A Map for Work...
... A Map for Life

Sheng (Zak) Zhao
Yuwen (Echo) Zheng
Anna Shi

cd-026

Sophie, our courier

8:00 AM

5:00 PM

10:00 PM

Working hours

https://www.shutterstock.com/video/clip-4376276-stock-footage-delivery-courier-woman-giving-package-wearing-blue-uniform-woman-courier-smiling-happy-on-white.html

After hours

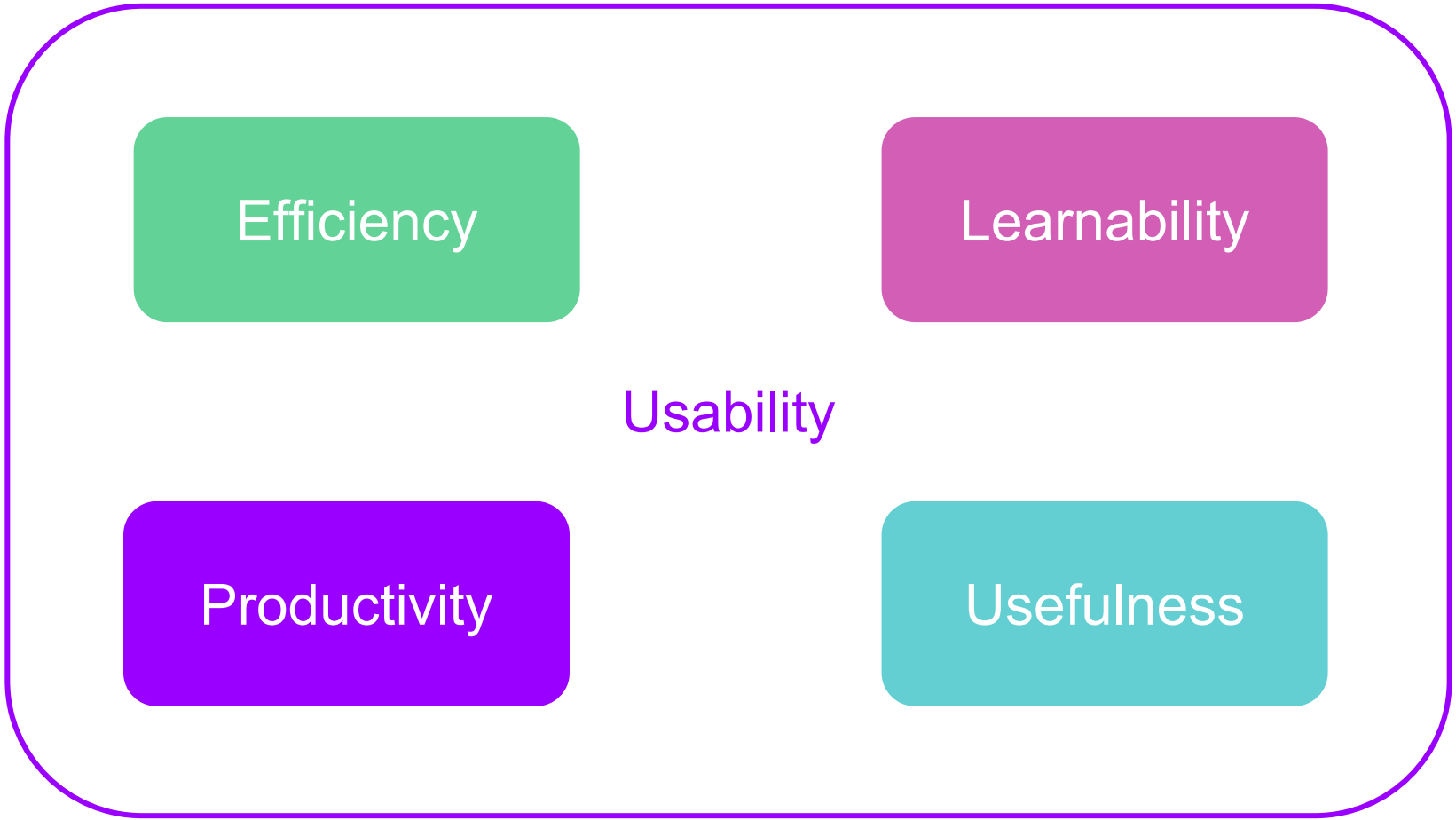
https://economictimes.indiatimes.com/magazines/panache/looking-for-a-new-job-how-about-shopping-for-someone-else-at-rs-25000-per-day/articleshow/60188028.cms

Presentation Overview

1. Pathage
2. Guiding principles
3. Path finding algorithms
4. Navi-Safe
5. Take-away

Pathage - A path for your package

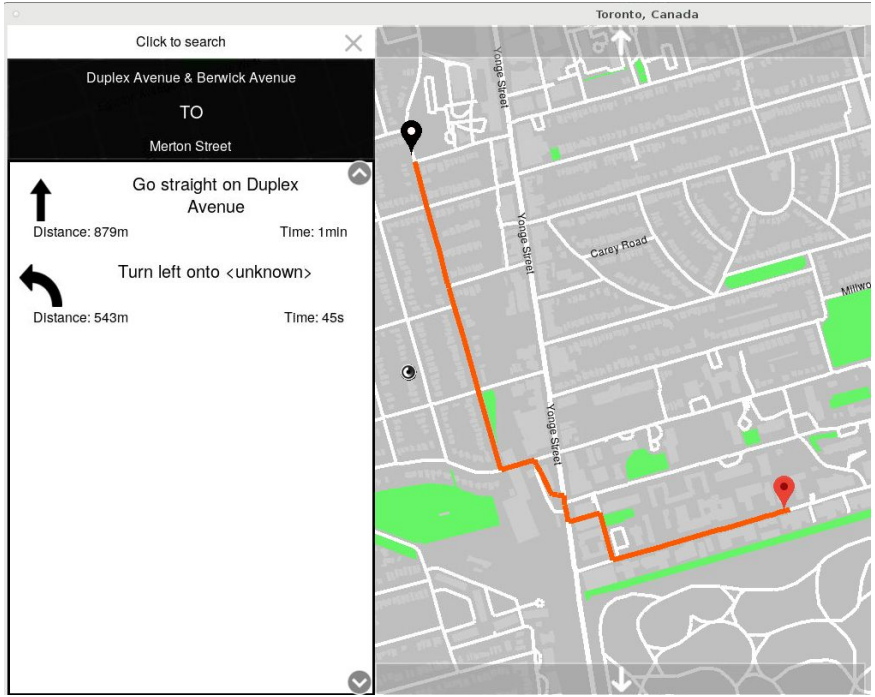
http://www.cristazone.com/packages/



A. Seffah *et al*, "Usability measurement and metrics: A consolidated model," *Software Qual J,* vol. 14, *(2),* pp. 159-178, 2006.

Efficiency of information

- Is it easy to find the information you need?



https://docs.optaplanner.org/7.4.1.Final/optaplanner-docs/html_single/index.html

Learnability

- Is it intuitive?

Learnability

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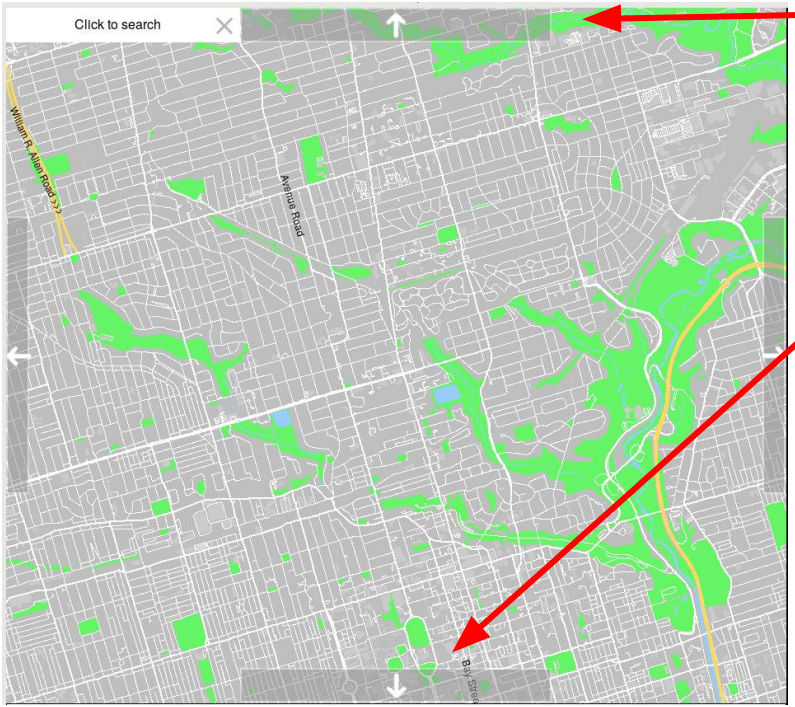
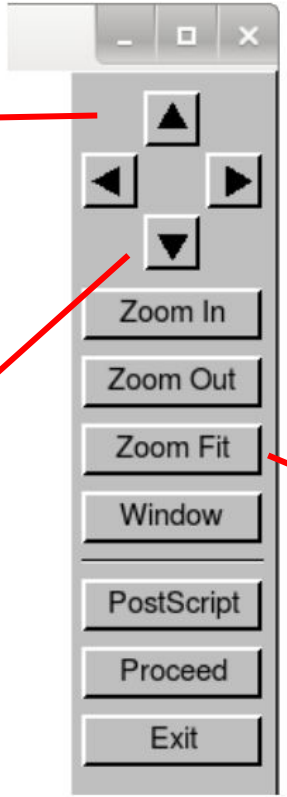




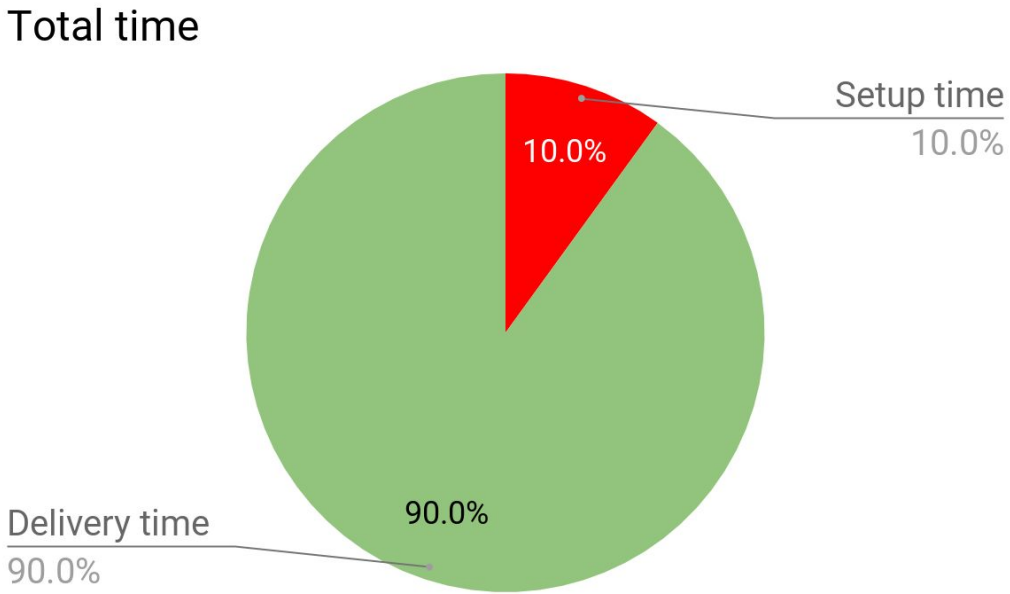
http://www.eecg.utoronto.ca/~czajkow/ece297/ECE297/assignments/easygl/easygl.pdf

Learnability

- Is it intuitive?

