Song Noh

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EXPERIENCE

Incheon National University   Incheon, South Korea
Assistant Professor   Sep. 2018 - Present
- Signal processing algorithm for human-type and machine-type communications
- Design of intelligent wireless communiation systems

Intel Corporation   Oregon, USA
Wireless Standards Research Engineer   Dec. 2015 - Jul. 2018
- Investigation of the dynamic blockage effects on performance in mmWave
- Development of PHY and MAC algorithm for self-contained and flexible duplex transmission
- Performance analysis of wireless backhaul solution in sub-6GHz and mmWave bands
- Technical contribution to Integrated Access and Backhaul for NR study item

Purdue University   Indiana, USA
Research Assistant   Jan. 2012 - Dec. 2015
- Multi-resolution codebook and beamforming sequence design in millimeter wave systems
- Pilot beam pattern and hybrid beamforming design in massive MIMO systems
- Precoder design for blind separation and estimation in MIMO-OFDM systems
- Development of a link level simulator based on Digital Video Broadcasting (DVB-T2)

EDUCATION

Purdue University   Indiana, USA
Ph.D. in Electrical and Computer Engineering   Aug. 2011 – Dec. 2015
Advisors: Professors Michael Zoltowski and David Love

Korea Advanced Institute of Science and Technology (KAIST)   Daejeon, South Korea
Master of Science in Electrical Engineering   Feb. 2010
Advisor: Professor Youngchul Sung

Soongsil University   Seoul, South Korea
Bachelor of Engineering in Electrical Engineering   Feb. 2008

PUBLICATIONS <u>Journal Articles</u>

Song Noh, Jiho Song, Youngchul Sung, and Heejung Yu, "Subspace-based AoA estimation for millimeter-wave hybrid array of subarrays," In preparation for submission, 2020.

Song Noh Jaeku Lee, Heejung Yu, and Jiho Song, "Channel estimation with beam squint in hybrid beamforming massive MIMO systems," In preparation for submission, 2020.

Song Noh and Hyunchae Chun, "Beamforming algorithms," *J. Korean Inst. Electromagn. Eng. Sci.,* vol. 31, no. 8, pp 701 – 712, Aug. 2020.

Song Noh, Jiho Song, and Youngchul Sung, "Fast beam search and refinement for millimeter-wave massive MIMO based on two-level phased arrays," *IEEE Trans. Wireless Commun.,* (Early Access), Jul. 2020.

W. Khalid, H. Yu, and **Song Noh**, "Residual energy analysis in cognitive radios with energy harvesting UAV under reliability and secrecy constraints," *Sensors,* vol. 20, no. 10, May 2020.

Jiho Song, Byungju Lee, **Song Noh**, and Jong-Ho Lee, "Adaptive multiuser transmission using millimeter wave beam alignment with user selection," *IEEE Trans. Veh. Technol.,* pp 1 - 1, May 2020.

Byounghak Kim, Heejung Yu, and **Song Noh**, "Cognitive interference cancellation with digital channelizer for satellite communication," *Sensors,* vol. 20, no. 2, Jan. 2020.

Jiho Song, Byungju Lee, **Song Noh**, and Jong-Ho Lee, "Limited feedback designs for machine-type communications exploiting user cooperation," *IEEE Access*, vol. 7, pp 95154 - 95169, Sep. 2019.

Song Noh, Michael Zoltowski, and David Love, "Multi-resolution codebook and adaptive beam-forming sequence design for millimeter wave beam alignment," *IEEE Trans. Wireless Commun.,* vol. 16, no. 9, pp 5689 – 5701, Sep. 2017.

Il Y. Chun, **Song Noh**, David Love, Thomas M. Talavage, Stephen Beckley, and Sherman J. Kisner, "Mean square error (MSE)-based excitation pattern design for parallel transmit and receive SENSE MRI image reconstruction," *IEEE Trans. Comput. Imag.,* vol. 2, no. 4, pp. 424 – 439, Dec. 2016.

Song Noh, Michael Zoltowski, and David Love, "Training sequence design for feedback assisted hybrid beamforming in massive MIMO systems," *IEEE Trans. Commun.,* vol. 61, no. 1, pp 187 – 200, Jan. 2016.

Song Noh, Michael Zoltowski, Youngchul Sung, and David Love, "Pilot beam pattern design for channel estimation in massive MIMO systems," *IEEE J. Sel. Topics Signal Process.,* vol. 8, no. 5, pp. 787 – 801, Oct. 2014.

Song Noh, Youngchul Sung, and Michael Zoltowski, "A new precoder design for blind channel estimation in MIMO-OFDM systems," *IEEE Trans. Wireless Commun.,* vol. 13, no. 12, pp. 7011 – 7024, Dec. 2014.

Conference Papers

Hyeong Sook Park, Eun-Young Choi, Young Seog Song, **Song Noh**, and Kyungsik Seo, "DNN-based phase noise compensation for sub-THz communications," in *Proc. ICTC,* Jeju Island, Korea, Oct. 2020.

