone 13
iOS 15.2
5:34
Area Four Cafe
Cafe Luna
The Picower Institute for Learning and Memory
MIT
MIT.nano
Massachusetts Institute of Technology
Maps
Legal
Good morning, Kevin
Start location?
Where to?
Home
New Vassar
Class
Directions

How Does It Work?

Explanation -- Single Floor Plan

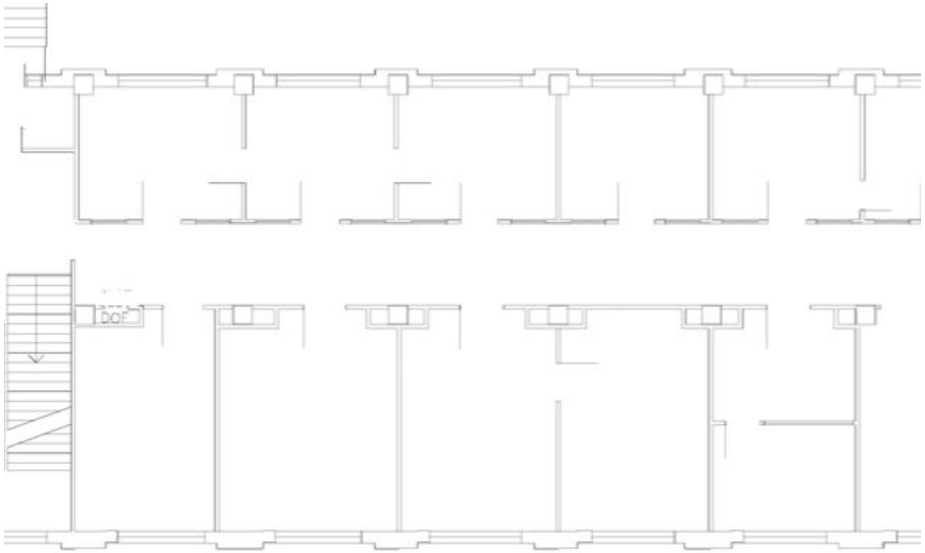
1. Scrape Floor Plans from MIT website, and process into images



2. Extract key information (**room coordinate locations & names**) via pre-trained neural network text detection and recognition models (EAST, Easy OCR).

