The Logistics of Travel Time Calculations (and Associated Pitfalls)

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HM Courts and Tribunals Service

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Overview

- Ministry of Justice Reform Programme
  - Investing over £1bn in updating infrastructure
    - Prisons, Courts, etc.
- HM Courts and Tribunals Service
  - Over 300 properties around the country
  - Over 20,000 employees
    - Judges, Analysts, Clerks, etc.
  - Thousands of cases heard each year for each jurisdiction
    - Are the current locations still providing value for money?
    - Would it be more cost effective to buy/build new properties?
    - How would those changes affect court workloads, users, staff, etc.?
  - As lead GIScientist, advise on best approach

Travel Times – Internal Option

- Internal Infrastructure
  - Open Source
    - QGIS, PostgreSQL/PostGIS, pgrouting, Leaflet/node.js
  - Proprietary
    - ArcGIS, DBMS, Network Analyst, ArcGIS Online
- Pros
  - Manage and Edit in-house
  - Store/Maintain/Verify Outputs
- Cons
  - Initial time/cost to set up
  - Requires GIScientist to maintain
  - Requires IT support

Travel Times – External Option

- External Infrastructure
  - Commercial Contract (ad hoc)
  - Commercial Solution (regular use)
  - APIs
    - Google Maps API
    - TransportAPI
- Pros
  - No need to have/maintain internal infrastructure and/or resources
  - External entity (should) add confidence to accuracy of output
- Cons
  - Can be expensive depending upon need
  - Reliant upon external resources
  - Inability to change calculation parameters easily
  - Possible restrictions of use

Travel Times – Current Methodology

- Initially no Geography/GIS experts to advise on methodology
  - Data Scientists, Statisticians, Economists, etc.
- Origin / Destination Pairs (CSV)
  - Staff: origin (home postcode) / destination (court postcode) pairs
  - Users: origin (LSOA centroid [latitude/longitude]), destination (court postcode) pairs
- Requirement for Public Transportation as well as Drive Time results
- Analysis of interest to HR and Property
  - Separately Resourced

Travel Times – Current Methodology

- API calls made to Google Maps API to do calculations
  - Initially written in Python, rewritten in R
    - Difficulties maintaining in Python; more familiar with R
  - Code written in a way to chunk processing and allow timeouts
    - Tens of thousands of calls
    - Network/VPN issues
- Outputs then analysed in Excel and reported in Excel, Word, etc.
  - No involvement of GIS

Travel Times – Current Methodology

- Google Maps API Challenges
  - Transparency of Calculation Method
  - Scientific Verifiability
    - Run for different days
    - Run from different machines
    - Ability to store results
      - FOI requests
  - Escalating costs based on number of calls and how often it's run
    - Sample population under pay threshold
    - LSOA centroids of staff to court
    - LSOA to LSOA matrix
  - Lack of dedicated development support

Travel Times – Current Methodology

- General Challenges
  - Non-Experts setting/tweaking parameters
  - Lack of internal infrastructure/funds/resources for creation and sustainability of in-house solution
  - Lack of prioritisation
    - Med/High impact, but Low priority
      - Possibly because existing solution provide figures “sufficient” for purpose
  - Difficulties associated with sustainability of any solution due to churn
  - Internal connectedness with regard to shared communication, analyses, costs AND benefits

