SELECTED TOPICS IN ADVANCED ELECTRONICS

Edited by

Khalid A. S. Al-Khateeb

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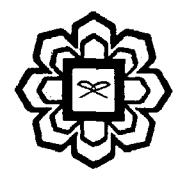

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CHAPTER 25

INTELLIGENT AUTO TRACKING IN 3D SPACE BY IMAGE PROCESSING

By

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Synopsis

Robotic vision systems can play an important role in a variety of high tech applications. A system can be designed and analyzed for real time tracking of manoeuvring objects. Passive detection using live TV images provides the tracking signals derived from the video data. The calibration and orientation of two cameras can be done by a bundle adjustment technique. The target location algorithm determines the coordinates of the centroid of the target in the image plane and relates it to the aim point in the object plane. Stereoscopic images provide information from which the range r of the target can be determined. The azimuth θ and elevation φ are determined by correlating the x-y displacements of the centroid in the image plane with the angular displacement of the target in the object plane. The servo drive signals for both the robot motion and the angular positioning of the cameras are derived from the image processing algorithm that keeps the centroid of the target image in the centre of the frame and the target in line with the axis of the optical system. Hence, the spherical coordinates of the target are defined and updated with every TV frame. The time development of the centroid in successive TV frames represents the real time trajectory of the target path. A non-linear prediction technique keeps the target within the aim zone of the tracking system. The processing time is minimized to within a TV frame time. A small area (a window) around the target is isolated by image segmentation. The rest of the image information is discarded. Hence, the target is contained within the window. The geometric centre of the window is made to