stplanr: A Package for Geographic Transport Data Science

Robin Lovelace, Leeds Institute for Transport Studies and LIDA

Abstract

Tools for transport planning should be flexible, scalable and well-integrated with geographic data. **stplanr** meets each of these criteria by providing functionality commonly needed for transport planning in R, with an emphasis on spatial transport data. Reproducible code - https://github.com/ropensci/stplanr.

Introduction

stplanr is an R package for transport planning (Lovelace and Ellison 2016).

Install **stplanr** from CRAN:

```
install.packages("stplanr")
```

It automatically loads the **sp** package (Pebesma and Bivand 2005), for plotting etc:

```
library(stplanr)
```

```
## Loading required package: sp
```

OD Data

Perhaps the most common type of aggregate-level transport information is origin-destination ('OD') data (Bonnel and Hombourger 2014).

```
data("flow", package = "stplanr")
row.names(flow) <- NULL
head(flow[c(1:3)], 2) # some od data
```

```
##   Area.of.residence Area.of.workplace All
## 1         E02002361         E02002361 109
## 2         E02002361         E02002363  38
```

```
data("cents", package = "stplanr")
cents@data[1:2, 1:3] # point data
```

```
##       geo_code  MSOA11NM percent_fem
## 1708 E02002384 Leeds 055    0.458721
## 1712 E02002382 Leeds 053    0.438144
```

We use `od2line` to combine `flow` and `cents`, to join the former to the latter (Figure 1).

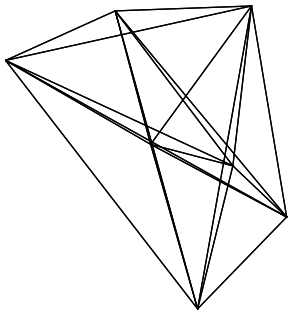

Figure 1: Geographical 'desire lines' created with stplanr from OD data.

```
l <- od2line(flow = flow, zones = cents)
plot(l)
```

Route networks

Route networks can be created and even navigated (Figure 2).

```
plot(route_network, lwd=0)
plot(l, lwd = l$All / 10, add = TRUE)
lines(routes_fast, col = "red")
routes_fast$All <- l$All
rnet <- overline(routes_fast, "All", fun = sum)
rnet$flow <- rnet$All / mean(rnet$All) * 3
plot(rnet, lwd = rnet$flow / mean(rnet$flow))
```

The route to Manchester

We can find a route (e.g. to Manchester for GISRUK) using the `route_*()` functions (Figure 3):

```
r = route_cyclestreet("Leeds, UK", "Manchester")
mapview(r)
```


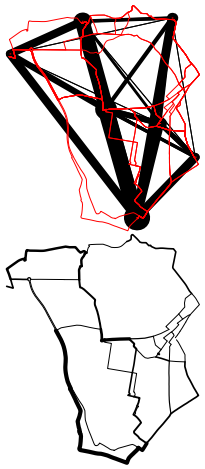

Figure 2: Visualisation of travel desire lines, with width proportional to number of trips between origin and destination (black) and routes allocated to network (red) in the left-hand panel. The right hand panel shows the route network dataset generated by overline().

Use in policy

stplanr was originally created to enable development of the Propensity to Cycle Tool (Lovelace et al. 2017). This is the UK's first open source, publicly accessible transport model that provides results at area, line and route network levels. The PCT estimates cycling potential along all major cyclable roads in England (Figure 4).

References

Bonnel, Patrick, and Etienne Hombourger. 2014. "Passive Mobile Phone Dataset to Construct Origin-Destination Matrix : Potentials and Limitations 1 Literature Survey." *10th International Conference on Transport Survey Methods*, 1–20.

Lovelace, Robin, and Richard Ellison. 2016. *Stplanr: Sustainable Transport Planning*. https://github.com/ropensci/stplanr.

Lovelace, Robin, Anna Goodman, Rachel Aldred, Nikolai Berkoff, Ali Abbas, and James Woodcock. 2017. "The Propensity to Cycle Tool: An Open Source Online System for Sustainable Transport Planning." *Journal of Transport and Land Use* 10 (1). doi:10.5198/jtlu.2016.862.

Pebesma, Edzer J, and Roger S Bivand. 2005. "Classes and Methods for Spatial Data in R." *R News* 5 (2): 9–13.