Travel Times – Internal Pilot

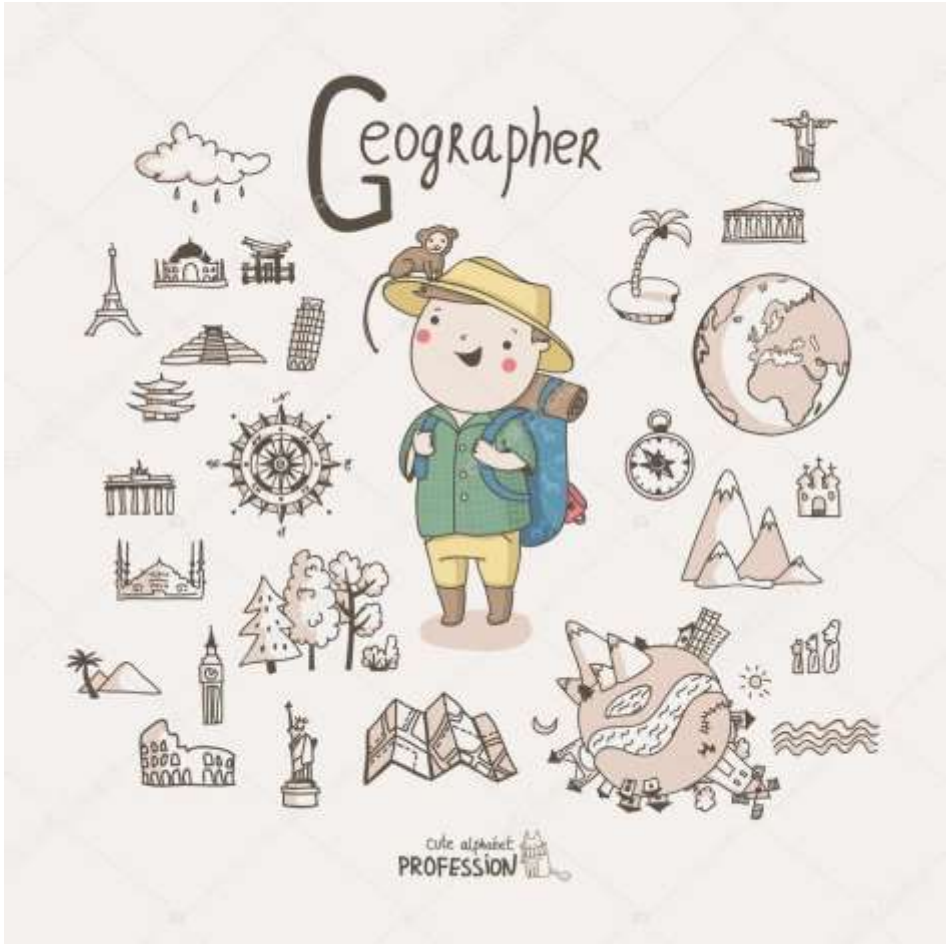
- GIS Intern – 3 months
- Failure to Attend Warrants – Analysis
  - Publication – 10 years of data (~1.6 M records)
    - Defendant Information
    - Receiving Court
    - Analyses and Information largely quantitative/statistical
  - Desire for a complementary GIS analysis
    - Intersect with spatial layers
      - CAMEO, Indices of Deprivation, Average Income, Education, Employment, etc.
    - Visualise outputs in an impactful way
      - Static and Dynamic

Travel Times – Internal Pilot

- Challenges
  - Getting security clearance and HR processing
  - Difficulties obtaining data due to bureaucracy, legacy system issues, lack of area expertise, etc.
    - Data quality and matching issues
      - Missing postcodes, different names, manual errors, etc.
  - Providing equipment with the necessary capabilities
    - Setup and Licencing Software
    - Developing workarounds when functionalities were blocked
      - Intern brought their own laptop with ArcGIS and Network Analyst
      - Unable to unzip outputs as Geodatabase is blocked by Antivirus
    - Laptop did not have enough processing power
      - 4 days to load 2000 network points
      - Analysis instead used As the Crow Flies
  - Lack of internal visibility, recognition and prioritisation of this work

Travel Times – Overall Recommendations

- Involve a Geographer/GIScientist



Travel Times – Overall Recommendations

- Modernise your data infrastructure

Travel Times – Overall Recommendations

- Pool resources to share benefits

Travel Times – Overall Recommendations

- Consider your existing infrastructure and resources
  - Select the right solution for your organisation
  - Make sure your solution is sustainable

Travel Times – Overall Recommendations

- Better demonstrate the value of GIS

Travel Times – Government Geography Profession

- Standardised Methodology
- Recommended Infrastructures and Industry Partners
- Centralise Efforts for Cross Government Benefit

GEOGRAPHY

Government Geography Profession

- Sign up: www.surveymonkey.co.uk/r/CRL289S
  - Answer “Geography” for Question 11
- Awards: https://governmentscienceandengineering.blog.gov.uk/2020/01/10/gse-opportunities-nominations-for-the-geography-in-government-awards-2020/
- Slack: govgeography.slack.com
- Events information, job listings, mentorship and support