

# Calculating road distances from LSOA centroids to town centre retail boundaries

This document describes how to calculate the shortest road distance between the LCR LSOA centroids and town centre retail boundaries using the `shortest_distance` function from the `huff-tools` library. For that the following data inputs are required:

- 1) The Meridian 2 road network available here. The road data are provided as separate shapefiles that you will need to merge together using a GIS software such as ArcGIS or QGIS. In ArcGIS this can be accomplished with the Append tool.
- 2) A shapefile of LSOAs for Leeds City Region (created as described in `Create_LSR.Rmd`).
- 3) Town centre retail boundaries.

The `shortest_distance` function accepts five arguments. These are:

- 1) The path to the shapefile (`path_to_shp`),
- 2) The name of the shapefile without the `.shp` extension (`shp_name_in`),
- 3) The path to save the returned road network as shapefile (`path_to_save`),
- 4) The name of the new shapefile without the `.shp` extension (`shp_name_out`),
- 5) True or False to specify whether or not to plot the disconnected parts of the road network (`plot_output`).

The last three arguments are optional. The third and the fourth arguments can be used if the user wants to save the connected part of the road network as a shapefile, by default the function returns the (connected) road network as a list so as to be used in other functions of the `huff-tools` package. Bear in mind that depending on the size of the road network it might take a considerable amount of time to convert the returned list to a `SpatialPolygonsDataFrame` object and plot it in R. Finally, the default value for plotting the output is `FALSE`, change it to `TRUE` if you want to plot the results. An example of using the `get_connected` function is provided below.

```
# Specify working directory
setwd("~/PresentationLDC")

# Load huff-tools library
source("huff-tools.r")

# Import LSOA boundaries data
lsoas <- readOGR("data", "LCR_lsoas")
lsoas@data[,1] <- as.character(lsoas@data[,1])

# Import town centre retail boundaries
destinations <- readOGR("data", "LCR_destinations")

# Clean the Meridian 2 road network with the get_connected function from the huff-tools library
# We need to specify the directory that the road data were downloaded and the name of the shapefile data
roads <- get_connected("~/PresentationLDC/data", "Meridian2")

# Convert the town centre boundaries from polygon data to point data
# For that use the polygons_to_points function from the huff-tools library
destinations_pnt <- polygons_to_points(destinations, "ID")

# Use the shortest_distance function to calculate road distances
distances <- shortest_distance(destinations_pnt,
                              destinations_pnt@data$Names,
                              lsoas,
                              lsoas@data$LSOA11CD,
                              roads)
```

```
names(distances)[3] <- "distance"

# Save the calculated distances as csv file
write.csv(distances, "data", "distances.csv", row.names = F)
```