Development of the library for enhancing of image resolution based on Super-Resolution technology

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Background

What does Super-Resolution (SR) mean?
How can we use it?
What does Super-Resolution mean

Source image  Zoomed image (x3)  After using Super-Resolution (x3)
What does Super-Resolution mean

Source image  |  Zoomed image (x4)  |  After using Super-Resolution (x4)
How can we use it
Purpose

Implement a program Library for Enhancing of Image Resolution (LEIR) based on Super-Resolution technology.

Requirements:

• Implementation SR technology in the library
• Integration with external systems
• Low entry threshold
Scheme of interaction LEIR and an external system
More detail about the algorithm

There are two classical approaches:

• The classical multi-image super-resolution (MISR)
• Example-Based super-resolution (EBSR)
SR from a Single Image (SRSI)

Super-Resolution from a Single Image

Classical multi-image super-resolution

Example-Based super-resolution
Background for SRSI

The approach is based on the observation that patches in a natural image tend to redundantly recur many times inside the image.

Input image

Various scales of input image
How does SRSI use the classical MISR approach

Classical Multi-Image SR

Single-Image Multi-Patch SR
How does SRSI use the classical EBSR approach
Analogues

There are two groups:

• Program libraries
• Different tools.
OpenCV

Advantages
• Implementation of two SR methods
• Free and open source
• Large community

Disadvantages
• Input data – sequence of frames
• Poor quality of the results
Results of the OpenCV methods

Source image

Scaled image

Scale factor: x3
Source image size: 320x240
After SR: 946x706
Time: 15 sec
Intel Core i5-2450M 2.50GHz
Visual comparison

OpenCV method

Super-Resolution from a Single Image
Advantages of LEIR

• Universal type of input data (a single frame or a sequence of frames)
• Good quality of results
• Easy to use (low entry threshold)
Results

• Optimal direction of development
• Design of library
• Optimal Super-Resolution algorithm
Next steps

• Realization of all components
• Testing and debugging
• Further improvement of methods