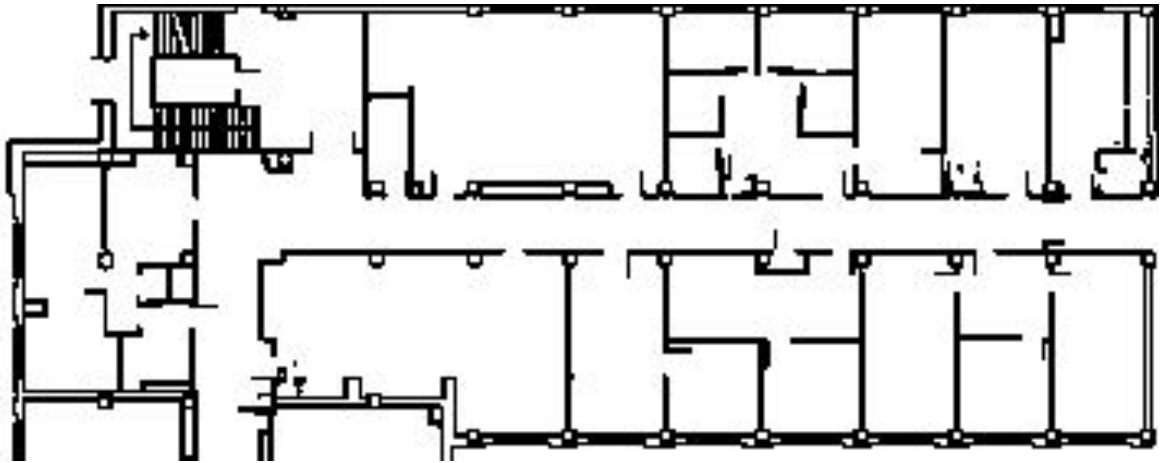
Explanation -- Single Floor Plan

3. Remove all doors & text from the floorplans



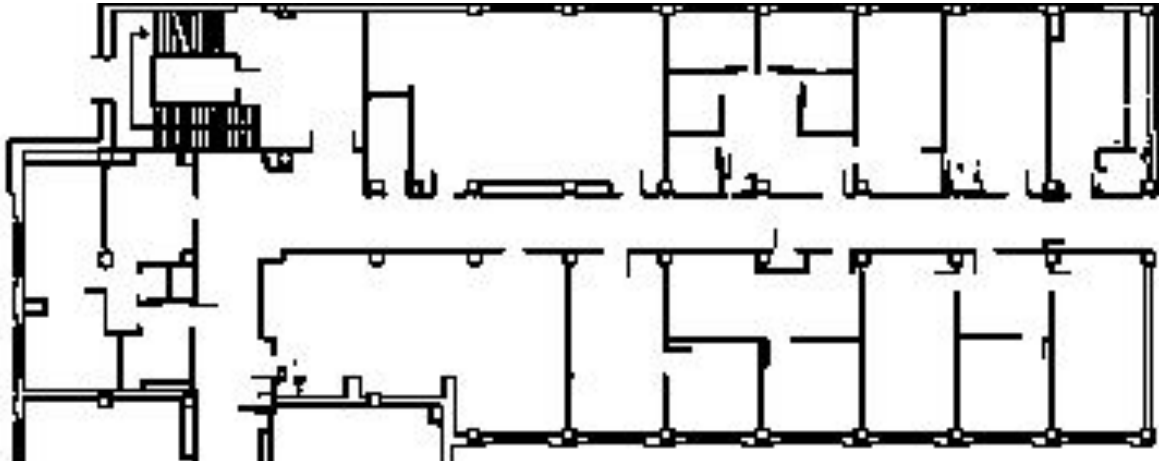
Explanation -- Single Floor Plan

4. Blur floor plans by reducing resolution



Explanation -- Single Floor Plan

5. Create a custom graph from the reduced resolution image

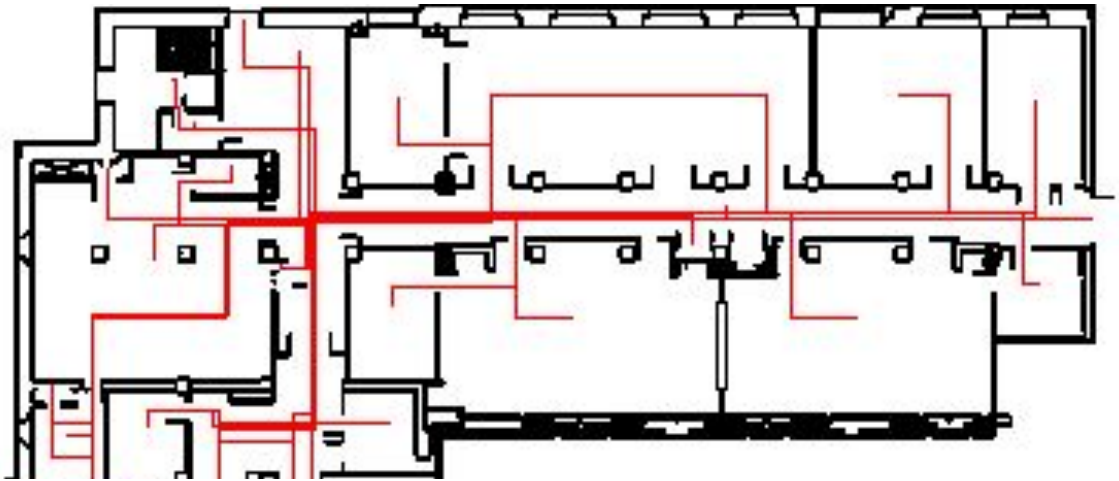


We treat every pixel as a node in the graph

Explanation -- Single Floor Plan

6. CONDENSE graph by running an additional all pairs shortest paths algorithm (APSP).

All red pixels here become a part of the final graph



Explanation -- Single Floor Plan

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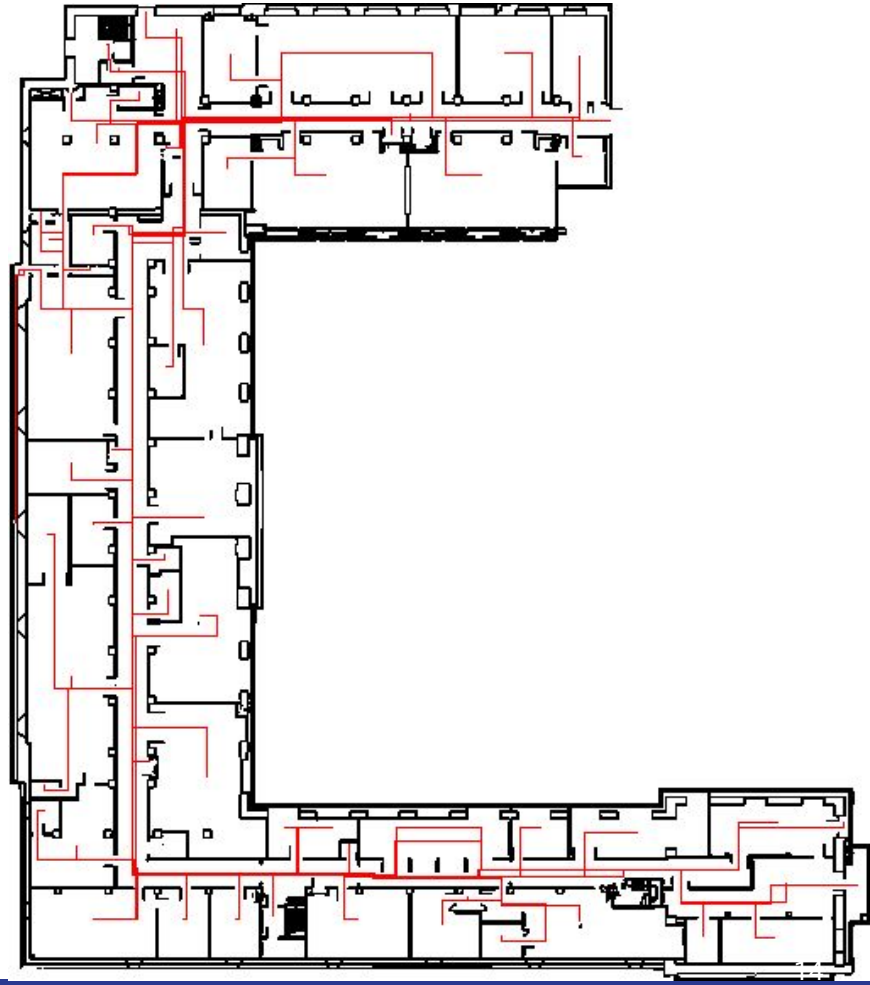
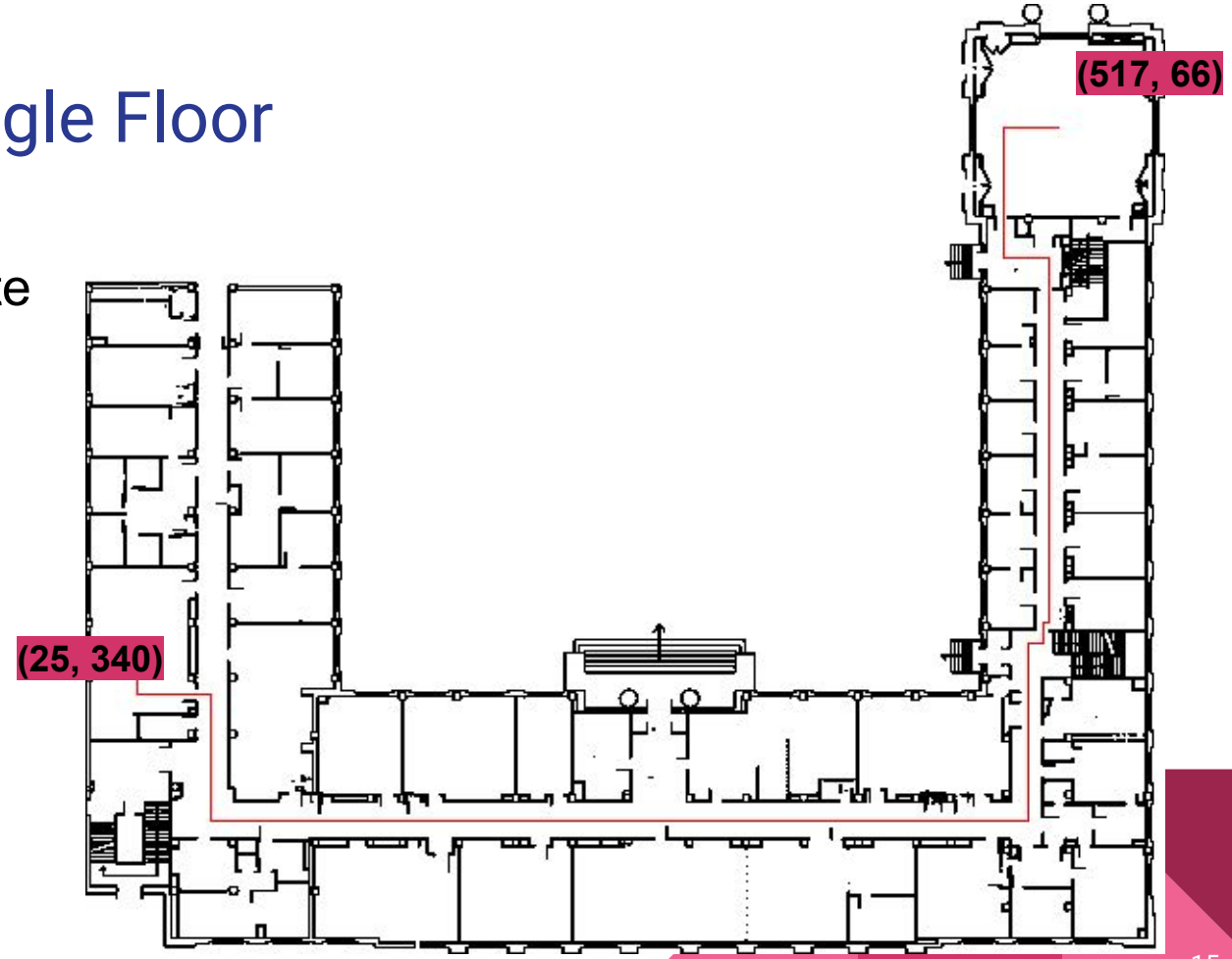


Explanation -- Single Floor

7. Run a modification of Dijkstra's algorithm to route you from one room to another

Start = 1-190: (517, 66)

End = 1-115: (25, 340)

