

Optimizing the arrangement of multiple cameras for effective capturing of visual information

بهینه سازی چیدمان دوربینها برای بازسازی صحنه

Abstract

Multiple cameras are frequently used in many applications, such as visual surveillance and broadcasting of sports events. The scenario in which a single camera attached to a robot moves to different locations to scan a scene can also be considered as a multiple camera system. This is referred to as visual simultaneous localisation and mapping (SLAM). Traditionally, the main purpose of using multiple cameras is to cover the scene, and the placement of cameras is decided by human experience. The recent development in immersive virtual reality and visual SLAM requires reconstructing the scene, i.e. generating 3D geometric models of the scene objects with surface texture from the images captured by the cameras. In this case, the theory of camera geometry alone cannot evaluate whether a given camera placement is sufficient and appropriate for reconstruction, because the camera geometry does not take the scene into consideration.

In this talk, I will present the result of our research in the development of mathematical models and algorithms for optimising the arrangement of cameras for the purpose of reconstructing the scene. In particular, our focus is on two criteria. One is the quality of depth estimation, since accurate depth estimation is a key to quality 3D modelling of the scene. The other is the quality of arbitrary view synthesis, since view synthesis is essential to many immersive systems including the future free-viewpoint video (FVV). We have developed two mathematical models, called correspondence field of cameras and the effective sampling density that can be used to optimise the camera arrangement.

در خیلی موارد داده‌ی مربوط به یک صحنه توسط تعدادی دوربین بدست می‌اید. زمانی که یک ربات با دوربین حركت می‌کند تا یک محیط را پویش کند هم شبیه یک سیستم چند دوربینی است. در حال حاضر چیدمان دوربین‌ها در دور صحنه بر حسب تجربه فردی است. در این صحبت من نتایج اخیر پژوهش خود را در مورد بهینه سازی چیدمان دوربینها عرضه می‌کنم. هدف اصلی ما در این پژوهش بازسازی ویدئوی صحنه است. تمرکز ما برای بهینه سازی تخمین عمق و تخمین نماهای مختلف می‌باشد.

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