

A Study on the Optimization of 3D Expressions for the Analysis of Local Scale Meteorological and Air Quality Information

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In the last 10 years (2007 ~ 2016), 162 people have been killed and about 6.3 trillion won in property damage in Korea alone, the report showed. This is due to the increase of severe weather on the local scale as climate change progresses due to global warming. This study developed the 3D expression system specialized for the local scale. We used one of the commercial engines, Unreal Engine 4 and C++ language, to express meteorological and air quality information in 3D. As input data, the result of WRF and CMAQ modeling were used. Using high-resolution DEM data, 3D terrain was created, and wind vector field was implemented to indicate wind. And we have implemented isolines that indicate temperature and precipitation. In addition, by studying a new expression method to represent the wind, we implemented a stream vector and stream line, which is a vector and streamline moving along the wind flow. And the 3D volume rendering method using Raymarching algorithm is applied to express 3D data, cloud and air pollutant density.

For the analysis of local scale 3D expression cases, the day when the land and sea breeze was blown off the west coast including Seoul and Incheon was selected. And we analyzed a typhoon case of mesoscale. To show that air quality information can also be analyzed, the density of air pollutants such as fine dust and carbon monoxide was expressed and analyzed in 3D volume rendering. As a result of the case analysis, the modeling results were well reflected and the changes in meteorological and air quality information over time were easily identified. And the 3D volume rendering expression allowed us to analyze the vertical structure and distribution of clouds and air pollutants density in a new perspective.

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Keywords: Air Quality information, 3D expression, Local scale

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