

University of Macau

Abstract

VISUALIZATION OF METEOROLOGICAL DATA

by Tam Chi Man Benedito

Thesis Supervisor: Associate Dean of Faculty of Science and Technology Wu Enhua
Master of Science in Software Engineering

This paper presents methodologies on visualizing the meteorological data in two main manners. These 2 parts are: the 2D Visualization of the Air-Pollution Index (API) on Guangdong region, and 3D Visualization of Clouds by measuring the heights of clouds from the satellite data.

The scattered raw data were acquired. They are the daily API of year 2001 to 2007. These included the daily API's of 21 main cities in Guangdong region. They were transferred into a set of grid-point data by interpolation. Before that, several interpolation methods are compared, and the characteristics are analyzed. A prototype program was coded to perform some experiments for the analysis. The Cressman Scheme was chosen as its characteristics showed that it is very suitable for dealing with the API data as well as other meteorological data. With those 7-year API grid-point data, contour charts and different analysis charts are drawn. Some enhancements were adopted on those charts in order to bring out some details. Then, a brief analysis about the situation of the air pollution in Guangdong region has been carried out. These are the first part of the research.

The second part is to model the clouds in the satellite images. 2 different satellite images provided by the FY2C (a meteorological satellite of China) and from MT-SAT (a meteorological satellite of Japan) for the same instance was acquired. Apparently, they are the same. However, because of the different spatial position of these 2 satellites, there are different levels of parallax. A prototype program was coded to perform some experiments. That is pattern recognition for the same cloud in the 2 images by cross-correlation. Some experiments were carried out with different settings. Then, the delay-indices which are actually the shifting distances of the same cloud pattern, were obtained. By using some geographical formulae, with the shifting distance, the height of the cloud was then calculated. A simple diagnostic checking based on the lapse rate of the atmospheric temperature was used to check the result. Finally, the 3D clouds are modeled by using those height data.

Experimental results have confirmed the feasibility of the methodologies presented.

Keyword: visualization, meteorological, API, satellite.