SLAM and Real-Time SFM

Andrew Davison
Imperial College London, UK

Abstract

In robotics, augmented reality and other applications, an understanding of the 3D configuration of a scene and a sensor-carrying body's movement through it must be obtained in real-time if interaction is to be enabled --- this is the problem known as Simultaneous Localisation and Mapping (SLAM). In this lecture, we will concentrate on practical methods for SLAM with a single camera as the only sensor. We will start from now well-established pipelines for real-time structure from motion based on point features, covering the feature matching front-ends and estimation back-ends which have proved to be most successful for robust and scalable real-time systems. The lecture will then move on to cover recent algorithms which enable live dense estimation of scene surface geometry and are able also to make use of this for better camera tracking. These are steps on the path towards the future of powerful real-time 3D scene understanding systems based on vision which will aim to get ever closer to recovering models of real-world objects and physics.