Augmented Resource Allocation Framework for Disaster Scenarios

Final Presentation - Luke Guerdan

Overview

1. Problem Motivation
2. Background
3. Previous Works
4. Solution
5. Methodology
6. Experimental Results
7. Conclusion

Disaster Resource Allocation: Motivation

How can we leverage?

Centralized information storage

Human knowledge of the situation

Dynamic routing algorithms

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- fire

Patient
- Inj

Incide
- Mal

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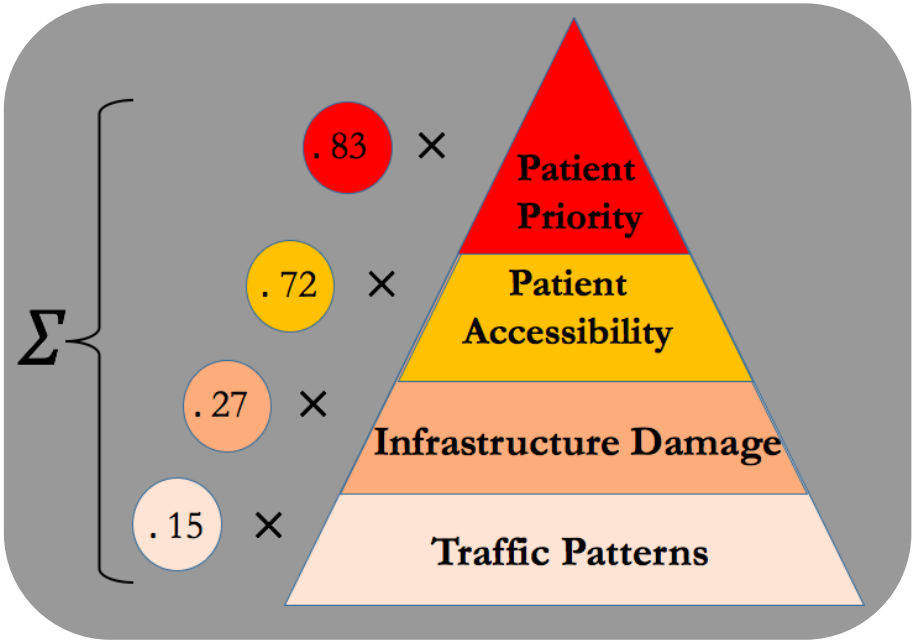
Related Work: Analytic Hierarchy Process

- Each factor in response ranked by importance
- Importance determined by expert in disaster management

Problems:

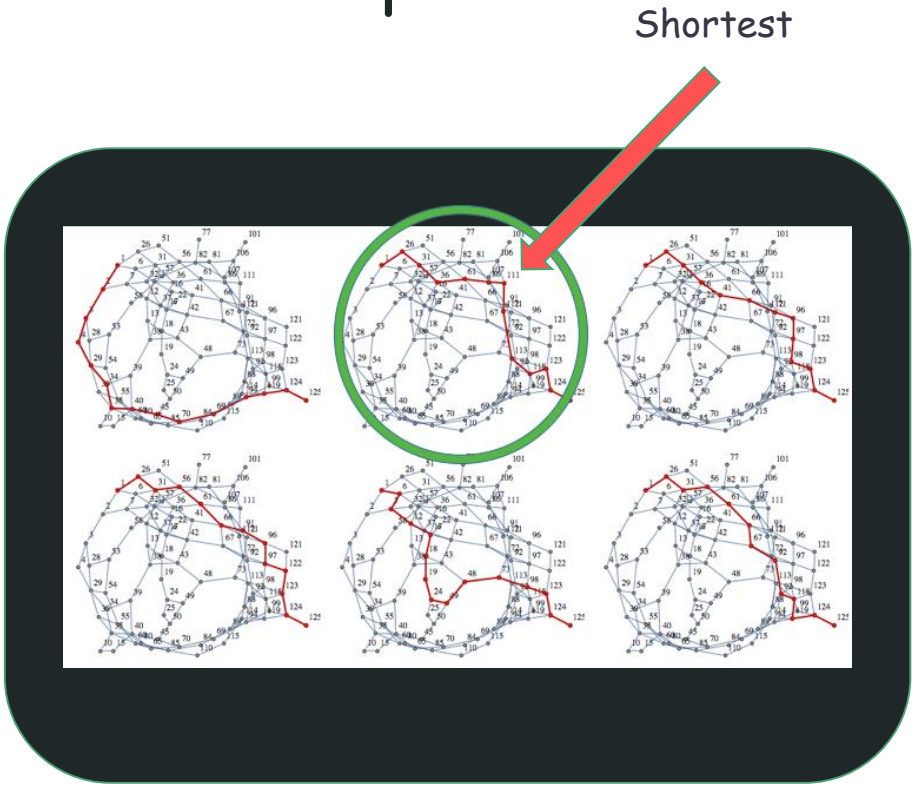
- Requires manual configuration each emergency
- Priority changes
- Different for each emergency



