Phoenix Project Proposed Project: Investigation of Piezo-film Applanation Tonometer

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Introduction: Previous Phoenix Project attempts to sense a complete pulse wave at the wrist or forearm by placing piezo film on the skin have not been very successful – typically only part of the pulse wave is detectable. There are a few devices on the market or in development that use a technique that's a bit more sophisticated: a small sensor is depressed into the skin directly over the artery, so it is putting pressure directly on the artery but not the surrounding area, and the pulse wave is recovered by recording either the movement of the sensor or the changes in backpressure on the sensor. This project consists of investigation into the technique and sensors that could be used, followed by a formal report of positive and negative results delivered to Phoenix Project advisors.

Scope: The student team research existing published designs, will pick one or more designs whereby a piezo film sensor and pressure-inducing device (example, a cylindrical plunger) are placed on the skin over an artery in the wrist, forearm, ankle, neck, or earlobe. The piezo film could above or below the pressure-inducing mechanism. The pressure-inducing mechanism must be controllable, so a microcontroller could be used to activate the pressure mechanism while a reading is being take, and release the pressure during periods when no reading is being taken. The team must develop written implementation requirements, physical mounting requirements, power requirements, and accuracy/precision requirements from Phoenix Project information, and take those requirements into account in the design as much as possible. The team must construct or obtain a multi-channel filter/amplifier circuit, and perform experiments with an array of sensors at the wrist, forearm, and other locations, with analysis of how realistic and complete the pulse waveforms are. Finally, an analysis of how closely the Phoenix Project requirements of robustness, accuracy, cost-to-build, and manufacturability were met will be performed by the student team, and the entire project reported upon.

Known User Specifications: Blood pressure is to be correlated to cuff pressure within +/- 3mmHg. The system design should have a path to achieve ease of use, wearability, and low cost (less than $100).

No Proprietary Information: The Phoenix Project is completely open source; all information can be freely distributed, discussed with prospective employers, and included on résumés.