

Seong-Hyok Kim

Research Engineer II

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BIOGRAPHY



Dr. Seong-Hyok Kim received his B.S.E. and M.S. degree at the Department of Electrical Engineering, Seoul National University in 1996, 1998, respectively. He received his Ph. D. degree in Electrical Engineering and Computer Science from Seoul National University in 2002. His doctorate research at the Lab. for Micro Sensors and Actuators (MiSA) focused on the design and the fabrication of a silicon microgyroscope operating at atmospheric pressure.

After joining LG Electronics Institute of Technology as a Senior Research Engineer in 2002, he participated in the design and fabrication of a wide variety of microelectromechanical systems (MEMS) devices for portable electronics; an electrostatic/electromagnetic actuator for an objective lens positioning in the optical drive system, a MEMS optical switch in the optical communication system, a miniaturized and magnetically levitated linear-expansion valve for home appliances, a high-speed scanning mirror for the next generation display device, micro fluidic devices, a large-displacement micro iris actuator for a camera phone, and micro piezoelectric devices for proximity power sensing and energy harvesting.

In 2005, Dr. Kim joined the Micro Sensors and Micro Actuators Laboratory (MSMA Lab.) at Georgia Institute of Technology as a postdoctoral fellow and led the PowerMEMS research group at the MSMA lab. The PowerMEMS research group is dedicated to developing MEMS components for energy conversion and generation. Since he became a Research Engineer II, a non-tenure track research faculty at Georgia Institute of Technology in 2007, Dr. Kim has been leading the MSMA laboratory's research projects and supervising graduate students as the deputy of Professor Mark G. Allen, the Senior Vice Provost for Research and Innovation. Dr. Kim has published more than 48 peer-reviewed journal and conference articles and holds 29 Korean/International patents in the field of MEMS including power MEMS, bio MEMS, polymer MEMS, optical MEMS, and MEMS sensors and actuators. His current research interests include 3D micro/nano structures for integrated power electronics, energy storing devices and miniaturized energy harvester, soft-lithography based polymeric microneedle / micro-electrode-array (MEA) for drug delivery and human health and environmental monitoring, bio-inspired sensors for unmanned aerial vehicle (UAV) and robots, and micro/nano fabrication processes for micro/nano sensors and actuators.

RESEARCH INTERESTS

Energy conversion devices using micro/nano fabrication technologies

- *Power-on-chip or power-in-package*: Micro/nanofabrication of miniaturized components for energy conversion
 - ✓ High frequency, high power, high efficiency CMOS-integrable transformer, inductor and capacitor for chip-scale power converter / inverter in portable electronics and photovoltaic
 - ✓ Micro/nanofabricated pseudo-magnetic material and devices for high energy density energy conversion
 - ✓ Self-packaged on-chip energy conversion components for portable power electronics and “*wireless energy transfer*” applications
- Miniaturized energy harvester for ubiquitous sensor network (USN) and biomedical applications as a self-sustainable energy source
 - ✓ Miniaturized self-sustainable power generator from chemical/kinetic energy sources for USN applications and biomedical applications
 - ✓ *Intelligent Power Skin*: An artificial skin that provides intelligent solution for lightweight structural material. This “*Power Skin*” will serve not only as a structural material but also as an energy harvesting and storing component as well as an environmental monitoring system.

Devices for Environmental and Biomedical Applications, and Bio-mimicry using micro/nano technologies

- Large array flexible-PCB based biomimetic sensors
 - ✓ Large array environmental monitoring system for monitoring wind, humidity, temperature, pressure and etc.
 - ✓ Biocompatible and flexible sensor for health monitoring system
- *Intelligent power skin*
- Mosquito needle inspired microneedle / micro electrode array (MEA) for biomedical applications
 - ✓ Self-administered microneedle array for vaccination against pandemic disease.
 - ✓ Low-cost flexible MEA with integrated fluidic components for cell/neuron culturing, stimulating, and monitoring.
- Bio-inspired nanoscale sensors / actuators / 3D materials based on soft-lithography for biomedical applications

Micro/Nanofabrication

- Development of 3D micro/nano structures for micro/nanoscale sensor and actuator applications.
- Development of CMOS-compatible micro/nanofabrication process for consumer electronics
- Low-cost fabrication technology for flexible, conformal, scalable, and moldable intelligent components in large array.
- Integration of carbon nanotube and piezoelectric nanowires with microfabricated structures for better electrical and physical properties.

EDUCATION

Seoul National University

(Mar. 1992 ~ Feb. 2002, Seoul, Korea)

- Ph. D. in Electrical Engineering and Computer Science (EECS) (Mar. 1998 ~ Feb. 2002)
 - ✓ Dissertation : “A Micromachined and Non-Vacuum Packaged Silicon Vibratory Gyroscope”
 - ✓ Implemented a mass-producible and commercially available MEMS gyroscope by considering structural damping and process simplification. The fabrication process was a simple silicon-on-glass micromachining process which required only a single mask photolithography process. The gyroscope demonstrated a high Q value that reached up to 1000 at atmospheric pressure. Also, it demonstrated 0.01deg/sec of long-term bias stability with the dynamic range of +/- 100 deg/sec at the atmospheric pressure.
 - ✓ Dissertation Committee: Prof. Jang-Gyu Lee (Chair), Prof. Yong-Kweon Kim (Co-Chair, Academic advisor), Prof. Kukjin Chun, Prof. Changdon Kee, Prof. Seung-Ki Lee
- MSc in Electrical Engineering (Mar. 1996 ~ Feb. 1998)
 - ✓ Dissertation : “(110) Silicon Anisotropic Etching for High Aspect Ratio Structures”
 - ✓ Studied the anisotropic etching of (110) silicon in order to achieve vertical high-aspect-ratio comb-drive actuator and applied the comb-drive actuator with width-to-height aspect ratio larger than 80 to an electrostatically driven and electromagnetically sensed microgyroscope operating at atmospheric pressure.
 - ✓ Academic Advisor: Prof. Yong-Kweon Kim
- BSc in Electrical Engineering (Mar. 1992 ~ Feb. 1996)
 - ✓ Dissertation : “A Study and Evaluation of EHD Pump for Micro EHD Pump”
 - ✓ Academic advisor: Prof. Yong-Kweon Kim
 - ✓ Mentor: Prof. Jin-Woo Choi (Currently with Louisiana State University)

