Lyne Tchapmi Petse
Szu-Po Wang
Wenting Zheng

6.111 Final Project Abstract — Portable EKG Monitoring System

Technology in the biomedical field has been advancing rapidly in the recent years, giving rise to a great deal of efficient, personalized and fast care for patients. Machines used at hospitals across the world have seen huge improvements over the years. At the same time, there is still much to be done to make healthcare systems even better. One area is portability of medical electronics. Currently, a lot of medical machines that are used to monitor vital signs are heavy machines that have long wires that need to be constantly connected to the patients. This means that patients are confined within a certain space with limited mobility. For this project, we aim to develop a portable EKG that will measure a patient's heartbeat, then wirelessly transmit the information using infrared sensor to a remote location, where the information will be processed and displayed on a screen.

This system will have a base station and a portable EKG meter, and we wil use IR to transmit data between them. The EKG meter consists of a small FPGA board, an EKG sensing interface, and an IR transmitter circuit. Analog EKG data would firstly be sampled and converted to digital by analog-digital converter and stored in FPGA. After that, the FPGA board will pack the data and send them through the IR transmission channel. For the base station, it would first gather data from the IR receiver circuit and store them into its own FPGA board. The board could then display the EKG waveform on the monitor. Furthermore, the base station will use digital signal processing to retrieve patient information, like the heartbeat rate. As a result, we could build a system that monitors patient's EKG data remotely.

Following the above description of how the system operates, we could divide it into four parts: the gathering system of EKG data, the IR channel composed of the transmitter and the receiver, the digital signal processing part for retrieving useful information, and the display system to show results on the monitor.

Possible extensions for the project include doing more elaborate signal processing on the EKG data, like identifying different part of heartbeat cycle. We could also set alarm when heartbeat changed abnormally. The transmission of data can also be protected through encryption. We could also use digital modulation to take multiple measurements from different patients, transmit and display them simultaneously.