City Focus app

Data Processing

1. Downloaded data (see Data Management Plan: CityFocus_DMP_version1.pdf) were reprojected in WGS84/UTM32 reference system (EPSG:32632) and clipped according to the Milan Municipality bounding box.

2. Data obtained from different sources were merged and duplicates were filtered out by means of buffers

3. For each datum of interest, a 200 m resolution *score* raster map which assigns score values between 0 and 1 was generated. Depending on the formats and characteristics of the data, this step was performed as follow:

   a. Point features

   The point features used in the application are related to services (hospitals, banks, post offices, etc.), education (universities, kindergartens, primary schools, etc.) and transportation (train and metro stations, bus stops) information.

   For these kind of data, *spatial concentration* maps were generated by means of a quartic kernel density function applied by considering a kernel radius of 1200 m (equivalent to approx 15 minutes walking distance).

   Score maps were derived from *spatial concentration* maps by means of a normalization procedure which consists in dividing each cell value by the maximum value observed in the map.

   The GRASS GIS Python script for point features score maps generation is available here.

   b. Polygonal features

   The considered polygonal features are related to natural data such as parks, green areas, natural waters, etc.

   After a rasterization process, *proximities* maps were generated by applying multiple-distance buffers (400 m, 800 m, 1200 m).

   Score maps were derived from *proximities* maps by means of a reclassification which assigns a score depending on the distance from the features according to the following rules:

Distance d [m] classes	Score
d=0	1
0<d≤400	0.75
400<d≤800	0.50
800<d≤1200	0.25
d>1200	0

The GRASS GIS Python scripts for score maps generation is available here:

- Point features processing:
https://github.com/GabrielePrestifilippo/CityFocus/tree/master/Data%processing/point_process.py
- Polygonal features processing:
https://github.com/GabrielePrestifilippo/CityFocus/tree/master/Data%processing/poly_process.py

c. Grid and Raster data

Grid and raster data of interest for the application concern land use, temperature, pollution (PM2.5) and population density variables.

The PM2.5 *score* map was obtained by means of the previous mentioned (section a) normalization procedure applied on the "inverse" PM2.5 map in such a way to have high scores for less polluted areas.

Regarding to the land use map, three different classes related to artificial surfaces were considered: *continuous urban fabric*, *discontinuous urban fabric* and *industrial or commercial unit*. For each class a *score* map was generated by assigning value 1 to the cells within the land use class of interest and value 0 outside.

The temperature map and the rasterized population density map were reclassified according to three different categories, *low*, *medium* and *high*, by considering an equal-interval classification (see table below). For each category a *score* map was generated by assigning score 1 to the cells within the category of interest and score 0 outside.

Classes	Category
$MIN \leq x < \frac{1}{3}*MAX$	low
$\frac{1}{3}*MAX \leq x < \frac{2}{3}*MAX$	medium
$\frac{2}{3}*MAX \leq x \leq MAX$	high

All these *score* maps were generated by means of GRASS GIS raster calculation tool ([r.mapcalc](#)).

4. Score maps (i.e. the data processing output) represent the application database upon which City Focus app computes the final map displaying the best locations according to user's preferences. The following table contains information about score maps and associated criteria.

Score Map name in the DB	Associated Criterium
commind.tiff	Industrial or commercial units
continuous.tiff	Continuous urban fabric
discontinuous.tiff	Discontinuous urban fabric
high_pop.tiff	High Population Density
high_temp.tiff	High Temperature
low_pop.tiff	Low Population Density
low_temp.tiff	Low Temperature
med_pop.tiff	Medium Population Density
med_temp.tiff	Medium Temperature
N_EEA.tiff	Air Quality
Narea_cani_10_res.tiff	Dog Parks
Naree_verdi_clean_10_res.tiff	Green areas
Natms.tiff	ATMs
Nbanks.tiff	Banks
Nbus_stops.tiff	Bus Stops
Ncafe.tiff	Coffee Shops
Nhigh_schools.tiff	High Schools
Nhospitals.tiff	Hospitals
Nkindergarten.tiff	Kindergartens

Nparchi_10_res.tiff	Parks
Npharmacies.tiff	Pharmacies
Npolice_stations.tiff	Police Stations
Npost_offices	Post Offices
Nprimary_schools.tiff	Primary Schools
Nsecondary_schools.tiff	Secondary Schools
Nsupermarkets.tiff	Supermarkets
NTrain_MetroStations.tiff	Train and Metro Stations
NUniversities.tiff	Universities
Nveterinary_clinics.tiff	Veterinary Clinics
Nwater_10_res.tiff	Natural Water

Date and Place
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