Kaveh Pahlavan

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I. *Academic Experiences and Awards*

In my career I was fortunate to gain academic experiences in a variety of US institutions as well as EU university systems and the educational systems in the countries with fast growing economies. With the current trends in globalization of academic life, I believe these experiences would allow me a better understanding of the faculty and student bodies in academic institutions.

Highlights of Academic Experiences

- On sabbatical leave, Harvard University, Cambridge, MA, Spring 2011
- International Visiting Professor, Center for Wireless Communications, University of Oulu, Finland, 2001–2007
- On sabbatical leave, Olin College, Needham, MA, Fall 2004
- On sabbatical leave as a Fulbright-Nokia fellow, University of Oulu, Finland, 2000
- Professor of CS, WPI, 1999-present
- Founded the world's first academic research program in indoor geolocation, WPI, 1996
- Professor of ECE, WPI, 1990-present
- Assistant Professor of EE, WPI, 1985-1987
- Associate Professor of EE, WPI, 1987-1990
- Founded the world's first academic research program in wireless LAN, WPI, 1985.
- Assistant Professor of EE, Northeastern University, Boston, MA, 1979-1983

Honors & Awards

- Recipient of "overseas famous scholar award" from R.I. China, to serve as a visiting professor at the University of Science and Technology Beijing, China (2019-2021).
- WPI Board of Trustees Award for Outstanding Research and Creative Scholarship in 2011.
- Lead the US review team for midterm evaluation of the TEKES sponsored NETS national R&D program in Finland, 2003.
- Lead the US team to review the Finnish Academy/TEKES sponsored ETX, TLX, INVITE and Telektronics national R&D programs, 2000.
- Awarded the first Fulbright-Nokia fellowship, 2000.

- Selected as a member of the Evolution of Untethered Communications Committee, National Research Council, 1997.
- Elected as the first non-Finnish fellow of the Nokia, 1999.
- Elected as a fellow of the IEEE for contributions in wireless networks, 1996.
- Selected as the first Weston Hadden Professor of ECE, WPI, 1993-1996

II. Industrial Experiences

I have been involved in a few major start-up company experiences as an entrepreneur to help designing pioneering technologies and directing research and development programs. In addition I have served as a corporate consultant for a number of companies worldwide.

Highlights of Entrepreneurship

- Chief technical advisor of the Skyhook, Boston, MA, the world leader in WiFi localization for smart devices, 2004-1014.
- Technical advisory board, National Scientific Corporation, San Jose, California, one of the pioneers in semiconductor designs for telecommunication applications, 2001-2004
- Technical advisory board, Global Communication Devices, Concord, MA, a pioneer in fabless semiconductor design for 802.11 radio market, 2000-2003
- Chief technical officer of the Intrak Wireless, Woburn, MA, one of the pioneering indoor geolocation companies using TOA technologies, 1998-2002.
- Chief technical advisor of the RoamAbout group of the DEC which designed the first award winning PCMCIA WLAN, 1993-1996.
- Chief technical advisor of the WINDATA, Northborough, MA, one of the pioneering WLAN companies of the world, 1990-1993.
- Director of Advanced Developments, INFINET, INC., Andover, MA, 1983-1985

Corporate Consulting Experiences

- GTE Laboratories, Motorola/Codex, BBN, Mitre Corp., and 3COM, in Massachusetts
- United Technology Research Center, Connecticut
- Honeywell Avionics Systems, Arizona
- Jet Propulsion Laboratories, Savi Technologies, RadioLAN, California
- Nokia Mobile Phones, LK-Products, and Elektrobit, Finland
- NTT, Japan

III. Services to the Professional Community

I have founded, chaired and organized a number of technical events, journals and magazines. These activities have been instrumental in a realistic growth and dissemination of knowledge in the science and technology evolving around my areas of research.