Seoul Science High School

(Mar. 1989 ~ Feb. 1992, Seoul, Korea)

HONORS AND AWARDS

- Korean National Scholarship, Information and Telecommunication National Scholarship Program, *The Ministry of Information and Communication*, Republic of Korea (Aug. 2005 ~ Jul. 2007)
- Silver Prize, Samsung Humantech Thesis Prize, “A Non-Vacuum Packaged Silicon Vibratory Micro Gyroscope” (2002)
- Industry-University Cooperative Scholarship, LG Electronics (2001)
- Korean Representative, Expo '93 International Microrobot Competition, “Sigma-3” (1993)

LECTURES AND INVITED TALKS

- “MEMS and its Application to Cellular Phone,” Invited Seminar, LG Electronics, Feb. 2010
- “Applied MEMS: Micro/Nano fabrication technologies for bio, energy, sensor and actuator applications,” Invited Lecture for undergraduate students in Semiconductor Physics class, *Korea University*, Sep. 2009
- “Applied MEMS: Micro/Nano fabrication technologies for bio, energy, sensor and actuator applications,” Invited Seminar, *Sungkyunkwan University*, Sep. 2009
- “Applied MEMS: Micro/Nano fabrication technologies for bio, energy, sensor and actuator applications,” Invited Seminar in Yonsei Nanomedical National Core Research Center, *Yonsei University*, Aug. 2009
- “Micro/Nano/Bio Research Activities at Georgia Tech,” Brain Korea 21 Seminar, *Seoul National University*, Seoul, Korea, Sep., 2008
- “Micro/Nano/Bio Research Activities at Georgia Tech,” LG Electronics Institute of Technology, Seoul, Korea, Sep., 2008
- “Power MEMS and Other MEMS Researches in Georgia Tech,” Brain Korea 21 Seminar, *Seoul National University*, Seoul, Korea, July., 2006
- “Power MEMS,” LG Electronics Institute of Technology, Seoul, Korea, July., 2006
- “MEMS Inertial Sensors,” *Kwangwoon University*, Korea, Apr., 2005

TEACHING EXPERIENCE

Undergraduate Mentor, School of EECS, Seoul National University

(1999 ~ 2001, Seoul, Korea)

- Mentored 8 undergraduate students and 4 out of 8 undergraduate students joined our laboratory after finishing an undergraduate term project.

Teaching assistant, School of EECS, Seoul National University

- Electronic Circuits (420.202) (Spring 2002)
- Introduction to Microsystem Technology (4541.532) (Fall 2001)

PROFESSIONAL EXPERIENCE

Research Engineer II, Georgia Institute of Technology

(Sep. 2007 ~ Present, Atlanta, USA)

- Co-directed/co-directing more than 5 project groups with more than 15 graduate students at the MSMA Lab. as the deputy of Prof. Mark G. Allen, a Senior Vice Provost for Research and Innovation at Georgia Institute of Technology.
- Especially responsible for the following projects:
 - ✓ Power MEMS devices of energy harvesting from the environment for wireless sensor networks applications
 - ✓ Miniaturized technology components for energy conversion
 - ✓ Wireless energy transfer
 - ✓ Self-administered microneedle patches for influenza vaccines
 - ✓ Bio-inspired large area micro flow sensor array
- Authored and coauthored 4 peer-reviewed journal article and 11 international conference papers

Postdoctoral Fellow, MSMA Lab., Georgia Institute of Technology (Aug. 2005 ~ Aug. 2007, Atlanta, USA)

- Conducted researches as a lead scientist for more than 4 different research projects
- Especially responsible for the following projects:
 - ✓ Miniaturized technology components for energy conversion
 - ✓ Micro turbine generator
 - ✓ Pneumatic polymeric bubble actuator for tactile display application
- Contributed to initiating 3 directly/indirectly related derivative projects.
- Authored and coauthored 1 peer-reviewed journal articles and 7 international conference papers.

