מכון ויצמן למדע

THE WEIZMANN INSTITUTE OF SCIENCE

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Vision and Robotics Seminar

Room 1 ,Ziskind Building
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at 12:15

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Technion

Deformation-aware image processing

Abstract:

Image processing algorithms often involve a data fidelity penalty, which encourages the solution to comply with the input data. Existing fidelity measures (including perceptual ones) are very sensitive to slight misalignments in the locations and shapes of objects. This is in sharp contrast to the human visual system, which is typically indifferent to such variations. In this work, we propose a new error measure, which is insensitive to small smooth deformations and is very simple to incorporate into existing algorithms. We demonstrate our approach in lossy image compression. As we show, optimal encoding under our criterion boils down to determining how to best deform the input image so as to make it "more compressible". Surprisingly, it turns out that very minor deformations (almost imperceptible in some cases) suffice to make a huge visual difference in methods like JPEG and JPEG2000. Thus, by slightly sacrificing geometric integrity, we gain a significant improvement in preservation of visual information.

We also show how our approach can be used to visualize image priors. This is done by determining how images should be deformed so as to best conform to any given image model. By doing so, we highlight the elementary geometric structures to which the prior resonates. Using this method, we reveal interesting behaviors of popular priors, which were not noticed in the past.

Finally, we illustrate how deforming images to possess desired properties can be used for image "idealization" and for detecting deviations from perfect regularity.

Joint work with Tamar Rott Shaham, Tali Dekel, Michal Irani, and Bill Freeman.