

Stephen Baek

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Biography

Stephen Baek is a researcher interested in applying his computational geometry and machine learning background to advance various multidisciplinary research areas including digital human modeling, human-centered product design, medical image processing, digital dentistry, 3D printing, and interactive media art. He has published a number of articles introducing novel multidisciplinary ideas based on computer-aided design and computational geometry theories, including one in the *'Most Cited Articles in Computer-Aided Design Journal.'*

He received both of his B.S. and Ph.D. degrees with the best thesis honors from the School of Mechanical and Aerospace Engineering at Seoul National University, Korea in 2009 and 2013, respectively. During his studies, he has received *'National Science and Engineering Scholarship'* and *'Global Ph.D. Fellowship'* from the Korean Ministry of Education. His postdoctoral research at Seoul National University has also been awarded *'Presidential Postdoc Fellowship'* from the President of Korea. Dr. Baek is currently an Assistant Professor in the Department of Mechanical and Industrial Engineering, the director of Innovative Design and Art Laboratory (IDEA lab), a faculty researcher in the Virtual Soldier Research (VSR) Program at the Center for Computer-Aided Design (CCAD), and a faculty member of the Public Digital Arts (PDA) Cluster at The University of Iowa.

Keywords: Computational geometry; Deep learning on non-Euclidean datasets; Data-driven geometry modeling; Digital human modeling; 4D (3D+time) scanning; Medical geometry processing; Morphometry; Statistical shape analysis; Interactive media art

Education

Ph.D. Mechanical and Aerospace Engineering, Seoul National University, Korea, 2013.

Thesis: Nonlinear Analysis of the Space of Human Body Shapes and Its Application to Parametric Human Modeling System (*Best Thesis Honor, Grand Prize from 'the Society of CAD/CAM Engineers Graduate Thesis Awards'*)

B.S. Mechanical and Aerospace Engineering, Seoul National University, Korea, 2009.

Thesis: A Modeling Method for 3D Face Model Using Single 2D Front-View Image (*Best Thesis Honor*)

Affiliations

Assistant Professor | Department of Mechanical & Industrial Engineering, The University of Iowa

Director & Founder | Innovative Design and Art (IDEA) Laboratory

Researcher | Virtual Soldier Research, Center for Computer-Aided Design, The University of Iowa

Faculty Member | Public Digital Arts Cluster, The University of Iowa

Honors and Awards

Best Paper Award from International Conference on Maintenance and Rehabilitation of Constructed Infrastructure Facilities, 2017.

Most Cited Articles in Computer-Aided Design since 2011, Elsevier, 2016.

Best Paper Award from 2015 Annual Conference of the Society of CAD/CAM Engineers, 2015.

Best Paper Award from 2014 Summer Conference of the Society of CAD/CAM Engineers, 2014.

Bronze Prize from 15th Korea CAD/CAM Software Competition, 2014.

Grand Prize from the 1st Delcam Korea & the Society of CAD/CAM Engineers Best Graduate Thesis Awards, 2014.

Best Paper Award from 2014 Annual Conference of the Society of CAD/CAM Engineers, 2014.

Best Student Paper from 2014 Annual Conference of the Society of CAD/CAM Engineers, 2014.

Best Ph.D. Thesis from the School of Mechanical and Aerospace Engineering at Seoul National University, 2014.

Presidential Postdoc Fellowship from the President of Republic of Korea, 2013–2015.

Top 25 Hottest Articles Published in Computer-Aided Design in 2012, Elsevier, 2012.

Bronze Prize from 13th Korea CAD/CAM Software Competition, 2012.

Global Ph.D. Fellowship from the Korean Ministry of Education, 2011–2013.

Best Paper of the Year from Transactions of the Society of CAD/CAM Engineers, 2011.

Best Paper of the Year from Transactions of the Society of CAD/CAM Engineers, 2010.

Bronze Medal from 2009 Korea Software Awards, 2010.

Best Bachelor's Thesis from the School of Mechanical and Aerospace Engineering at Seoul National University, 2008.

Outstanding Design Award from Seoul National University Robot Competition, 2008.

Best Product Development Award from Seoul National University CAD/CAM Contest, 2007.

Award for Appreciation in 2007 School Retreat Program from the School of Mechanical and Aerospace Engineering at Seoul National University, 2007.

Outstanding Design Award from Seoul National University Mechanical Design Contest, 2005.

National Science and Engineering Scholarship from the Korean Ministry of Education, 2005-2009.

