MODELLING URBAN HEAT ISLAND WITH LANDSAT IMAGES AND LIDAR DATA SET

Esra Şengün[*1], Hossein Arefi[1], Samet Aksoy[2], Peyman Taheri[3]

[1]*Hochschule Mainz - University of Applied Sciences, School of Engineering, Department of Geoinformatics and Surveying, Mainz, Germany*
[2]*Istanbul Technical University, Civil Engineering Faculty, Geomatics Engineering Department, Istanbul, Turkey*
[3]*School of Surveying and Geospatial engineering, College of engineering, University of Tehran, Tehran, Iran*

Abstract

Today, while urbanization and population growth are increasing unpredictably, the negative impact of human beings on nature is also increasing. Depending on the population, the needs of citizens, especially housing, are also increasing. Accordingly, agricultural and bare lands are being replaced by urban and industrial areas. Rapidly increasing urban structures cause an increase in temperature in cities and the formation of urban heat islands (UHI). In this study, it is aimed to produce the severity of the UHI with the help of a model without using thermal images. The city of Sioux Falls in the state of South Dakota in the United States of America was selected as the study area. For this purpose, indices were generated from Landsat using Google Earth engine (GEE) and LIDAR data sets using Point Data Abstraction Library (PDAL) covering the years 2008 and 2020 to estimate the urban heat island severity and these were used as input to the machine learning (ML) algorithm. For ground truth, the UHI severity map produced from thermal satellite images was used. Random forest was used as the ML algorithm and the overall accuracy was found to be 0.45 for 2008 and 0.64 for 2020. Predicted UHI severity maps were produced.

Keywords: *Random Forest (RF), urban heat island (UHI), LIDAR, Landsat, PDAL, Google Earth engine (GEE).*