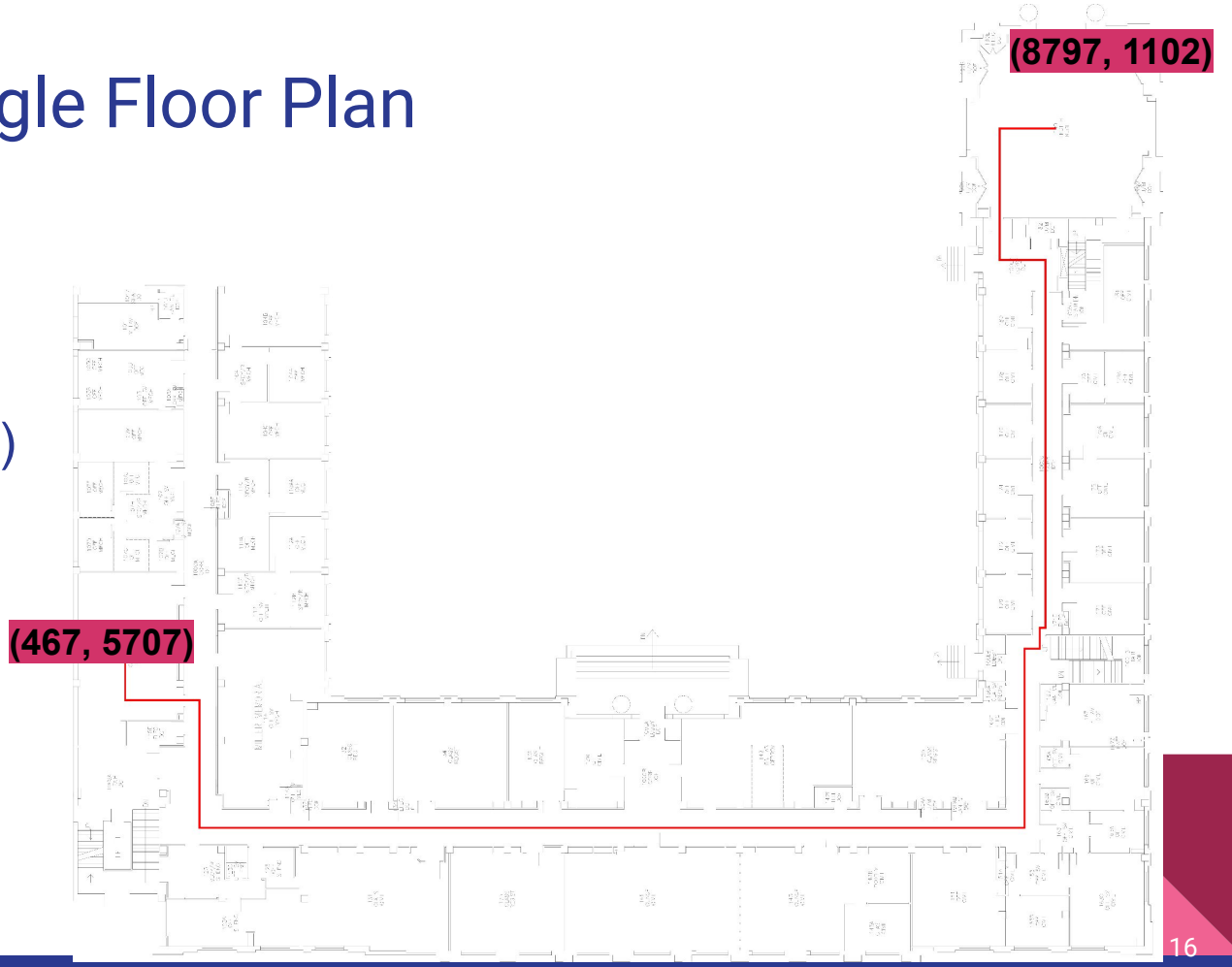


Explanation -- Single Floor Plan

8. Overlay on the original high resolution image

Start = 1-190: (8797, 1102)

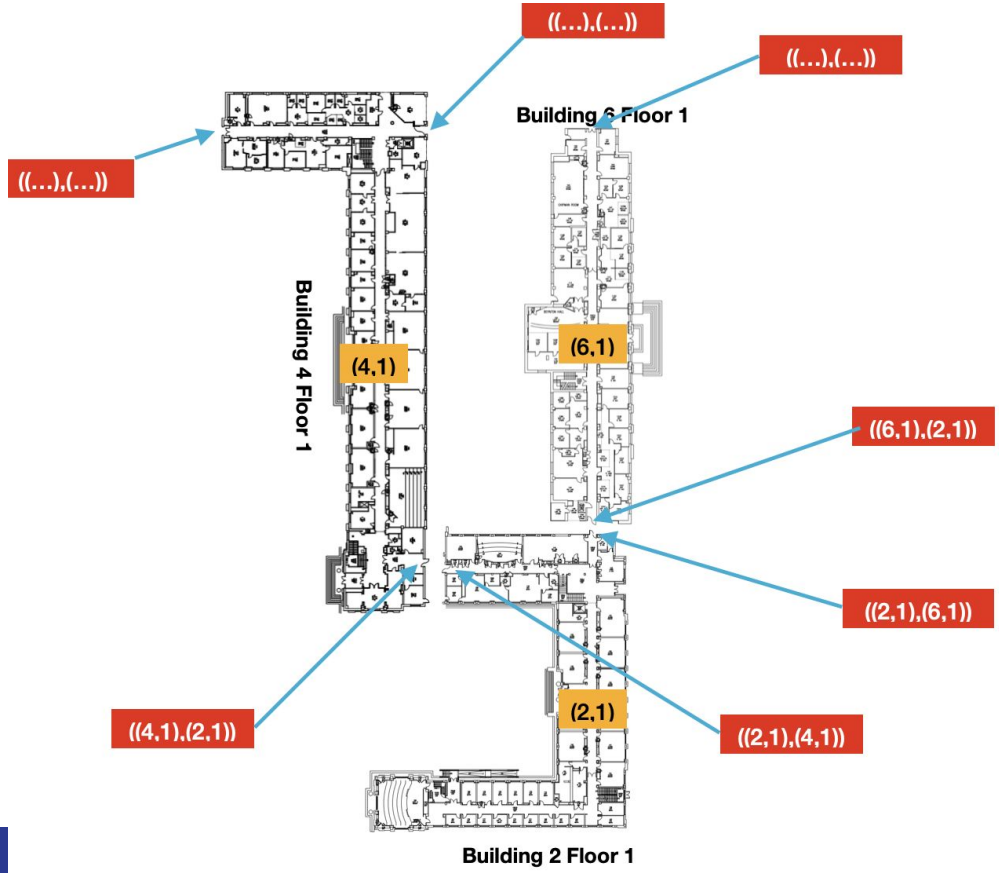
End = 1-115: (467, 5707)



How Do We Go Between Buildings?

