System and Methods for Motion Estimation in Digital Videos Using Amplitude-Modulation Frequency-Modulation (AM-FM) Models

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Technology description

A new approach for motion estimation from digital videos based on the use of 2D amplitude-modulation frequency-modulation (AM-FM) models.

Background

Motion estimation or optical flow methods in digital videos are increasingly used in various applications such as security, medicine, and tracking. Obtaining information movement is the first step for advanced applications where artificial intelligence methods could make quick decisions with less error compared to humans. The Horn-Schunck (HS) method on dense optical flow has laid the basis of the variational framework for motion estimation. The increasing power of computation units facilitated the development of increasingly accurate models. Unfortunately, there are two major limitations with currently available technologies: 1) the accuracy of the estimate and 2) the processing time. There is a present market need for new methods that produce more accurate motion estimations from noisy videos in rapid time.

Technology Description

Researchers from the University of New Mexico and the University of Engineering and Technology (Universidad de Ingeniería y Tecnología - UTEC) have developed a new approach for motion estimation from digital videos based on the use of 2D amplitude-modulation frequency-modulation (AM-FM) models. This approach uses an AM-FM representation to derive AM and FM based equations that can be applied to two consecutive frames to derive motion estimates. The multidimensional AM-FM representations provide representations of non-continuous information images. The AM-FM estimate captures single images and features of a video that can lead to different applications in image and video analysis, with emphasis in medical applications. This technology can be included as a new feature for next generation ultrasound equipment producing new information to the user to analyze the situation.

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Application area

Advantages/Applications
A new AM-FM representation method for motion estimation that is based on two consecutive frames only.
Fully developed approach will be able to combine estimates from different scales so as to provide better estimates of more complex motions.
Proposed methodology has been successfully tested on sinusoidal, periodic motions, and also on constant, translational motions, of synthetic AM-FM textures.
Compared to intensity-based approaches, this technology can yield significantly better estimates for translational texture motions.
Can specifically be used for images with textures without well-defined edges.
Addresses complex texture movements that cannot be effectively modeled by standard methods of intensity-based optical flow.
Potential applications in biomedical imaging.
Applications in image and video analysis, for example in computer aided diagnosis.

Institution

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