TOP 5 PROMINENT RESEARCH ACTIVITIES IN GEORGIA INSTITUTE OF TECHNOLOGY

- **Technology Components for High Frequency Passive Components for Wireless Resonant Energy Transfer (Project Leader, PI: Mark G. Allen) 100K USD/yr; National Semiconductor, USA (Jun. 2009 ~ Present)**
 - ✓ Project aim: To investigate and develop optimum technologies for the integration or co-packaging of high frequency passive components for wireless resonant energy transfer, *i.e.* Wireless battery charging.
 - ✓ Have contributed initiating this project and have been leading the project group as a project leader.
 - ✓ Have been developing high frequency passives such as inductors and capacitors with consideration of co-integration and/or co-packaging with CMOS circuitry.
 - ✓ Have been managing weekly conference calls and reports.
- **Technology Components for Fully Integrated DC/DC Converters (Project Leader, PI: Mark G. Allen) 133K USD/yr; 530K USD funded as of today; National Semiconductor, USA (Aug. 2005 ~ Jun. 2009)**
 - ✓ Project aim: To develop an integrated power converter in portable power electronics using miniaturized on-chip power electronics components as well as 3D through-silicon-via (TSV) process
 - ✓ Have been leading the project group, “PowerMEMS Research Group,” at the MSMA Lab.
 - ✓ Have been developing an integrated power converter with one of the leading semiconductor company in the US.
 - ✓ Responsible for initiating 3 directly/indirectly related derivative projects:
 - Due to excellent results during the first six months of my tenure as a postdoctoral fellow, this project has expanded to 3 directly/indirectly related projects and became a major area of research at the MSMA Lab.
 - ✓ Developed CMOS-compatible on-chip inductor and demonstrated a 5W CMOS-integrated Buck converter operating at 5MHz with maximum efficiency of 78%.
 - ✓ Demonstrated the 3D micro capacitor with a capacitance density of 1.6nF/mm² (5 times that of parallel-plate capacitor), scalable up to 40nF/mm² (100x times that of parallel-plate capacitor)
 - ✓ Demonstrated the feasibility of a high-*k* capacitor with an expected capacitance density of 7.6fF/μm²
 - ✓ Have been overseeing the derivative projects including the 3D through-silicon-via (TSV) project and high-*k* power capacitor project for integrated power converter since Sep. 2007.
 - ✓ Provided weekly reports
 - ✓ Co-authored 2 international conference papers
- **Power MEMS Devices of Energy Harvesting From the Environment for Wireless Sensor Networks Applications (Project Leader, PI: Mark G. Allen), 60k USD/yr; 120K USD funded; Electronics and Telecommunications Research Institute (ETRI), Korea (Jul. 2007 ~ Jan. 2009)**
 - ✓ Project aim: To develop MEMS-based energy scavengers from ambient power sources
 - ✓ Successfully led and completed the project by designing and characterizing a miniaturized energy harvester for USN applications.
 - ✓ Demonstrated an air-driven energy harvester operating at ambient air-flow, which comprises a mechanical resonator with a frequency-matching acoustic resonator as an energy-preconcentrator.
 - ✓ Provided interim and final reports.
 - ✓ Authored 1 international conference paper and 1 peer-reviewed journal paper
- **Self-Administered Microneedle Patches for Influenza Vaccines (Project Leader, Co-PI: Mark G. Allen) 240K USD/yr; 500K USD funded as of today; National Science Foundation (NSF) / National Institute of Health (NIH), USA (Nov. 2007 ~ Present)**
 - ✓ Project aim: To develop potentially low-cost mass-manufacturable microneedle patches for mass-immunization against pandemic influenza

- ✓ Responsible for research activities in designing and characterizing microneedle systems that deliver influenza vaccines into skin.
 - ✓ Developed 800 μ m tall high-aspect-ratio solid microneedle array using SU-8 epoxy micromachining with integrated lens. The developed solid microneedle array has been used as a mold for bio-compatible/bio-degradable solid microneedle arrays for transdermal drug delivery.
 - ✓ Developed hollow microneedle arrays with biodegradable tip and drug reservoir for low-cost, self-packaged, self-administered microneedle patch.
 - ✓ Have been improving the fabrication processes for polymeric microneedle array by developing photolithography and micromolding-based potentially low-cost, high-aspect-ratio hollow microneedle patches to deliver large amount of drug and large molecular weight compounds into human skin.
 - ✓ Responsible for writing and distributing quarterly reports.
 - ✓ Co-authored 2 international conference papers
- **Dynamic Flight Maneuvering Using Virtual Control Surfaces Generated by Trapped Vorticity (Project Leader, Co-PI: Mark G. Allen)** **(Aug. 2006 ~ present)**
123K USD/yr; 500K USD funded as of today; US Airforce, USA
 - ✓ Project aim: To develop surface-mounted flow sensor array for rapid, dynamic maneuvering and attitude control of small scale UAVs
 - ✓ Have been leading the project by directing the design, simulate and characterize of a bio-inspired micro flow sensor.
 - ✓ Proposed the bio-inspired micro flow sensor design and developed a flexible-PCB based microfabrication technology for low-cost large array flow-sensor array in UAV.
 - ✓ By utilizing an aeroelastic fluttering effect that causes vibration of the 3D sensor elements and by measuring the vibration amplitude, the bias stability was improved by 100 times compared to a direct measurement method.
 - ✓ Provided interim and final reports.
 - ✓ Co-authored 2 international conference papers and 2 peer-reviewed journal papers

OTHER RESEARCH ACTIVITIES IN GEORGIA INSTITUTE OF TECHNOLOGY

- **Nanofabrication** **(Aug. 2008 ~ present)**
 - ✓ Project aim: To develop a highly functional substrate using micro/nanofabrication technologies
 - ✓ Provided technical guidance for two projects: Molecular imprinted polymers for biomedical applications and patterned Carbon Nanotube (CNT); and elastomer bilayer material for piezoresistive sensor applications.
 - ✓ Co-authored / co-directed 2 conference publications related to this project in 2009
- **Hybrid Ink** **(Sep. 2008 ~ Jan. 2009)**
 - ✓ Project aim: To develop specialty ink, used as a surgical marking medium, and the dispensing container for this ink.
 - ✓ Contributed to this project by designing the experimental protocol and supervising an undergraduate student.
- **Micro Turbine Generator (Co-PI: Mark G. Allen)** **(Aug. 2005 ~ Dec. 2007)**
141K USD/yr; 1M USD funded; Defense Advanced Research Projects Agency (DARPA), USA
 - ✓ Project aim: To develop meso/micro scale self-contained magnetic generators for high power density electro-mechanical energy conversion system in military and portable electronics
 - ✓ Managed this project by organizing collaborative efforts with MIT, providing technical guidance to research efforts at MSMA Lab, and providing quarterly and final reports to DARPA.
 - ✓ The project was extended due to the distinctive results on the world-first miniaturized micro-turbine based micro generator, reported in at least 4 international conference proceedings and 3 international journal article.
 - ✓ Co-authored/co-directed 2 international conference paper
- **Digital Clay** **(Jan. 2006 ~ May 2008)**
 - ✓ Project aim: To develop pneumatic polymeric bubble actuator array and a piezoelectric micro valve for a next generation tactile display, particularly for remote medical operation.
 - ✓ Provided technical advice for the development of kinematically-stabilized microbubble actuator array.
 - ✓ Developed characterization protocols for the actuator and provided numerical simulation results.
 - ✓ Characterized a portable refreshable Braille cell.
 - ✓ Contributed to the development of solid hydraulically-amplified piezoelectric microvalve by assisting design, modeling, fabrication and characterization.
 - ✓ Co-authored 3 international conference papers and co-directed 1 peer-reviewed journal paper
- **Micro Earthmagnet Field Sensor** **(Aug. 2005 ~ Mar. 2007)**
 - ✓ Project aim: To develop portable electronics with personal navigation and motion sensing applications
 - ✓ Demonstrated nano-watt level ultra low power consumption magnetic field sensor with electromagnetically driven and sensed scheme.
 - ✓ Provided influential ideas during the decision-making process.
 - ✓ Co-authored 2 international conference paper and 1 peer-reviewed journal paper

