Fully Automated Real-Time Augmented Reality

Proposal for demonstration at ICCV 2003

Authors: Vincent Lepetit, Luca Vacchetti, Julien Pilet, Pascal Fua
Contact: Vincent Lepetit (vincent.lepetit@epfl.ch)
(Tel: +41 21.693.67.16 Secretary: +41 21.693.75.19 Fax: +41 21.693.75.20)
Approximate size of space: 1 desk
We provide the equipment (one laptop, one camera).

We propose to demonstrate a fully automated system for real-time Augmented Reality. It relies on purely passive vision techniques to solve the initialization and real-time tracking problems, given a rough CAD model of parts of the real scene. It does not require a controlled environment, for example placing markers. It handles arbitrarily complex models, occlusions, large camera displacements and drastic aspect changes, without imposing any restriction on the target object's complexity.

Automated initialization relies on a method we developed for 3D object recognition. Our method goes much further than recent work on object recognition towards reducing the computational burden, thus making it suitable for AR applications: the computation time is less than one second, and the estimated object pose is accurate enough to initialize our tracker, even in presence of cluttered background or partial occlusions.

The real-time camera tracking relies on the algorithm described in [1], and can handle large camera displacements, drastic aspect changes and partial occlusions and is drift- and jitter- free. It achieves this level of performance by fusing the information from preceding frames in a conventional recursive tracking fashion with the one provided by a very limited number of key-frames created during an off-line stage.

The demonstration runs on a laptop with an attached fire wire camera and it tracks at a rate of 25 hertz. It will consist in detecting and tracking in real-time a diverse set of objects – the tea box of Fig. 1 and 2. but also human faces as in Fig. 3 – and adding virtual parts to them.

The human face tracking demo can be automatically initialized only if the face is known by the system. In the other case, the tracking part must be initialized by hand. We have already tested this demonstration over more than one hundred people of all ages, with success.
A MPEG movie can be seen at:
http://cvlab.epfl.ch/~vacchetti/augmentedFace/augmentedFace.html

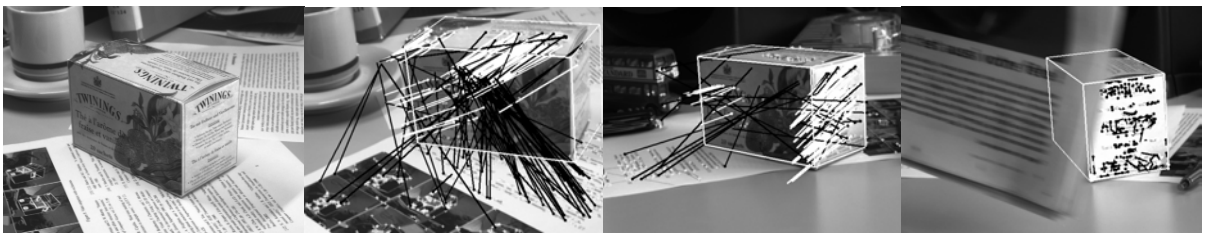

Fig 1. Automatic initialization. Given one image of the object (left), our system estimates the pose of the object in new images, even in presence of cluttered background or occlusions.

Fig.2: Tracking the tea box going through aspect changes. In the last two pictures, the box is turned into a Swiss Chalet by texture mapping it.

Fig.3: Screenshots from our human face tracking demo: we use a generic model to track the face of the person in front of the camera. Then, virtual glasses and moustaches are added.

Reference:

[1] L. Vacchetti, V. Lepetit and P. Fua, "Fusing Online and Offline Information for Stable 3D Tracking in Real-Time", CVPR 2003.