

HIGH ACCURACY IN 3D RECONSTRUCTION BY FUSION OF IMU AND IMAGING DATA: APPLICATION IN HEALTH MEDICINE

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ABSTRACT

In this thesis, high accuracy in 3D reconstruction for an application in health medicine, human limb volume calculation, is studied using two techniques: depth sensor and multi-view stereopsis. For the depth sensor case, accurate 3D reconstruction is built by two stages. In the coarse stage, an initialization is generated by fusion of imaging and gyroscope data captured by a combination of IMU and IR sensors. In the fine stage, a novel algorithm, named Iterative Clustered Closest Point (ICCP), is proposed for *stitching* of multiple 3D point clouds. For the case of multi-view stereopsis, a new iterative algorithm is proposed for camera motion estimation, which combines RGB and IMU data from a smart phone. The system produces a 3D model of limbs accurate enough for volume estimation. In order to prove the accuracy of proposed methods for this application in health medicine, many tests are performed in this thesis.