Related Work: K shortest paths

- Uses Dijkstra's shortest path algorithm
- Multiple 'short' paths generated

- Short paths determined by
  - Infrastructure damage
  - Patient priority
  - Accessibility

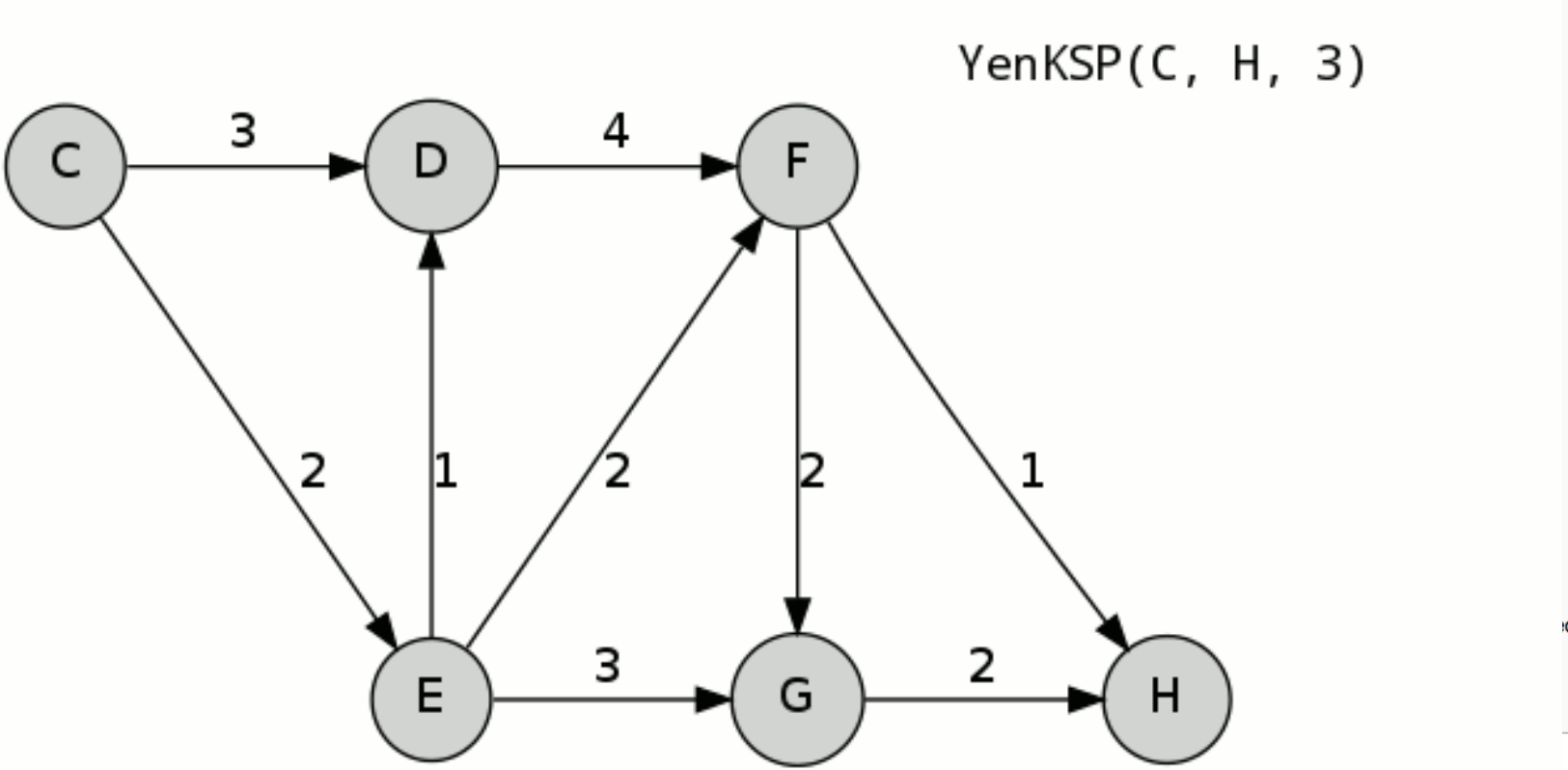


Definitions:

- **G(V, E)**: weighted directed graph, with set of vertices **V** and set of directed edges **E**,
- **w(u, v)**: cost of directed edge from node **u** to node **v** (costs are non-negative).