Senior Research Engineer, LG Electronics Institute of Technology

(Mar. 2002 ~ Aug. 2005, Seoul, Korea)

- Major roles: Project development and execution, and strategy planning and technological trend analysis
- Low-Power and Ubiquitous Sensor Network (USN) for Home Appliances (2004 ~ Aug. 2005)
 - Developed internal resources with a strategy planning group at LG Electronics that guided the development of the company's next-generation business model that will allow the company to maintain its role as a leader in the electronics market.
 - Provided influential information about USN for home appliances, ranging from market-trend to state-of-the-art technologies, and then suggested an appropriate business model worth over additional \$100M in annual revenue for the company.
- Proposed and successfully completed 6 different projects in the field of portable electronics ranging from camera-phones, laptop systems, next-generation optical data storage devices, and home appliances. Provided the design, simulation, implementation, and characterization of head components using MEMS (Micro-Electro-Mechanical Systems) technology. Most projects were successfully demonstrated in less than 6 months to meet rapidly changing market needs.
 - Authored / Co-authored 5 peer-reviewed journal papers and 6 international conference papers.

MAJOR RESEARCH PROJECTS

- ✓ A Miniaturized Actuator for a Small-Form-Factor Camera (2004 ~ 2005)
- ✓ An Electrostatic Actuator for a High Speed Scanning Mirror for Laser Display (2003 ~ 2004)
- ✓ Micro Fluidic Devices for Mobile Electronics (2003 ~ 2004)
- ✓ A Large Displacement Electromagnetic Actuator (2003 ~ 2004)
- ✓ A Miniaturized and Magnetically Levitated Linear-Expansion Valve (2002 ~ 2003)
- ✓ An Integrated Optical Flying Head for Small Form Factor Data Storage Drive (2002 ~ 2003)

Technical Advisor, IntelliMicrons Co. Ltd.

(Mar. 2001 ~ Aug. 2005, Seoul, Korea)

- The technology for the non-vacuum packaged gyroscope, demonstrated in my doctoral dissertation, was transferred to this venture company. The device is expected to be mass-producible and commercially available by adopting a simple fabrication process and eliminating additional packaging, which constitutes 80% of the manufacturing cost of conventional gyroscopes. The gyroscope is planned to be commercialized and is expected to penetrate the inertial sensor market which is worth \$2B in annual revenue.

PUBLICATIONS

- 16 papers in peer-reviewed international journals on MEMS
 - Journal of Micromechanics and Microengineering (IF: 2.23), Sensors and Actuators A: Physical (IF:1.72), Japanese Journal of Applied Physics(IF: 1.25), IEEE Transactions on Magnetics (IF: 0.96), Smart Materials and Structures (IF:1.743) and etc.
- 32 papers in world leading conferences on MEMS
 - 6 papers in IEEE International Conference on Micro Electro Mechanical Systems (MEMS, acceptance ratio ~ 30%), 9 papers in IEEE International Conference on Solid-State Sensors and Actuators (Transducers, acceptance ratio ~ 35%) and etc.
- 29 patents in Korea, Japan, China, Europe and US, which are mostly targeted to win the next standardization war as a consumer electronics company.
 - 7 patents issued in US.

Peer-Reviewed International Journals (accepted/published)

- W. Xu, M. Kranz, **S.-H. Kim**, M. G. Allen, "Micropatternable Elastic Carbon Nanotube/PDMS Electrets," *Journal of Micromechanics and Microengineering*, Accepted.
- Y. Zhao, Y. Li, B. Pan, **S.-H. Kim**, Z. Liu, M. M. Tentzeris, J. Papapolymerou, and M. G. Allen, "RF evanescent-mode cavity resonator for passive wireless sensor applications," *Sensors and Actuators A: Physical (IF:1.72) in press*
- C.-H. Oh, J.-H. Choi, H.-J. Nam, J.-U. Bu, and **Seong-Hyok Kim**, "Ultra-Compact, Zero-Power Magnetic Latching Piezoelectric Inchworm Motor with Integrated Position Sensor for Portable Electronics," *Sensors and Actuators A 158 (2010) 306-312*, [doi:10.1016/j.sna.2010.01.022](https://doi.org/10.1016/j.sna.2010.01.022) (Corresponding author)
- C. Song, A. R. Aiyar, **S.-H. Kim**, and M. G. Allen, "Exploitation of Aeroelastic Effects for Drift Reduction in An All-Polymer Air Flow Sensor," *Sensors and Actuators A: Physical (IF:1.72)*. [doi:10.1016/j.sna.2010.01.008](https://doi.org/10.1016/j.sna.2010.01.008) (Corresponding author)
- A. R. Aiyar, C. Song, **S.-H. Kim** and M. G. Allen, "An All-Polymer Air-Flow Sensor Array using a Piezoresistive Composite Elastomer," *Smart Mater. Struct.* **18** (2009) 115002. (IF:1.51) (Corresponding author)
- S.-H. Kim**, C.-H. Ji, W. P. Galle, F. Herrault, X. Wu, J.-H. Lee, C.-A. Choi, and M. G. Allen, "An Electromagnetic Energy Scavenger From Direct Airflow," *J. Micromech. Microeng.* **19** (2009) 094010. (IF:2.233)
- S.-K. Choi, **S.-H. Kim**, Y.-K. Yoon, and M. G. Allen, "A Magnetically Excited And Sensed MEMS-Based Resonant Compass," *IEEE Transaction on Magnetics*, **42** 10, pp. 3506-3508, Oct. 2006 (IF:0.96)
- C.-H. Ji, M. Choi, S.-C. Kim, S.-H. Lee, **S.-H. Kim**, Y.-J. Yee, and J.-U. Bu, "An Electrostatic Scanning Micromirror with Diaphragm Mirror Plate and Diamond Shaped Reinforcement Frame," *Journal of Micromechanics and Microengineering*, Vol. 16, pp. 1033-1039, Apr. 2006 (IF 2.321)

