Built-up land change prediction and its application in Beijing urban planning using deep learning method

Abstract: Predicting the change of built-up land can contribute to the knowledge of land use research and improve the efficiency of urban planning. The change of built-up land is a non-linear process and associated with multi type of factors including the spatial information (the land use statue, transportation distribution, etc.) and time sequence information (the historical change of population, economic value, etc.). In this research, we improved a mixed deep neural network (MDNN) to predict the change of built-up land. This network can be divide into three parts, the convolution part was employed to extract spatial features, the Long-short-time-memory (LSTM) part was employed to predict the future change of the time sequence factors, and the combining part was employed to combing the spatial features and future time sequence factors to generate the predict results (built-up land lose, built-up land appear, and keep current statue) for every land use grid. This network was trained with the data of Beijing, 2010 - 2015 and applied to predict the change of built-up land from 2015 – 2020. Finally, we proposed a spatial distribution suggestion of the built-up planning based on the predicting results and the Beijing urban planning. This research shows that that deep learning method can help to improve the efficiency of land use change prediction and provide planning support in urban management.