Professional Activities

Reviewer of Scientific Journals

Computer-Aided Design, Elsevier.

Computer-Aided Design and Analysis, Taylor & Francis.

ASME Journal of Computing and Information Science in Engineering

IEEE Transactions on Biomedical Engineering.

Computer Methods and Programs in Biomedicine, Elsevier.

Artificial Intelligence in Medicine, Elsevier.

The Visual Computer, Springer.

IEEE Computer Graphics and Applications.

Computer Animation and Virtual Worlds, Wiley.

International Journal of Industrial Ergonomics, Elsevier.

Transactions of the Society of CAD/CAM Engineers.

Service

Organizing Committee, Annual CAD Conferences and Exhibitions, December 2016–Present.

Reviewer, Iowa Space Grant Consortium Scholarship, August 2016.

Academic Advisor, Alpha Pi Mu, The University of Iowa, September 2015–Present.

Coordinator, Design and Manufacturing Elective Focus Area (EFA), October 2015–Present.

Department Secretary, The University of Iowa, August 2016–Present.

IE Program Secretary, The University of Iowa, August 2015–August 2016.

Work Experience

Assistant Professor, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, IA, August 2015–Present.

Visiting Research Associate, Ronald E. McNAIR Center for Aerospace Innovation and Research, The University of South Carolina, Columbia, SC, October 2014.

Senior Researcher, Institute of Advanced Machinery and Design, Seoul National University, Seoul, Korea, September 2013–July 2015.

Technical Research Personnel, Republic of Korea Army (Alternative Military Duty), October 2011–February 2015.

Graduate Research Assistant, Human-Centered CAD Laboratory, Seoul National University, Seoul, Korea, March 2009–August 2013.

Design Engineer (Part-time), Department for Robot Arm Design, Hurotech Co. Ltd., Seoul, Korea, March 2008–October 2008.

Undergraduate Research Assistant, Human-Centered CAD Laboratory, Seoul National University, Seoul, Korea, September 2007–February 2009.

Teaching

Instructor, IE:6232 Advanced Computer-Aided Design and Manufacturing, Graduate Course, The University of Iowa, 2015–Present.

Instructor, ENGR:2760 Design for Manufacturing, Core Engineering Course, The University of Iowa, 2016–Present.

Instructor, Computer-Aided Design, Graduate Course, Seoul National University, 2014.

Teaching Assistant, Digital Computer Concept and Practice, Undergrad Course, Seoul National University, 2011–2012.

Teaching Assistant, Computer-Aided Design, Graduate Course, Seoul National University, 2010–2012.

Teaching Assistant, Computer-Aided Design and Manufacturing, Undergrad Course, Seoul National University, 2010–2012.

Publications

Journal Articles

Sun, Z., He, Y., Gritsenko, A., Lendasse, A., **Baek, S.**, (2017). Deep spectral descriptors: learning the point-wise correspondence metric via siamese deep neural networks. *ArXiv Preprint: ArXiv:1710.06368*, **Submitted to Computer Graphics Forum**.

Shi, Y., Zhang, Y., **Baek, S.**, Backer, W. D., Harik, R., (2017). Validation of feature recognition on manufacturability analysis for additive manufacturing. *Computer-Aided Design and Applications*, **Accepted**.

Sun, Z., **Baek, S.**, Harik, R., (2017). Mesh segmentation via geodesic curvature flow. *Computer-Aided Design and Applications*, **Accepted**.

Harik, R., Shi, Y., **Baek, S.**, (2017). Shape Terra: mechanical feature recognition based on a persistent heat signature. *Computer-Aided Design and Applications*, 14(2): 206–218. DOI: 10.1080/16864360.2016.1223433.

Akusok, A., **Baek, S.**, Miche, Y., Björk, K.-M., Nian, R., Lauren, P., Lendasse, A., (2016). ELMVIS+: fast nonlinear visualization technique based on cosine distance and extreme learning machines. *Neurocomputing*, 205: 247–263. DOI: 10.1016/j.neucom.2016.04.039.

Baek, S.-Y., Lee, K., (2016). Statistical foot-shape analysis for mass-customisation of footwear. *International Journal of Computer Aided Engineering and Technology*, 8(1/2): 80–98. DOI: 10.1504/IJCAET.2016.073265.

Baek, S.-Y., Kam, D.-U., Lee, K., (2015). Differential operators on a triangular mesh and their applications. *Transactions of the Society of CAD/CAM Engineers*, 20(1): 44–54.

