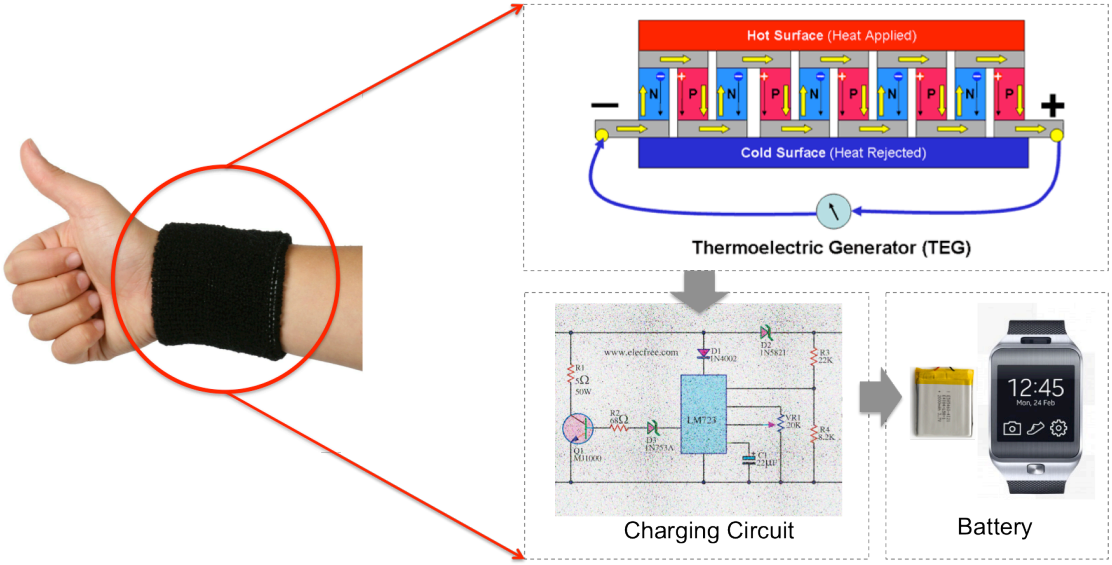
Wear-&-Charge: A Thermoelectric Generator For Charging Wearable Electronics Using Body Heat

OVERVIEW:

Wearable technologies are becoming companions of our life and expected to cross the market value of $14 Billion by 2018. One major issue every consumer face is the short battery life of wearable devices. Industries are fiercely seeking energy harvesting sources to prolong the battery life. One of such sources is the human body. Human beings are warm-blooded animals and generate more than 100W of heat on average. Devices with direct contact to the human body can harvest this heat energy by means of thermoelectric generators (TEGs) that can convert heat, or temperature difference, into electric energy. In other words, the body heat can be used a power source to charge the battery of wearable devices. The difference in temperature of the surrounding environment and the human body is very important in generating electricity through heat energy of the body. Therefore, the placement location and the skin contact area of TEGs become deciding factors in designing such body-worn energy harvesters.

Wear-&-Charge will involve the design of a body-worn TEG system that will convert the body heat into electric energy to charge A Samsung Gear smartwarch. Various experiments including simulation and modeling will be conducted to quantify the generated electric energy.

SYSTEM:



TEAM DESCRIPTION:

- One electrical engineer (for TEG element), one electrical engineer (for charging circuit), and one computer engineer (for simulation of TEG)
- Passionate, get-things-done kind of drive, independent thinkers, and collaborative
- TEG element: Strong interest in developing alternate energy harvesting solutions.
- Charging circuit: One can develop skills of designing miniaturized charging circuits for modern wearable electronics
- Simulation: Interest in modeling thermoelectric material for energy harvesting.

DELIVERABLES:

Thermoelectric Generator:

- Interfacing TEG elements on wearable objects such as armbands or knee bands.
- Conducting experiments to correlate skin coverage area and heat transfer rate.

Charging circuit:

- Designing a circuit to charge lithium ion batteries.
- Transitioning from breadboard to miniaturized PCB that can fit into wearable objects.

Simulation:

- Simulation and modeling of thermoelectric energy harvesting from body heat
- State-of-the-art modeling software will be provided.

"Do something wonderful, people may imitate it." - Albert Schweitzer

For questions and concerns, please feel free to contact Dr. Kunal Mankodiya via email: kunalm@ele.uri.edu.