Super resolution from a single visual source

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Overview

Many imaging devices produce signals of unsatisfactory resolution (e.g. a photo from a cell-phone camera may have low spatial resolution or a video from a web camera may have both spatial and temporal low resolution). Previous methods for Super-Resolution (SR) require multiple images of the same scene, or else an external database of examples. This method applies digital processing to reconstruct more satisfactory high-resolution signals.). The algorithm exploits the inherent local data redundancy within visual signals (redundancy both within the same scale and across different scales). This method provides the ability to perform SR from a single image (or a single visual source. Additional examples of the methods' capabilities can be found here: http://www.wisdom.weizmann.ac.il/~vision/SingleImageSR.html%20%20 [1]

Background and Unmet Need

Ever taken a digital photograph and then found out you had missed the fine details that made the scene so impressive visually? Many imaging devices produce signals of unsatisfactory resolution (e.g. a photo from a cell-phone camera may have low spatial resolution or a video from a web camera may have both spatial and temporal low resolution). Applying a Photoshop sharpen filter may make the photo appear sharper, but such filters are lossy – they actually reduce the amount of fine detail in the image.

The Solution

Prof. Michal Irnai and her team developed a method for enhancing the spatial and or temporal resolution (if applicable) of an input signal such as images and videos from a single source.

Technology Essence

This method applies digital processing to reconstruct more satisfactory high resolution signals. Previous methods for Super-Resolution (SR) require multiple images of the same scene, or else an external database of examples. This method provides the ability to perform SR from a single image (or a single visual source). The algorithm exploits the inherent local data redundancy within visual signals (redundancy both within the same scale, and across different scales). This super-resolution process pulls unseen details from the nooks and crannies of a single digital photograph. Their process can capture true detail which cannot be seen in the original image.

Examples of the methods' capabilities can be found here:

http://www.wisdom.weizmann.ac.il/~vision/SingleImageSR.html [2]

Applications and Advantages

Applications

- Enhancing the spatial resolution of images
- Enhancing the spatial and or temporal resolution of video sequences
- Enhancing the spatial and or temporal resolution (if applicable) of other signals (e.g., MRI, fMRI, ultrasound, possibly also audio, etc.

Advantages

- No need for multiple low resolution sources or the use of an external database of examples.
- Superior results are produced due to exploitation of inherent information in the source signal.

Patent Status

USA Granted: 9,692,939 USA Granted: 8,989,519