Baek, S.-Y., Lim, J., Lee, K., (2015). Isometric shape interpolation. *Computers & Graphics*, 46(1): 257–263. DOI: 10.1016/j.cag.2014.09.025.

- Park, J., Kim, T., **Baek, S.-Y.**, Lee, K., (2015). An algorithm for estimating surface normal from its boundary curves. *Journal of Computational Design and Engineering*, 2(1): 67–72. DOI: 10.1016/j.jcde.2014.11.007.
- Baek, S.-Y.**, Lee, K., (2014). An isometric shape interpolation method on mesh models. *Transactions of the Society of CAD/CAM Engineers*, 19(2): 1–10.
- Cho, S., Baek, D., **Baek, S.-Y.**, Lee, K., Bang, H., (2014). 3d volume drawing on a potter's wheel. *IEEE Computer Graphics and Applications*, 34(3): 50–58. DOI: 10.1109/MCG.2014.3.
- Choi, J.-H., **Baek, S.-Y.**, Kim, Y., Son, T.-G., Park, S., Lee, K., (2014). Automatic detection of inferior alveolar nerve canal from cone-beam computed tomography images for dental surgery planning. *Studies in Health Technology and Informatics*, 196(1): 61–65. DOI: 10.3233/978-1-61499-375-9-61.
- Song, J., Cho, S., **Baek, S.-Y.**, Lee, K., Bang, H., (2014). GaFinC: gaze and finger control interface for 3d model manipulation in cad application. *Computer-Aided Design*, 46(1): 239–245. DOI: 10.1016/j.cad.2013.08.039.
- Baek, S.-Y.**, Lee, K., (2013). Parametric human body modeling system for virtual garment fitting. *International Journal of Computer Aided Engineering and Technology*, 5(2/3): 242–261. DOI: 10.1504/IJCAET.2013.052932.
- Baek, S.-Y.**, Wang, J. H., Song, I., Lee, K., Lee, J., Koo, S., (2013). Automated bone landmarks prediction on the femur using anatomical deformation technique. *Computer-Aided Design*, 45(2): 505–510. DOI: 10.1016/j.cad.2012.10.033.
- Lee, S., **Baek, S.-Y.**, Son, J., Kim, D., Lee, K., (2012). Changes in medio-lateral knee joint reaction force of patients with over-pronation during gait due to insole parameters - a case study. *Transactions of the Society of CAD/CAM Engineers*, 17(3): 149–155.
- Baek, S.-Y.**, Lee, K., (2012). Parametric human body shape modeling framework for human-centered product design. *Computer-Aided Design*, 44(1): 56–67. DOI: 10.1016/j.cad.2010.12.006. **Top 25 Hottest Articles Published in Computer-Aided Design in 2012.**
- Lee, J., **Baek, S.-Y.**, Lee, K., (2010). 3d generic vertebra model for computer aided diagnosis. *Transactions of the Society of CAD/CAM Engineers*, 15(4): 297–305. **Best Paper of the Year.**
- Choi, J.-H., Park, S.-W., **Baek, S.-Y.**, Lee, K., (2010). Evaluation of handheld products by computing user hand fatigue. *Simulation Modeling Practice and Theory*, 18(2): 230–239. DOI: 10.1016/j.simpat.2009.10.009.
- Jang, T., **Baek, S.-Y.**, Lee, K., (2009). Synthesis of human body shape for given body sizes using 3d body scan data. *Transactions of the Society of CAD/CAM Engineers*, 14(6): 364–373. **Best Paper of the Year.**

Conference Proceedings

- Gritsenko, A., Sun, Z., **Baek, S.**, Miche, Y., Hu, R., Lendasse, A., (2017). Deformable surface registration with extreme learning machines. In *International Conference on Extreme Learning Machines (ELM2017)*. Yantai, China.
- Nolte, Z., Riley, M., Harik, R., **Baek, S.**, (2017). Mosquito Popper: a multiplayer online game for 3d body scan data segmentation. In *14th Annual International CAD Conference (CAD'17)*. Okayama, Japan.
- Shi, Y., Zhang, Y., **Baek, S.**, Harik, R., (2017). Validation of feature recognition on manufacturability analysis for additive manufacturing. In *14th Annual International CAD Conference (CAD'17)*. Okayama, Japan.

Sun, Z., **Baek, S.**, Harik, R., (2017). Mesh segmentation via geodesic curvature flow. In *14th Annual International CAD Conference (CAD'17)*. Okayama, Japan.

