* **Miniaturize using a custom PCB –** We would like to design and fabricate a custom printed circuit board (PCB) which can literally fit the size of an average human hand. This will consist of a combination of the circuit components, a Lithium Polymer battery and a flexible LCD display.

We even might consider making use of flexible printed circuits so that it gives the user freedom of flexing the hands without worrying about the rigidity of the setup. This will make the device “wearable” in its true sense. We plan to use surface mounted device (SMD) components for all the existing counterparts on the circuit.



Figure 1.Future Setup Implementation of LabGloves

* **Implement AC/DC current and AC voltage in the design –** We would like to have an additional functionality of measuring the AC-DC current and AC voltage using the LabGloves. This will make it complete in terms of DMM functions. The real challenge lies in shorting a wire while measuring the current in a circuit and making it pass through the internal components.
* **Make a single board for all including the MCU** – We plan to use a smaller 32 pin SMD version of the AVR AtMega 1284P MCU to make the system compact. Instead of using a different prototyping board for the MCU, it will be a part of the main circuit with peripheral components around it.

The user interface module will be connected to the main breakout board through the glove fabric. We need to take care of the ergonomic factors and usability while finalizing the design.

* **Include the future patenting strategy and market available for its use –** We are definitely looking forward to the LabGloves as a future product and it is important for us to protect the intellectual property rights (IPR) associated with it. Right at the beginning of spring’15 semester we plan to file a provisional patent on it to get the protection rights of a year before filing the actual patent. LabGloves©- name of the product needs to be a copyright as well.

We plan to approach Cornell University patent and TM office to get directions in this aspect.

* **Insulate the Glove for future –** It is essential that we provide a right insulation for the glove to minimize the risks it possess to the user. We plan to sandwich the circuit layer between the two insulating layers for full-proof insulation. However, the overall thickness o0f the sandwich is the most important parameter as it should not make wearing the glove an uncomfortable affair.

* **Bypassing a mode for other modes –** Currently, in the existing setup when the user measures a particular parameter and switches to a different mode it does not take care of the fluctuations in the reading. For e.g.: If you have frequency generator connected to the probes and try to measure capacitance without disconnecting the probes, it will fluctuate the value of capacitance being measured.

We need to implement bypassing of other modes when measuring in a particular mode. A combination of SMD MUX’s can do this trick (needs to be researched more)

* **Add-On functionalities –** It will be very useful if we can get other functionalities such as humidity, surface thickness, level testing etc. on the finger tips. It will be a challenge to implement these functions using a single finger probe.

Understanding the nature of the future work and citing a potential in the LabGloves© our team is planning to take it ahead in the spring’15 semester as an independent study project with Prof. Bruce R Land!