Productivity

- How quickly can you get going?
    - More time in GIS = Less time doing work



Productivity

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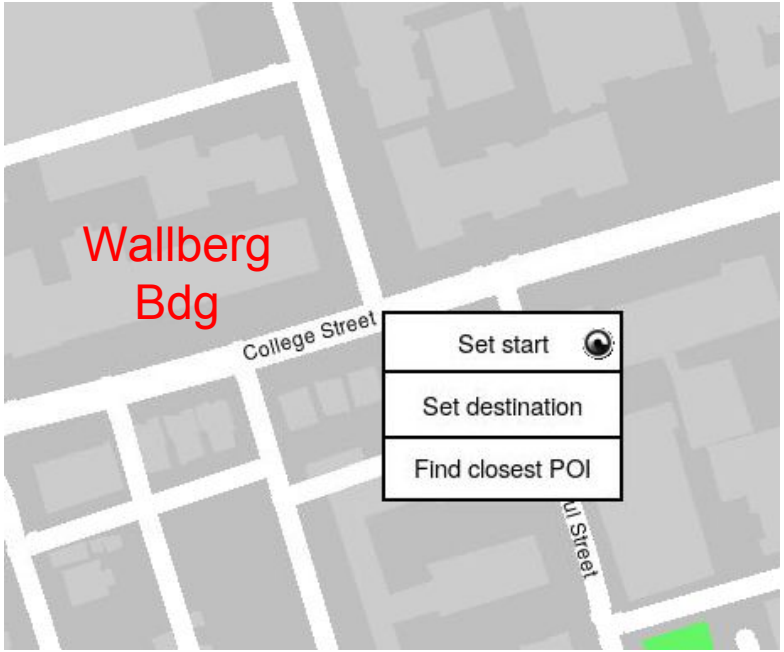

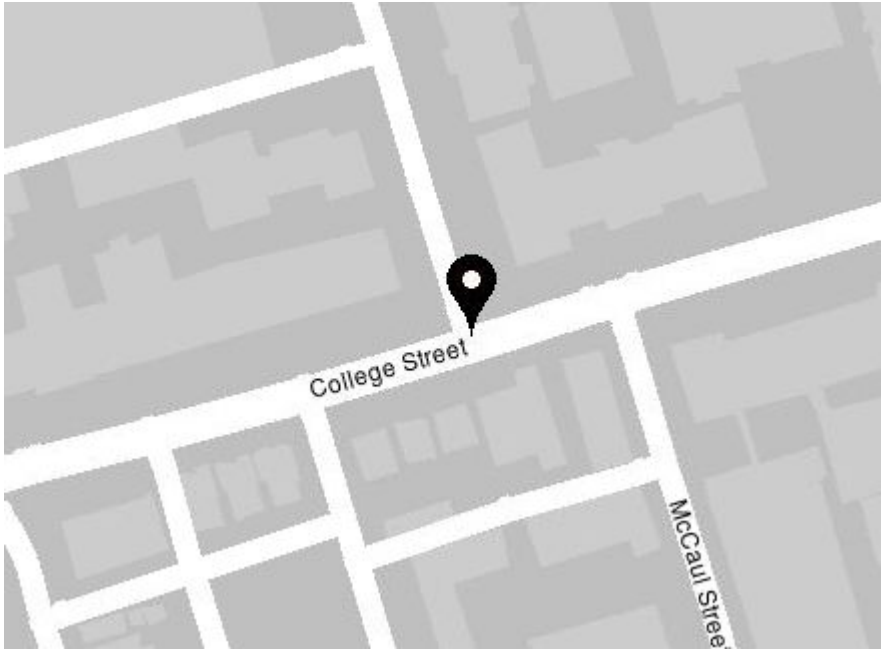

Productivity

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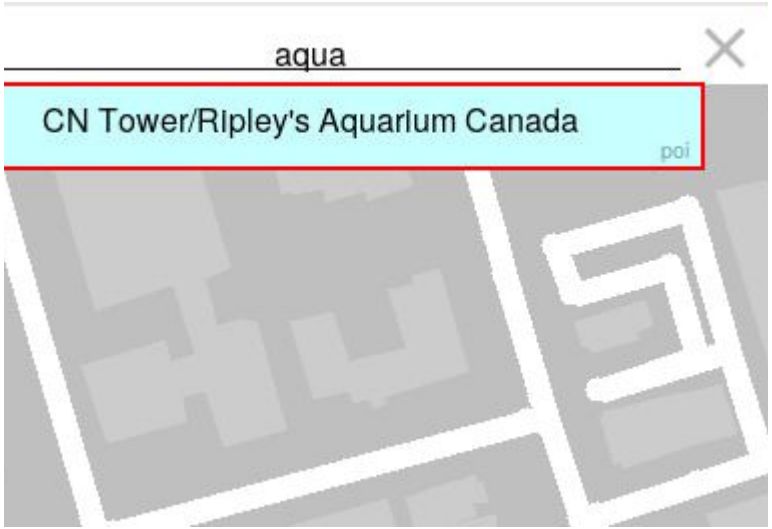

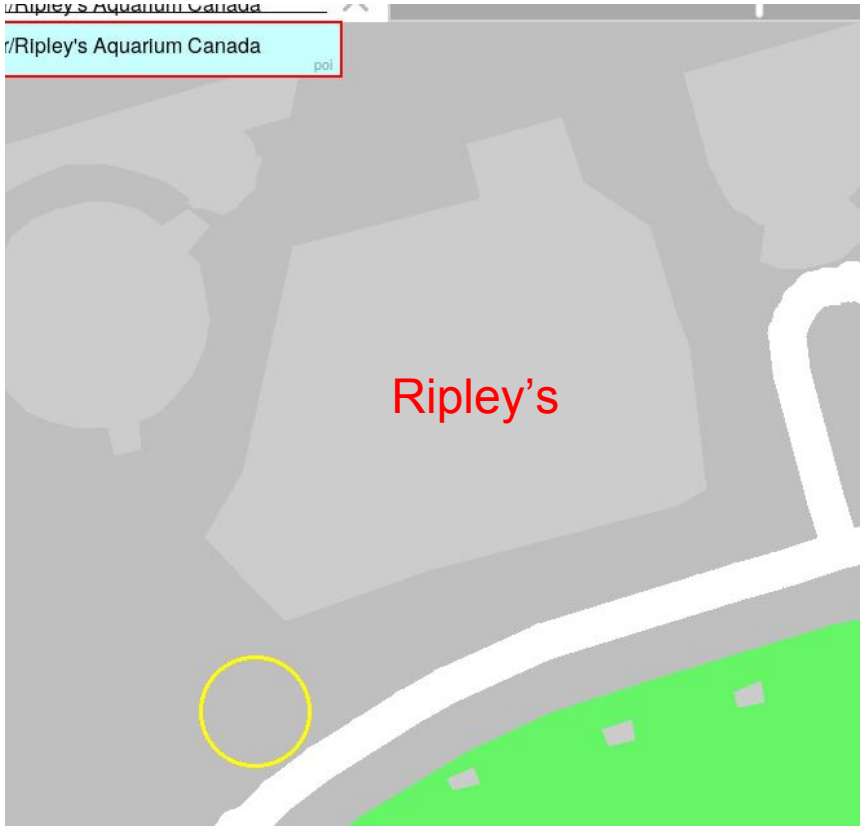

Productivity

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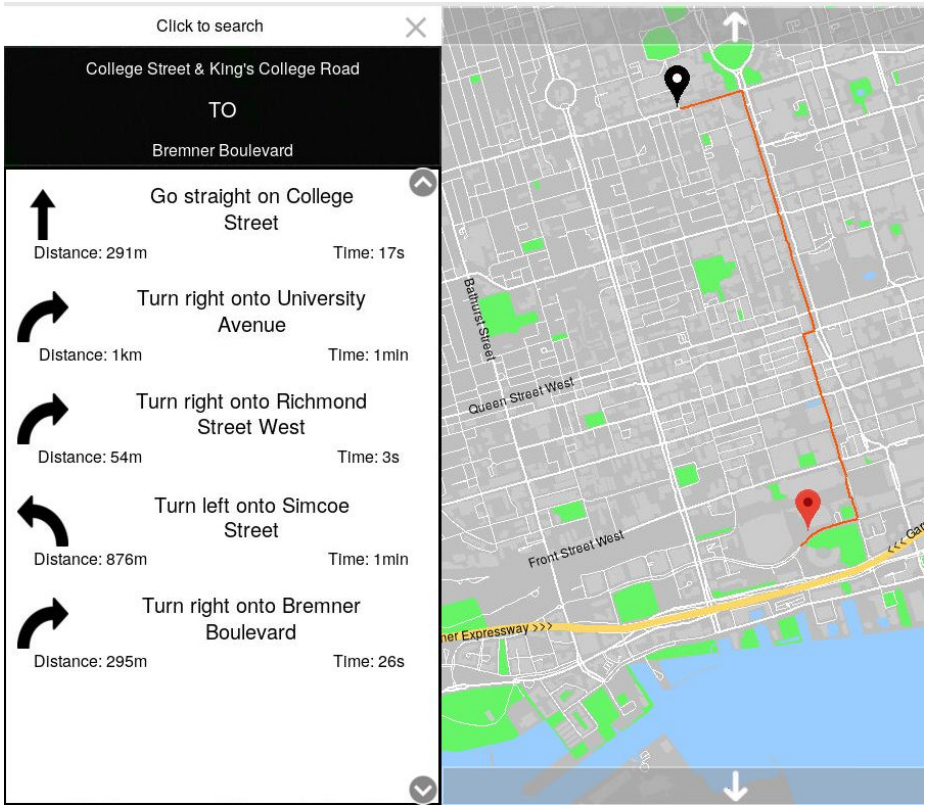
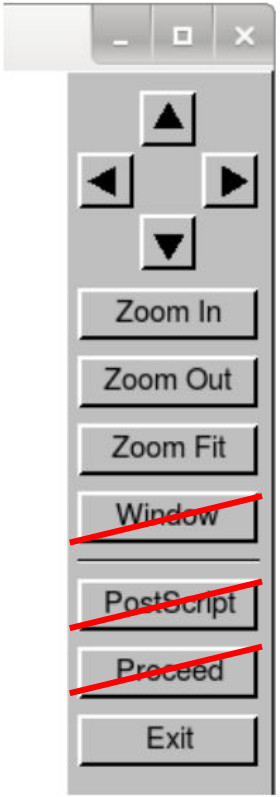