Baek, S., Lee, H., Bhatt, R., Farrell, K., Arora, J. S., Abdel-Malek, K., (2017). Parametric modeling of korean construction workers for the safer construction environment. In *International Conference on Maintenance and Rehabilitation of Constructed Infrastructure Facilities (2017 MAIREINFRA)*. Seoul, Korea. **Best Paper Award.**

Luo, Y., **Baek, S.**, Lu, J., (2017). Classifying stress strain curves obtained at rupture and non-rupture sites in ascending thoracic aneurysm tissue using machine learning. In *5th International Conference on Computational and Mathematical Biomedical Engineering (CMBE2017)*.

Akusok, A., Eirola, E., Miche, Y., Oliver, I., Björk, K.-M., Gritsenko, A., **Baek, S.**, Lendasse, A., (2016). Incremental ELMVIS for unsupervised learning. In *International Conference on Extreme Learning Machines (ELM2016)*. Marina Bay Sands, Singapore.

Gritsenko, A., Akusok, A., **Baek, S.**, Lendasse, A., (2016). ELMVIS++R – Mastering visualization with target variables. In *International Conference on Extreme Learning Machines (ELM2016)*. Marina Bay Sands, Singapore.

Baek, S., Sun, Z., Mate, S. S., (2016). Development of full-resolution anthropometric human models based on nonlinear statistical shape analysis. In *7th International Conference of Applied Human Factors and Ergonomics*. Orlando, Florida.

Gritsenko, A., Akusok, A., Miche, Y., Bjork, K.-M., **Baek, S.**, Lendasse, A., (2016). Combined nonlinear visualization and classification: ELMVIS++C. In *2016 International Joint Conference on Neural Networks (IJCNN 2016)*. Vancouver, Canada.

Harik, R., **Baek, S.-Y.**, Bruchem, B.-J. V., Tooren, M. V., (2015). SHAPE TERRA: industrial feature recognition based on persistent heat signature. In *12th Annual International CAD Conference (CAD'15)*. London, The United Kingdom.

Harik, R., **Baek, S.-Y.**, Bruchem, B.-J. V., Tooren, M. V., (2015). Shape Terra: a feature recognition tool using persistent heat signature. In *2015 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea.

Jang, S., Woo, S., Kam, D.-U., **Baek, S.-Y.**, Lee, K., (2014). Automatic generation of lego layout from 3d model. In *2014 Autumn Conference of the Korean Society of Mechanical Engineers*. Gwangju, Korea.

Kim, D.-W., **Baek, S.-Y.**, Lee, K., (2014). Local parameterization of meshes using geodesics. In *2014 Autumn Conference of the Korean Society of Mechanical Engineers*. Gwangju, Korea.

Lee, J., Lim, J., **Baek, S.-Y.**, Lee, K., (2014). Extraction of a margin line for dental CAD. In *2014 Autumn Conference of the Korean Society of Mechanical Engineers*. Gwangju, Korea.

Woo, S., **Baek, S.-Y.**, Lee, K., (2014). Optimization method for rapid rigid-registration between x-ray and digitally reconstructed radiography. In *2014 Autumn Conference of the Korean Society of Mechanical Engineers*. Gwangju, Korea.

Baek, S.-Y., Lim, J., Lee, K., (2014). Isometric shape interpolation. In *Shape Modeling International (SMI2014)*. Hong Kong.

Baek, S.-Y., Kam, D.-U., Lee, K., (2014). Differential operators on a triangular mesh and their applications. In *2014 Summer Conference of the Society of CAD/CAM Engineers*. Muju, Korea. **Best Paper Award.**