Kyungsik Seo and **Song Noh**, "Evaluation of DNN-based channel estimation techniques in millimeter wave systems," in *Proc. KICS,* Yongpyong, Korea, Aug. 2020.

Kyungsik Seo and **Song Noh**, "Performance analysis of beam search techniques in millimeter wave systems," in *Proc. KICS,* Yongpyong, Korea, Feb. 2020.

Song Noh, Kyungsik Seo, Mirae Kim, and Jeonghwan Im, "Beam misalignment-aware beamforming system design," in *Proc. KICS,* Seoul, Korea, Nov. 2019.

Song Noh, Jeonghwan Im, Mirae Kim, and Kyungsik Seo, "Beamformed signal classification based on multiple hypothesis testing," in *Proc. KICS,* Jeju, Korea, Jun. 2019.

Song Noh, Dawei Ying, Qian (Clara) Li, Hassan Ghozlan, Apostolos (Tolis) Papathanassiou, and Geng Wu, "System evaluation for millimeter-wave radio access network," in *Proc. IEEE ICC,* Kansas City, MO, May 2018.

Song Noh, Michael Zoltowski, and David Love, "Multi-resolution codebook based beamforming sequence design in millimeter-wave systems," in *Proc. IEEE Globecom,* San Diego, CA, Dec. 2015.

Song Noh, Michael Zoltowski, and David Love, "Downlink training codebook design and hybrid precoding in FDD massive MIMO systems," in *Proc. IEEE Globecom,* Austin, TX, Dec. 2014. (**Best Paper Award**)

Song Noh, Michael Zoltowski, Youngchul Sung, and David Love, "Training signal design for channel estimation in massive MIMO systems," in *Proc. IEEE ICASSP,* Florence, Italy, May 2014.

Song Noh and Michael Zoltowski, "A new precoder design for precoding-based blind channel estimation for MIMO-OFDM systems," in *Proc. IEEE Globecom,* Atlanta, GA, Dec. 2013.

Song Noh and Michael Zoltowski, "Blind separation for precoding-based blind channel estimation for MIMO-OFDM systems," in *Proc. Asilomar,* Pacific Grove, CA, Nov. 2013.

Song Noh, Michael Zoltowski, Youngchul Sung, and David Love, "Optimal pilot beam pattern design for massive MIMO systems," in *Proc. Asilomar,* Pacific Grove, CA, Nov. 2013.

EXTERNAL ACTIVITIES

Technical Committee Activities

- Member, Wireless World Research Form (WWRF), Steering Board   Oct. 2017 - Jul. 2018

Reviewer of Journal and Conference Papers
- IEEE Transactions on Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology
- IEEE Communications Letters, IEEE Wireless Communications Letters, IEEE Signal Processing Letters
- IEEE Globecom, IEEE ICC, IEEE WCNC

AWARDS AND HONORS	- Next Generation and Standards (NGS) Division Recognition Award, Intel	Q3 2017
	- Wireless Communication Research (WCR) Division Recognition Award, Intel	Q1 2017
	- IEEE Transactions on Communications Exemplary Reviewer	Apr. 2015
	- Silver Prize in the 21st HumanTech Paper Contest sponsored by Samsung	Feb. 2015
	- IEEE Global Communications Conference (Globecom) Best Paper Award	Dec. 2014

Patents

1. Timing based contention resolution during a random access procedure (U.S. Patent: WO2018 0848 79A1, 2018)

2. Power based contention resolution during a random access procedure (U.S. Patent: WO2018 0848 77A1, 2018)

3. Measurement reporting with number of available beams (U.S. Patent: WO2018 0634 36A1, 2018)

4. Pre-grant packet header processing (U.S. Patent: WO2018 031065A1, 2018)

5. Enodeb assisted network UE scheduling in 5G NR-things sidelink (U.S. Patent: WO 2018 0848 80A1, 2018)

6. Data transfer and reception procedures in 5G NR-things sidelink communications (U.S. Patent: WO2018 0805 65A1, 2018)

7. Subframe structure and communication procedure for 5G NR-things vehicle to vehicle (U.S. Patent: WO2018 0805 66A1, 2018)

8. Network-assisted transmission mode for vehicle-to-vehicle (v2v) communication (U.S. Patent: WO2018 0805 68A1, 2018)

9. Buffer status reporting in 5G NR-things sidelink communications (U.S. Patent: WO2018 0805 61A1, 2018)

10. Retransmission procedurese for fifth generation (5G) new radio (NR) things sidelink (tSL) communication (U.S. Patent: WO2018 0310 65A1, 2018)

11. Procedures and signaling for scheduling and resource assignment in 5G NR-things sidelink communication system (U.S. Patent: WO2018 0710 51A1, 2018)

12. Signal degradation detection and recovery (U.S. Patent: WO2018 0310 65A1, 2018)

13. Method of heterogeneous BRS transmission in NR (U.S. Patent: WO2018 0315 83A1, 2018)

14. Higher layer design for user plane packet processing in fifth generation (5G) new radio (NR) things sidelink (tSL) communication (U.S. Patent: WO2017 1921 64A1, 2017)