Real time demonstration

Usefulness

- Do we need it?
  - PostScript?
    - User unlikely to print
  - Same with Window and Proceed



http://www.eecg.utoronto.ca/~czajkow/ece297/ECE297/assignments/easygl/easygl.pdf

Responsiveness

- > 10 seconds
  - User loses attention
- 1 second
  - Does not break flow of application
- **0.1 seconds**
  - **User feels directly in control**

Pathage: 22fps -> 0.046 sec

J. Nielsen, *Usability Engineering.* 1993.

Milestone 3 - Point to Point Pathfinder

$$t(n) = c(n) + f(n)$$

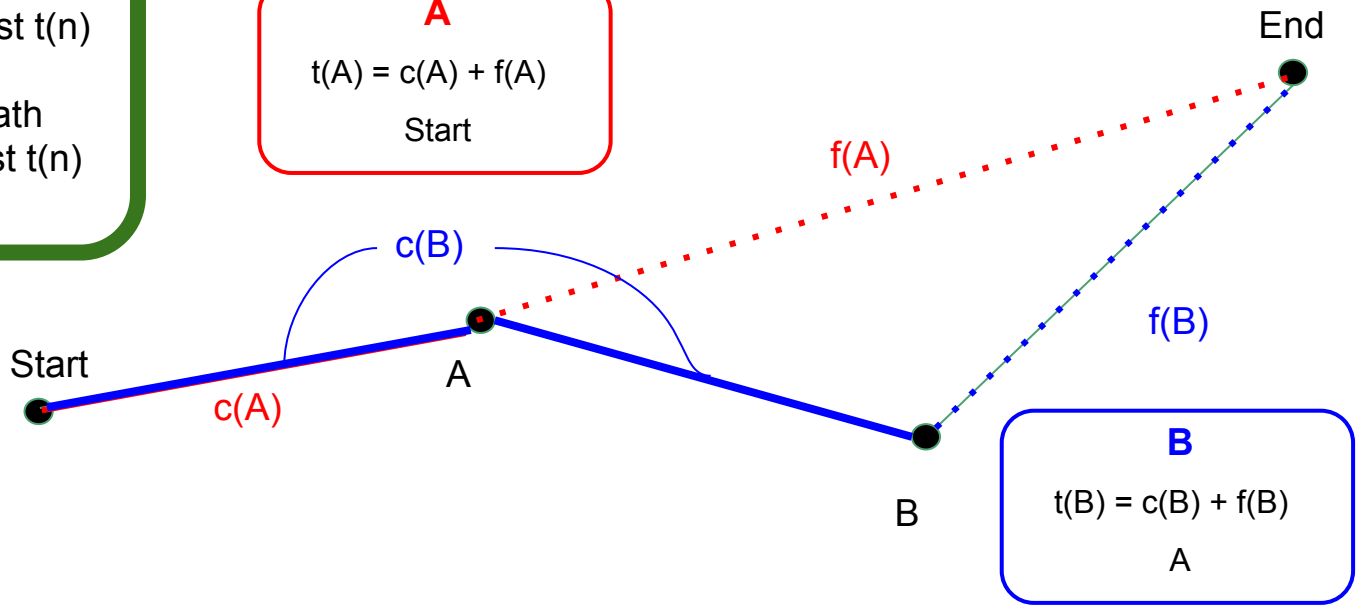
- $t(n)$: total cost
- $c(n)$: current cost from Start
- $f(n)$: future predict cost to End

Modified version of A*

Every Point

Smallest total theoretical cost t(n)

The previous point on the path which computes the smallest t(n)



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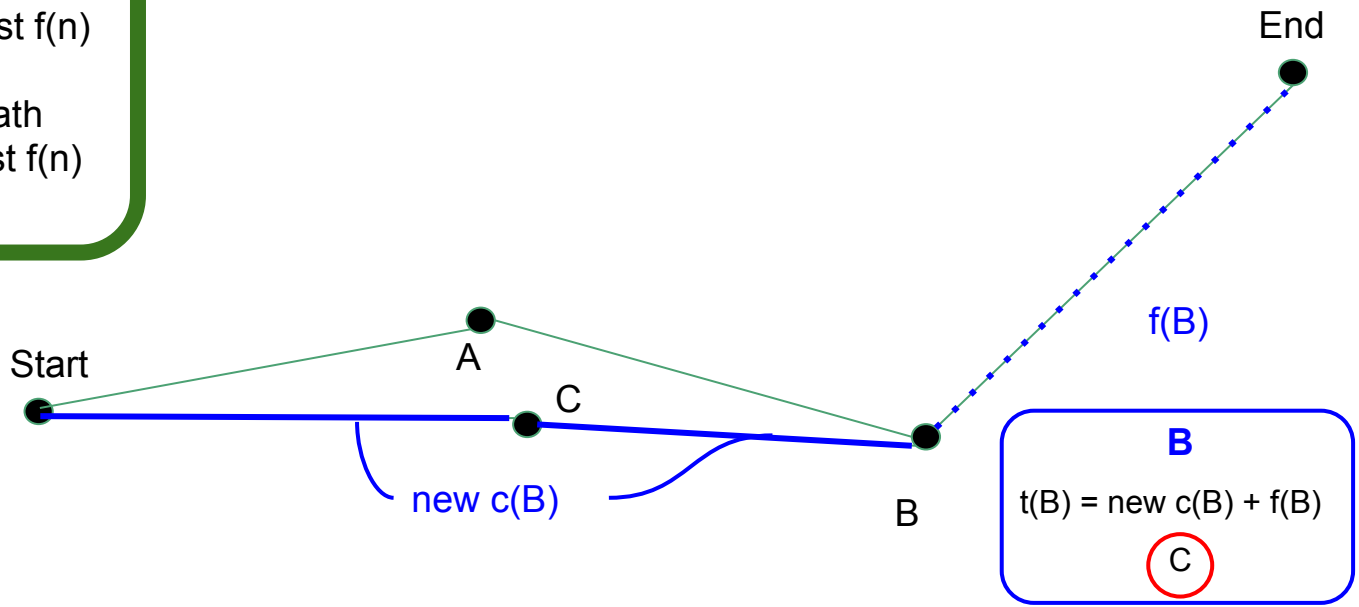
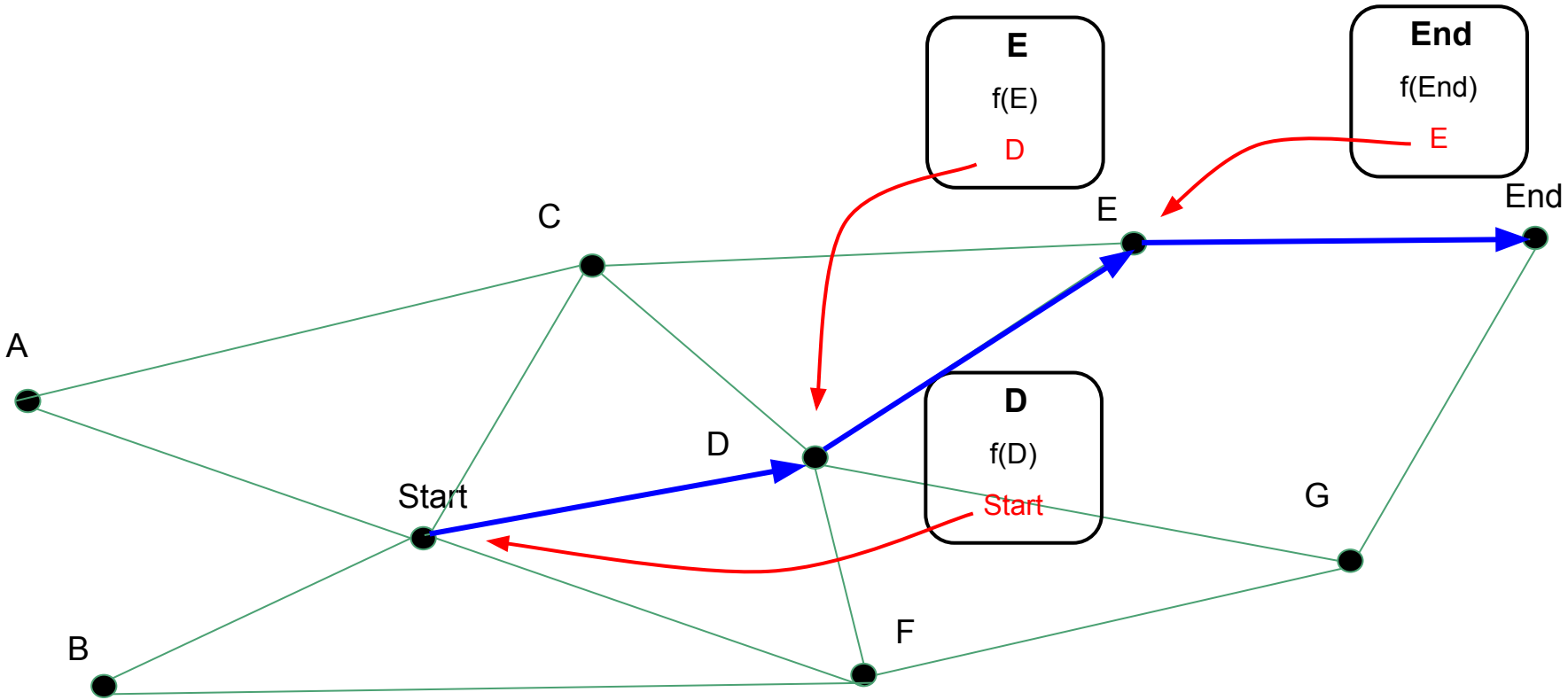
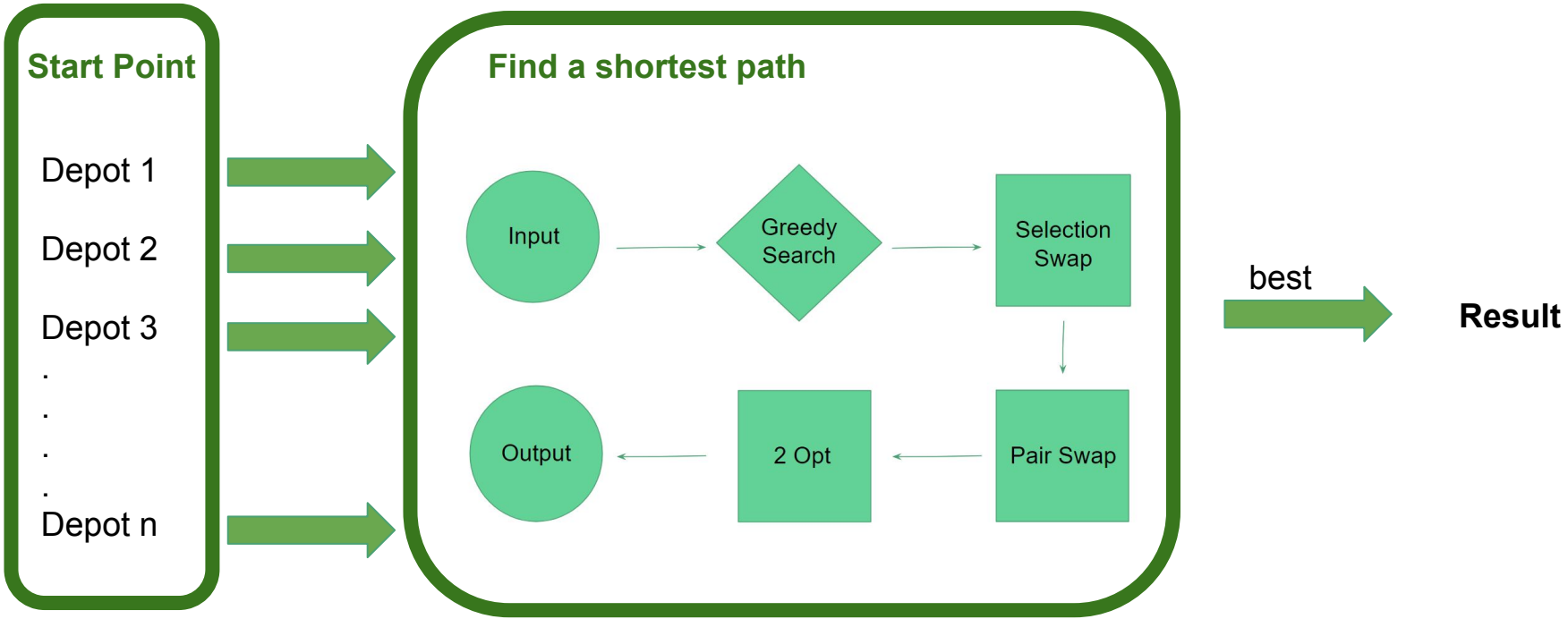