- Kim, D.-W., Lee, J., **Baek, S.-Y.**, Lee, K., (2014). Algorithm for generating high-precision point cloud using quaternary coded structured light and phase. In *2014 Summer Conference of the Society of CAD/CAM Engineers*. Muju, Korea.
- Woo, S., Lee, J.-H., **Baek, S.-Y.**, Lee, K., (2014). Automatic generation of high-quality digitally reconstructed radiography for registration between 2d x-ray image and 3d CT image. In *2014 Summer Conference of the Society of CAD/CAM Engineers*. Muju, Korea.
- Lee, J.-H., Woo, S., **Baek, S.-Y.**, Lee, K., Dong, Y., Lee, S., (2014). A c-arm calibration method for 2d-3d registration. In *2014 Annual Conference of the Korean Society of Medical Robot*. Seoul, Korea.
- Lim, J., **Baek, S.-Y.**, Lee, J., Lee, K., (2014). Automatic determination of the insertion axis of a dental crown that minimizes undercut area. In *10th International Symposium on Tools and Methods for Competitive Engineering (TMCE 2014)*. Budapest, Hungary.
- Baek, S.-Y.**, Lee, K., (2014). An isometric shape interpolation method on mesh models. In *2014 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea. **Best Paper Award.**
- Choi, J.-H., **Baek, S.-Y.**, Kim, Y., Son, T.-G., Park, S., Lee, K., (2014). Automatic detection of inferior alveolar nerve canal from cone-beam computed tomography images for dental surgery planning. In *NEXTMED/MMVR21*. Manhattan Beach, CA, USA.
- Lim, J., **Baek, S.-Y.**, Lee, J., Lee, K., (2014). Automatic algorithm for finding insertion axis of dental prosthesis. In *2014 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea.
- Park, J.-S., Kim, T., **Baek, S.-Y.**, Lee, K., (2014). An algorithm for estimating surface normal from its boundary curves. In *2014 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea. **Best Student Paper Award.**
- Song, J., Cho, S., **Baek, S.-Y.**, Lee, K., Bang, H., (2013). GaFinC: Gaze and finger control interface for 3d model manipulation in cad application. In *SIAM Conference on Geometric & Physical Modeling (GD/SPM13)*. Denver, CO, USA.
- Park, H., Lee, D., Yang, S., Lee, S., **Baek, S.-Y.**, Lee, K., (2012). Kinecad: a novel gesture-based CAD system using kinect. In *2012 Asian Conference on Design and Digital Engineering (ACDDE 2012)*. Hokkaido, Japan.
- Baek, S.-Y.**, Wang, J. H., Song, I., Lee, K., Koo, S., (2012). Automated bone landmarks prediction on the femur using anatomical deformation technique. In *Symposium on Solid and Physical Modeling (SPM 2012)*. Dijon, France.
- Lee, S., **Baek, S.-Y.**, Son, J., Kim, D., Lee, K., (2012). Changes in medio-lateral knee joint reactions of flatfoot patients due to insole conditions. In *18th Congress of the European Society of Biomechanics*. Lisbon, Portugal.
- Baek, S.-Y.**, Son, J., Lee, K., (2012). Statistical analysis of foot shape for designing mass-customized footwear. In *9th International Symposium on Tools and Methods for Competitive Engineering (TMCE 2012)*. Karlsruhe, Germany.
- Son, J., **Baek, S.-Y.**, Lee, K., (2012). Automatic measurement of dimensions of 3d foot scan data. In *Asian Workshop on 3D Body Scanning Technologies*. Tokyo, Japan.
- Lee, S., **Baek, S.-Y.**, Son, J., Kim, D., Lee, K., (2012). Changes in medio-lateral knee joint reaction force of patients with over-pronation during gait due to insole parameters. In *2012 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea.

- Son, J., **Baek, S.-Y.**, Lee, K., (2012). An algorithm for automatic measurement of dimensions of 3d foot scan data. In *2012 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea.
- Baek, S.-Y.**, Lee, J., Lee, K., (2011). Deformation of raw 3d scan surfaces via multi-resolution RBF networks. In *Asian Workshop on 3D Body Scanning Technologies*. Tokyo, Japan.
- Jo, J., **Baek, S.-Y.**, Lee, K., Song, I.-s., Koo, S., (2011). Statistical deformation of femur geometry. In *2011 Spring Conference of the Korean Society of Mechanical Engineers*. Pohang, Korea.
- Lee, J., **Baek, S.-Y.**, Lee, K., (2011). 3d generic vertebra model for computer aided diagnosis. In *2011 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea.
- Baek, S.-Y.**, Lee, K., (2010). Interactive parametric modeling of human body shape. In *2010 Asian Conference on Design and Digital Engineering (ACDDE 2010)*. Jeju, Korea.
- Baek, S.-Y.**, Lee, K., (2010). Parametric human body modeling system for virtual garment fitting. In *8th International Symposium on Tools and Methods of Competitive Engineering (TMCE 2010)*. Ancona, Italy.
- Baek, S.-Y.**, Kim, B.-Y., Lee, K., (2009). 3d face model reconstruction from single 2d frontal image. In *8th ACM SIGGRAPH International Conference on Virtual Reality Continuum and Its Applications in Industry*. Tokyo, Japan.
- Jang, T., **Baek, S.-Y.**, Lee, K., (2009). Synthesis of human body shape for given body parameters using 3d body scan data. In *2009 Annual Conference of the Society of CAD/CAM Engineers*. Pyeongchang, Korea.

