Abstract

Stereo Vision Based Control for a Tele-Cardiac Auscultation System
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Cardiac auscultation skills are essential tools that help to obtain a precise cardiovascular evaluation. Although, medical skills of using stethoscope for the cardiac auscultation are still required, in large-scale medical services, the number of the doctor seems to be small. As a result, a tele-cardiac auscultation is proposed to address these inadequate problems. The thesis presents an application of a stereo vision system to the tele-cardiac auscultation system which is aimed at overcoming the problem of insufficient number of doctors compare with the higher number of patients. Stereo vision techniques are able to analyze multiple images of the same scene captured to recover three-dimensional structural information, as a result, the position of stethoscope location on the human body in the tele-diagnostic system can be estimated.

The stereo vision system simulates human vision which the reconstruction of points in three-dimensional space can be done by using the knowledge of a camera calibration, an image rectification, an epipolar geometry, and a correspondence analysis. In addition, the correspondence analysis is the main issue of this study. In this thesis, the procedure of the correspondence analysis has been seperated into two steps, i.e., the human body edge detection and matching, and the human body region matching. A comparative study of four image matching techniques to the correspondence analysis of a stereo image pair has also been presented, including the sum of absolute difference (SAD) matching, the sum of square difference (SSD) matching, the zero mean normalized cross correlation (ZNCC), and the phase only correlation (POC). In this robustness study, an integrated input environment has been set up to acquire the similarity measurement. The precision of the correlation result and the reconstruction of points of these algorithms are the significant factors of selecting the stereo matching algorithm that is appropriate to the proposed tele-cardiac auscultation system.