Major Contributions to Conferences and Journals

- General Chair and Organizer, IEEE 10th International Symposium on Medical Information and Communication Technology (ISMICT'16), Worcester, MA, March 20-23, 2016
- Executive Chair, the IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC), Washington DC, September 2-5, 2014.
- General Chair, the third Invitational Workshop on Opportunistic RF Localization for Next Generation Wireless Devices, New Orleans, Alabama, May 7, 2012.
- General Chair, the IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC), Toronto, Canada, September 11-14, 2011.
- Founder and General Chair, the first Invitational Workshop on Body Area Networking Technology and Applications, WPI, June 19-20, 2011.
- General Chair, the second Invitational Workshop on Opportunistic RF Localization for Next Generation Wireless Devices, Worcester, MA, June 19-20, 2010.
- Founder and the General Chair, the first Invitational Workshop on Opportunistic RF Localization for Next Generation Wireless Devices, Worcester, MA, June 16-17, 2008.
- General Chair, The Second International Conference on Mobile Adhoc Sensor Systems (MASS05), Washington, DC, Nov. 7-10, 2005.
- Co-chair, the International Workshop on Wireless Adhoc Network (IWWAN), Oulu, Finland, June 1-3, 2004.
- Co-chair, the International Workshop on Ultra Wideband Systems, Oulu, Finland, June 2-5, 2003.
- General Chair, the Third IEEE workshop on Wireless Local Area Networks, Newton, MA, September 27-18, 2001.
- TPC-Chair and Organizer, the IEEE Personal Indoor and Mobile Radio Communications (PIMRC), Boston, MA, September 11-14, 1998.
- General Chair, the second IEEE workshop on Wireless Local Area Networks, Worcester, MA, October 24-25, 1996.
- Member of the advisory board of the IEEE Wireless Magazine, 1994-present.
- Founder and Editor-in-Chief of the International Journal of Wireless Information Networks, 1994-present.
- Co-founder, Organizer and TPC-Chair, the IEEE Personal Indoor and Mobile Radio Communications (PIMRC), Boston, MA, October 19-21, 1992.
- Founder and General Chair, the first IEEE workshop on Wireless Local Area Networks, Worcester, MA, May 9-10, 1991.

IV. Highlights of Educational Contributions

During my academic life I have always paid considerable attention to my classes and research students. I have been engaged in supervising a number of diversified graduate theses at WPI and the University of Oulu in a variety of sub-disciplines of wireless access and localization field.

PhD Dissertations Supervised in the Past

1. Julang Ying, Three Cyberspace Applications for IoT RF Cloud in Localization, Motion Detection, and Security, WPI, 2020
2. Bader A. Alkandari, A Novel Approach for MAC and PHY Performance Analysis in Relay Networks in Presence of Interference and Shadow Fading, 2019

3. Umair Khan, "Computational techniques for Modeling RF Propagation inside the Human Body" PhD, WPI, 2017.

4. Nader Bargshady, Hybrid UWB and WiFi Localization for Robotics Applications" PhD, WPI, 2017

5. Fardad Askarzadeh, "Effects of Micro-metals on Precision of Indoor Geolocation Systems" PhD, WPI 2017

6. Yishuang Geng, Radio Propagation for Localization and Motion Tracking In Three Body Area Network Applications, 2016.

7. Guanqun Bao, On Simultaneous Localization and Mapping inside the Human Body (Body-SLAM), 2014

8. Yunxing Ye, Comparative Performance Evaluation of RSS- and TOA-based Localization inside the GI tract, PhD Dissertation, expected on May 2013.

9. Ferit Ozan Akgul, *Modeling the Behavior of Multipath Components Pertinent to Indoor Geolocation*, **WPI**, May 2010.

10. Mohammad Heidari, *Dynamic Behavior and Detection of Direct Path for Indoor Geolocation*, **WPI**, August 2008.

11. Juha-Pekka, *Effects of Handoff Algorithms on the Performance of Multimedia Wireless Networks*, **University of Oulu**, Finland, June 2008.

12. Nayef Alsindi, *Indoor Cooperative Localization for Ultra Wideband Wireless Sensor Networks*, **WPI**, May 2008.

13. Muzaffer Kanaan, *Node Density and Quality of Estimation for Infrastructure-based Indoor Geolocation Using Time of Arrival*, **WPI,** May 2008.

