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Real-time Recovery of Degraded Images using Multiple Sparse Models

AzTE Case # M13-148P

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Intellectual Property Status:

Patent Pending

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Background

In many resource-constrained and noisy scenarios, the process of sensing as well as transmitting images introduces various forms of degradations. For example, in Magnetic Resonance Imaging (MRI), the lengthy sensing process may result in blurry images due to subtle movements of the patient. Bandwidth limitations and noisy channels may introduce degradation in images during transmission. Existing technologies for image recovery exploit the statistical structure of images. An important class of methods assumes that images can be accurately represented using a linear combination of a small set (sparse) of patterns from a "dictionary." These methods often involve sophisticated mathematical optimizations and complex algorithmic components. The widespread need for image recovery systems necessitates the development of a single approach that can recover high quality images from different forms of degradation with minimal computational burden.

Invention Description

Researchers at Arizona State University have developed a computationally simple, low-memory, and inherently parallelizable system for image recovery. The proposed invention learns multiple weak sparse models and appropriately combines them to recover the image from its degraded version. The weak models used replace the inherently complex optimization with operations that involve only simple comparisons, and computation of correlations. Obtaining the "dictionary" is also simplified and can be as simple as randomly choosing a subset of training samples. By appropriately weighting the contribution of each of the weak models, the combination can provide better image recovery compared to a single sophisticated sparse model. This approach may be applied in real-time applications, and in mobile platforms that have low computational resources.

Potential Applications

- Digital Image Editing Software
- Mobile Phone Camera Software
- Mobile Phone Image Editing Applications
- Medical Imaging

Benefits and Advantages

- **Highly Scalable** – Proposed system is highly scalable as it is parallel-friendly.
- **Real Time Applications** – By storing the look-up tables in the GPU memory and performing all computations in the GPU, the full potential of GPUs can be harnessed, thereby enabling real-time image recovery and enhancement.
- **High fidelity recovery** – Recovered images are of high-fidelity, since a weighted combination of multiple models is used.