Links that do not satisfy constraints on the shortest path are removed from the graph

- **s**: the source node



dge **(u, v)** to path $\mathbf{P_u}$

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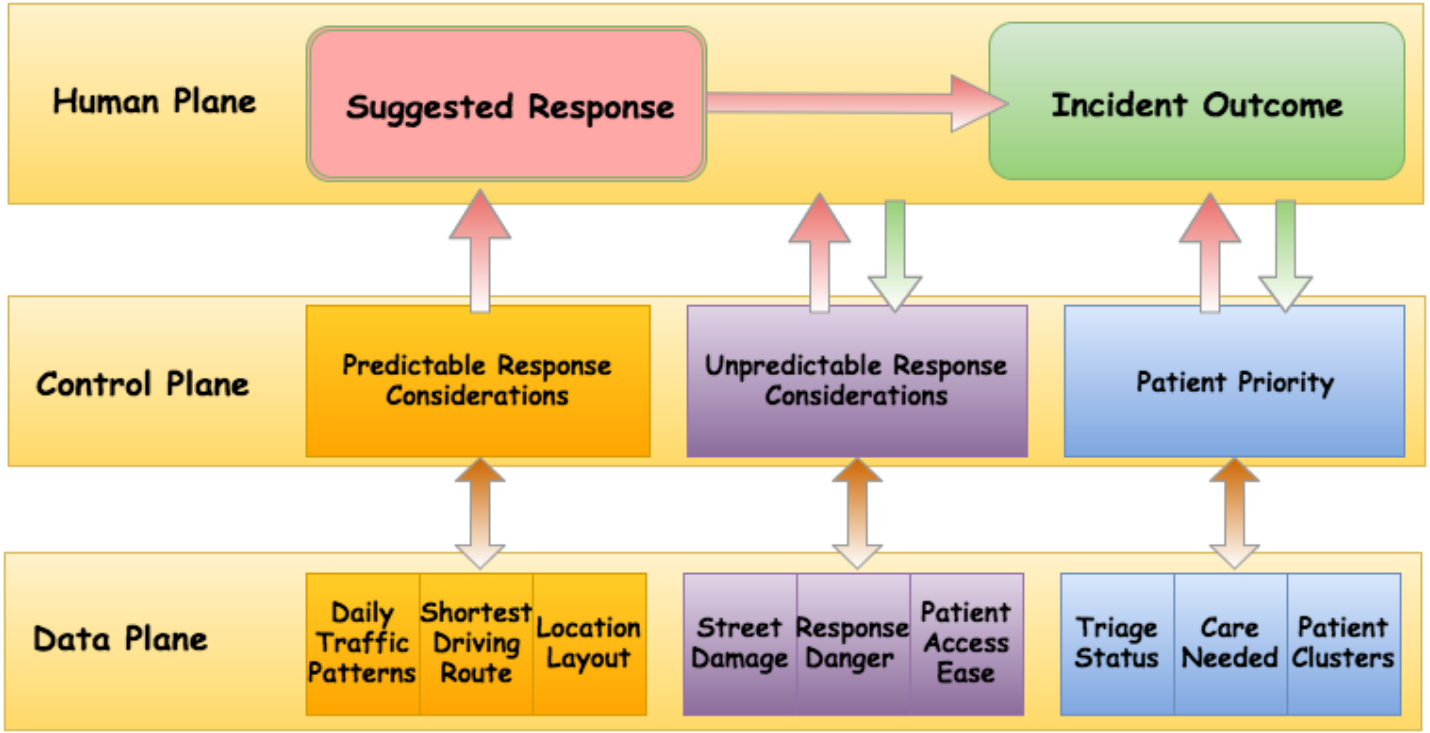
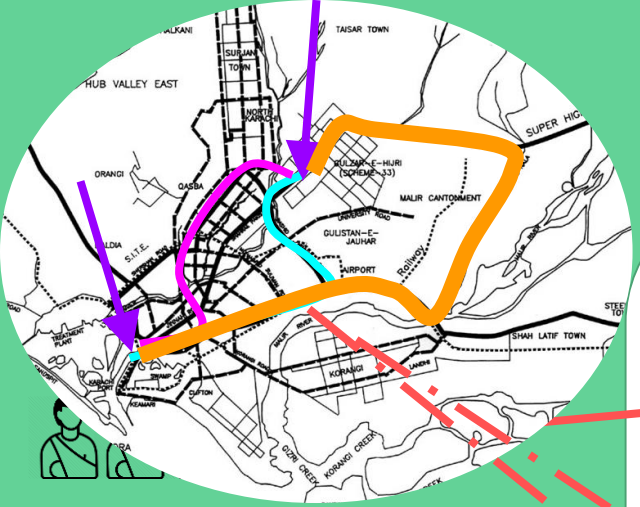
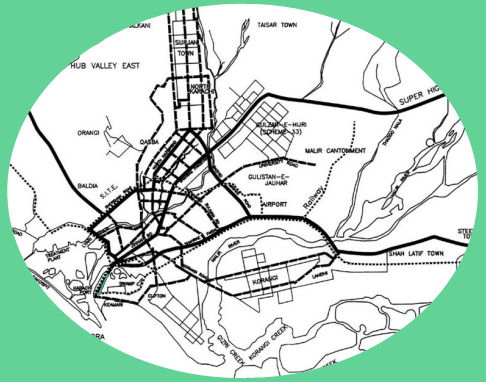
Augmented Resource Allocation







