Analysis of Images of Ice Floes

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ABSTRACT

This talk will address the problem of determining the semi-rigid motion of an ice floe from a series of grayscale images of the floe. The analysis will start with the global properties of the images. The next step is to determine the scale and character of the relevant local properties and to identify minimal rigid regions of the image. The final step is to determine how the regions have evolved between successive images. Combinations of Euclidean invariants will be used to look for possible matching regions.

Keywords and phrases: morphological operations, edge detection, components ,moments

1 INTRODUCTION

The extent of the sea-ice effects the interaction between the ocean and the atmosphere, which is an important part of the global climate. Changing weather patterns of wind and temperature affect the ice floes. In particular, wave action leads to the break up of the floes. The ability to automate the description of the motion of ice floes from images of the floes can be used in the formulation, the evaluation and in the eventual application of models of the dynamics of ice floes.

The analysis of remotely sensed data has a vast literature, and the processing of satellite images is highly developed. The application to ice floes is used by several agencies. The Ice Service of Environment Canada provides extensive information about the current sea ice. These services use multilayered techniques to first classify the ice type, often partly with human assistance. The early analysis of images at the level of individual floes was dependent on the use of marker buoys. The data we use has a buoy but the techniques used are independent of this.

One method of automated analysis that has been used on floes is the Image Pyramid Area Correlation (IPAC) method computed from Synthetic Aparture Radar(SAR) images.

This paper will explore the extent to which simple techniques can be used to automate the analysis of two dimensional images of an ice floe.

The particular sequence of images used illustrate the efficacy and the limitations of the analysis. There is positional information about this sequence of images and there is a visible marker in the ice that helps align the images. The images are taken under sufficiently varying conditions that features that are exagerated in one image are indiscernable in the next. The time interval between images is sufficient that the ice floes have also undergone significant changes in their character and geometry.