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Project

Motion Analysis for Advanced Image Communication Systems

Objectives and Contents

This research programme extends and completes the work programme of the HCM Research Network on "Motion Analysis for Advanced Image Communication Systems" (MANADIX). The description is limited here to the new tasks or the expected supplementary contribution to the tasks of the initial work programme. The main task of MANADIX project is to develop efficient algorithms for motion analysis. For many methods of motion analysis the efficiency depends on some parameters, which may be different for different image sequences. The important problem of automatic selection of these parameters will be addressed. In the case of change detection important parameters may be the variance of the inter-image difference for the background and for the moving area, and the size of the moving objects. Various methods of motion estimation will also be considered. In particular, when a pel-recursive algorithm is used, an important parameter to be tuned, controls the rate of convergence of the estimator. Approaches will be developed to adapt this parameter to the local characteristics of the image content and to the locally valid real motion model.

The second task of this supplementary research programme is the analysis of the motion field using a pyramidal multiresolution representation of the image data. The accuracy of the motion field estimator is related to the spatial frequencies of the 2-D signal. Thus multiresolution or subband analysis will improve the efficiency of any method of estimation and in the same time it will accelerate the convergence time for the iterative methods.
Different schemes of wavelet transforms will be investigated, with the corresponding scale function to construct the low-pass pyramid. The other frequency bands could also be used for estimation purposes, and in any case should be taken in consideration for quantization and coding to constitute the whole communication system. Another important aspect which will be investigated concerns the cooperation strategy within the data pyramid (coarse-to-fine, fine-to-coarse, oscillatory), and the definition of operators for propagating the motion field from one resolution level to another.

Foreseen results

Development of advanced data-adaptive change detection and pel-recursive motion estimation algorithms.

Development of multi-resolution motion estimation schemes based on wavelet transform and inter-level propagation strategy.