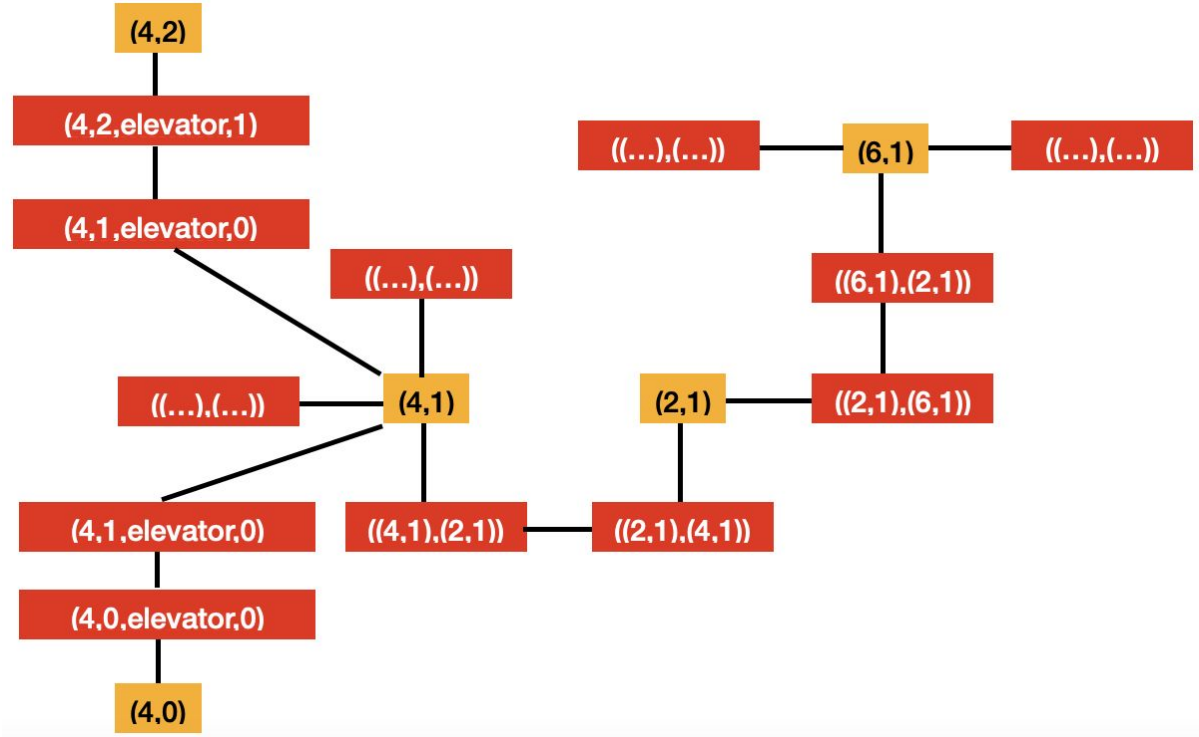
Explanation -- Multiple Floor Plans

1. Create an “abstracted graph” of MIT’s campus

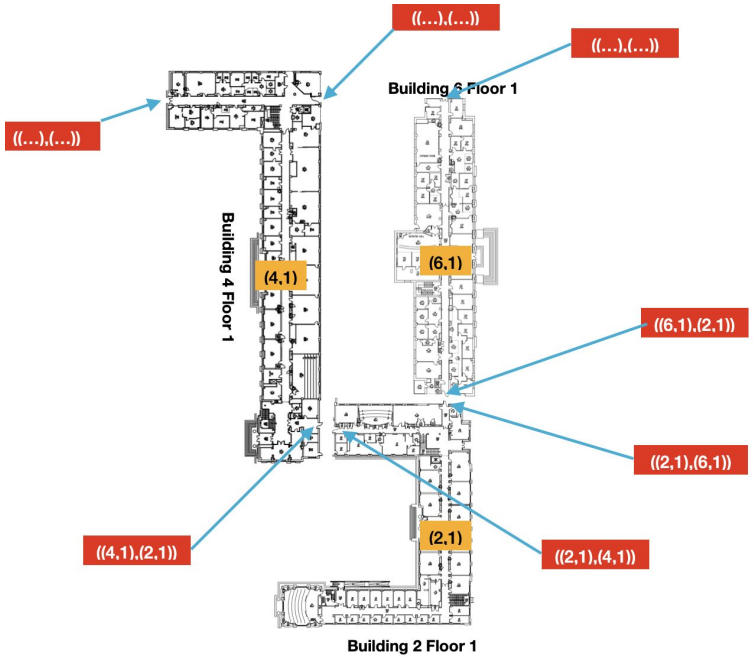


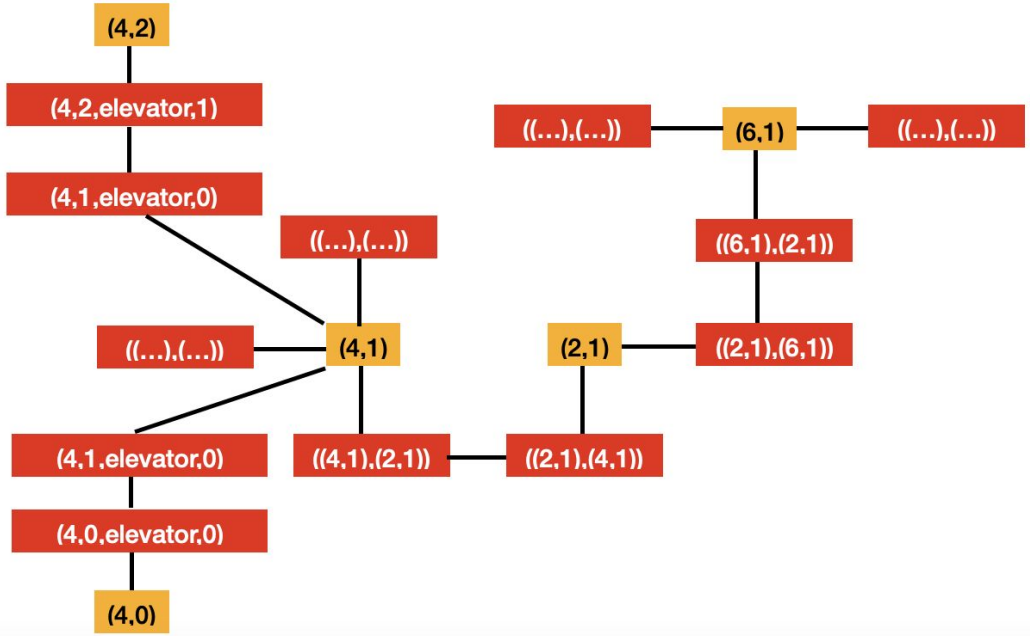
Explanation -- Multiple Floor Plans

1. Create an “abstracted graph” of MIT’s campus using **elevators, staircases, entry-exits between buildings**



Explanation -- Multiple Floor Plans



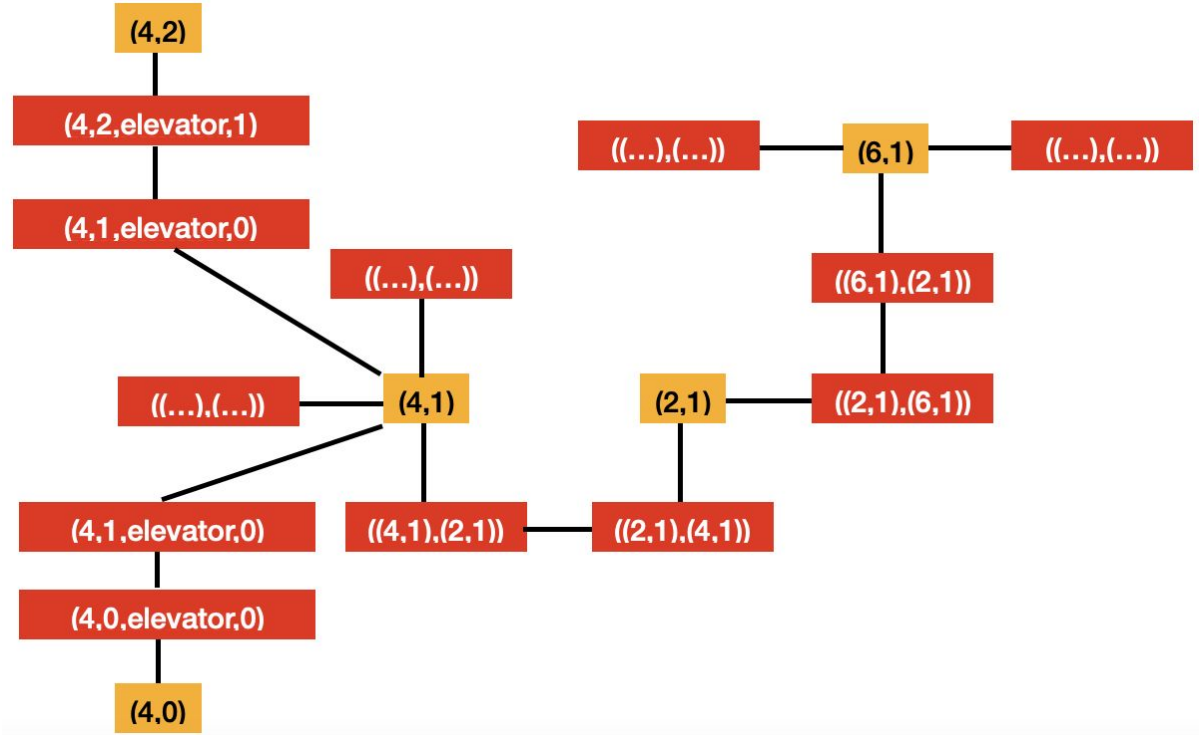


Explanation -- Multiple Floor Plans

