Research@VSAP

VSAP is a joint research initiative between Khalifa University of Science, Technology and Research (KUSTAR), U.A.E. and the University of Bristol, U.K.

### Research Areas
- Gesture recognition and articulated object tracking
- Biometrics and interaction with robotic devices
- 3D feature-based search and retrieval
- Efficient algorithms and architectures for feature-based image processing
- Collaborative visual environments
- Perceptual image enhancement
- Low light and low contrast imaging
- Airborne video processing
- Underwater visual processing and communications
- Vision based robotic control
- Visual inspection of advanced manufacturing processes
- Medical image enhancement and classification

### Contact Information
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VSAP Research Center
VSAP is a joint research initiative between Khalifa University of Science, Technology and Research (KUSTAR), U.A.E. and the University of Bristol, U.K.
Research Themes

Surveillance and Machine Vision
- Scene Understanding
- Detection and Tracking
- Vision for UAV/UGV
- Crowd Analysis

Video Communications & Image Security
- Secure Video Communication
- Joint encryption and compression
- Efficient video coding
- Digital Watermarking

Biometrics and Bio-imaging
- 2D/3D Face Recognition
- Facial expression analysis
- Micro/Macro scale enhancement
- Segmentation and Evaluation

Facilities
- Indoor surveillance environment consisting of 6 cisco cameras with a 4TB Rack Server.
- Dark room environment for lighting controlled data collection and experimentation
- Cameras: Canon 1D, Lytro Illum, FLIR Thermal camera, USB FLEA, Kinect, among others.

Expertise
- Low-level image enhancement
- Contrast enhancement
- Perceptual image processing
- Target detection, tracking, re-identification and motion analysis
- Multi-camera modeling, calibration, tracking
- Moving camera target detection and tracking
- Visual search and classification

Current Projects
- Illumination invariant gesture recognition
- Sensor fusion-based big data analytics for healthcare surveillance system
- Crowd behavior and emotion analysis for situation awareness
- Target detection in remote sensing using image fusion
- Efficient image and video denoising

Completed Projects
- Intelligent multi-sensor surveillance system for elderly care
- Efficient algorithms and architectures for feature point detection
- Target detection, tracking and identification using multiple cameras (static/moving)
- Autonomous human target identification and tracking using multiple cameras in crowded environments
- Low light image enhancement – fog/haze removal

Video Communication and Image Security

Facilities
- VSAP hosts HPC facilities through its IBM Server (IBM System x3650 M3).
- Samsung SUR40 with Microsoft® PixelSense™.
- VSAP strongly partners with University of Bristol and Khalifa University Robotics Institute (KURI) for data acquisition, field-testing and operations.
- VSAP works together with the Information Security group at KU on some projects.

Expertise
- Scalable video coding, Transcoding.
- Link adaptation.
- Wireless video communication efficiency, complexity and resilience
- Digital watermarking.

Current Projects
- Video security assurance framework based on an efficient joint encryption compression approach
- Digital watermarking for medical images

Completed Projects
- Digital image watermarking for satellite images
- Link adaptation for wireless video communication systems

Biometrics and Bio-imaging

Facilities
- Dedicated Biometrics lab space within the VSAP center.
- 3D Face scanners, Bumblebee Stereo camera, Multispectral Fingerprint scanner, Fujitsu PalmSecure Palm Vein Scanner and Gazepoint Eye Tracker.
- VSAP strongly partners with University of Bristol and Biomedical Engineering Department at KU for field testing and operations.
- VSAP also has strong links with key medical institutions and clinics that provide necessary support and data on several projects.

Expertise
- 2D/3D Face analysis
- Face Expression Analysis
- Macro-/Micro-scale object motion capture, detection, tracking and analysis
- Segmentation and detection
- 2D, 3D modeling and reconstruction
- Visualization and assessment of medical digital images

Current Projects
- Capsule localization using multiple images in capsule endoscopy
- People identification from partially hidden 3D facial images
- Computer-aided diagnosis system for early and automated detection of infantile dysmorphic syndrome in the UAE
- Detecting Down Syndrome in infants using 2D and 3D facial images
- Volumetric detection and tracking of cell particles

Completed Projects
- A Grading System for Assessing Posterior Capsule Opacification using Medical Images
- Detection and segmentation of sputum cell for early lung cancer detection
- Encoding and alignment of 3D facial images
- Computer-aided diagnosis system for early detection of cervix cancer from pap smear images