Homework 2: STA465/ STA2016

Homework 2 is due on Monday, February 22nd at 23:59 EST. The homework assignment is worth 20 points in total.

Question 1 (8 pts)

Use the 'World' data set available in the R package `tmap`.

Question 1.1

What type of spatial object is the 'World' data set? What is the CRS?

Question 1.2

What is the projection used and what aspect(s) are preserved?

Question 1.3

Using the projection argument of `tm_shape()`, create maps of the World data set with two other projections. State what aspect(s) are preserved with the projections you use.

Question 1.4

The 'World' data set contains a column labeled "HPI" that stands for Happy Planet Index. Information about this metric can be found here: http://happyplanetindex.org Make a four panel map that plots: HPI, life expectancy, footprint and inequality.

Question 2 (8 pts)

Altitude data for the USA can be obtained using the raster R package:

```
usa_elev <- raster::getData('alt', country='USA', level=1)
```

Select the altitude data for Oahu, Hawaii, only.

Question 2.1

Make the altitude data for Oahu into a spatial object with geometry type points. Include R code used and output of the data set to show that it is in fact now a spatial object. Do not forget to select a CRS.

Question 2.2

Using a basemap of your choosing, plot the altitude points onto a map of Oahu. Allow the points to change colors by altitude. Include R code used.

Question 2.3

Convert the spatial object into a raster, and plot the raster. Include R code and show that the object is now a raster.

Question 2.4

Download the data for organic matter at https://gis.ctahr.hawaii.edu/SoilAtlas#downloads. What soil orders of organic matters exist at altitudes of $>$ 1000 m? Make a map of the organic matter soil orders for altitudes $>$ 1000 m. Include R code.

Question 3 (4 pts)

Question 3.1

Using the R packages `tmap` or `mapview`, make the plot in Question 1.4 interactive.

Question 3.2

Using the R packages `tmap` or `mapview`, make the plot in Question 2.2 interactive.