SHORT NOTES ON THE DISSERTATION

Title:	**Video Super-Resolution**
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Abstract:

The aim of the thesis is to develop video super-resolution methods to increase the resolution, reconstructed information quality and effective applications for video information.

The research's objectives:

1). Develop an approach for multi-frames static video super-resolutions in the frequency domain by the global estimation method PSEFD.

2). Develop an approach for multi-frames video super-resolution in the spatial domain by the global estimation method MMAD.

3). Develop an approach for multi-frames video super-resolution in the spatial domain by global estimation method Bayesian MAP.

4). Develop an approach for single-frame video super-resolution by the combination spatial interpolation CSI.

Results and contributions of the dissertation:

The dissertation has achieved the research objectives. The proposed methods have met the significant improvements on the comprehensive issues of the video super-resolution problems. The proposed super-resolution methods have achieved significant advances in the comparison to other methods with state of the art. The significant contribution of the dissertation can be specified as follow,

1) Build a basic of mathematic theory about video super-resolutions.
2) The phase-shift estimation method in frequency domain PSEFD has exposed effectively in motion estimation for static video frames.
3) A general algorithm for motion estimations following step-by-step in shift and rotation. This algorithm simplifies and makes possible solving the multivariate motion estimation problem in practical.
4) The minimum mean absolute differential of grayscale error, MMAD, showed much potential in reconstructing and improving video images
5) The MAP Bayesian theory for motion estimation problems in the space of low resolution images is the foundation for developing motion estimation algorithms with a high accuracy and then fast processing time.
6) The global motion estimation algorithms based on MAP Bayesian theory have a power ability for motion estimations in block sizes of pixels with a high accuracy and low complexity.
7) The multi-frame reconstruction algorithm BM allows to remove noisy pixels and loop of remapping the main LR frame. Therefore, it is enhanced significantly the quality of the reconstructed HR images.
8) The combination spatial interpolation method CSI, has effectively solved the weakness of the current single-frame super-resolution methods. It is to eliminate the degraded pixels at the texture regions of the reconstruction HR images.

9) The single-frame SR method CSI allows to enhance the video information remarkably with the real-time processing ability.

Practical applications and further developments:

The demand for observing clear image details is very essential in many areas. Therefore, the practical needs of video super-resolution applications are very large and form variety. The dissertation with the achieved results shows much potential for further developments in actual applications as follows,

1). Study an effective method for de-blurring the motion blur and embed this method in the proposed super-resolution algorithms for further development the quality of reconstructed HR video images.

2). Study embedding the combination spatial method CSI into the super-resolution method BM to enhance generally the quality of the reconstructed HR video images.

3). Develop the super-resolution methods, MMAD and PSEFD, to become a specialized software for the analysis of medical images such as X-ray, CT images, detailed examination of industrial products or structures mining analysis

4). Develop the super-resolution method BM to become a commercial software used in the fields of High Definition Television and investigations in national security issues.

5). Develop the super-resolution method CSI to become a commercial software used in the field of television with real-time processing abilities.

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