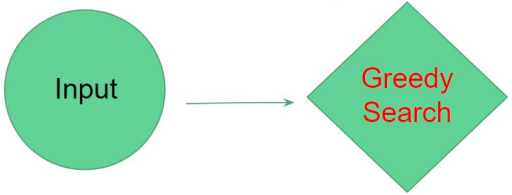
Returning the shortest path



Milestone 4 - Traveling Courier

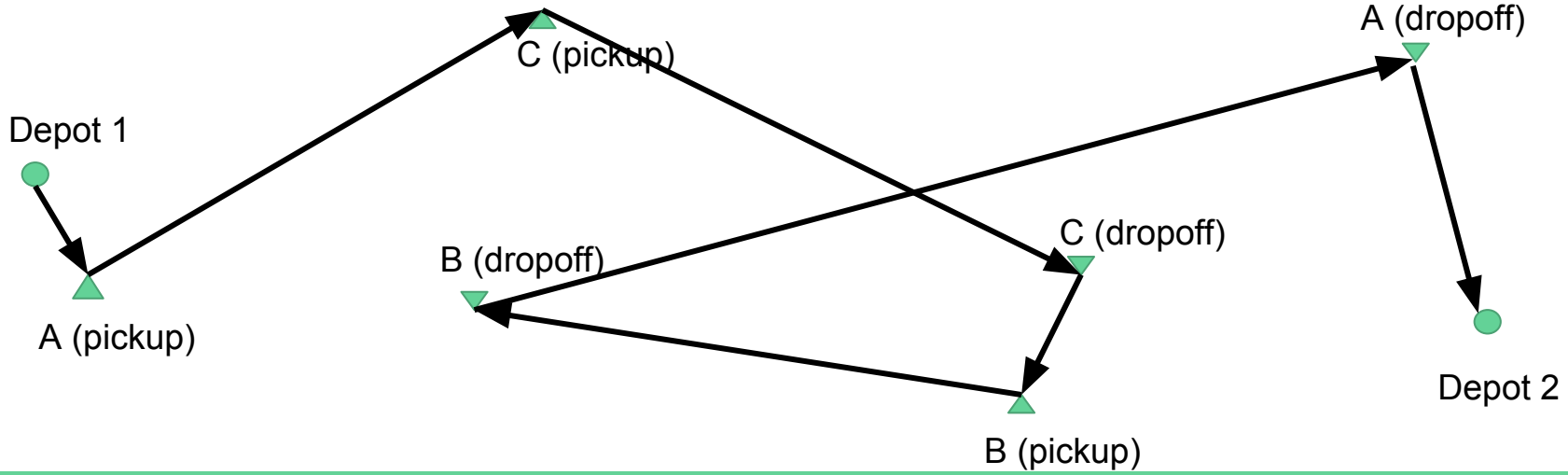


Example - Start with Depot 1



Delivery Order:

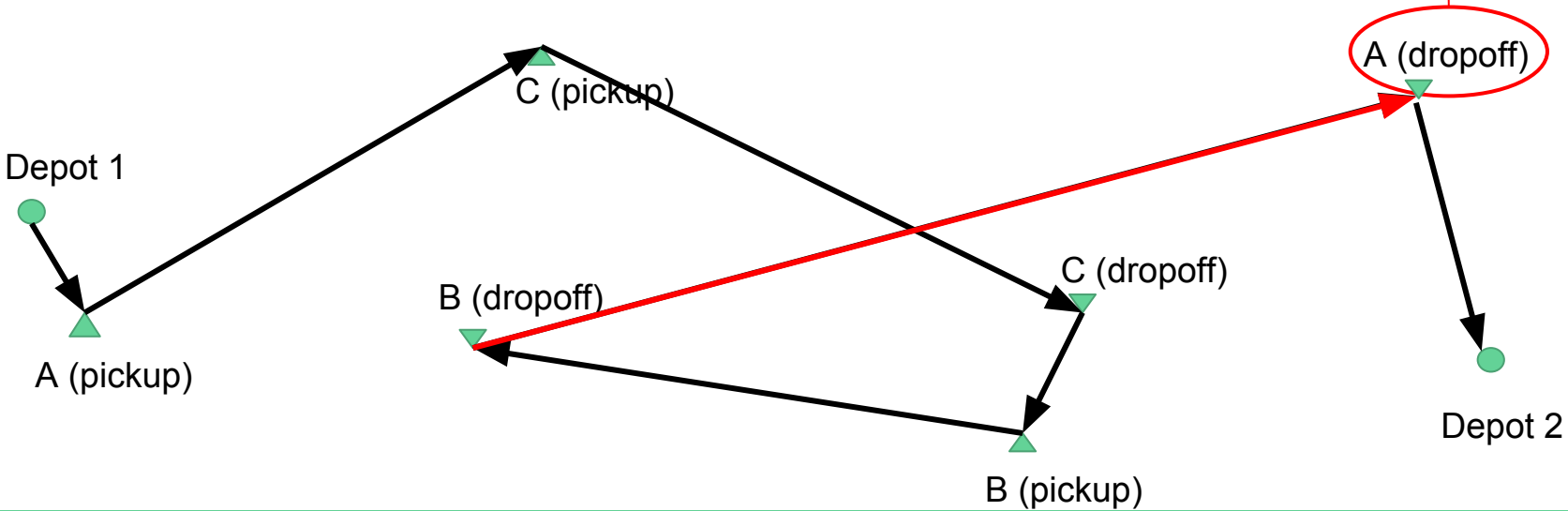
1, A↑, C↑, C↓, B↑, B↓, A↓, 2

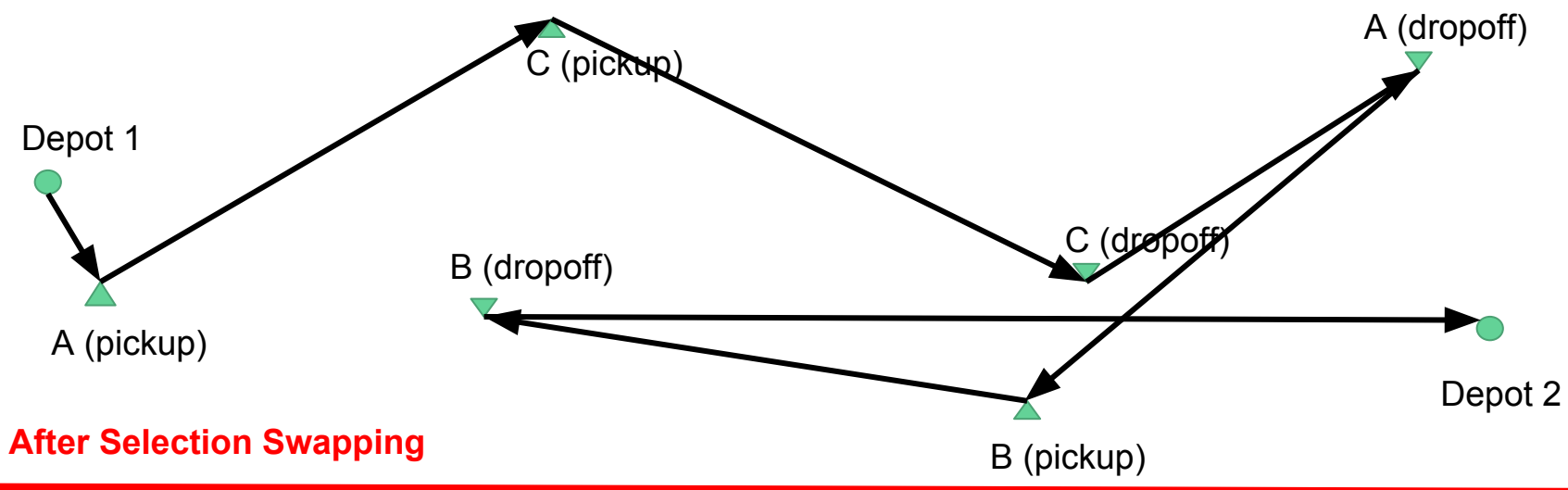


Delivery Order:

1, A↑, C↑, C↓, B↑, B↓, A↓, 2

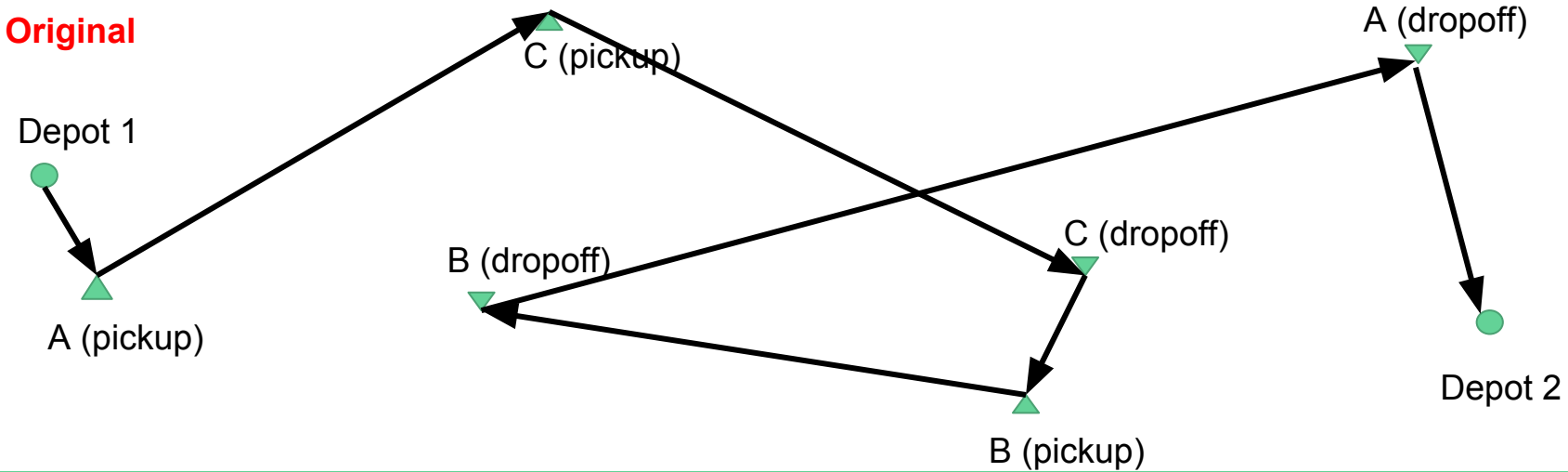
shift range

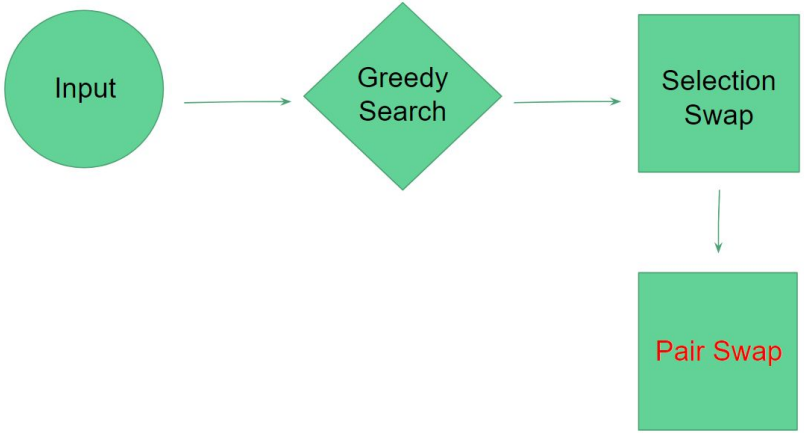




After Selection Swapping

Original





Delivery Order:

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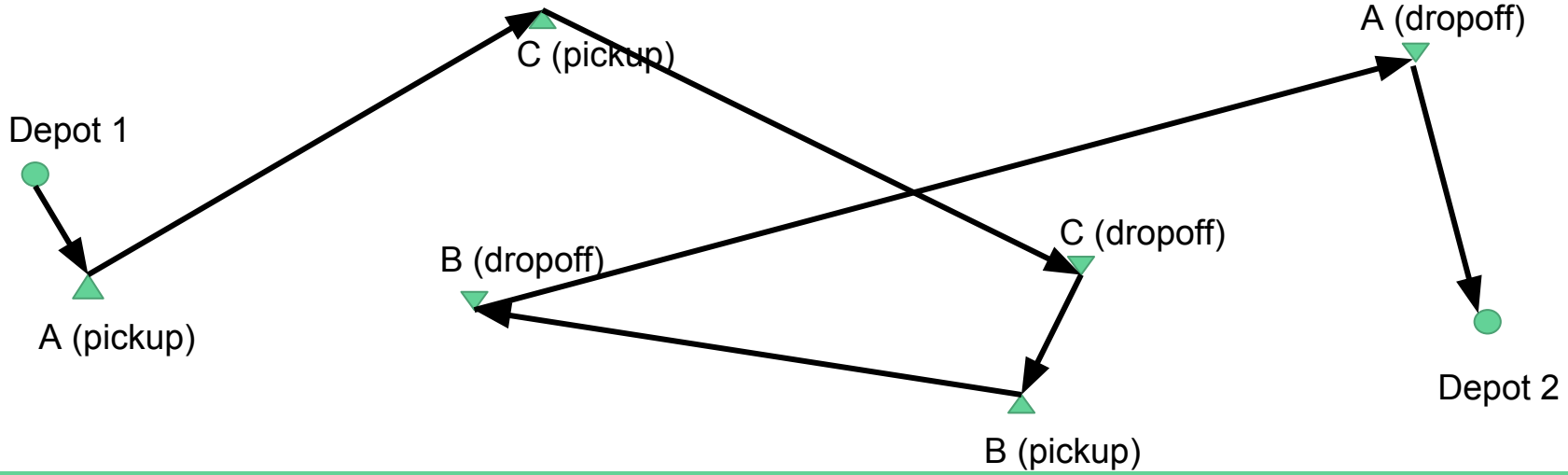
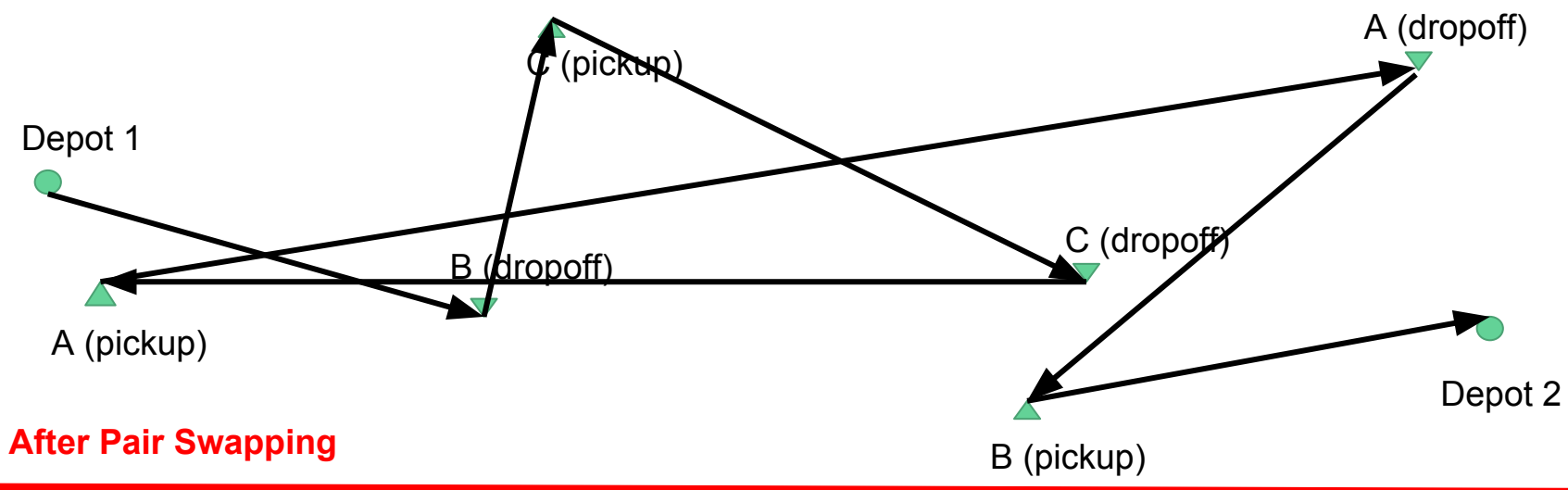
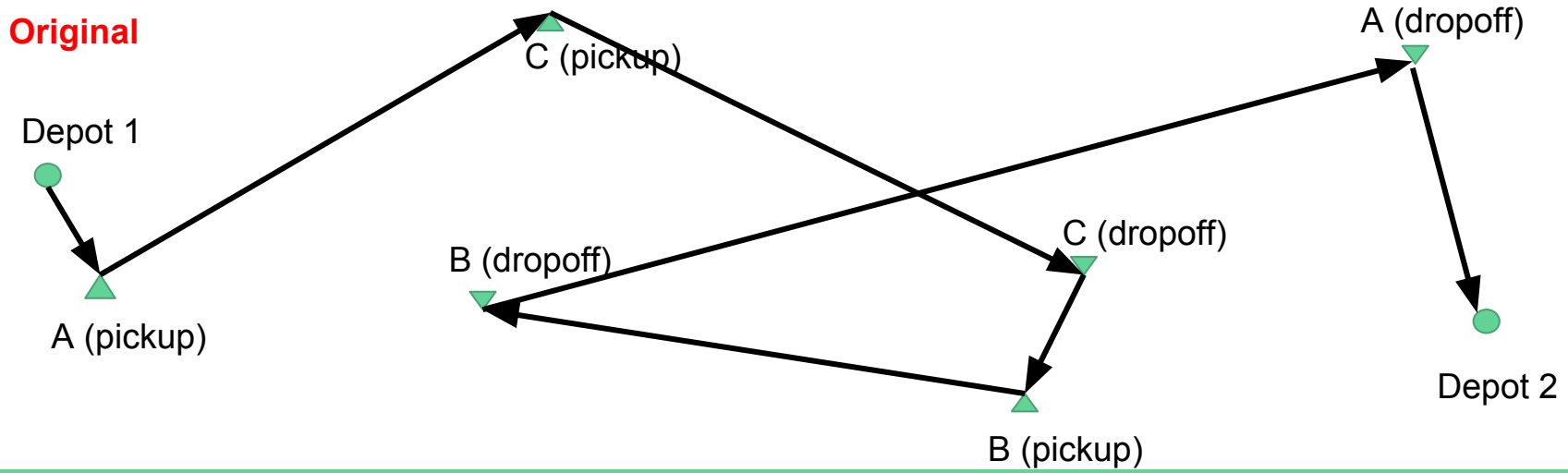
1, B↑, C↑, C↓, A↑, A↓, B↓, 2