14. Ahmad Hatami, *Application of Channel Modeling for Indoor Localization Using TOA and RSS*, **WPI**, August 2006.

15. Bardia Alavi, *Distance Measurement Error Modeling for Time-of-Arrival Based Indoor Geolocation*, **WPI**, May 2006.

16. Boris Ramos, *The Impact of Universal Service Obligations and Other External and Cross Subsidies on Teledensity in Developing Countries"*, **WPI**, May 2006. <u>Inter-disciplinary committee: Khalid Seed from Social Science Department (chair), K. Pahlavan (co-chair)</u>.

17. Mika Ylianttila, *Vertical Handoff and Mobility, Vertical Handoff and Mobility - System Architecture and Transition Analysis*, **University of Oulu**, Finland, May 2005.

18. Xinrong Li, *Super-resolution TOA estimation with diversity for indoor geolocation*, **WPI**, May 2003

19. Sastri Kota, *Broadband Satellite Internet - Quality of Service, Technology, and Services,* **University of Oulu**, Finland, 2003.

20. Robert Tingley, *Space-Time Parameter Estimation and Statistical Modeling of the Indoor Radio Channel*, **WPI**, May 2000

21. Prashant Krishnamurthy, *Analysis and Modeling of the Wideband Radio Channel for Indoor Geolocation Applications*, **WPI**, May 1999.

22. Richard Stanley, *Modeling and Optimizing Wireless Network Infrastructure Economic Cost*, **WPI**, May 1998

23. Mudhzaffar Hassan-Ali, *Using Ray-Tracing Techniques in Site-Specific Statistical Modeling of Indoor Radio Channels,* **WPI**, May 1998.

24. Ghazizahedi Alireza, *Traffic Engineering for Wireless LANs*, **WPI**, May 1998.

25. Aram Falsafi, *Comparative Performance Evaluation of Transmission Techniques Applied to Wireless Local Area Networks*, **WPI,** May 1996.

26. Ganing Yang, *Performance Evaluation of High Speed Wireless Data Systems Using a 3D Ray Tracing Algorithm*, **WPI**, May 1994.

27. Mich Chase, *Performance of M-ARY CDMA Over Modeled and Measured Indoor Radio Channels*, **WPI,** May 1993.

28. Rajamani Ganesh, *Time Domain Measurements Modeling and Simulation of the Indoor Radio Channel*, **WPI**, May 1991.

29. Steve Howard, *Frequency Domain Characteristics and Auto-Regressive Modeling of the Indoor Radio Channel*, **WPI**, May 1991.

30. Ker Zhang, *Wireless Local Networks for Integrated Voice/Data Services*, **WPI**, May 1990.

31. Tom Sexton, *Channel Modeling and High Speed Data Transmission Performance for the Indoor Radio Channel*, **WPI,** May 1989.

V. Publications by Category

For over a few decades of research and entrepreneurship, I have published numerous books, seminal visionary and technical papers and key patents in three areas of research. Since 2009, I am involved in RF propagation studies for body area networks. From 1996 to 2010, I worked on radio propagation analysis for design of indoor geolocation systems. From 1985 to 2000 I worked on indoor radio propagation for wireless LAN applications. Following publications provides an overview of my publications in different categories. More organized version of these publication with associated citation is available at [Google Scholar](#) . I have received close to 13K citations and an H-index of 54 on these publications.

Text Books

1. **K. Pahlavan**, Understanding Communications Networks for Emerging Cybernetics Applications, River Publishers, The Netherlands, 2021.

2. **K. Pahlavan**, Indoor Geolocation Science and Technology – At Emergence of Smart World and IoT, River Publishers, The Netherland, 2019

3. **K. Pahlavan** and P. Krishnamurthy, Principles of Wireless Access and Localization, John Wiley and Sons, 2013

4. **K. Pahlava**n and P. Krishnamurthy, Networking Fundamentals – Personal, Local and Wide Area Communications, John Wiley and Sons, 2009 (Translation in Chinese is published too).

5. **K. Pahlavan** and Allen Levesque, Wireless Information Networks – Second Edition, John Wiley and Sons, 2005.

6. S. Kota., **K. Pahlavan**, and P. Leppanen, Broadband Satellite Internet, Kluwer Publishing Company, 2004.

7. **K. Pahlavan** and P. Krishnamurthy, Principles of Wireless Networks – A Unified Approach, Prentice Hall, 2002 (Translation in Chinese is published too) .

