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Clustering of Synoptic Pattern over the Korean Peninsula from Meteorological Models

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Numerical modeling data on meteorological and ocean science is one of example of big geographic data sources. The properties of the data including the volume, variety, and dynamic aspects pose new challenges for geographic visualization, and visual geoanalytics using big data analysis using machine learning method. A combination of algorithmic and visual approaches that make sense of large volumes of various types of spatiotemporal data are required to gain knowledge about complex phenomena.
In the East coast of Korea, it is suffering from property damages and human causalities due to abnormal high waves (swell-like high-height waves). It is known to be caused by local meteorological conditions on the East Sea of Korean Peninsula in previous research and they proposed three kinds of pressure patterns that generate abnormal high waves. However, they cannot describe all kinds of pressure patterns that generate abnormal high waves.
In our study, we propose unsupervised machine learning method for pattern clustering and applied it to classify a pattern which has occurred abnormal high waves using numerical meteorological model's reanalysis data from 2000 to 2015 and past historical records of accidents by abnormal high waves. About 25,000 patterns of total spatial distribution of sea surface pressure are clustered into 30 patterns and they are classified into seasonal sea level pressure patterns based on meteorological characteristics of Korean peninsula. Moreover, in order to determine the representative patterns which occurs abnormal high waves, we classified it again using historical accidents cases among the winter season pressure patterns.
In this work, we clustered synoptic pattern over the Korean Peninsula in meteorological modeling reanalysis data and we could understand a seasonal variation through identifying the occurrence of clustered synoptic pattern. For the future work, we have to identify the relationship of wave modeling data for better understanding of abnormal high waves and we will develop pattern decision system to predict abnormal high waves in advances.

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