Applications of Radon transform in Image Recognition and implementation on a Digital Signal Processor (DSP)

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Abstract

The purpose of this thesis is to implement a complete standalone image recognition system based on a state of the art DSP core.

We want to measure the position and the angle of mounting points of some special cylindrical Meuon detectors that are being used in high energy physics experiments and more specifically in the ATLAS detector of LHC experiment at CERN. In order to accomplish this complex image recognition task we use the circular version of Radon transform because of its robustness against noise. In order to complete the system we use techniques from several areas like computer graphics (Bresenham algorithm), video encoders/decoders using the ITU 656 modern digital video protocol, general signal and image processing techniques (filter design, cross correlation, edge detection) and statistical pattern recognition (Bayesian classifiers).

The setup includes a video camera with standard video out, EZ-KIT Lite development board for Analog Devices' ADSP – BF533® digital signal processor and a video monitor where the results are being presented.

The in depth analysis and presentation of the methodology we used while developing this application and complete theory coverage can advance the reader with a complete overview of the steps that are required for developing an embedded image recognition system.

Keywords:

Radon and Hough transform, BF 533, image recognition, ATLAS experiment, ITU 656