9. W.-T. Sung, **S.-H. Kim**, J.-G. Lee and T.-S. Kang, "Development of a Bulk-Micromachined Single Crystal Silicon Gyroscope of Wide Operating Range at Atmospheric Pressure," *Key Engineering Materials*, Vol 306-308 2006 1259-1264
10. S.-K. Kim, J.-M. Park, G.-S. Park, J.-K. Lee, J.-G. Lee, H.-W. Jung, J.-Y. Kim, **S.-H. Kim**, Y.-J. Yee, J.-H. Kim, J.-H., and J.-U. Bu, "An optical flying head assembly for a small-form-factor plastic disk in PCMCIA-Like Drive," *Japanese Journal of Applied Physics*, Vol. 43, No. 7B, pp.4752-4758, 2004
11. C.-H. Ji, Y.-J. Yee, J.-H. Choi, **S.-H. Kim**, and J.-U. Bu, "Electromagnetic 2x2 optical switch," *IEEE Journal of Selected Topics in Quantum Electronics*, Vol. 10, Issue 3, 545-550, 2004
12. **S.-H. Kim**, Y.-J. Yee, J.-H. Choi, H. Kwon, M.-H. Ha, C.-H. Oh, and J.-U. Bu, "Integrated MEMS optical flying head with lens positioning actuator for small form factor optical data storage," *Sensors and Actuators A: Physical*, Vol. 114/2-3, pp 429-437, 2004
13. J.-Y. Lee, **S.-H. Kim**, H.-T. Lim, C.-H. Kim, C.-W. Baek, and Y.-K. Kim, "Electric spring modeling for a comb actuator deformed by the footing effect in deep reactive ion etching," *Journal of Micromechanics and Microengineering*, Vol. 13, pp. 72-79, 2003
14. **S.-H. Kim**, S.-H. Lee, and Y.-K. Kim, "A high-aspect-ratio comb actuator using UV-LIGA surface micromachining and (110) silicon bulk micromachining," *Journal of Micromechanics and Microengineering*, Vol. 12, No. 2, pp. 128-135, 2002
15. **S.-H. Kim**, Y.-K. Kim, J.-W. Song, and J.-G. Lee, "A surface-bulk-micromachined electromagnetic gyroscope operating at atmospheric pressure," *Japanese Journal of Applied Physics*, Vol. 39, No. 12B, 2000
16. **S.-H. Kim**, S.-H. Lee, H.-T. Lim, Y.-K. Kim, and S.-K. Lee, "Anisotropic Bulk Etching of (110) Silicon with High Aspect Ratio," *Transactions of IEE Japan*, Vol. 118-E, No. 1, pp. 32-36, 1998

International Journals (in preparation)

1. **S.-H. Kim**, W. P. Galle, A. Mohan, P. Johnson, P. Smeys, P. Hopper and M. G. Allen, "Miniaturized Power Converter with Integrated MEMS Inductor," *in preparation*
2. W. P. Galle, **S.-H. Kim**, X. Wu, L. Milner, P. Johnson, P. Smeys, P. Hopper and M. G. Allen, "Ultra-Compact Power Conversion Based on a CMOS-Compatible Microfabricated Power Inductor with Minimized Core Losses," *in preparation*
3. W. P. Galle, **S.-H. Kim**, U. Shah and M. G. Allen, "Micromachined Capacitors Based on Automated Multilayer Electroplating," *in preparation*
4. S.-J. Paik, **S.-H. Kim**, P.-C. Wang, B. A. Wester, and M. G. Allen, "Dissolvable-Tipped, Drug-Reservoir Integrated Microneedle Array for Transdermal Drug Delivery," *in preparation*
5. P.-C Wang, B. A. Wester, S. Rajaraman, S.-J. Paik, **S.-H. Kim**, and M. G. Allen, "Hollow Polymer Microneedle Array Fabricated by Photolithography Process Combined with Micromolding Technique," *in preparation*
6. X. Wu, **S.-H. Kim**, C.-H. Ji, and M. G. Allen, "A Solid Hydraulically-Amplified Piezoelectric Microvalve," *in preparation*
7. X. Wu, **S.-H. Kim**, C.-H. Ji, and M. G. Allen, "A Portable Pneumatically-Actuated Refreshable Braille Cell," *in preparation*

International Conferences (Peer-Reviewed)

