BME 484 Biomedical Engineering Capstone Design **Project Proposal**

Project Title: Android Application to Facilitate the Learning of Traditional Chinese Medicine

Pulse Diagnosis via Wrist Pulse Simulator Technology

Team: Mackenzie Mitchell, Project Manager

Jake Morris, Hardware Engineer Ian Kanterman, Software Engineer

Abstract: Pulse diagnosis is an important evaluation technique in Traditional Chinese

Medicine (TCM). It involves the palpation of the radial arterial pulses using three fingers to recognize 29 different pulse patterns using pulse strength, depth, and rate to diagnose various ailments. Due to the infrequency and subtlety of numerous patterns, it is difficult to train practitioners to correctly identify said patterns and ensure that the diagnosis correlates with that of other practitioners. The aim is to create a user-friendly application for students and doctors to effectively learn and experience even the most uncommon pulse patterns. Previously, a wrist pulse simulator was developed with a graphical user interface

(GUI) for the design and execution of any desired waveform to simulate palpating forces in the wrist via solenoids. This study aims to improve previous

developments by incorporating a bluetooth module that will connect to an Android application, allowing wireless access, programming, and control of pulse waveforms for studying and teaching purposes. This will create a reliable and repeatable pedagogical standard for TCM students and doctors, improving

consistency in the field of TCM pulse diagnosis.

Innovation: Our novel idea is to design an Android Application that will communicate

wirelessly with the existing Wrist Pulse Simulator via Bluetooth. We will also expand on the existing hardware by incorporating size-variable contact points that

simulate different artery widths.

Materials: Dragon Skin® 20, \$30.10 (2 lb x 1) Trial Unit

https://shop.smooth-on.com/dragon-skin-20

Alginate Molding Powder, \$31.68 (3 lb x 1)

 $\frac{https://www.amazon.com/Alja-Safe-Alginate-3-lb-Box/dp/B000KVSU60/ref=sr_1_1?ie=UTF8\&qid=1505849975\&sr=8-1\&keywords=alginate+molding+powder$

Solenoids (x 4)

https://www.adafruit.com/product/2776

Subtasks:

All- Research (TCM Pulse Diagnosis, Android Application development) Contributions to paper and poster

Mackenzie- Troubleshooting, time management, creation of hand model *Jake*- Solidworks

Re-design solenoid container

Re-design contact points for solenoids (smaller and larger)

Bluetooth incorporation (software and hardware)

Ian- Initialize application development

BME Capstone	-	0 9	0 a	1	1	1	1	1	1	1	1	1	1 2	1	1	1	0	0	0	0	0	0	0	0 2	0		0 ว	0 ว	0 3	0 4	0 4			0	-
Design General	1	1	1	1	1	1	1	1	1	,	/	/	1	/	1	1	1	1	/	/	/	1	1	1	1	1	/	1	1	1	/	1	1	1	1
Timeline	1	1		0	9						2					2					2	0 5	1	1 9							0 9	1		3	
1. Team & topic	İ	Ĺ											_						-					Ť							_		Ť		
2. Design																																			
3. Hardware (Hand model)											П																								
4. Hardware (3D-printing)								Г																											
5. Software (App development)																																			
6. Mid-year progress report																																			
7. Testing & improvement																																			
8. NEBEC Conference paper																																			
9. Grant proposal (TBA)																																			
10. NEBEC Conference (TBA)																																			

References

- [1]Y. Chung, C. Hu, C. Yeh and C. Luo, "How to standardize the pulse-taking method of traditional Chinese medicine pulse diagnosis", *Computers in Biology and Medicine*, vol. 43, no. 4, pp. 342-349, 2013.
- [2]H. Wang and Y. Cheng, "A quantitative system for pulse diagnosis in Traditional Chinese Medicine", in 2005 IEEE Engineering in Medicine and Biology 27th Annual Conference, Shanghai, 2005, pp. 5676-5679.
- [3]C. Luo, Y. Chung, C. Hu, C. Yeh, X. Si, D. Feng, Y. Lee, S. Huang, S. Yeh and C. Liang, "Possibility of quantifying TCM finger-reading sensations: I. Bi-Sensing Pulse Diagnosis Instrument", *European Journal of Integrative Medicine*, vol. 4, no. 3, pp. e255-e262, 2012.
- [4]J. Maestri, S. Borges, G. Halkidis, M. Boudreaux, G. Boudreaux-Bartels and Y. Sun, "Graphical User Interface to Generate Waveforms for a Wrist Pulse Simulator Used in Traditional Chinese Medicine Education", in *42nd Annual Northeast Bioengineering Conference*, Binghamton University, 2016.
- [5]E. King, D. Cobbin, S. Walsh and D. Ryan, "The Reliable Measurement of Radial Pulse Characteristics", *Acupuncture in Medicine*, vol. 20, no. 4, pp. 150-159, 2002.