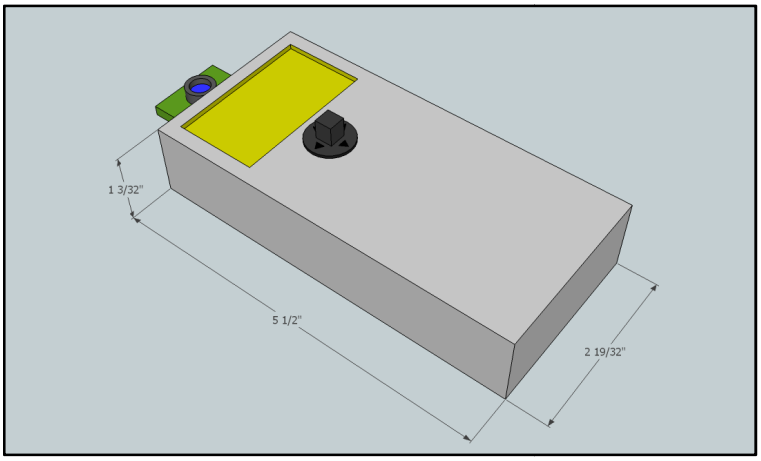
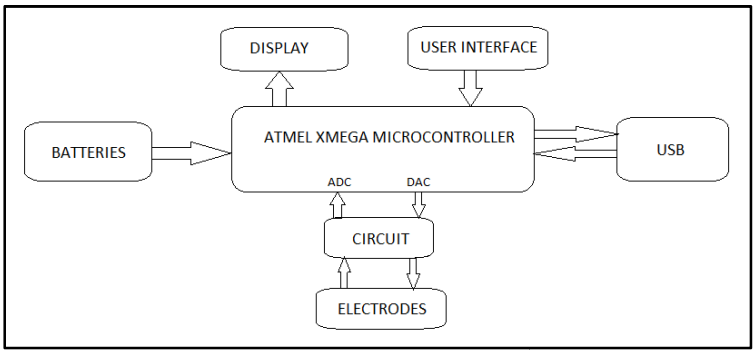
ElectrodeSense

Team Members: Michael Zimmer, Ramsin Yadgar, Tony Hobza
Advisors: Aaron Rowe, Dr. Ryan White, Jim Honea
Funding: The Plaxco Group, UCSB



The device is a battery powered, hand-held potentiostat which controls a three electrode cell that functions as a biosensor. Programmable hardware and a user interface allow the device to be used with a wide array of biosensors with minimal effort. Basic results are shown on the device's display, while more detailed results can be downloaded to a computer via USB. Some current and future applications of biosensors involve the detection of cocaine, gentamicin, thrombin, and PDGF (platelet-derived growth factor) in both buffer and serum. For example, law enforcement could quickly use it on-site for detection of cocaine.

Currently there are both large laboratory potentiostats and portable potentiostats which could serve the same function as our hand-held device, but often have more functionality than is needed and are expensive. The ElectrodeSense, with prototypes costing under $80 and high volume costs under $30, is designed to be a cheaper alternative to current devices costing over $1000.



A 16 characters x 3 line display and a four directional switch allow the device to both display results and choose profiles of the medium and contaminant. The device uses a digital-to-analog converter to apply a square wave with a ramped DC offset voltage to a feedback network attached to the electrodes. An analog-to-digital converter is used to measure the small nanoampere to microampere range current that results between the counter and working electrode. With the presence of a contaminant in the medium, the interaction between the contaminant and the DNA on the electrodes produces a deviation from the base current-potential relationship, which can be related to the concentration of the contaminant. The microcontroller is then used to analyze the data and display results.