1. W. P. Galle, **S.-H. Kim**, U. Shah and M. G. Allen, "Micromachined Capacitors Based on Automated Multilayer Electroplating," *Tech. Dig. 23rd IEEE Int. Conf. Micro Electro Mechanical Systems (MEMS 2010), Jan. 24-28, 2010, Hong Kong, China*, pp. 332-335
2. S.-J. Paik, **S.-H. Kim**, P.-C. Wang, B. A. Wester, and M. G. Allen, "Dissolvable-Tipped, Drug-Reservoir Integrated Microneedle Array for Transdermal Drug Delivery," *Tech. Dig. 23rd IEEE Int. Conf. Micro Electro Mechanical Systems (MEMS 2010), Jan. 24-28, 2010, Hong Kong, China*, pp. 312-315
3. W. Xu, M. Kranz, **S.-H. Kim**, M. G. Allen, "Micropatternable Elastic Carbon Nanotube/PDMS Electrets," *Tech. Dig. PowerMEMS 2009, Dec. 1-3, 2009, Washington DC, USA*, pp.177-180
4. P.-C Wang, B. A. Wester, S. Rajaraman, S.-J. Paik, **S.-H. Kim**, and M. G. Allen, "Hollow Polymer Microneedle Array Fabricated by Photolithography Process Combined with Micromolding Technique," *Tech. Dig. 31st Annual International IEEE EMBS Conference 2009, Minneapolis, USA, SuB06.2*
5. C. Song, A. R. Aiyar, **S.-H. Kim**, and M. G. Allen, "Exploitation of Aeroelastic Effects for Drift Reduction in An All-Polymer Air Flow Sensor," *Tech. Dig. Transducers 2009, Jul. 2009, Denver, USA*, pp. 1545-1548
6. A. R. Aiyar, C. Song, **S.-H. Kim**, and M. G. Allen, "An All-Polymer Air-Flow Sensor Array using a Piezoresistive Composite Elastomer," *Tech. Dig. 22nd IEEE Int. Conf. Micro Electro Mechanical Systems (MEMS 2009), Jan. 2009, Sorrento, Italy*, pp. 447-451
7. **S.-H. Kim**, C.-H. Ji, W. P. Galle, F. Herrault, X. Wu, J.-H. Lee, C.-A. Choi, and M. G. Allen, "An Electromagnetic Energy Scavenger From Direct Airflow," *Tech. Dig. of PowerMEMS 2008 + microEMS 2008, Nov. 2008, Sendai, Japan*, pp. 133-136
8. S. Rajaraman, Y. Zhao, X. Wu, **S.-H. Kim**, and M. G. Allen, "Metal Transfer Micromolding (MTM) Process for High-Aspect-Ratio 3-D Structures with Functional Metal Surfaces," *presented in International Symposium on Flexible Automation (ISFA 2008), Atlanta, USA, June 2008*
9. Y. Zhao, **S.-H. Kim**, Y. Li, B. Pan, X. Wu, E. M. Tentzeris, J. Papapolymerou, and M. G. Allen, "A Micromachined Airflow Sensor Based on RF Evanescent-Mode Cavity Resonator," *presented in Tech. Dig. International Microwave Symposium (IMS 2008), Atlanta, USA, June 2008*
10. X. Wu, **S.-H. Kim**, C.-H. Ji, and M. G. Allen, "A piezoelectrically-driven high flow rate axial polymer microvalve with solid hydraulic amplification," *Tech. Dig. 21st IEEE Int. Conf. Micro Electro Mechanical Systems (MEMS 2008), Tucson, USA, January 2008*, pp.523-526
11. F. Herrault, C.-H. Ji, **S.-H. Kim**, X. Wu, and M. G. Allen, "A microfluidic-electric package for Power MEMS generators," *Tech. Dig. 21st IEEE Int. Conf. Micro Electro Mechanical Systems (MEMS 2008), Tucson, USA, January 2008*, pp.112-115

