A Multi-View Camera System for the Generation of Real-Time Occlusion-Free Scene Video

Alparslan Yildiz and Y. Sinan Akgul
GIT Vision Lab, Department Of Computer Engineering
Gebze Institute Of Technology, Turkey

Introduction

Multi camera setups are bound to have occlusions. It would be very useful if we resolve these occlusions. The problem is to find an approach to resolve these occlusions in real-time.
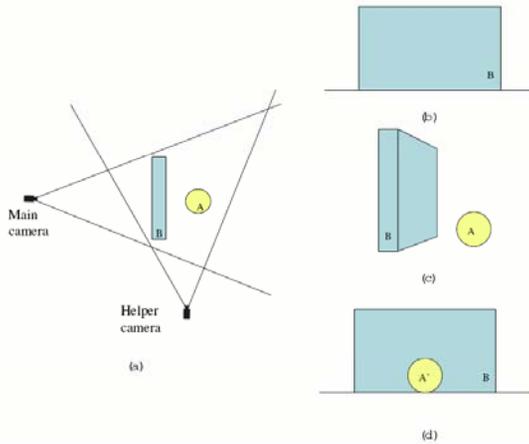
(a) A scene containing a wall and a dynamic sphere. (b) View of the scene from main camera. (c) View of the scene from second camera. (d) "Occlusion-free" view of the scene for the main camera view.

Motivation

Such a system would be very useful for both automated and manual processing.
For example:
- ✓ Entertainment
- ✓ Communication
- ✓ Manual video surveillance

Method

To solve occlusion problem, the proposed method uses previously learned un-occluded views of the dynamic objects to be super-imposed on the occlusion when they are occluded by the static objects.

Occlusion Detection For Indoor Setups

For indoor setups, we use structured light to find occluded areas in all views. Structured light source is placed as close as possible to the main view. Later, u-v code maps are used to find the occlusions. This preprocess makes the run-time phase faster and helps to find the perspective transformations between views.

For outdoor setups we make a cross-check to determine whether an object is occluded or not.
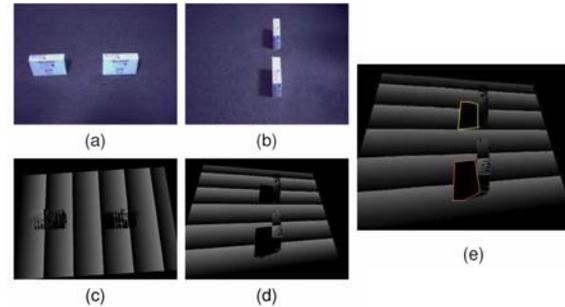
(a) Main view of the scene with two occlusions. (b) Helper view of the scene. (c) low order u codes for the main view. (d) low order u codes for helper view. (e) Occluded areas found on the helper view.

General Steps of the Run-Time

✓ A continuous occlusion check is done for each dynamic object in the scene.

✓ While dynamic objects are not in the occlusion area, the images of the objects from all views are registered and learned.

✓ When a dynamic object steps in an occluded area, the system makes a search with the image of the object from the un-occluded view. The best result found has a corresponding pair for the occluded view. That corresponding pair is super imposed on the occlusion in real-time.

✓ For objects that do not have a suitable search result, the system transforms the visible view of the occluded object onto area that causes the occlusion.

Results

The proposed approach actually works very well. Below is an experiment of a man passing behind an occlusion.