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E90
Topic Selection Memo

Noninvasive Optical Monitoring Techniques

The popularity and demand for noninvasive blood monitoring techniques is continuously growing. Transmission pulse oximetry has long been available as a means for determining the arterial oxygen saturation, but primarily in fingers, earlobes, and the feet of neonates, a limitation attributable to the greater reliability and accuracy of commercially available transmittance devices.

Expansion of this basic technique has been taken in many directions, and previous work done in the department includes optimization of analog and digital signal processing and statistical analysis, the design of custom-made laser diode based reflectance and transmittance devices for comparison, use of a white light source and spectroscopy, and the use of a LED light source [1-4]. Much of this work, however, is in need of renewal due to a lack of recent activity. Avenues for possible work include further exploration of signal processing techniques for the reliability of reflectance oximetry, renewal of the broad-spectrum spectroscopy technique for potential monitoring of glucose, bilirubin, and carboxyhemoglobin saturation in addition to oxygen, upgrading current in-house LABVIEW code, and the development of an artificial finger for testing purposes.

Prospective advisors: Profs. Cheever and Molter

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2. Bright, Corinne. *Noninvasive Optical Monitoring: Laser Diode-Based Reflectance Pulse Oximetry*. Senior Design Projects, Department of Engineering, Swarthmore College, Vol 1, 1998.
3. Tong, Ka Man Mark. *Extending Pulse Oximetry: Design and Development of a Broad-spectrum, Spectroscopy-based Arterial Blood Monitoring System*, Senior Design Projects, Department of Engineering, Swarthmore College, Vol. 5, 1999.
4. Lee, Jonathan. *Light Emitting Diode (LED): Reflectance Pulse Oximetry*, Senior Design Projects, Department of Engineering, Swarthmore College, Vol. 3, 2003.