12. C.-H. Oh, **S.-H. Kim**, J.-H. Choi, H.-J. Nam, and J.-U. Bu, "Ultra-Compact, Zero-Power Latching Linear Motor with Integrated Position Sensor for Portable Electronics," in *the 14th International Conference on Solid-State Sensors and Actuators(Transducers '07)*, Lyon, France, June 2007, pp. 1167-1170
13. F. G. Herrault, C.-H. Ji, R. H. Shafer, **S.-H. Kim**, and M. G. Allen, "Ultraminaturized Milliwatt-Scale Permanent Magnet Generators," in *the 14th International Conference on Solid-State Sensors and Actuators(Transducers '07)*, Lyon, France, June 2007, pp. 899-902
14. S.-K. Choi, **S.-H. Kim**, Y.-K. Yoon, and M. G. Allen, "Exploitation of Nonlinear Effects for Enhancement of the Sensing Performance of Resonant Sensors," in *the 14th International Conference on Solid-State Sensors and Actuators(Transducers '07)*, Lyon, France, June 2007, pp. 745-748
15. X. Wu, H. Zhu, **S.-H. Kim**, and M. G. Allen, "A Portable Pneumatically-Actuated Refreshable Braille Cell," in *the 15th International Conference on Solid-State Sensors and Actuators(Transducers '07)*, Lyon, France, June 2007, pp. 1409-1412
16. W. P. Galle, X. Wu, L. Milner, **S.-H. Kim**, P. Johnson, P. Smeys, P. Hopper, K. Hwang, and M. G. Allen, "Ultra-Compact Power Conversion Based on a CMOS-Compatible Microfabricated Power Inductor with Minimized Core Losses," in *the ECTC 2007*, Reno, USA, May 29 2007-June 1 2007, pp. 1889-1894
17. X. Wu, G. Yuan, S.-O. Choi, Y. Zhao, **S.-H. Kim**, Y.-K. Yoon, and M. G. Allen, "Lateral Lamination Approach for Multilayer Piezoelectric Microactuator," *Tech. Dig. Solid-State Sensor, Actuator and Microsystems workshop(Hilton Head 2006)*, Hilton Head Island, USA, June 2006
18. S.-K. Choi, **S.-H. Kim**, Y.-K. Yoon, M. G. Allen, "A Magnetically Excited And Sensed MEMS-Based Resonant Compass," *Tech. Dig. InterMag 2006*, San Diego CA, May 8-12 2006, pp. 595
19. C.-H. Ji, **S.-H. Kim**, and J.-U. Bu, "Diamond Shaped Frame Supported Electrostatic Scanning Micromirror," in *the 14th International Conference on Solid-State Sensors and Actuators(Transducers '05)*, Seoul, Korea, June 5-9 2005, pp. 992-995
20. **S.-H. Kim**, Y.-J. Yee, J.-H. Choi, H. Kwon, M.-H. Ha, C.-H. Oh, and J.-U. Bu, "A micro optical flying head for a PCMCIA-sized optical data storage," in *the 17th IEEE International Conference on Micro Electro Mechanical Systems(MEMS 2004)*, Maastricht, Netherlands, Jan. 25-29 2004, pp. 85 – 88
21. C.-H. Ji, Y.-J. Yee, J.-H. Choi, **S.-H. Kim**, and J.-U. Bu, "Latchable electromagnetic 2/spl times/2 photonic switch for low power operation," in *IEEE/LEOS International Conference on Optical MEMS 2003(MOEMS 2003)*, Waikoloa HI, USA Aug. 18-21 2003, pp. 51-52
22. S.-K. Kim, J.-K. Lee, J.-M. Park, G.-S. Park, J.-G. Lee, C.-W. Lee, D.-H. Son, J.-Y. Kim, **S.-H. Kim**, and Y.-J. Yee, "PCMCIA like ultra small form factor optical drive," in *Optical Data Storage(ODS) 2003*, Vancouver, B.C., Canada May 11-14 2003, pp. 5-13
23. **S.-H. Kim**, Y.-J. Yee, J.-H. Choi, H. Kwon, M.-H. Ha, C.-H. Oh, and J.-U. Bu, "Integrated micro optical flying head with lens positioning actuator for small form factor data storage," in *the 12th International Conference on Solid-State Sensors and Actuators(Transducers '03)*, Jun 8-12 2003, pp. 607-610
24. J.-Y. Lee, **S.-H. Kim**, H.-T. Lim, C.-H. Kim, and Y.-K. Kim, "Modeling of the comb actuator deformed by microloading effect in deep reactive ion etching," in *SPIE Micromachining and Microfabrication 2001*, San Francisco CA, USA, Oct. 22 2001, pp. 250-260
25. J.-Y. Lee, C.-H. Kim, H.-T. Lim, **S.-H. Kim**, and Y.-K. Kim, "Stable position control of comb actuator with large displacement," in *the International Conference on Electrical Engineering(ICEE) 2001*, Xi'an China, Jul 22-26 2001, pp. 1490-1493
26. **S.-H. Kim**, J.-Y. Lee, C.-H. Kim, and Y.-K. Kim, "A single crystal silicon gyroscope operating at atmospheric pressure," in *Technical Digest of 18th Sensor Symposium*, Kanakawa Japan, May 30-31 2001, pp.293-296
27. **S.-H. Kim**, J.-Y. Lee, C.-H. Kim, and Y.-K. Kim, "A bulk-micromachined single crystal silicon gyroscope operating at atmospheric pressure," in *the 11th International Conference on Solid-State Sensors and Actuators(Transducers 01)*, Munich Germany, Jun 10-14 2001, pp. 476-479
28. **S.-H. Kim** and Y.-K. Kim, "A surface-bulk micromachined electromagnetic gyroscope operating at atmospheric pressure," in *International Microprocesses and Nanotechnology Conference(MNC 2000)*, Tokyo Japan Jun.11-13, 2000, pp. 148-149
29. **S.-H. Kim**, S.-H. Lee, and Y.-K. Kim, " A novel fabrication process for high-aspect ratio comb actuator combining (110) silicon anisotropic etching with electroplating," in *the 10th International Conference on Solid-State Sensors and Actuators(Transducers '99)*, Sendai Japan, Jun 7-10 1999, pp. 110-113
30. S.-H. Lee, H.-T. Lim, **S.-H. Kim**, Y.-K. Kim, and S.-K. Lee, "Design of a planar vibratory gyroscope using electrostatic actuation and electromagnetic detection," in *Symposium Gyro Technology*, Stuttgart, Germany Sep 16-17 1997, pp.10.0-10.11
31. **S.-H. Kim**, S.-H. Lee, H.-T. Lim, S.-K. Lee, and Y.-K. Kim, "(110) silicon etching for high aspect ratio comb structures," in *IEEE 6th International Conference on Emerging Technology and Factory Automation(ETFA '97)*, Los Angeles CA, USA Sep 9-12 1997, pp.248-252
32. **S.-H. Kim**, S.-H. Lee, H.-T. Lim, S.-K. Lee, and Y.-K. Kim, "Anisotropic bulk etching of (110) silicon with high aspect ratio," in *Technical Digest of 15th Sensor Symposium*, Kanagawa Japan May 1997, pp.193-196

Patents

1. Y.-J. Yee, C.-H. Ji and **S.-H. Kim** "Scanning device and fabrication method thereof," *US 7453617*, Nov. 2008
2. J.-H. Park, C.-H. Ji, M.-H. Ha, **S.-H. Kim**, J.-U. Bu and Y.-J. Yee, "Lens driving device," *US 7412157*, Aug. 2008
3. **S.-H. Kim**, J.-H. Choi, C.-H. Oh, and Y.-J. Yee, "Optical Pickup Head of Optical Recording Reproducing Apparatus, Fabrication Method thereof, Lubricant-Coated Optical Pickup Head of Optical Recording Reproducing Apparatus and Lubricant Coating Method thereof," *US 7289421*, Oct. 2007
4. C.-H. Ji, Y.-J. Yee, J.-H. Choi and **S.-H. Kim**, "Device for reducing deterioration of image quality in display using laser," *US*

