Exploiting Inertial Planes for Multi-sensor 3D Data Registration

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Introduction:

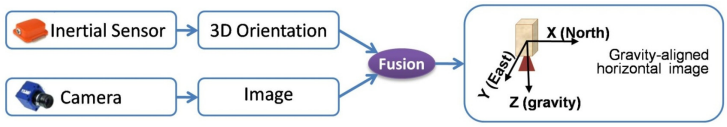
❖ 3D reconstruction using images is still a key challenging in computer vision. Variety of applications such as: surveillance, human behaviour modeling, virtual-reality, teleconferencing, human-robot interaction, medical industries and object recognition can benefit from it.

❖ Nowadays, camera network is ubiquitous. Recently, Inertial Sensor (IS) is becoming much cheaper and more available such that nowadays even many smart phones can be found equipped in both IS and camera sensors. We take the advantage of having a camera already coupled with an IS and investigate the problem of multi-sensor data registration.

Contributions:

❖ Exploiting inertial data for 3D volumetric reconstruction using a network of virtual cameras (IS-camera couples) and proposing a multi-layer data registration framework using homography concept.

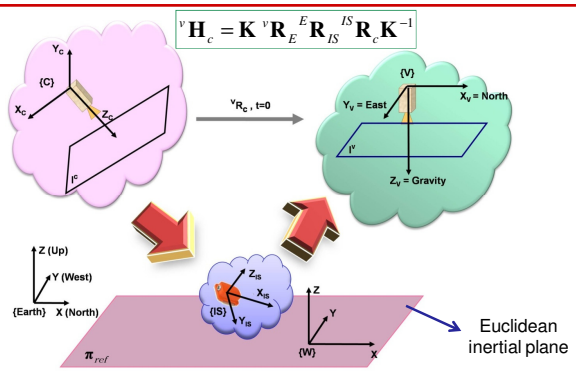
❖ A real-time prototype to fully reconstruct human body by using a parallel processing architecture implemented on GP-GPU.



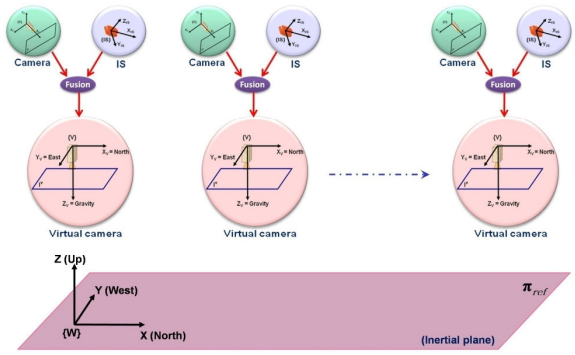
❖ Proposing a two-point-based method to estimate translation among two virtual camera in the framework

❖ Exploring geometric relation among the homography transformations of the image and virtual planes involved in the framework.

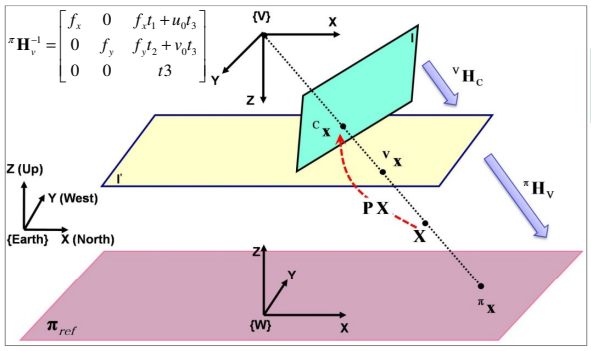
❖ Proposing an algorithm to have an appropriate coverage of the camera network to a polygonal object or scene, by using genetic algorithm.

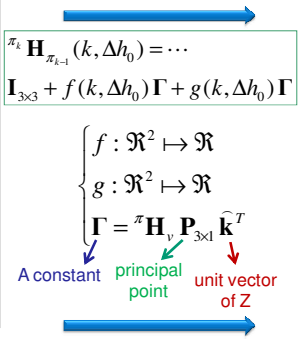


Virtual camera using infinit homography

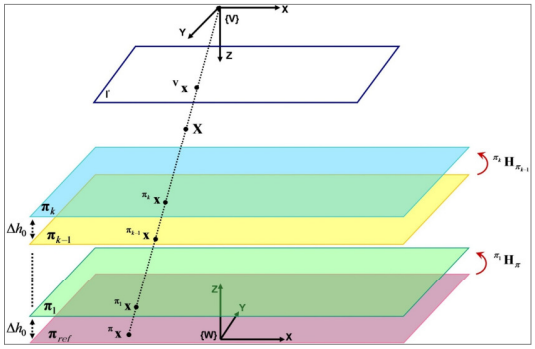


A sensor network comprised of IS-camera couples

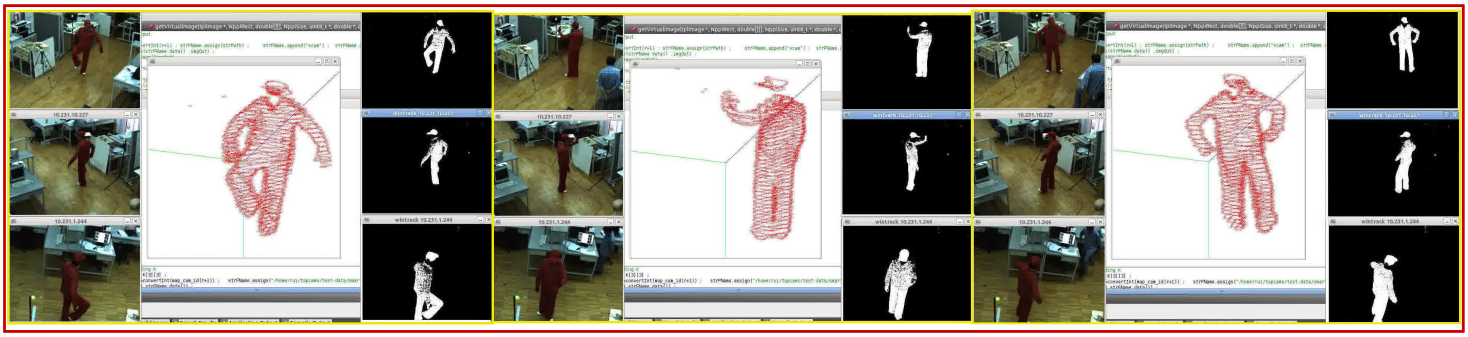




Registration of 3D points on an inertial planes



Extension for other euclidean inertial planes



Real-time results using GP-GPU parallel processing architecture

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