Using FOSS GIS Software to estimate prehistoric settlement preferences

Investigations on prehistoric settlement preferences has long been of interest because of their potential importance in the placement of cultural features within landscape. It is commonly accepted in archaeology, that settlement pattern is not random. Both settlement and geomorphological studies have shown that the location of archaeological sites is related to a wide range of environmental factors, such as elevation, slope gradient and the proximity to the water bodies. Before the use of GIS the evidence of environmental preferences on site locations was mostly intuitive and generalised. The adopting of GIS software to geomorphology and archaeology made it possible to perform statistical tests to the significance of the observed relations between environmental data and the location of archaeological sites.
We assume that if location of archaeological site is independent from environmental feature both, distributions should be very similar. We adopted bootstrap method instead of classic nonparametric test to investigate if differences between distribution of archaeological sites vary distinctly form distribution of morphometric feature. This paper has mostly methodological objective: to present the method which have been used to for environmental analysis of archaeological dataset.
The research area is situated in the South Wielkopolska, and covers Samica River wateroutlet, it belongs to the physiographic region of Kosician Plain and Krzywin Lakeland. A elevation for Digital Elevation Model have been derived from DETD level2 model acquired with collaboration with Silesian University. That model has horizontal resolution 1x1" and vertical resolution 1 m. In order to convert this DEM ito a continuously varying surface following steps were carried out: model have been imported into GRASS location with spatial reference CS92 (EPSG code 2180), next with r.contour have been change into vector format with 2 m interval. The resulting vector were again interpolated into 30m DEM using GRASS r.surf.rst module with default settings. RSME of new floating point model against old one was no more than 0.5 m. Eight environmental derivatives with TAS GIS and Open Source GIS software have been calculated: elevation relative to hydrological trend, distance to water bodies and distance to drenage system, distance to morenic plateau edge (both in the valley and in the plateau), slope gradient, transport capacity index, wetness index, and solar irradiation. Drenage network and Strahler's stream order was extracted using standard D8 and O'Callaghan and Mark algorithms.
Archaeological sites were digitalised from AZP maps into shapefile using QuantumGIS, next shapefile were imported into GRASS database and table with site's attributes of type and age was added. Afterwards archaeological data were divided into sets of the same age (neolithic, bronze, iron early and late medieval) and type (permanently and non permanently settled sites). Both raster morphometric derivatives and points datasets were imported to R using spgrass6 package. In R, all raster datasets were sampled in places of site location with overlay function of sp package.

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