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## Cloud Classification Using PCA

### Abstract

An automatic classification system is presented, which discriminates the different types of single-layered clouds using Principal Component Analysis (PCA) with enhanced accuracy and provides fast processing speed as compared to other techniques.

PCA is an image classification technique, which is typically used for face recognition. PCA can be used to identify the image features called principal components. A principal component is a peculiar feature of an image. The approach described in report uses this PCA capability for enhancing the accuracy of cloud image analysis. To demonstrate this enhancement, a software classifier system has been developed that incorporates PCA capability for better discrimination of cloud images. The system is first trained by cloud images. In training phase, system reads major principal features of the different cloud images to produce an image space. In testing phase, a new cloud image can be classified by comparing it with the specified image space using the PCA algorithm.

Weather forecasting applications use various pattern recognition techniques to analyze clouds' information and other meteorological parameters. Neural Networks is an often-used methodology for image processing. Some statistical methodologies like FDA, RBFNN and SVM are also being used for image analysis. These methodologies require more training time and have limited accuracy of about 70%. This level of accuracy often degrades classification of clouds, and hence the accuracy of rain and other weather predictions is reduced.

Better accuracy in cloud classification means accurate categorization of clouds according to high, mid and low levels. These high, mid and low-level clouds are further classified in their particular sub classes. PCA can easily handle a large amount of data due to its capability of reducing data dimensionality and complexity, thus getting better results. PCA algorithm provides a more accurate cloud classification that yield better and concise forecasting of rain.