מכון ויצמן למדע

THE WEIZMANN INSTITUTE OF SCIENCE

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Vision and AIV

on Sunday, Aug 15, 2021
at 11:00

https://weizmann.zoom.us/j/98972228231?pwd=Q1BjWjVtRWFyUXJoVDBHK2g5T2JIdz09 *** Please note the Unusual Time ***

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Algebraic Characterization of Relational Camera Pose Measurements in Multiple Images

Abstract:

Structure from Motion (SfM) deals with recovering camera parameters and 3D scene structure from collections of 2D images. SfM is commonly solved by minimizing the non-covex, bundle adjustment objective, which generally requires sophisticated initialization. In this talk I will present two approaches to SfM: the first approach involves averaging of essential or fundamental matrices (also called bifocal tensors). Since the bifocal tensors are computed independently from image pairs they are generally inconsistent with any set of n cameras. We provide a complete algebraic characterization of the manifold of bifocal tensors for n cameras and present an optimization framework to project measured bifocal tensors onto the manifold. Our second approach is an online approach: given n-1 images, I_1,...,I_{n-1}, whose camera matrices have already been recovered, we seek to recover the camera matrix associated with an image I_n . We present a novel solution to the six-point online algorithm to recover the exterior parameters associated with I_n. Our algorithm uses just six corresponding pairs of 2D points, extracted each from I_n and from any of the preceding n-1 images, allowing the recovery of the full six degrees of freedom of the n'th camera, and unlike common methods, does not require tracking feature points in three or more images. We present experiments that demonstrate the utility of both our approaches. If time permits, I will briefly present additional recent work for solving SfM using deep neural models.