2． 項目簡介

(*項目所屬科學技術領域、主要研究內容、發現點、科學價值、同行引用及評價等內容。*)

With the explosive growth in wired and wireless digital communication and ubiquitous internet multimedia services, enormous and diverse technologies are available for individuals to create, distribute, and access multimedia data, including images, videos, documents, biometrics and medical images. Network based camera systems are widely used to monitor public or strategic locations such as banks, casinos, commercial centers and airports for homeland security applications. These systems require robust feature extraction and analysis methods for recognizing and tracking the suspected criminals or objects, and multimedia security technologies for ensuring communication and storage security. Biometric identification systems for security access of classified locations (e.g. database and information centers in banks and governments) require feature extraction and analysis methods for identifying the authorized personnel and unwanted visitors, and multimedia security technologies to protect the biometrics information (fingerprints and facial features). Feature analysis and multimedia security are also extremely important to document analysis and protection for commercial and security purposes.

In this project, we have developed novel technologies and theories in feature analysis and multimedia security for different applications, including digital watermarking, image encryption, image classification and retrieval, document analysis and recognition. The following briefly lists our main contributions:

• Log-polar wavelet energy signatures for rotation and scale invariant texture classification
• Extraction of shift invariant wavelet features for classification of images with different sizes
• Kernel-view based discriminant approach for embedded feature extraction in high-dimensional space
• Rotation invariant texture feature for image retrieval
• Local contrast method for small infrared target detection
• Inner structure based weak classifier (ISABoost) for scene classification
• Sparse representation based regional information fusion in multifocus images
• Document clustering in correlation similarity measure space
• Document analysis and recognition by wavelet and fractal theories
• Error analysis of stochastic gradient descent ranking
• Geometric invariant watermarking by local Zernike moments of binary image patches
• Robust segments detector for De-synchronization resilient audio watermarking
• Pattern recognition system for JPEG steganography detection
• (n, k, p)-Gary code for image systems
• P-Fibonacci transform and decomposition for image encryption
• Parametric switching chaotic system for image encryption
• 1D chaotic system for image encryption

The research outcomes of this project have resulted in publishing more than 100 papers in international peer-review journals and conference proceedings. Many papers were published in top journals such as IEEE Transactions On Pattern Analysis and Machine Intelligence, IEEE Transactions on Geoscience and Remote

Sensing, IEEE Transactions on Audio, Speech, and Language Processing, , IEEE Transactions On Cybernetics, Signal Processing etc., and many top conferences such as IEEE International Conference on Multimedia and Expo (ICME), IEEE International Conference on Acoustics, Speech, and Signal Processing, IEEE International Conference on System, Man, and Cybernetics, etc. Some papers have been highly cited and have great impacts in the area of pattern recognition and multimedia security.

（*字數不超過 1200 字*）