Project Planning

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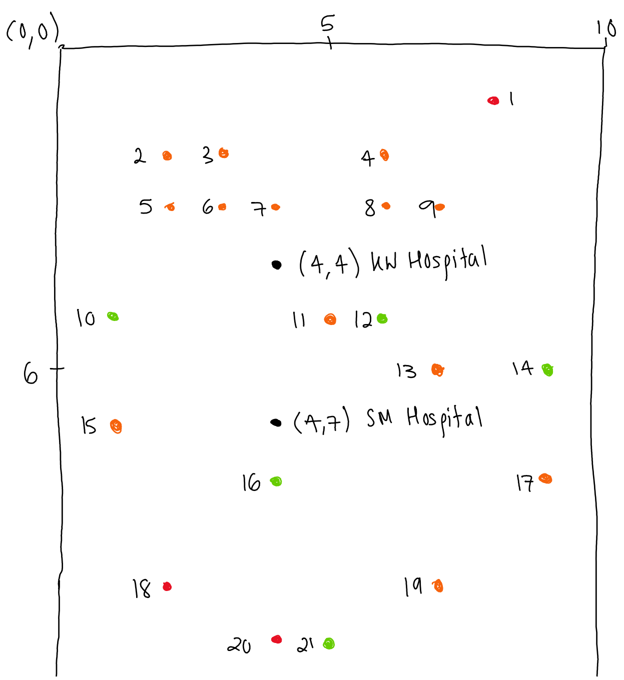
Demand Model:

Assumptions:

- demand is constant
  - • severe patient
  - • moderate patient
  - • low severity patient
- Kitchener-Waterloo demand can be captured by the following 10km × 13 km grid (based on demand data online)
- resource allocation in order of node number
  - • closer ambulance, farther ambulance, closer ERV, farther ERV
  - • closer ambulance, closer ERV, farther ambulance, farther ERV
  - • closer ERV, closer ambulance, farther ERV, farther ambulance



Variables:

design vectors → X_gr = [X1_gr, X2_gr]
X_SM = [X1_SM, X2_SM]

Where:

X1_gr = number of ambulances at Grand River
X2_gr = number of ERVs at Grand River
X1_SM = number of ambulances at St. Mary's
X2_SM = number of ERVs at St. Mary's

other → t = transport type adjustment factors (ERV = 1, ambulance = 2) accounts for cost and survival
d = distance between demand node and hospital (Euclidian)

indicies → m → demand nodes (0-21)
j → number of ambulances (0-48)
k → number of ERVs (0-8)

Objective Functions:

cost → $c(x) = \sum_{i=0}^{i=21} t_i (0.1\, d_i)$ avg fuel cost/km
(minimize)

survival → $s(x) = \sum_{i=0}^{i=21} t_i \left(\frac{1}{d_i}\right)$
(maximize)

calculate for every combination of ambulance/ ERV at Grand River / St. Mary's $\sum_{j=0}^{j=48} \sum_{k=0}^{k=8}$

Constraints:

$X_1\_gr + X1\_SM = 48 \longrightarrow X_1\_gr = 48 - X1\_SM$
$X2\_gr + X2\_SM = 8 \longrightarrow X2\_gr = 8 - X2\_SM$