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Fire Rescue Response Time Analysis

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INTRODUCTION

The City of London is served by the London Fire Department which has total of 113 fire stations serving the city. The purpose of the study was to evaluate options for improving response time, including the construction of a new fire station. Response times are measured starting when the call is dispatched to when on-scene crews have established the resources for initial attack.

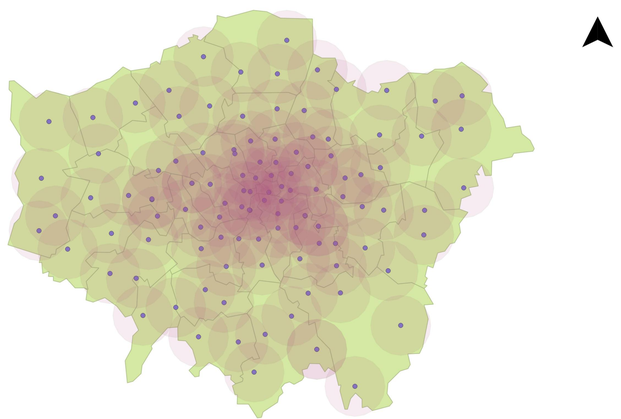
PROCEDURE AND RESULTS

The analysis was done by using four models which were developed for addressing the limitations of previous ones and bringing our final model as close to actual scenario as possible.

A. EUCLIDEAN MODEL

ASSUMPTION: Road connectivity, traffic and the population of the city has no effect on the fire response time.

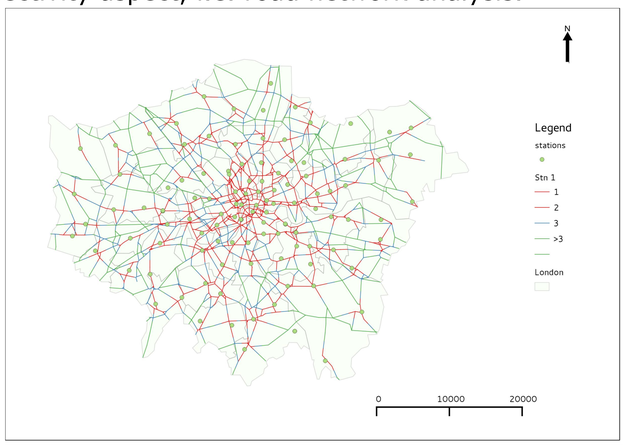
A buffer with specified radius was created for each fire station. Each buffer indicates the area a fire station can cover within a specified time. Taking average speed 40 km/h and max response time 5 minutes, a buffer of radius 3.33 km for each fire station was obtained.



Buffering with radius 3.3km

B. CONNECTIVITY MODEL

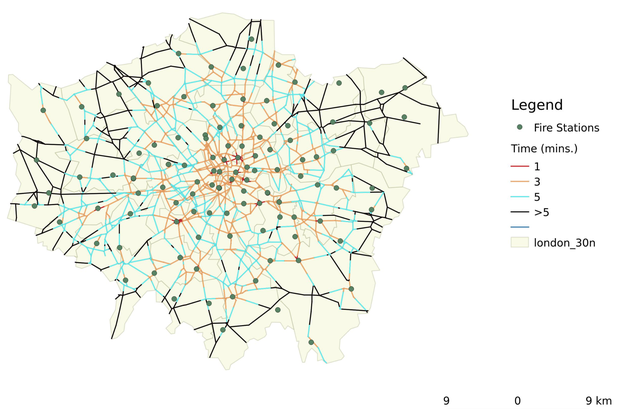
The road to a point from the fire station might not be straight, even though the point might be very close to the fire station. Thus we need to take into account the connectivity aspect, i.e. road network analysis.



C. TRAFFIC MODEL

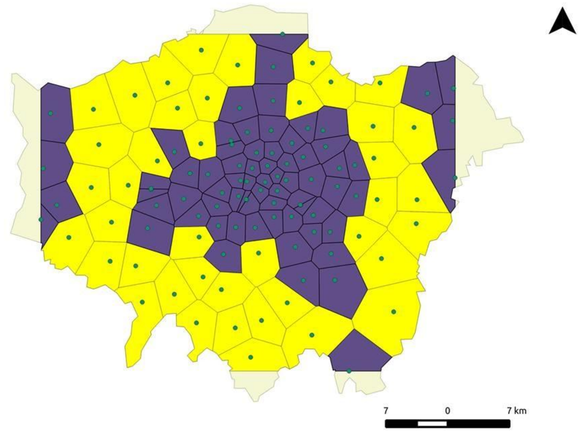
For each road, we have the Average Annual Daily Flow (AADF), which is a measure of the traffic on that road for the year 2011. To calculate the response time, we allocate different speeds to each road depending upon their corresponding AADF values.

· AADF < 25000, speed = 75 km/h
· AADF > 25000 and < 100000, speed = 60 km/h
· AADF > 100000 and < 200000, speed = 50 km/h
· AADF > 200000, speed = 35 km/h



D. POPULATION MODEL

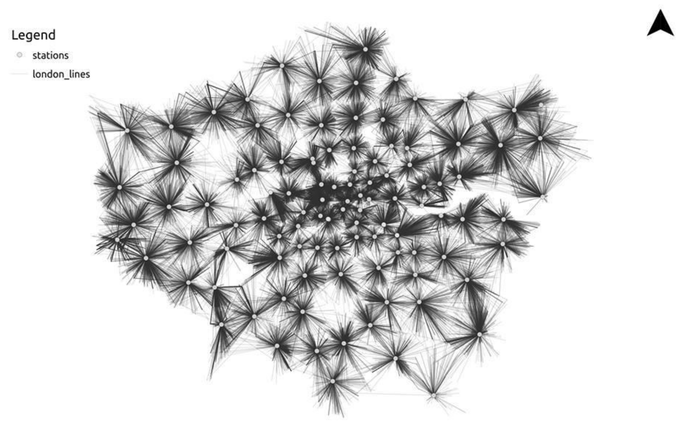
Assumptions: Area served by the fire station is approximately equal to the area covered by its Thiessen Polygon. Population density is assumed to be uniform in each borough to calculate the population of the Thiessen Polygon.



The regions in need of new fire stations (shown in yellow) are found based on a threshold - average value of population and area in our case.

VISUALIZATION

Using the actual Fire Response data for the year 2008, a visualization representing approximately 200000 fire callouts. Each fire station was connected to its callout site by straight lines, thus showing the coverage of fire stations.



London Fire Callouts for 1 Apr 2007 to 31 Dec 2008

URL: lsi.iiit.ac.in/R&D/2014