3D IMAGE ACQUIRING TECHNIQUE WITH IMPROVED ACCURACY

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ABSTRACT

This thesis proposed a Three Dimensional (3D) image acquiring technique with improved accuracy to recreate a 3D model of small high precision machine parts (stud mounted device) and presents a detailed Literature Review (LR) on 3D imaging techniques. 3D imaging has been used and applied in several fields, such as computer vision, machine vision, medical science, optics and robotics etc. The research in 3D applications development is progressing swiftly and industry is making the most out of it. To obtain 3D data and depth information, there different techniques that are currently being used for different applications. These 3D acquisition techniques are mainly classified into different categories. Amongst them, stereo vision technique is one that is the most well-known and used extensively in research and development. It can also be named as triangulation technique. Additionally, Three-Dimensional Digital Image Correlation (3D-DIC), Non-Rigid Structure from Motion (NRSFM), convex relaxation, structured light and coded structured light techniques contributed a lot in the research. Nonetheless, the research community is well aware of the fact that still much remains to be done. This thesis considered important findings from the literature review and identified best suitable method to reconstruct dense 3D shape of an object. The experiment performed using Structure from Motion (SFM) algorithm combined with Clustering based Multiview Stereo algorithm and final shape retrieved using screened poisson surface reconstruction technique. This method is adapted from previously proposed method by Gupta et al. in [1], but the method was proposed to monitor land-sliding in 3D high resolution. The software used in this study are MATLAB for reading the sequence of images and running SFM algorithm on the input images, Visual SFM is used for applying CMVS algorithm on the point cloud produced by SFM and lastly Meshlab takes the CMVS output file and reconstruct the surface of the object and produces a fine and accurate 3D model. The results of the proposed method have been evaluated by calculating Mean Absolute Error and percentage error between the observed and calculated values. The results show that the proposed technique achieves better accuracy with reduce cost and computational time under particular conditions.

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