Invited Talks

- Deep Learning on Non-Euclidean Data. *Translational Research Seminar*, Department of Radiation Oncology, University of Iowa Hospitals and Clinics, The University of Iowa, Iowa City, IA, November 2017.
- Teaching Computers How to Design. *Mechanical Engineering Graduate Seminar*, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, IA, October 2017.
- Teaching Computers How to Design. Korea Institute of Science and Technology, Seoul, Korea, August 2017.
- Digital Human Models for Human-Centered Infrastructure, Korea Institute of Construction Technology, Goyang, Korea, August 2017.
- Teaching Computers How to Design, Department of Mechanical Engineering, Kyungpook National University, Daegu, Korea, August 2017.
- Teaching Design to Computers. *Industrial Engineering Graduate Seminar*, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, IA, March 2017.
- Solving Computational Geometry Problems with Games, EPX Video Game and Animation Studio, The University of Iowa, Iowa City, IA, February 2017.
- Inside IDEA lab, *Public Digital Arts Showcase*, Public Digital Arts (PDA) Cluster, The University of Iowa, Iowa City, IA, October 2016.
- MetaCAD: CAD beyond CAD. *Informatics Symposium*, The University of Iowa Informatics Initiative (UI3), Iowa City, IA, April 2016.

Design from Big Data. *Graduate Seminar*, Department of Mechanical Engineering, University of Wisconsin at Madison, WI, January 2016.

MetaCAD: CAD beyond CAD. *ECE Graduate Seminar*, Department of Electrical and Computer Engineering, The University of Iowa, Iowa City, IA, January 2016.

Solving Industrial Engineering Problems using Global Brain. *Industrial Engineering Graduate Seminar*, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, IA, October 2015.

Technology and Art. *Department of Mechanical and Industrial Engineering Advisory Board Meeting*, The University of Iowa, Iowa City, IA, October 2015.

MetaCAD: CAD beyond CAD. *Mechanical Engineering Graduate Seminar*, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, IA, September 2015.

Understanding Digital Shapes. *Korean-American Scientists and Engineers Association (KSEA) Iowa City Chapter Meeting*, Iowa City, IA, September 2015.

Understanding Human Body Shapes. *Mechanical Engineering Graduate Seminar*, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, IA, January 2015.

Understanding Human Body Shapes. *Graduate Seminar*, School of Mechatronics, Gwangju Institute of Science and Technology (GIST), Gwangju, Korea, December 2014.

Knowledge-Based Design Framework for User-Tailored Insoles. *2012 Annual Conference of the Society of CAD/CAM Engineers*, Pyeongchang, Korea, August 2012.

Patents

Lee, Y., Lee, K., **Baek, S.-Y.**, Kam, D.-U., Kim, D.-W., Yoo, S. Tire Recognition Method and Apparatus, *United States Patent Application 20160224863*, August 2016.

Lee, Y., Lee, K., **Baek, S.**, Kam, D.-U., Kim, D.-W., Yoo, S. Method and Apparatus for Measuring Tire Tread Abrasion, *United States Patent Application 20160221404*, August 2016.

Lee, Y., Lee, K., **Baek, S.**, Kam, D.-U., Kim, D.-W., Yoo, S. Method of Measuring Tread Abrasion of Tire and Apparatus Thereof, *Republic of Korea Patent No. 10-1534259*, June 2015.

Lee, Y., Lee, K., **Baek, S.**, Kam, D.-U., Kim, D.-W., Yoo, S. Method of recognizing tire damage and method thereof, *Republic of Korea Patent No. 10-1504345*, March 2015.

Lee, K., **Baek, S.** Apparatus and Method for Displaying 3-dimensional Contents, *Republic of Korea Patent No. 10-1310498*, September 2013.

Lee, K., **Baek, S.** Method of Manufacturing an Insole, *Republic of Korea Patent No. 10-1223238*, January 2013.

Ahn, S.-H., Park, S.-W., Li, L., **Baek, S.** Opening and Closing Door Knob Aids, *Republic of Korea Patent No. 10-1113498*, January 2012.

Lee, K., **Baek, S.** System for Creating 3D Human Body Model and Method Therefor, *Republic of Korea Patent No. 10-1072944*, October 2010.