Collaborative mobile computer vision

Doctoral School: Doctoral School of Computer Science
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Topic Description:
The goal of the proposed research is to develop new algorithms that exploit the imaging and connectivity capabilities of modern mobile devices (smartphones and tablets) and provide new visual information contents for users. The project addresses three tasks, that have the common goal of collaborative virtual view generation and revealing their practical usabilities.

By utilizing these approaches new information contents can be generated and shared which would not be possible without collaboration of mobile imaging devices. These can be used to e.g., survey event venues, accidents or places after natural disaster. The main advantage of such an approach is that near real-time, actual status can be imaged contrary to the StreetView-like applications that provide rather old data.

The main challenges of the proposed work are as follows: Given an ad-hoc camera network (the mobile devices equipped with camera), algorithms should be developed to

- identify neighboring cameras with visual overlap,
- find correspondences between the views of these neighbors,
- recover full or partial geometry of the images in the network, and generate the desired synthetic views/reconstructions in a collaborative manner, where each device is processing its own image with possible (but minimal) interaction with its neighbors.

Specific aims of the proposed work

Task 1: Collaborative 3D reconstruction
A virtual view can be a reconstructed 3D model from normal or stereo images. The users will be able to observe objects, locations from different viewpoints. Even instructions could be sent to users where to move, which direction to turn to take new images that can further improve the reconstruction result.

Task 2: Collaborative panoramic image generation
A wider angle panoramic image can be generated from typically narrow angle mobile images. The images should have overlaps and can come from the same device (taking images or video when moving the device) or from other devices. The result of this task can also be used in Task 3.

Task 3: Collaborative synthetic view generation
Normal or 3D reconstructed images of different devices can be used to generate synthetic (e.g., aerial-like) views that can be used to give an overview map in traffic jams or events with large number of participants. Such an approach can be useful for detecting important events that affect large number of people and help e.g., organizing rescue plans and/or to provide faster and more precise information to them.

Collaboration
The proposed research is closely related to the FuturICT.hu TAMOP project and will involve collaboration with various international institutes (AIT, Austria; Technical University of Zagreb).

Admissible number of students: 1
Deadline for applications: 2016-09-30