

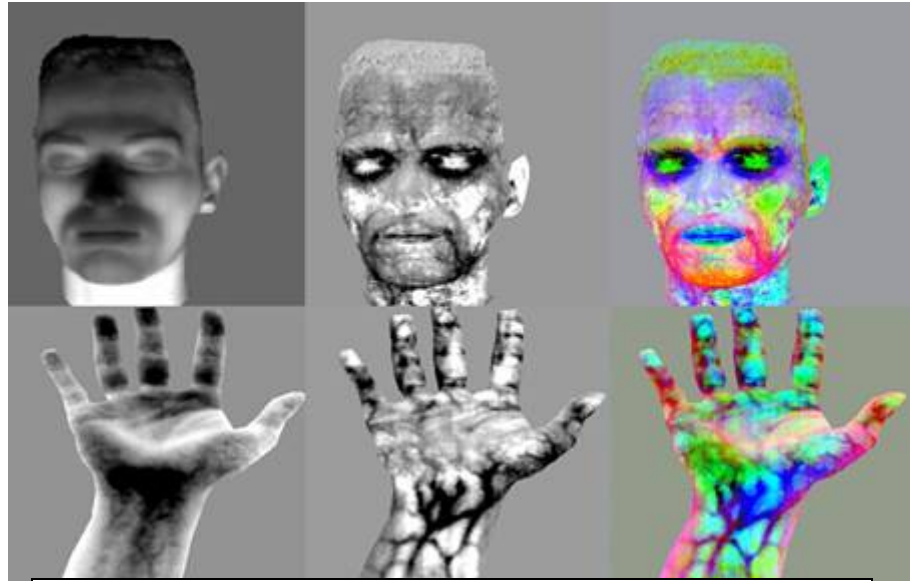
Emerging, Non-Invasive Biomedical Imaging Applications

Hyperspectral Scanning of Skin and Tissue Health

Hyperspectral imaging is a spectral analysis technique that allows for the determination and presentation of spectral data within a particular scene or field of view of interest. Over the past ten years, this technology has been widely used for two primary applications; the first being airborne military applications (surveillance, reconnaissance, spectral tagging of targets) and the second application being the remote sensing of earth (environmental analysis, geologic study, etc.). Essentially, a hyperspectral sensor collects both spatial and spectral information from a scene of interest, builds a hyperspectral datacube from these image slices, and presents a highly resolved, rendered image to the investigator. Hyperspectral imaging provides a researcher or clinician with the following information: a visual image of the scene of interest, the chemical spectra for any point or location in that scene, and a rendered image of the scene or sample at any target wavelength(s).

With new advances in sensor technology and the recent affordability of high performance spectral imagers, hyperspectral instruments have enabled a host of new applications – with key efforts in the area of

medical imaging. Rather than flying over battlefields, these hyperspectral sensors can be deployed to scan a patient's body in search of pre-cancerous lesions or to provide much needed spectral information through endoscopy procedures. These hyperspectral medical instruments hold great potential for non-invasive diagnosis of cancer, assessment of wound conditions, etc. For the patient, tremendous advantage is obtained by being able to not only diagnose the condition in a non-invasive manner but also to potentially treat the condition at the time of diagnosis. Great interest has been generated on the part of health care providers to investigate the promise of reducing health care costs and timeliness of treatment for many types of disease conditions through the use of hyperspectral scanning procedures.



Hyperspectral Images of Naturally Occurring Human Spectral Signatures Skin Surface and Sub-Surface Vascular System

Galileo Group is applying this approach to biomedical and biometric imaging with its partner Headwall Photonics, who is providing a new generation mini imaging sensor called Hyperspec™. Together, the two companies are implementing a consolidated business model to deploy the technology on commercial level scale into medical offices and clinics. Key application areas include skin cancer detection, wound management, and chemical agent absorption effects on human skin. Research has been completed in these areas, and continues underway with additional trials and testing. Biometric applications are also underway by correlating physiological signatures with spectral observations. Key to this success is the development of spectral libraries. With considerable investment in this technology, Galileo has developed an extensive database of human skin and tissue hyperspectral signatures, which when coupled with the targeting algorithms, form the basis for providing uniquely observable information.

Galileo Group is a nine year old company based in Melbourne, Florida, specializing in airborne remote sensing. Primary expertise is hyperspectral imaging and LIDAR mapping. This includes development of unique signature libraries and custom target algorithms to perform detection and classification operations to deliver a completed turn-key product. Galileo has excelled at commercializing hyperspectral technology to perform commercial high resolution collection projects on the order of several hundred thousand acres per job, with dozens of vegetative species classified as part of the deliverable. Economy of scale, coupled with the automation of most of the post-processing cycle has resulted in affordable access to this technology to new civil and commercial users. For more information, visit www.galileo-gp.com.

Headwall Photonics is the world's leading designer and manufacturer of imaging spectrometers and hyperspectral sensors. The company has extensive experience designing spectral sensing equipment for high performance imaging in harsh environments. Headwall has developed a family of integrated hyperspectral instruments that cover a number of spectral regions (visible-near infrared, near infrared, and short wave infrared). For more information, visit www.HeadwallPhotonics.com.