2. Example:

start: Room 4-100
end: Room 6-102

Run a Breadth First Search algorithm (BFS) with start = (4,1), end = (6,1)



Explanation -- Multiple Floor Plans

3. A “path” has now been created from (4,1) to (6,1):

[(4,1),

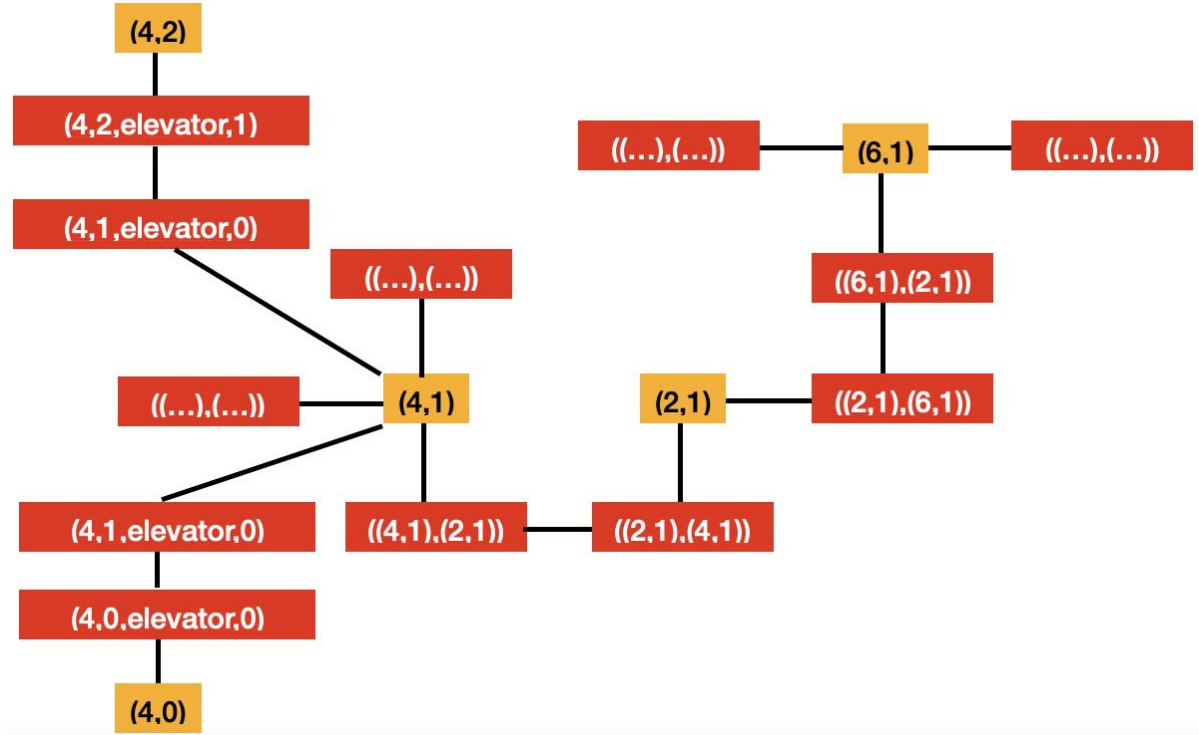
((4,1), (2,1)),

((2,1), (4,1)),

((2,1), (6,1)),

(6,1)), (2,1),

(6,1)]



Explanation -- Multiple Floor Plans

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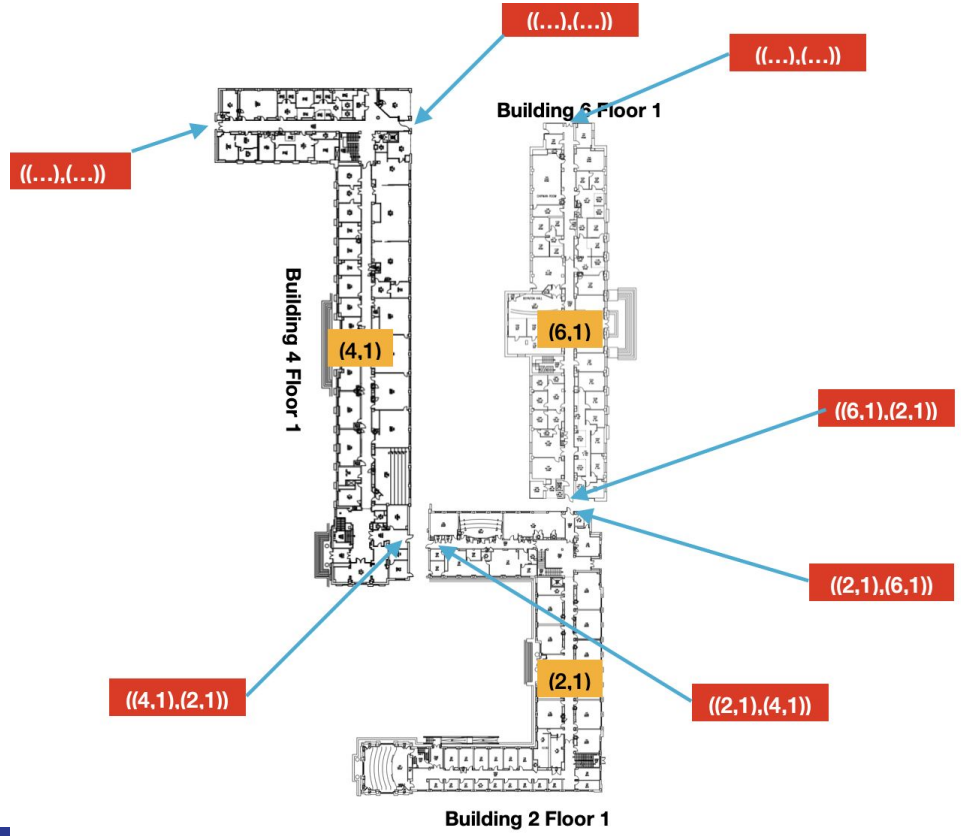
((2,1), (6,1)),

