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CS 594/594L Fall 2016 EECS/WSU

Project Proposal Due: Sept 29 **Group#: 06**

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TOPIC

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| **Remote Patient Monitoring System** |

PROBLEM STATEMENT WITH MOTIVATION

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| A Remote Patient Monitoring System (RPM) is composed of a number of sensors, a transmitter, and a receiver. The sensors and the transmitter are usually attached in patient’s body to collect medical and health data, and transmit the data to a monitoring center for analysis and/or intervention if necessary. The receiver is normally located at the data center to receive the data before it can be analyzed/stored for future use.  Remote Patient Monitoring Systems help reduce patients’ time of hospitalization and rate of re-admission by providing health professionals with patient’s data without the need of traditional visits and lab testing. The challenge is keeping them safe and light (wearable) while improving their functionalities and range (distance from data centers). |

**PROPOSAL**

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| **Sensors**  In this section we will look at the different types of sensors needed to record heartbeat and body temperature. NTC thermistors are one of the options that will be taken into consideration. Thermistors are incredibly accurate sensors when it comes to temperature. They “are composed of sintered ceramics consisting of highly sensitive material with consistently reproducible properties of resistance versus temperature” [1]. NTC stands for negative temperature coefficient; these thermistors are non-linear resistors, which makes it simple for them to sensor temperature change: if the temperature increases, the resistance decreases, and vice versa. They are also inexpensive. [1]    Figure 1. NTC Thermistors [2]  Regarding the heartbeat sensor we will identify what suits better for our needs but the components will probably include electrodes to be in contact with the skin, some sort of System-on-Chip technology that will be able to interpret the electrocardiogram generated from the electrodes. Then the data collected will be transmitter through a transmitter [3].  Screen Shot 2016-10-12 at 8  Figure 2: Electrode, System-on-Chip, Transmitter [3]  **Transmission**  In this section we will look into different ways data is transmitted from the patient to data centers and the challenges that come with each method. We will explore wired and WiFi, but focus on GSM and Satellite transmitters since the purpose is to enable the patient roam around as much as it is possible without compromising his/her health care.  When talking about remote digital operations, power questions are inevitable. That makes it important to look at the challenges that come with safely, conveniently, and reliably powering the RPMs. With the current Lithium batteries issue in Samsung phones, and the previous issue in Boeing 787 Dreamliner aircrafts, and taking into consideration that these RPMs are wearable, it is crucial that we look into, and address all concerns that come with Lithium batteries in RPMs.  **Reception**  In the receiver section, a receiver is used to receive the data with the help of an antenna placed at the transmitter end Then decoder will decode the received data and the transmitted data is compared with the data stored in the [8051 microcontroller](https://www.elprocus.com/types-of-interrupts-in-8051-microcontroller-and-interrupt-programming/), and then LED screen will display the output data.  http://www.mdpi.com/sensors/sensors-14-18009/article\_deploy/html/images/sensors-14-18009f5-1024.png  A wireless transmitter is used to send the data to a wireless receiver connected to a local monitoring unit. The receiver sends the data to the Monitoring Unit for graphical display. If the reading is less than 150 or more than 500 the alarm will be ON and it will alert the health care service provider.  **Works Cited**  1. Dale, Vishay. "NTC and PTC Thermistors." *Www.vishay.com*. Vishay, 07 Mar. 2002. Web. 12 Oct. 2016.  2. "What Is An NTC Thermistor." *Inrush Current Limiters*. Ametherm, Inc., n.d. Web. 12 Oct. 2016.  3. Yarlagadda, Archana. "Designing a Wireless Heart Rate Monitor with Remote Data Logging." Cypress Semiconductor Corp., Jan. 2009. Web. 12 Oct. 2016. 4. National Academy of Engineering (US) and Institute of Medicine (US) Committee on Engineering and the Health Care System; Reid PP, Compton WD, Grossman JH, et al., editors. Building a Better Delivery System: A New Engineering/Health Care Partnership. Washington (DC): National Academies Press (US); 2005. |

##### **OUTCOMES**

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| When we complete this project, we will have a better understanding on how RPMs help improve healthcare here in the United State by keeping medical and health costs low, and of course giving patients the much needed freedom in their daily life.  We will also understand the challenge that comes with operating these embedded systems safely while overcoming the issues like convenience, security, accuracy, delays, and power.  It is our hope that we may come up with a suggestion or two in solving the current issues. |