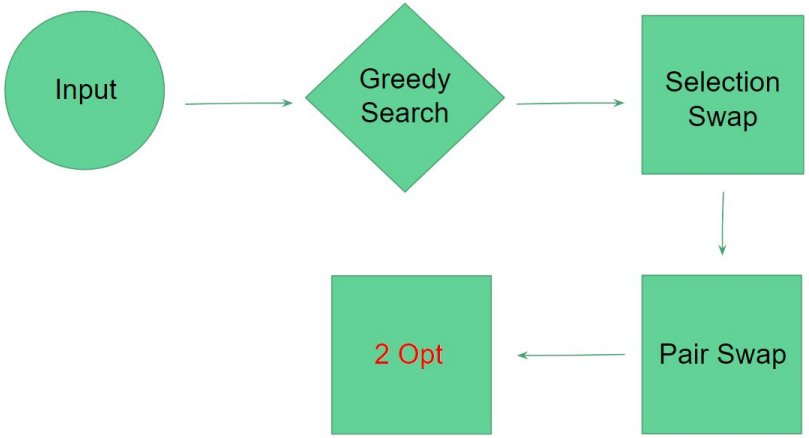




After Pair Swapping

Original





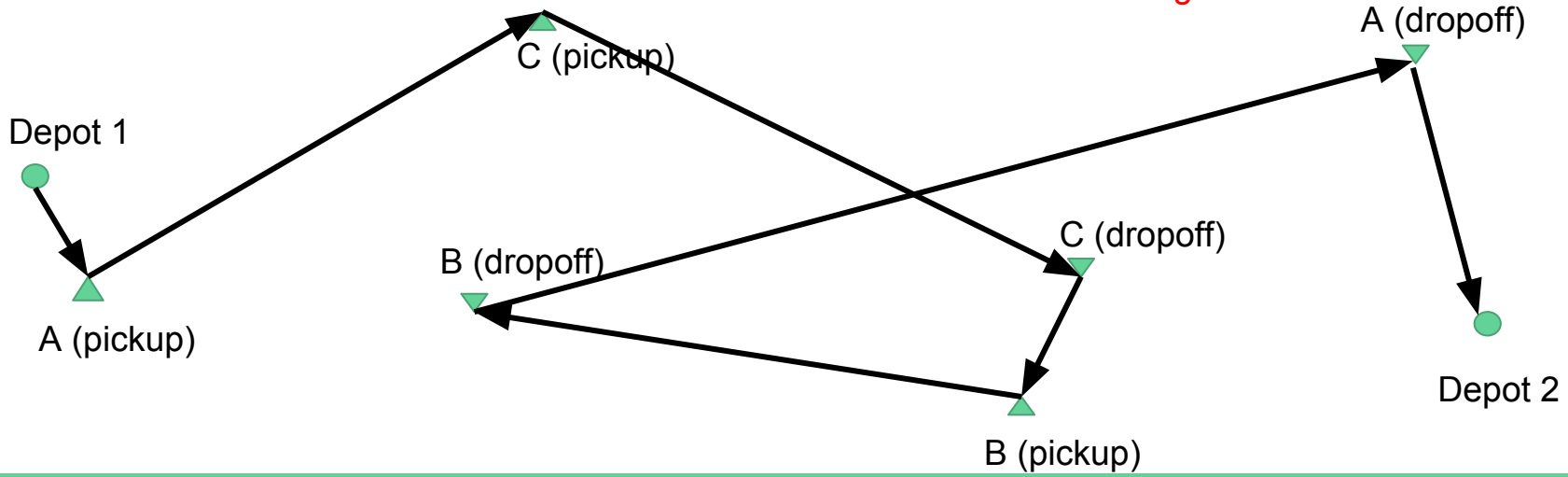
Delivery Order:

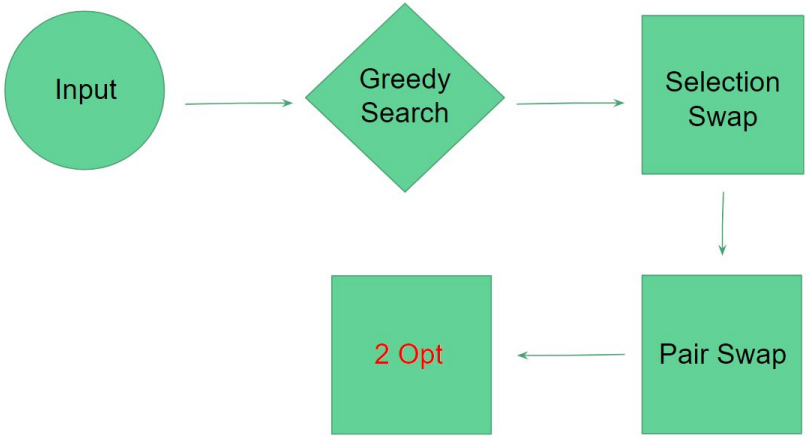
1, A↑, C↑, C↓, B↑, B↓, A↓, 2

inverse

1, A↑, B↑, C↓,C↑, B↓, A↓, 2

not legal





Delivery Order:

1, A↑, C↑, C↓, B↑, B↓, A↓, 2

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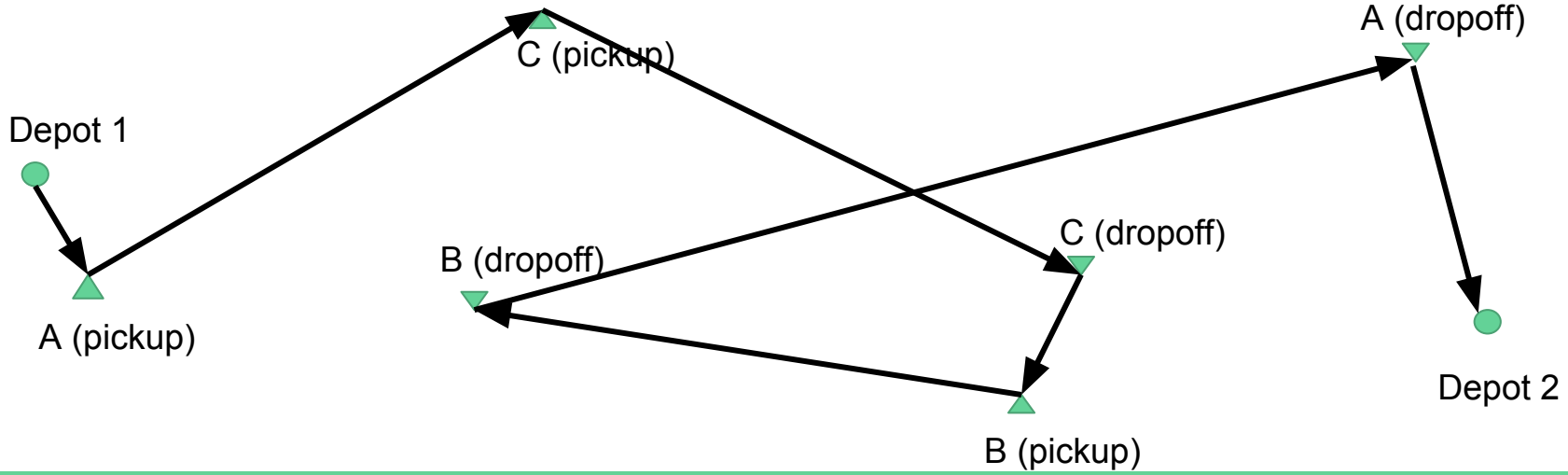
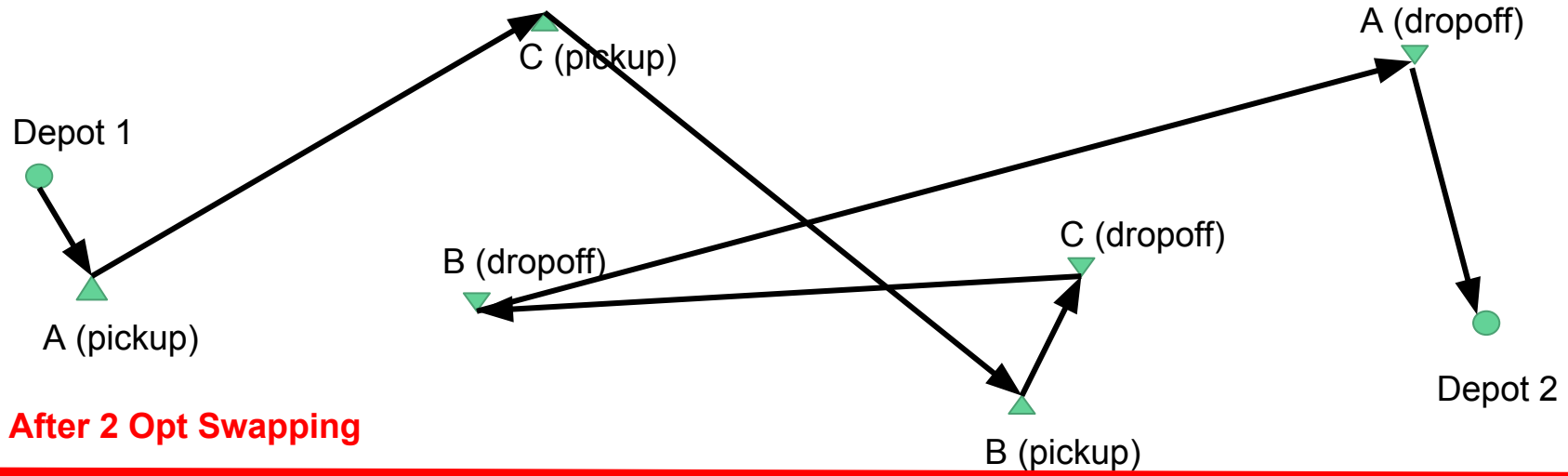
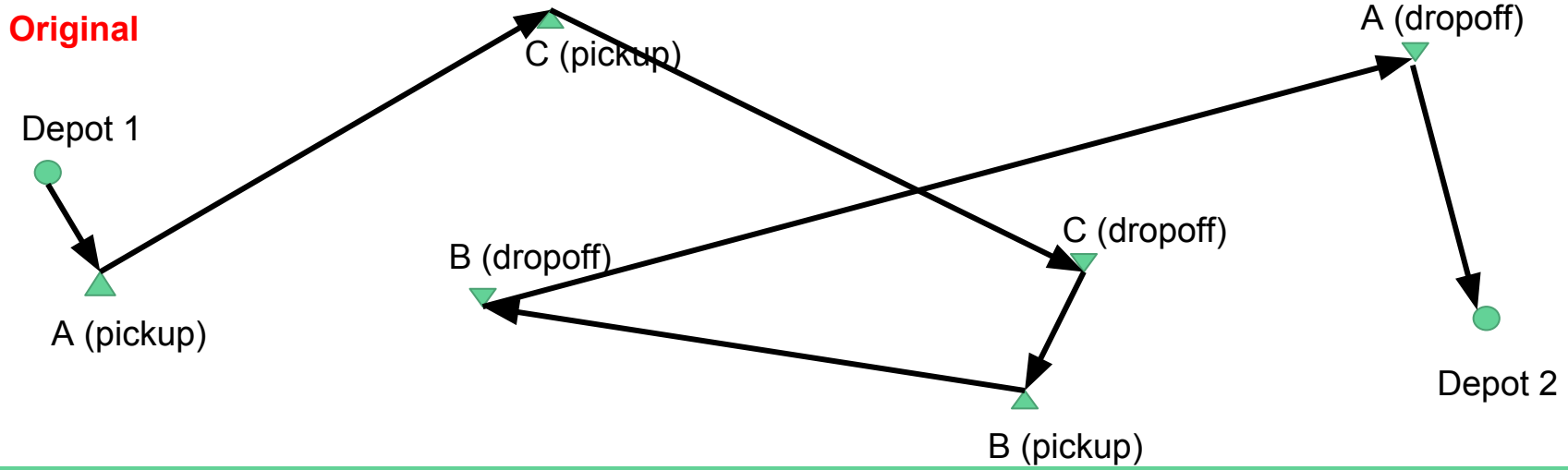
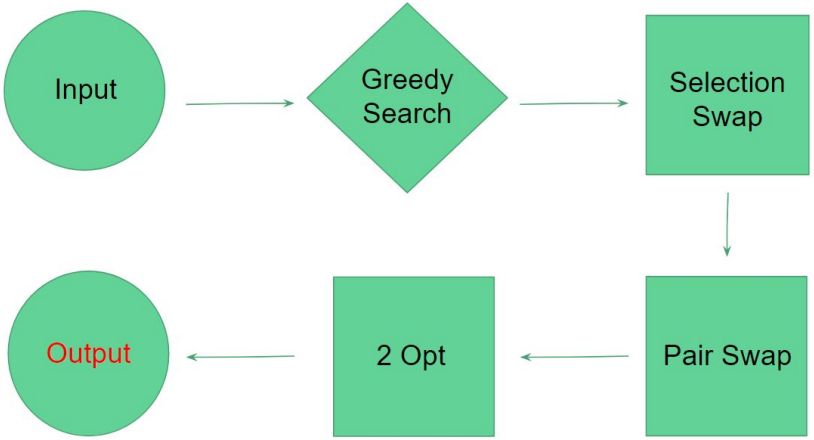




After 2 Opt Swapping

Original





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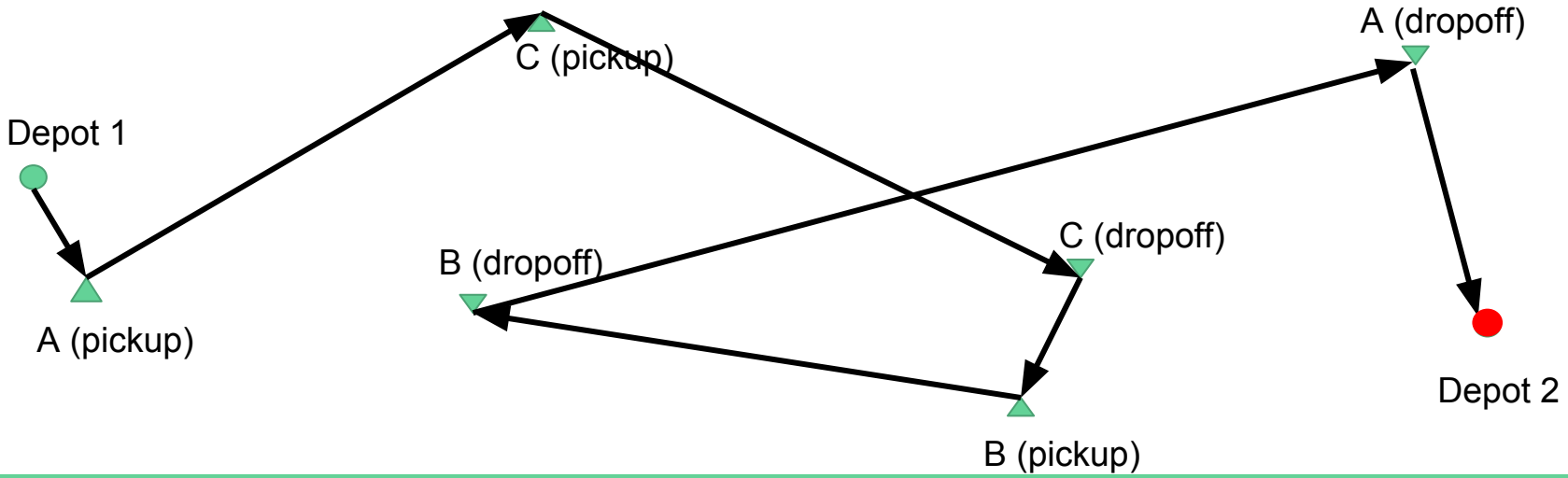
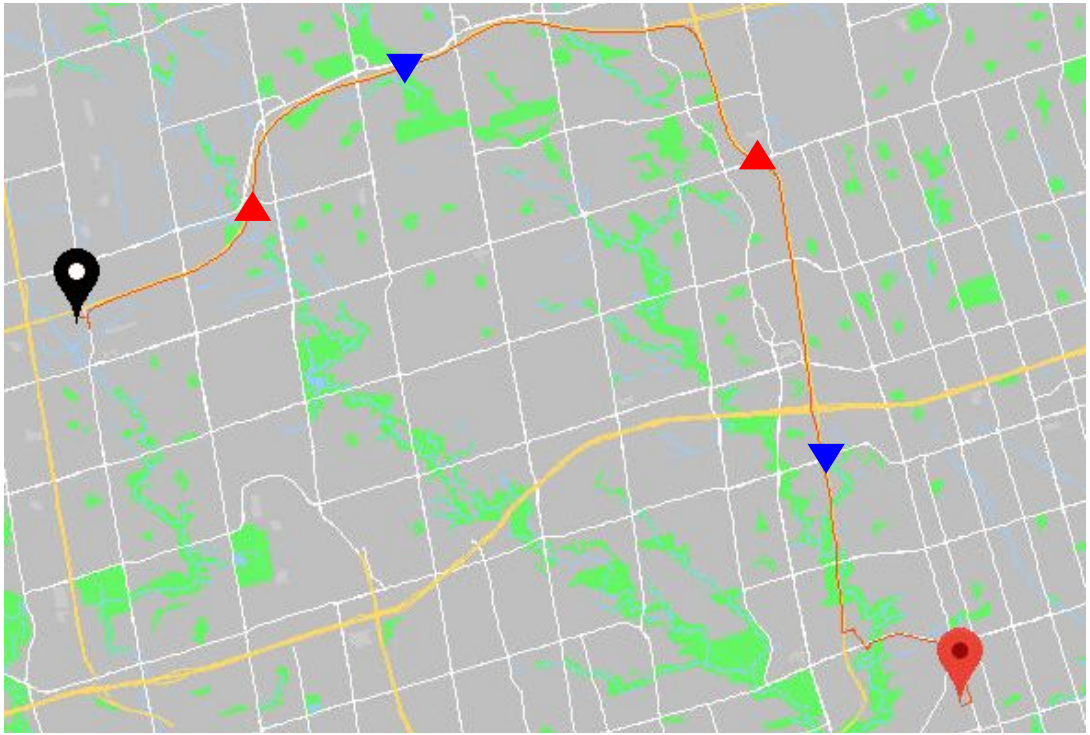
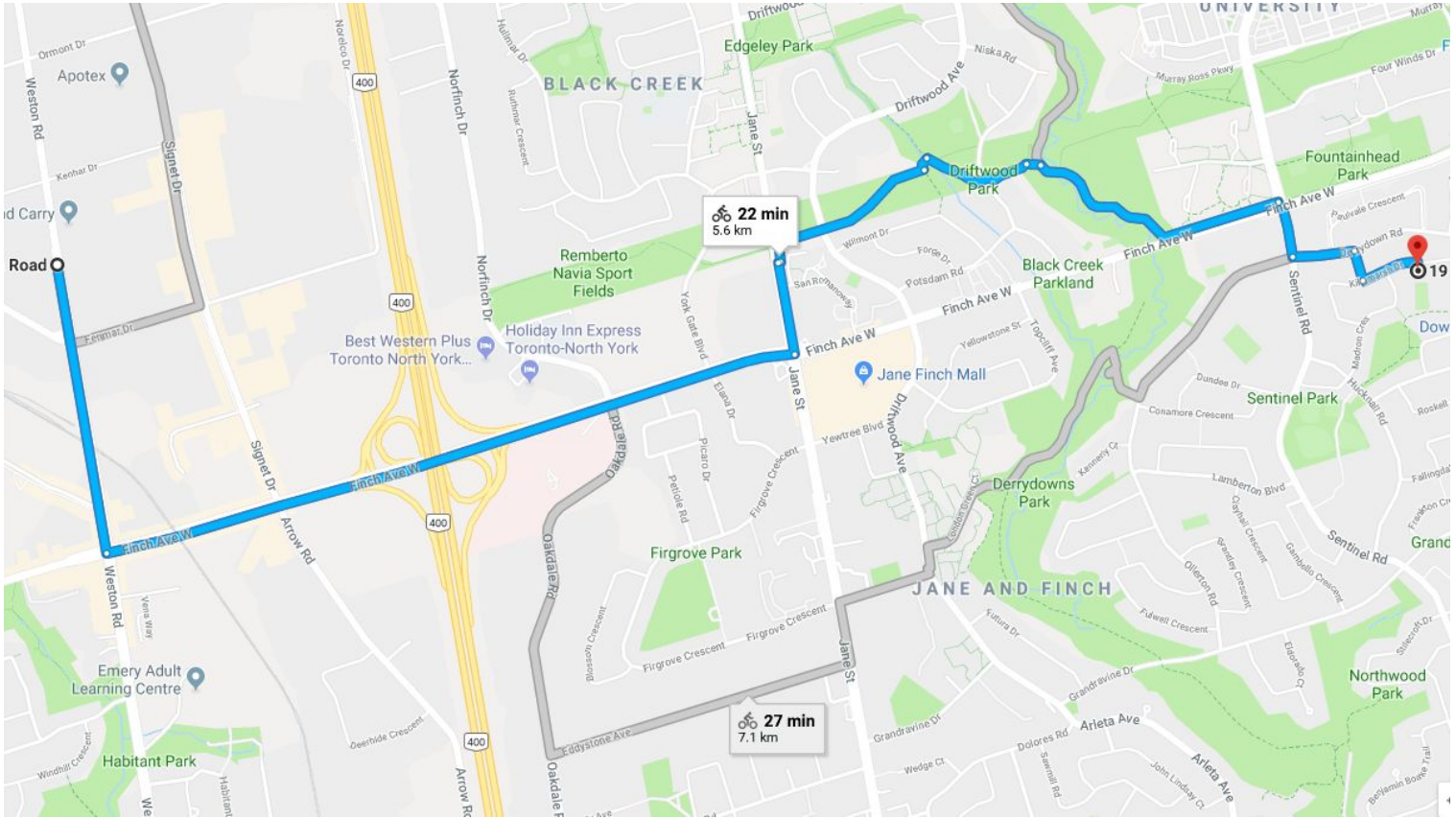
1, A↑, C↑, C↓, B↑, B↓, A↓, 2