(6,1)), (2,1),

(6,1)]



Explanation -- Multiple Floor Plans

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[(4,1),

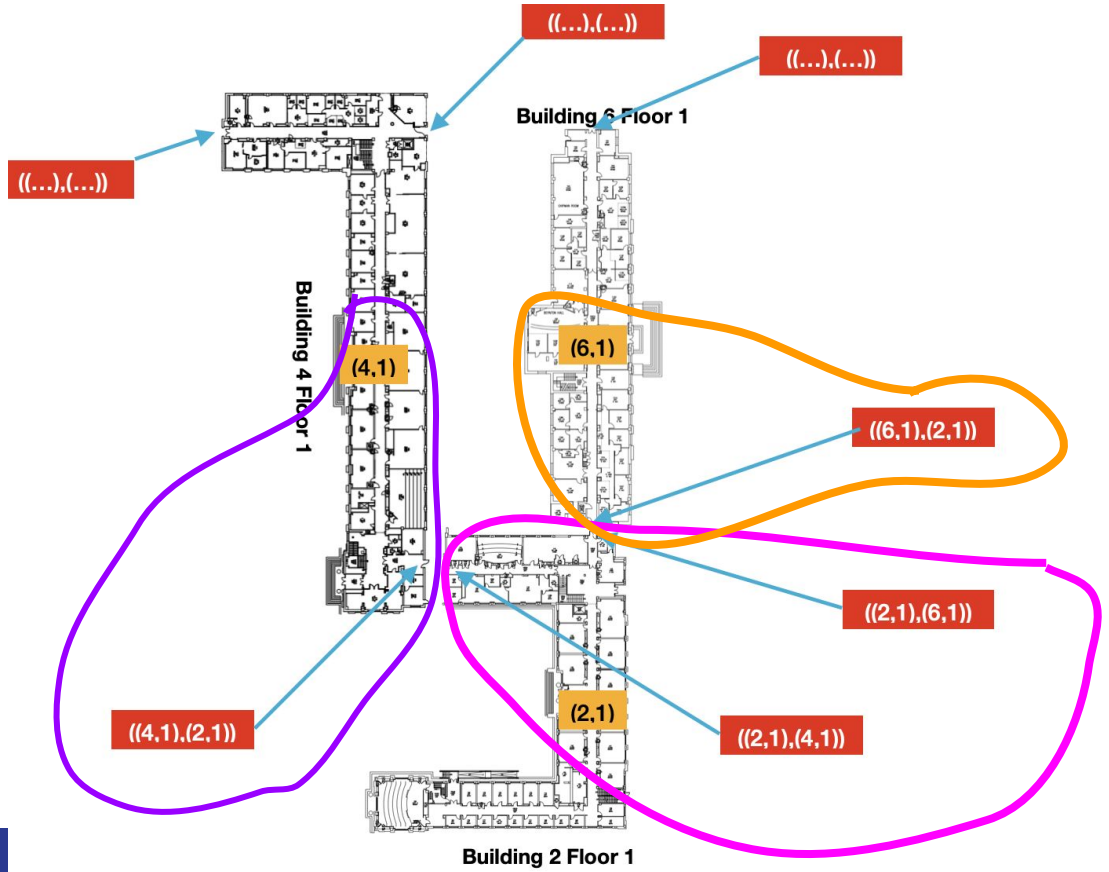
((4,1), (2,1)),

((2,1), (4,1)),

((2,1), (6,1)),

(6,1)), (2,1),

(6,1)]



Explanation -- Multiple Floor Plans

4. Run pathfinding on **each** of the floorplan graphs

[(4,1),

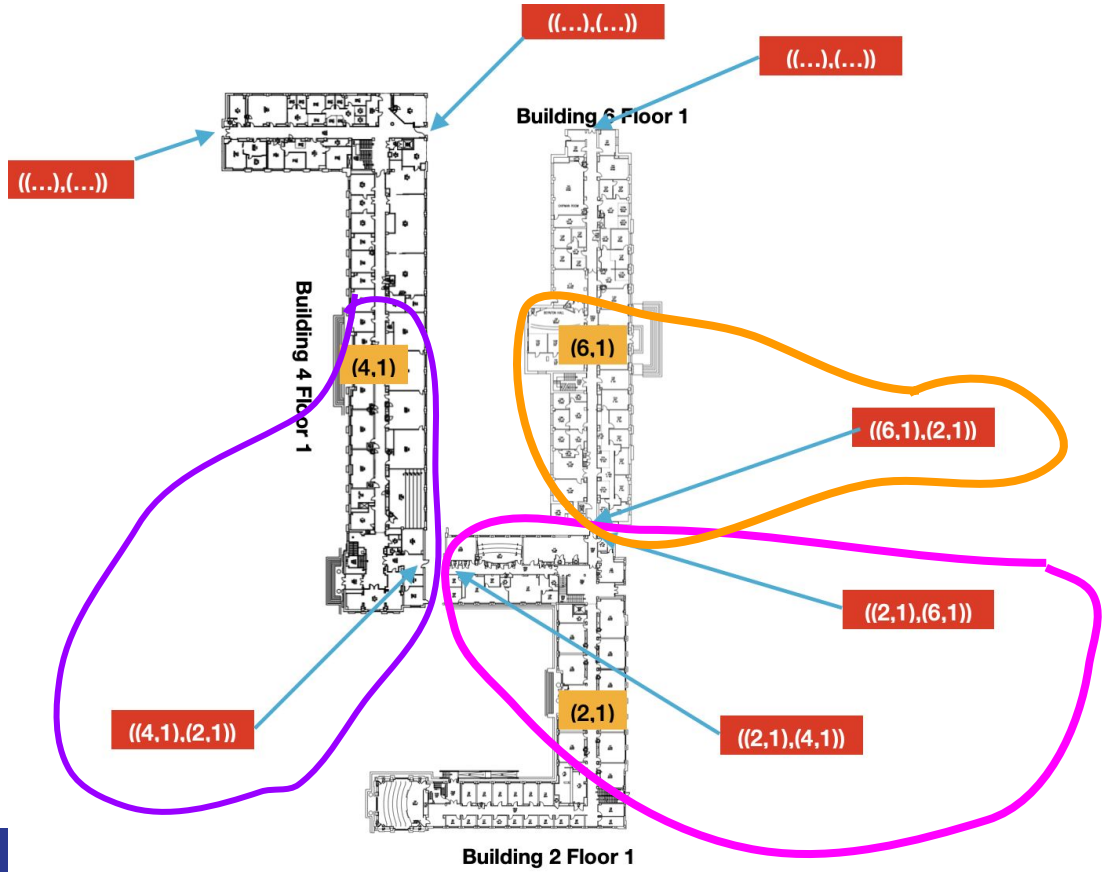
((4,1), (2,1)),

((2,1), (4,1)),

((2,1), (6,1)),

(6,1)), (2,1),

(6,1)]

