## **BME 484 Biomedical Engineering Capstone Design**

## **Project Proposal**

Project Title: Radio Frequency Identification for Tracking Hospital Personnel and Patients

Team: Tyler Gagan, Project Manager Lauren Porto, Hardware Engineer Delaney Santos, Software Engineer

**Abstract:** The purpose of this project is to further improve an existing model which uses radio frequency identification (RFID) and smartphone technologies to track hospital personnel and patients. The existing RFID system consists of several tags with individual identification numbers programmed to them. The tag reader will be installed in the entryways of specific rooms and hallways. When a tag comes in close contact and is identified, a signal is then transmitted via Wi-Fi to the hospital server, allowing for real time tracking of individuals carrying the RFID tags. Once identified, the tag data is also transmitted to an android device via bluetooth and information is displayed on the device.

**Innovation**: The innovative idea for this project is to collect the data from the RFID system and communicate to a main hospital server allowing for the tracking of hospital personnel and patients. An Android app would download information from the RFID database and upload the location information to the main hospital server.

**Materials:** To complete this project, we will be using the existing 2016 model as a base for the project. The prototype system consists of a breadboard with an Arduino UNO microprocessor. An RFID tag interrogator (MIFARE RFID-RC522, NXP Semiconductors, Eindhoven, Netherlands), two Bluetooth modems (BlueSMiRF Silver, SparkFun, Boulder, CO) and a portable USB charger for power. To complete this project, we must acquire an Android tablet, the existing code from 2016 and several other items:

· 2 Wi-Fi Modules - ESP8266 - \$6.95 - Source: https://www.sparkfun.com/products/13678

· 2 Logic Level Converters Tikta IIC I2C - \$4.95 - Source: <u>https://tinyurl.com/ycsxuma9</u>

**Subtasks**: (1) Obtain existing prototype hardware and software;

- (2) Identify issues in the existing prototype and debug;
- (3) Improve existing software development to the Android device, allowing more reliable tag reading;
- (4) Obtain all necessary materials for further developments;
- (5) Develop a web page attached to a server that will collect and hold tag data from Android device.

## Timeline:

BME Capstone Design General Timeline	09/12/16	09/19/16	09/26/16	10/03/16	10/10/16	10/17/16	10/24/16	10/31/16	11/07/16	11/14/16	11/21/16	11/28/16	12/05/16	12/12/16	12/19/16	12/26/16	01/02/17	01/09/17	01/16/17	01/23/17	01/30/17	02/06/17	02/13/17	02/20/17	02/27/17	03/06/17	03/13/17	03/20/17	03/27/17	04/03/17	04/10/17	04/17/17	04/24/17	05/01/17
1. Team & topic								1				1																						
2. Design					1		Ì		Ì	1	Ì					Ì																		
3. Subtask (1)																																		
4. Subtask (2)					1	1	1		1	1	1	1	1	1		1	1	1						1				1						
5. Subtask (3)																																		
6. Subtask (4)									1	1	1		1					1																
7. Subtask (5)																																		
8. Mid-year progress report			1		Ì											1	Ì	1						1	ĺ			1						
9. Project prototype																																		
10. Testing & improvement							1		1	1						1	1							1										
11. NEBEC Conference paper																																		
12. Grant proposal (TBA)		1	1	1	1	1	1	1	1	1						1	1							1	1						1			
13. NEBEC Conference (TBA)																																		
15. Final Report																																		

## **References:**

[1] Ajami S, Rajabzadeh A.. Radio Frequency Identification (RFID) technology and patient safety. J Res Med Sci. 2013;18:809–13. [Online]. Available: <u>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3872592/</u>

[2] Redfern, WS., et al. "Automated recording of home cage activity and temperature of individual rats housed in social groups: The Rat Big Brother Project", 2017 doi: 10.1371/journal.pone.0181068 [Online] Available: <u>https://www.ncbi.nlm.nih.gov/pubmed/28877172?report=abstract</u>

[3] Thottam R. et al "Radio Frequency Identification and Mobile Technologies for Personnel Tracking in a Hospital Environment" 2016 [Online] Available <u>http://www.ele.uri.edu/courses/bme484/2017/03\_NEBEC\_RFID.pdf</u>

[4] Xu H. et al, "An RFID Indoor Positioning Algorithm Based on Bayesian Probability and K-Nearest Neighbor" 2017 doi: 10.3390/s17081806 [Online] Available https://www.ncbi.nlm.nih.gov/pubmed/28783073

[5] Ouyang Y. et al, "An RF-based wearable sensor system for indoor tracking to facilitate efficient healthcare management." 2016 doi: 10.1109/EMBC.2016.7591808 [Online] Available <u>https://www.ncbi.nlm.nih.gov/pubmed/28269351</u>