Traveling Courier Outcome Example

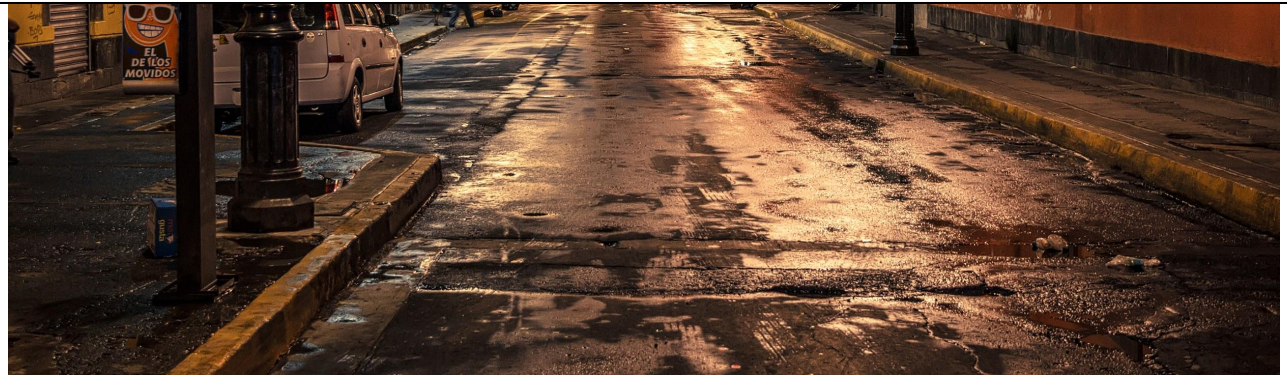


Once Sophie gets off work...



Once Sophie gets off work…

Problem: Navigation only considers most efficient path



iivangm / Instagram

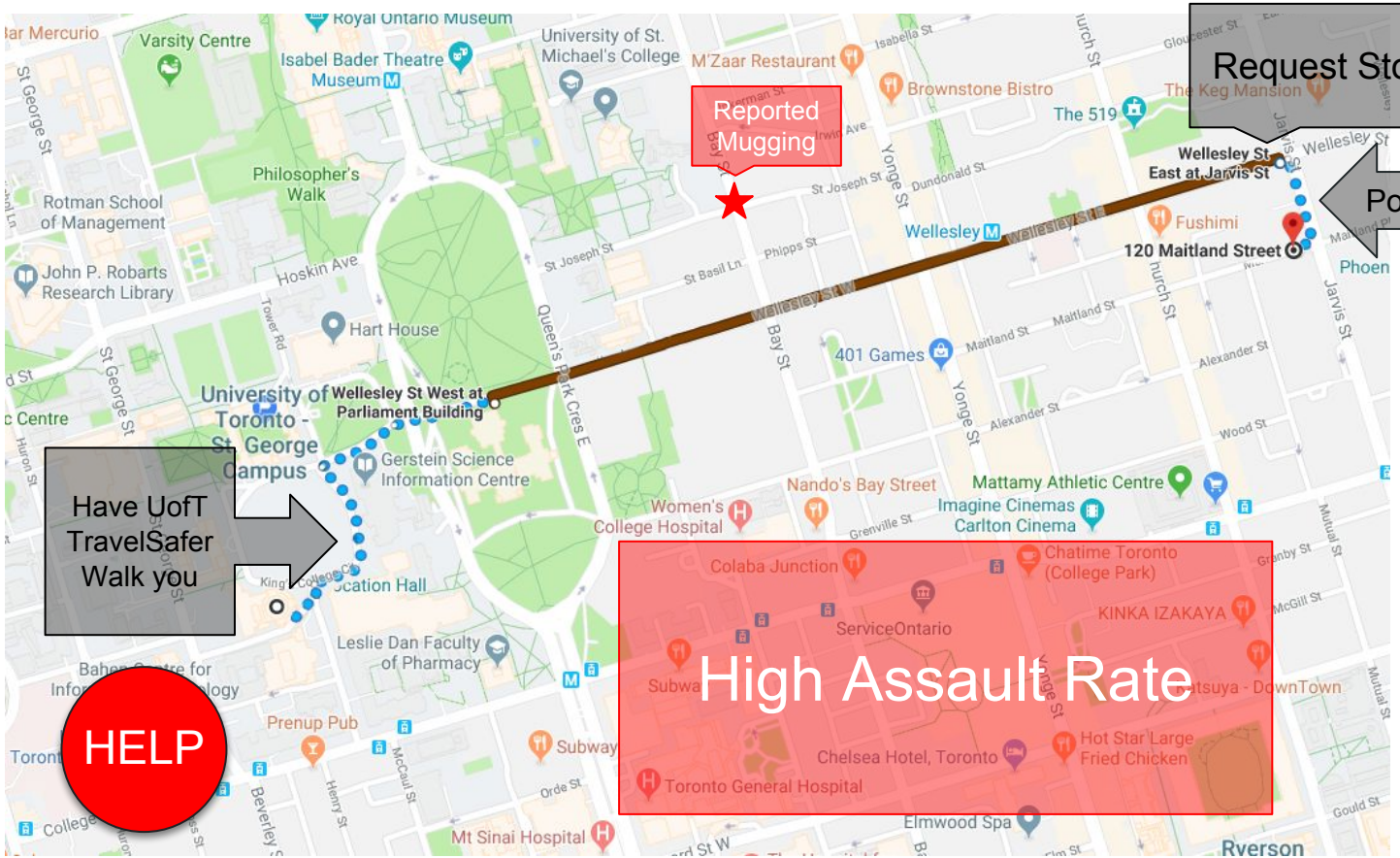
How can we help Sophie stay safe?

https://www.gtaust.com/news_item/category/live/id/431/White%20Night%20Festival%20Celebrates%20the%20Arts%20with%20Nexo,%20DiGiCo%20&%20RCF

http://www.cbc.ca/toronto/features/crimemap/

https://www.amazon.com/Boating-Sports-Safety-Effective-Shoreline/dp/B018Y6U3ZS

Navi-Safe integrates all these features together



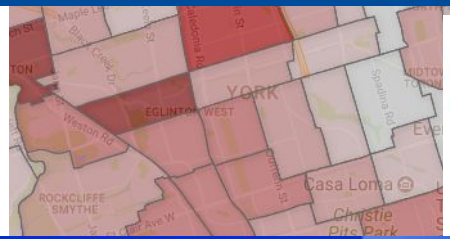
Modified from Google Maps

A user interface designed for usability

Navi-Safe navigation is like Pathage navigation

Integrating with other systems is a new challenge

Ryerson University



Toronto Police Twitter

TTC

UNIVERSITY OF TORONTO

YORK UNIVERSITÉ UNIVERSITY

http://www.cbc.ca/toronto/features/crimemap/

Take-Away

8:00 AM | 5:00 PM | 10:00 PM

Pathage | Navi-Safe

Working hours

https://www.shutterstock.com/video/clip-4376276-stock-footage-delivery-courier-woman-giving-package-wearing-blue-uniform-woman-courier-smiling-happy-on-white.html

After hours

https://economictimes.indiatimes.com/magazines/panache/looking-for-a-new-job-how-about-shopping-for-someone-else-at-rs-25000-per-day/articleshow/60188028.cms

Q & A