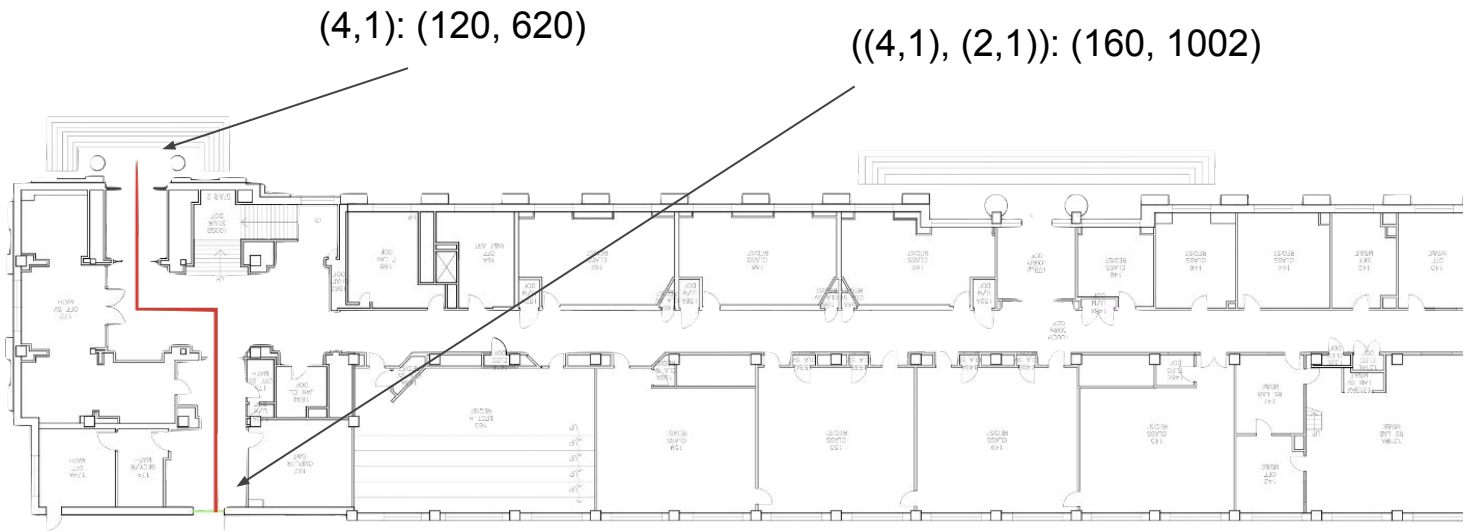


Explanation -- Multiple Floor Plans

Path One:

[(4,1),

((4,1), (2,1)),

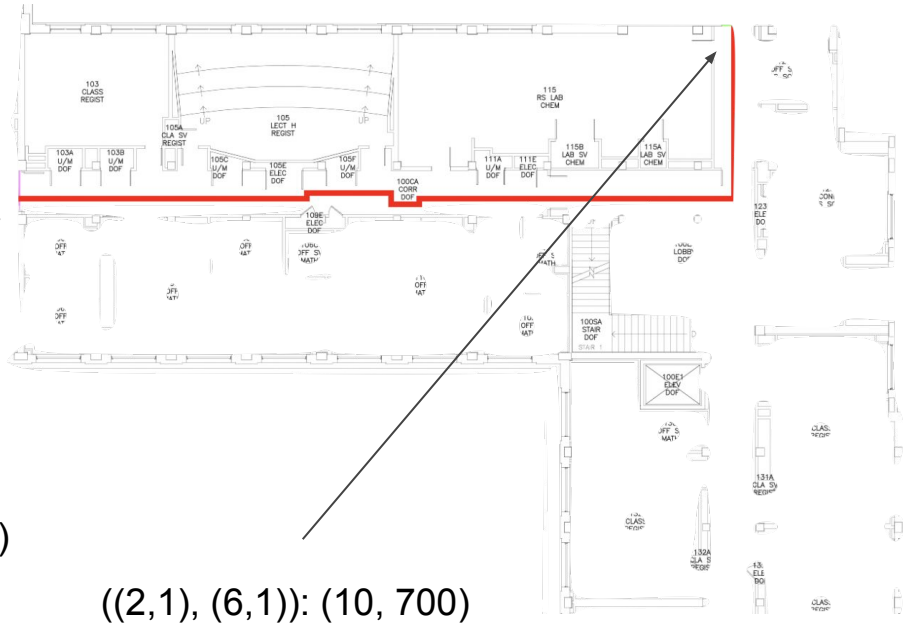


Explanation -- Multiple Floor Plans

Path Two:

((2,1), (4,1)),

((2,1), (6,1)),



((2,1), (4,1)): (300, 600)

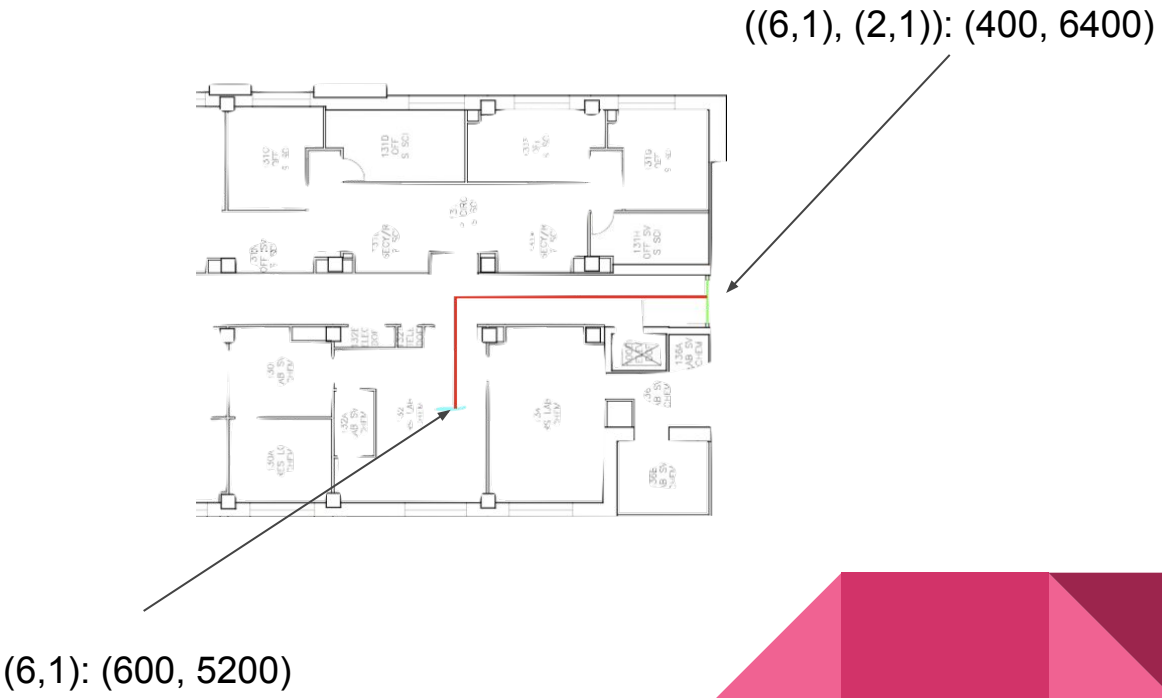
((2,1), (6,1)): (10, 700)

Explanation -- Multiple Floor Plans

Path Three:

(6,1)), ((2,1),

(6,1)