Augmented Annealing Algorithm

input : patient priority queue (P), road network matrix ($R.N.$)
output: shortest path matrix
$R.N.$ ⟵ initial $R.N.$ costs;
while P *is not* ∅ **do**
  Patient ← dequeue highest priority P;
  recommended ⇐ `KDijkstra(`$R.N$,*Patient*`)`;
  present possible paths to Incident Commander;
  if *other than shortest selected* **then**
    decrease_weights ⟵ longer path set minus shorter path;
    increase_weights ⟵ shorter path set minus longer path;
  else
    keep $R.N.$ constant;
  end
end

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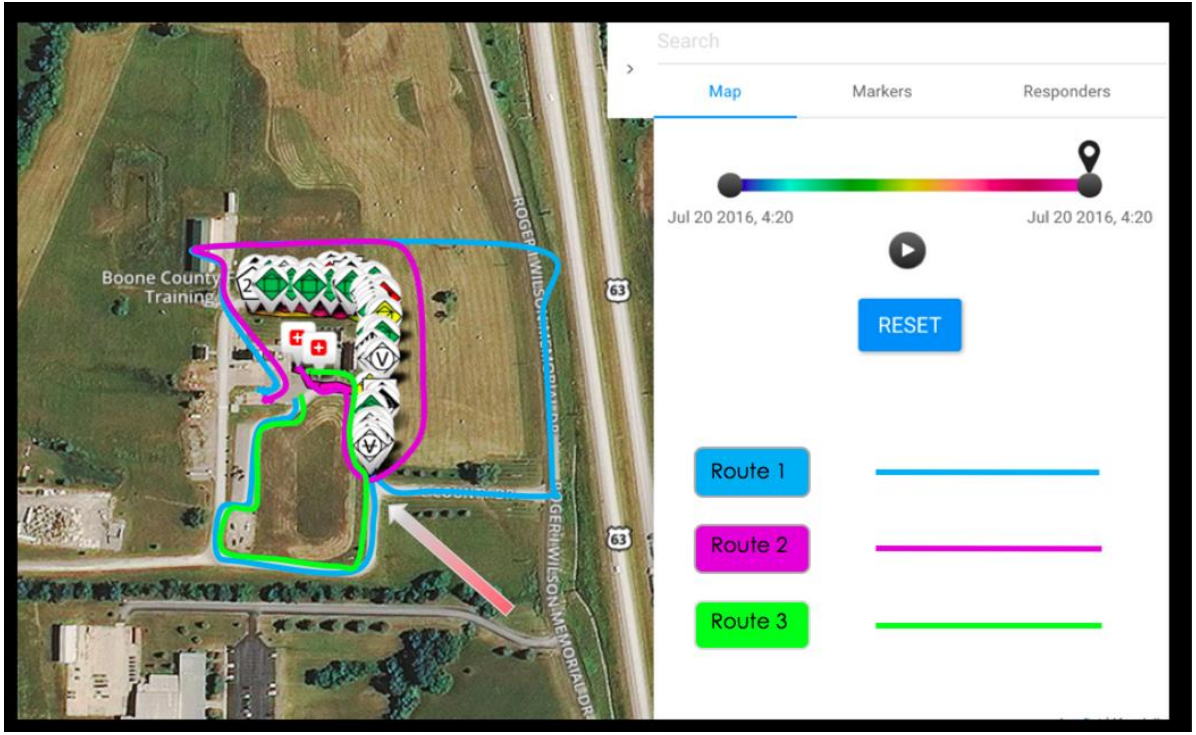
Panacea's Cloud



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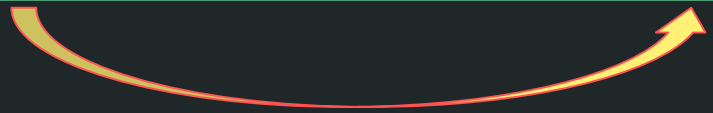
Conclusion

- Disaster's becoming more common
- Highly reliant on technology and internet access
- Need to adapt new innovations to disaster situations

- We've now established platform for future work
- Make Panacea's Cloud more robust
- Leverage progress for future intelligent decisions



Panacea's Cloud

Thank You!

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