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Extraction of moving object from spatio-temporal data and modeling of its generation extinction process

HONDA, Rie[1]* ; MATSUNAGA, Tomoya[1] ; MORI, Keita[1] ; MURATA, Ken T.[2] ; NAGAYA, Yoshiaki[2] ; UKAWA, Kentaro[3]

[1]Kochi University, [2]National Institute of Information and Communications Technology, [3]Systems Engineering Consultants Co., LTD.

A large amount of spatio-temporal data has been accumulated in the various field of the Earth science such as weather satellite observation and ground radar observation. Moving objects are often included in these spatio-temporal data. For example, the cloud lumps in the weather image, the rainfall area in radar data are equivalent to objects. These objects are generated at some time point, survive with their shape and feature changed for a while, and finally extinct. Objects interact each other, sometimes are fused or decomposed. The basic information of these objects are the position and the shape of these objects, feature based on texture or spatial pattern. We developed the method to extract theses information from spatio-temporal data semi-automatically in order to find higher-order spatio-temporal variation pattern from them. The objects are modeled by the combination of multivariate normal distributions and its model parameters are determined via EM algorithm. The number of components was determined based on BIC.

The developed method is applied to cloud lump extraction from a weather satellite image (IR1 image of MTSAT 6 and 7) and the extraction of the rainfall area from 3 dimensional weather radar data.

Keywords: Spatio-temporal, data mining, objects, modeling, weather images, radar