SUNGHWA LEE

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(Last update: July 12, 2023)

RESEARCH INTERESTS

I primarily focused on radar-based **silent speech recognition** during my Ph.D. studies.
Currently, my research interest lies in audio-based **speech and speaker recognition**.

EDUCATION

M.S./Ph.D. Student, School of Integrated Technology — Mar 2016 – Present
Advisor: Jiwon Seo
Yonsei University

B.S, School of Integrated Technology — Mar 2013 – Feb 2016
Yonsei University

PUBLICATIONS

Journal Papers

S. Lee, Y.-H. Shin, M. Kim, and J. Seo, "IR-UWB radar-based silent speech recognition of phonemes, words, and phrases," *IEEE Transactions on Audio, Speech, and Language Processing*, to be submitted.

S. Lee, E. Kim, and J. Seo, "SFOL DME pulse shaping through digital predistortion," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 58, no. 3, pp. 2616–2620, 2022.

Y. H. Shin, **S. Lee**, and J. Seo, "Autonomous safe landing-area determination for rotorcraft UAVs using multiple IR-UWB radars," *Aerospace Science and Technology*, vol. 69, pp 617–624, 2017.

Conference Papers

S. Lee and Y. H. Shin, "Movement detection of tongue and related body parts using IR-UWB radar," in *Proceedings of International Conference on ICT Convergence (ICTC)*, 2022, pp. 1487–1491.

S. Lee and J. Seo, "Word error rate comparison between single and double radar solutions for silent speech recognition," in *Proceedings of 2019 19th International Conference on Control, Automation, and Systems (ICCAS)*, 2019, pp. 1211–1214.

S. Lee and J. Seo, "IR-UWB Radar-Based Near-field head rotation movement sensing under fixed body motions," in *Proceedings of 2018 International Conference on Electronics, Information, and Communication (ICEIC)*, 2018.

S. Lee and J. Seo, "IR-UWB radar-based near-field intentional eyelid movement sensing under fixed head and body motions," in *Proceedings of 2017 International Conference on Control, Automation and Systems (ICCAS)*, 2017, pp. 1959–1962.

Domestic Conference Papers

S. Lee and J. Seo, "Target detection method using non-negative least squares for IR-UWB radar-based silent speech recognition," in *Proceedings of 2022 Winter Conference of the Korean Institute of Communications and Information Sciences (KICS)*, 2022, pp. 682–683.

S. Lee, S. Park, E. Kim, and J. Seo, "Implementation of real-time digital predistortion for SFOL pulse shaping in DME," in *Proceedings of 2022 Conference of the Institute of Positiong, Navigation, and Timing (IPNT)*, 2022, pp. 289-292.

S. Lee, S. Park, E. Kim, and J. Seo, "Automation of the digital predistortion testbed for SFOL DME pulse shaping," in *Proceedings of 2021 Conference of the Korean Navigation Institute (KONI)*, 2021, pp. 135–137.

S. Lee and J. Seo, "Analysis of radar data in the time and frequency domains for silent speech recognition," in *Proceedings of 2019 Conference of the Korean Navigation Institute (KONI)*, 2019, pp.63–65.

S. Lee and J. Seo, "Effective arrangement of multiple IR-UWB radars for silent speech recognition," in *Proceedings of 2018 Conference of the Korean Navigation Institute (KONI)*, 2018, pp.159–160.

S. Lee and J. Seo, "Estimation of liquid residue in an opaque and non-metallic container utilizing IR-UWB radar signal strength," in *Proceedings of 2017 Conference of the Korean Navigation Institute (KONI)*, 2017, pp. 170–171.

S. Lee and J. Seo, "UWB radar and range Doppler algorithm based SAR implementation for a short range single object detection," in *Proceedings of 2016 Summer Conference of the Institute of Electronics and Information Engineers (IEIE)*, 2016, pp. 530–532.

PROJECTS

Speaker verification May 2023 – Present

- Comparing the voice characteristics of a speaker against a claimed identity to either accept or reject the claim.
- I re-implemented a state-of-the-art speaker embedding model, ECAPA CNN-TDNN. (GitHub repository can be found here.)

IR-UWB radar-based silent speech recognition Mar 2016 – Apr 2023

- Converting speech movements, such as lip and tongue motions, captured by IR-UWB radar into text
- Supported by NRF in Korea.

Reinforcement learning-based simulation of autonomous drone navigation Jul 2019 – Nov 2020

- Enabling drones to reach their destination without prior knowledge of terrain information through reinforcement learning. (GitHub repository can be found here.)
- Supported by ETRI in Korea.

SKILLS

Programming Languages	Python, C, C++, Java, MATLAB
Deep Learning Frameworks	PyTorch, TensorFlow (Certified in Andrew Ng's TF-based DL course)
Speech Toolkits	SpeechBrain, Kaldi, HTK

PATENTS

Method and Apparatus for Silent Speech Recognition Using Radar
S.Lee and J. Seo
10-2022-0037046, Registered on 22 March 2022, South Korea.

AWARDS AND HONORS

Merit Academic Paper Award 2023
Yonsei University, South Korea

Excellent Paper Award Nov 2019
2019 Conference of the KONI

Best Achievement in the Creative Project 2015
Institute for Information & communications Technology Promotion, South Korea

Excellent Creative Exhibition Award 2014
College of Engineering, Yonsei University, South Korea

Graduate Fellowship 2016 – 2019
ICT Consilience Creative Program, Ministry of Science and ICT, South Korea

Undergraduate Fellowship 2013 – 2016
ICT Consilience Creative Program, Ministry of Science and ICT, South Korea