Explanation -- Multiple Floor Plans

5. Shazam!

[(4,1),

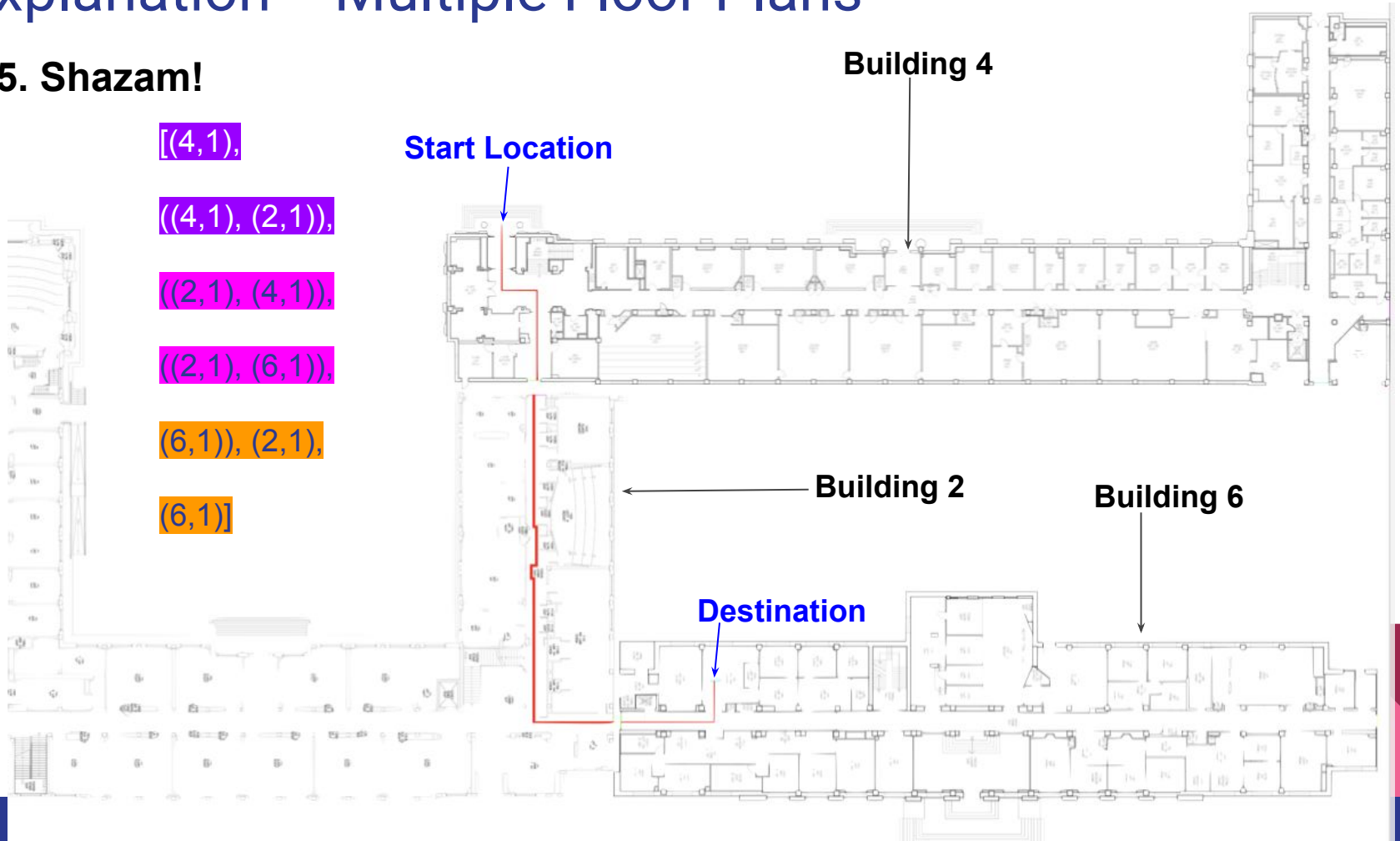
((4,1), (2,1)),

((2,1), (4,1)),

((2,1), (6,1)),

(6,1)), (2,1),

(6,1)]

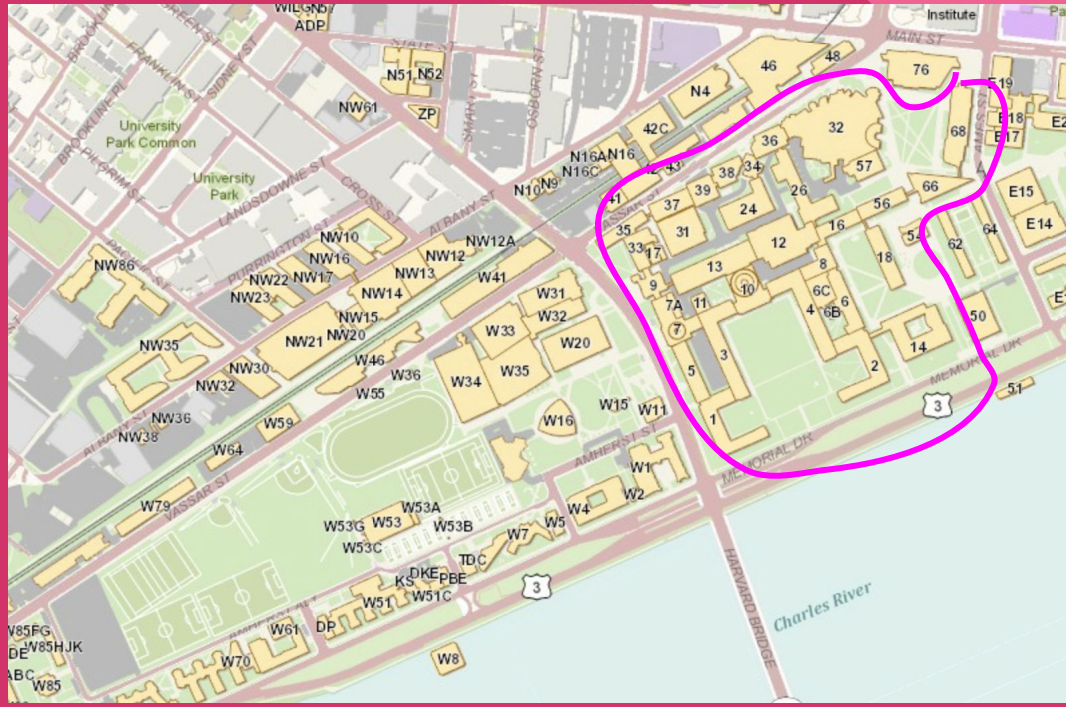


Next Steps

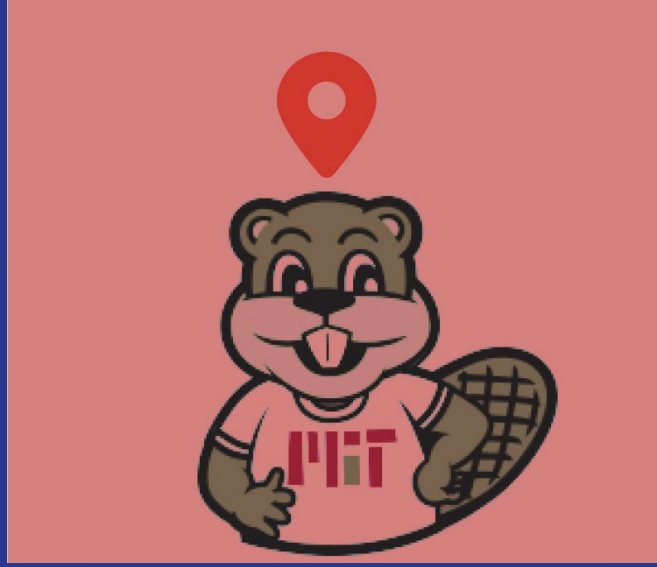
Beta version almost complete!

Expand coverage to outdoors

Real-time navigation



Thanks for Listening! Any Questions?



Try out our website at https://45.33.64.67