Research Activities Report - 2019 Overseas Research Experience Program -

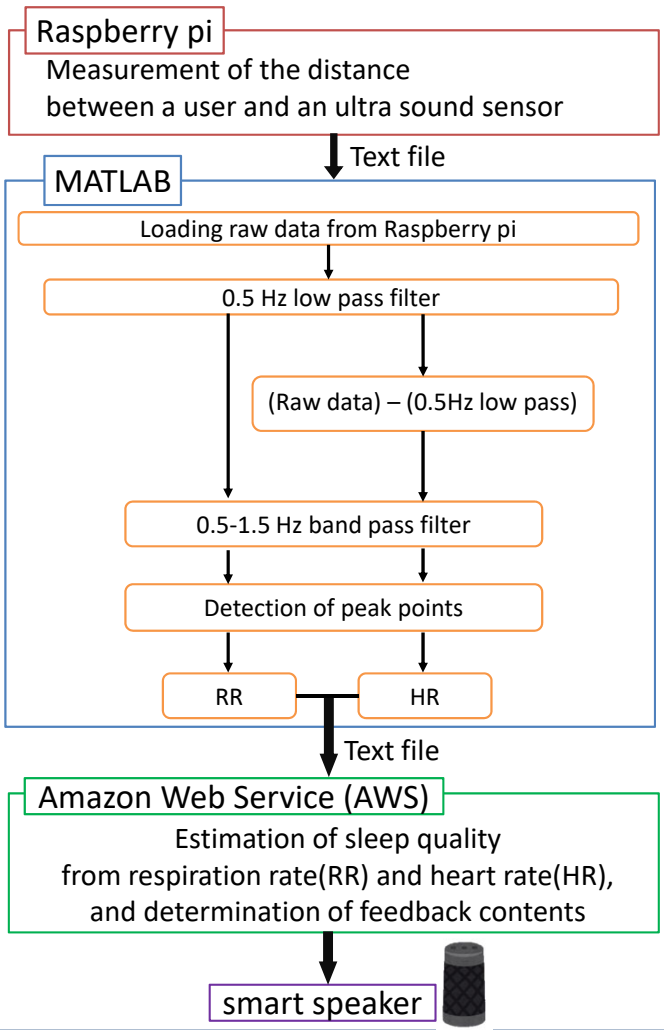
大阪工業大学 OSAKA INSTITUTE OF TECHNOLOGY

Research Topic	Estimation of Respiratory Rate and Heart Rate Using Ultra Sound Sensor for Assessment of Sleep Quality	Graduate School of Robotics & Design
Host University	Technical University of Munich / Munich / Germany	ARAI Ryota
Duration	From October 14 to November 22, 2019	

Summary of the Research Activities

Purpose : Development of a smart speaker based system to support users to improve their life style

System Design



Result

The power spectral of distance data from Raspberry pi was obtained by FFT. Respiratory component was observed around 0.2 Hz and heart beat component was observed around 0.8 Hz. Therefore, these components were extracted using band pass filter, and peak detection was performed. The respiratory rate and heart rate can be determined by detected peak interval.

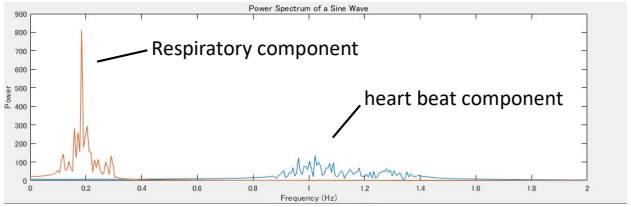


Fig.1 Power spectrum of respiratory and heart beat component

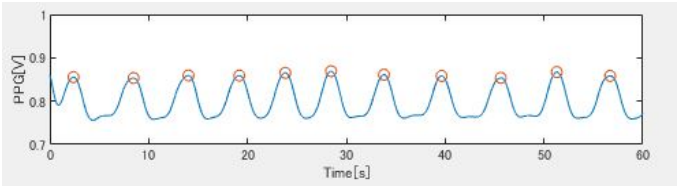


Fig.2 Detection of peak points of respiratory component

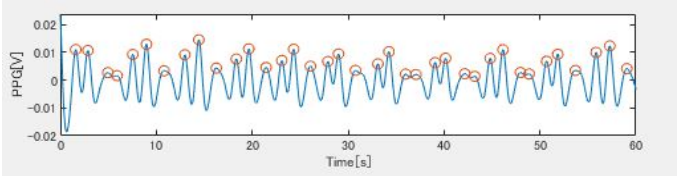


Fig.3 Detection of peak points of heart beat component

Conclusion

It is possible to acquire RR and HR by an ultra sound sensor.

Life of Munich

The university campus is located close to the city center of Munich and I can reach there by tram or subway. I attended to the laboratory on weekdays during my stay and reported research results to my supervisor once a week. However, I could constantly ask him if I had any questions. I ate lunch with the members of the lab in weekday and toured the city of Munich on weekend. I had the many valuable experiences of living abroad.

Fig.5 Ulm Cathedral

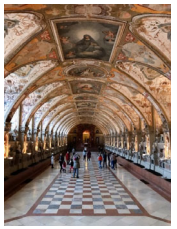


Fig.6 Antiquarian of München Residenz

指導教員講評

AIスピーカを用いた開発を主に行ってきており，MATLABを用いた信号処理は慣れないものであったが，短期間中に最低限の成果を残せてよかった．英語による議論やプレゼンテーションも上達した．今後の研究や国際会議発表に活かしてほしい．

指導教員氏名： 大須賀美恵子