Regularized Optimization Approach for Matrix Factorization Reconstruction with Application for AM-FM Demodulation

Published date: Dec. 15, 2014

Technology description

Image and video processing system based on amplitude-modulation frequency-modulation (“AM-FM”) demodulation.
This system has the ability to provide high quality reconstructions, both visually and quantitatively. More specifically, this system and methods reconstructs an image based on a Regularized Optimization (“RO”) of estimates to attain a small number of locally coherent components and simultaneously enforce a piecewise smooth constrain for amplitude functions.

Background

Image and video processing are forms of signal processing. Signal processing allows a set of characteristics or parameters related to the image or video to be obtained. Signal processing including analog signal processing, discrete time signal processing, and digital signal processing, which may involve a one-dimensional (“1D”), two-dimensional (“2D”) or three-dimensional (“3D”) input signal to which signal processing techniques are applied. Signal processing techniques include transform-based processing such as discrete or integral transforms which are implemented prior to Amplitude-Modulation Frequency-Modulation (“AM-FM”) processing.
Signal processing techniques include transform-based processing such as discrete or integral transforms which were implemented prior to AM-FM processing. Currently, the use of short-time Fourier Transform ("STFT") is used for non-stationary signals, and Discrete Wavelet Transform ("DWT") has also been used for transform-based image processing. A disadvantage of STFT is that it cannot be effectively generalized to images and videos. DWT, on the other hand, uses logarithmic divisions of the frequency, but does not measure frequency content directly. The development of accurate methods for estimating AM-FM image decompositions is of great interest due to is potentially significant impact on image analysis applications including areas of signal, image and video processing.

Technology Description

Researchers at the University of New Mexico have developed an image and video processing system based on amplitude-modulation frequency-modulation (“AM-FM”) demodulation. This system has the ability to provide high quality reconstructions, both visually and quantitatively. More specifically, this system and methods reconstructs an image based on a Regularized Optimization (“RO”) of estimates to attain a small number of locally coherent components and simultaneously enforce a piecewise smooth constrain for amplitude functions.

Publications

Multiscale AM-FM demodulation and image reconstruction methods with improved accuracy

About STC.UNM

As the technology-transfer and economic-development organization for the University of New Mexico, STC.UNM protects and commercializes technologies developed at the University of New Mexico (UNM) by filing patents and copyrights and transferring the technologies to the marketplace. We connect the business communication (companies, entrepreneurs and investors) to these UNM technologies for licensing opportunities and the creation of startup companies. Visit www.stc.unm.edu.

Application area

Processes stationary and non-stationary image and video content
AM-FM demodulation is useful in a variety of contexts and applications including, for example, characterization and classification of image and video from imaging modalities such as electron microscopy, spectral and hyperspectral devices, ultrasound, magnetic resonance imaging (“MRI”), positron emission tomography (“PET”), histology, color and monochrome images, molecular imaging, radiographs (“X-rays”), computer tomography (“CT”), and others
Specific applications in fingerprint identification, detection and diagnosis of retinal disease, malignant cancer tumors, cardiac image segmentation, atherosclerosis characterization, brain function, histopathology specimen classification, characterization of anatomical structure tracking such as

carotid artery walls and plaques or cardiac motion and as the basis for computer –aided diagnosis to name a few

Advantages

High quality reconstructions, both visually and quantitatively, when compared to standard reconstructions
Efficient reconstruction process using a select few channels and components that best approximates the image signal
Approach is superior over alternative approaches including Channelized Component Analysis (“CCA”), Dominant Component Analysis (“DCA”), Least-Squares Reconstructions (“LESHA” and “LESHAL”) and Multi-Scale Least-Squares Reconstructions (“MULTILES”)
Allows the identification of disease at different stages, such as retinal disease (diabetic retinopathy, age-related macular degeneration, glaucoma, etc.), pulmonary diseases (pneumoconiosis, lung nodules tumors, etc.), breast cancer, cellular abnormalities, or any pathological structure in a medical or biomedical image or video

Institution

The University of New Mexico

Inventors

Victor Manuel Murray Herrera
Marios Pattichis
Paul Rodriguez-Valderrama

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com