7116017, Oct. 2006

5. Y.-J. Yee, C.-H. Ji, and **S.-H. Kim**, "Micro actuator for controlling focal depth," *US 7079329*, Jul. 2006
6. J.-H. Choi, Y.-J. Yee, **S.-H. Kim**, I.-K. Kim, and B.-H. Chung, "Electromagnetic control valve," *US 7007917*, Mar. 2006
7. **S.-H. Kim** and Y.-K. Kim, "Gyroscope," *US 6845668*, 2005
8. J.-H. Park, C.-H. Ji, M.-H. Ha, **S.-H. Kim**, J.-U. Bu and Y.-J. Yee, "Driving Unit for Movement of Lens," *KR 10-0762992-0000*, Sep. 2007
9. C.-H. Oh, J.-H. Choi, T.-S. Lim and **S.-H. Kim**, "A Linear Driving Apparatus of Micro Camera," *KR 10-0762568-0000*, Sep. 2007
10. **S.-H. Kim**, C.-H. Ji, S.-C. Kim, J.-H. Choi, and J.-U. Bu, "Small Form Factor Camera module with a Mechanical Iris and Shutter," *KR 10-0760544-0000*, Sep. 2007
11. **S.-H. Kim**, J.-H. Choi, and Y.-J. Yee, "Portable Fuel Cell System," *KR 10-0758243-0000*, Sep. 2007
12. **S.-H. Kim**, J.-H. Choi, I.-J. Cho, and J.-U. Bu, "A Micro Stage," *KR 10-0741207-0000*, Jul. 2007
13. **S.-H. Kim**, T.-S. Lim, H. Kweon, C.-H. Oh, and Y.-J. Yee, "Bright Enhancement Film with cone structure array for Liquid crystal display backlight unit," *KR 10-0728368-0000*, Jun. 2007
14. **S.-H. Kim** and J.-H. Choi, "Iris and Shutter Apparatus of Camera," *KR 10-0736486-0000*, Jun. 2007
15. H. Kwon, C.-H. Oh, **S.-H. Kim**, T.-S. Lim, and J.-U. Bu, "Displacement Sensor for Miniaturized Camera Module," *KR 10-0714005-0000*, Apr. 2007
16. **S.-H. Kim**, J.-H. Choi, and C.-H. Ji, "Piezo Actuated Linear Motor, Driving Method thereof and Camera Module using the same," *KR 10-0693752-0000*, Mar. 2007
17. J.-H. Choi, **S.-H. Kim**, and C.-H. Ji, "Linear Actuator using Voice Coil Motor Type Actuation," *KR 10-0693421-0000*, Mar. 2007
18. **S.-H. Kim**, J.-H. Choi, Y.-J. Yee, and J.-U. Bu, "A low-power and proximity AC current sensor," *KR 10-0693417-0000*, Mar. 2007
19. C.-H. Ji, **S.-H. Kim** and Y.-J. Yee, "Scanning Micro-Mirror," *KR 10-0636348-0000*, Oct. 2006
20. C.-H. Ji, S.-H. Kim, and Y.-J. Yee, "Scanning Micro-Mirror Actuated by Electrostatic Force, Manufacturing Method Thereof and Optical Scanning Device using the same," *KR 10-0619696-0000*, Aug. 2006
21. **S.-H. Kim**, J.-H. Choi, and Y.-J. Yee, "Portable Fuel Cell Stack," *KR 10-0614963-0000*, Aug. 2006
22. **S.-H. Kim**, J.-H. Choi, and Y.-J. Yee, "Magnetically Levitated, Electromagnetically Actuated and Structurally Guided Valve having Coaxial Inlet and Outlet Ports for Fluidic Mass Flow Control," *KR 10-0578086-0000*, May 2006
23. **S.-H. Kim** and Y.-J. Yee, "A Washing Machine using of Vibration Sensor and the Method for Vibration Sensing," *KR 10-0557036-0000*, Feb. 2006
24. **S.-H. Kim**, J.-H. Choi, Y.-J. Yee, I.-K. Kim and B.-H. Jung, "Fluidic Mass Flow Control Valve Actuated by Electromagnetic Force," *KR 10-0546654-0000*, Jan. 2006
25. J.-H. Choi, **S.-H. Kim**, and Y.-J. Yee, "Fluidic Mass Flow Control Valve Actuated by Electromagnetic Force," *KR 10-0539544-0000*, Dec. 2005
26. Y.-J. Yee, **S.-H. Kim**, J.-H. Choi and C.-H. Ji, "Valve for Fluidic Mass Flow Control and Fabrication Method Thereof," *KR 10-0504794-0000*, Jul. 2005
27. **S.-H. Kim** and Y.-J. Yee, "Micro Magneto-Optical Head for Magneto-Optical Recording/Regenerating and Manufacturing Method Thereof," *KR 10-0504776-0000*, Jul. 2005
28. **S.-H. Kim** and Y.-K. Kim, "A Gyroscope and a Manufacturing Method of the same," *KR 10-0418624-0000*, Feb. 2004
29. S.-H. Lee, **S.-H. Kim**, H.-T. Lim, Y.-K. Kim, and S.-K. Lee, "Vibratory Gyroscope," *KR 10-0244123-0000*, Nov. 1999

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- Member of IEEE

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- Excellent experience in design, fabrication and evaluation of micro/nano sensors and actuators
- Fabrication techniques including polysilicon surface micromachining, silicon bulk micromachining, glass etching, electroplating, electroless plating, anodic bonding, dielectric/metal deposition, polymer micromachining, micromolding, wire bonding, flipchip bonding, stereolithography, SEM and etc.
- Excellent software experiences with ANSYS, MEMSPRO, ANSYS Workbench, IntelliSuite, AutoCAD, SolidWorks, CosmosWorks, CADENCE, Maxwell, FEMM, MATLAB, Simulink, ABAQUS, and OrCAD.
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