Time & Location: March 25, 2020 at 10:30 AM in Harris Corporation Engineering Center 450
Title: Increasing Accuracy Performance Through Optimal Feature Extraction Algorithms

This research developed models and techniques to improve the three key modules of popular recognition systems: preprocessing, feature extraction, and classification. Improvements were made in four key areas: processing speed, algorithm complexity, storage space, and accuracy. The focus was on the application areas of face, traffic sign, and speaker recognition.

In the preprocessing module of facial and traffic sign recognition, improvements were made through the utilization of grayscaling and anisotropic diffusion. In the feature extraction module, improvements were made in two different ways; first, through the use of mixed transforms and second through a convolutional neural network (CNN) that best fits specific datasets. The mixed transform system consists of various combinations of the Discrete Wavelet Transform (DWT) and Discrete Cosine Transform (DCT), which have a reliable track record for image feature extraction. In terms of the proposed CNN, a neuroevolution system was used to determine the characteristics and layout of a CNN to best extract image features for particular datasets. In the speaker recognition system, the improvement to the feature extraction module comprised of a quantized spectral covariance matrix and a two-dimensional Principal Component Analysis (2DPCA) function. In the classification module, enhancements were made in the visual recognition through the use of two neural networks: the multilayer sigmoid and convolutional neural network.

Results show that the proposed improvements in the three modules led to an increase in accuracy as well as reduced algorithmic complexity, with corresponding reductions in storage space and processing speed.

Major: Electrical Engineering

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Bachelor's of Electrical Engineering, BS, 1994, University of Calgary
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Approved for distribution by Wasfy B. Mikhael, Committee Chair, on March 5, 2020.

The public is welcome to attend.