8. **K. Pahlavan** and A. Levesque, Wireless Information Networks, John Wiley and Sons, 1995. This book is the first comprehensive textbook published in wireless networks and was in the best seller list of the John Wiley and Son.

Roadmap Books

1. A. Salo, **K. Pahlavan**, and J-P Salmenlaita, R&D Programs in Electronics and Telecommunication, Finnish Academy, Finland, 2000.

2. **K. Pahlavan (c**ommittee member), David Goodman (committee chair), National Research Council: The Evolution of Untethered Communications, National Academy Press, 1997.

Edited Books

1. R. Ganesh and **K. Pahlavan** (editors), Wireless Network Deployment, KAP, 2000.

2. R. Ganesh, S. Kota, **K. Pahlavan**, R. Agusti (Editors), Emerging Broadband Wireless Adhoc Network Technologies, Kluwer Publishing Company, 2005.
3. R. Ganesh, **K. Pahlavan** and Z. Zvonar (editors), Wireless Multimedia Network Technologies, Kluwer Academic Publisher, 1999.

Books Chapters

1. Ying, J., Pahlavan, K. and Xu, L., 2019. Using Smartphone Sensors for Localization in BAN. In *Medical Internet of Things (m-IoT)-Enabling Technologies and Emerging Applications*. IntechOpen.
2. A. H. Levesque and K. Pahlavan, "Wireless Data" revised and updated for the Third Edition of *The Mobile Communications Handbook*, Section II, CRC Press, 2012.
3. Askarzadeh, Y. Ye, U. Khan, F. Akgul, **K. Pahlavan** and S. Makarov, "Computational Methods for Localization in Close Proximity ", chapter of Position Location - Theory, Practice and Advances: A Handbook for Engineers and Academics, John Wiley and Sons, 2011.
4. N. Alsindi and **K. Pahlavan**, "Node Localization in Wireless Sensor Networks", Wireless Sensor Networks: A Networking Perspective, Wiley, 2008.
5. M. Heidari, M. and **K. Pahlavan**, "Performance Evaluation of WiFi RFID Localization Technologies," RFID Technology and Applications, Cambridge University Press, 2007.
6. M. Kanaan, B. Alavi, A. Hatami, **K. Pahlavan**, "Channel Modeling and Algorithms for Positioning in Indoor Wireless Networks", Springer Encyclopedia on Geographical Information Science, 2007.
7. P. Krishnamurthy and **K. Pahlavan**, Wireless Communications, Chapter 4, (edited by: H. Karimi and A. Hammad), *Telegeoinformatics: Location Based Computing and Services*, Taylor and Francis, 2004.
8. **K. Pahlavan**, J. Beneat, and X. Li, Trends in Wireless Indoor Networks, Wiley Encyclopedia of Telecommunications, Edited by John Proakis, John Wiley and Sons, 2002.
9. **K. Pahlavan**, X. Li, M. Ylianttila, and M. Latva-aho, "Wireless Data Communication Systems", Chapter 9 of Wireless Communication Technologies: New Multimedia Systems, Edited by R. Kohno, S. Sampei, and N. Morirnaga, Kluwer Academic Publishers, 2000.
10. **K. Pahlavan** and A. Levesque, Wireless Information Networks, a chapter in Worldwide Wireless Communications, edited by Frank Barnes, International Engineering Consortium, 1995.
11. **K. Pahlavan**, A. Zahedi, P. Krishnamurthy, Evolving Wireless LAN Industry Products and Standards, part of Wireless Communications, S. Glisic and P. Leppanen, Kluwer Academic Publishers, 1997.
12. Falsafi, **K. Pahlavan**, and J.W. Matthews, Packet Radio and Wireless Data Networks, vol 14, Encyclopedia of Telecommunication, Marcel Dekker, Edited by Froehlich/Kent, 1996.
13. **K. Pahlavan** and Al Levesque, Wireless Information Networks, John Wiley and sons, 1995.
14. Levesque and K. Pahlavan, Wireless Data, Chapter 35, Mobile Communications Handbook, CRC Press, 1995.
15. **K. Pahlavan**, "Wireless LANs", chapter 11, Personal Communciation, Gardiner and West (eds), Artech House, 1994.
16. **K. Pahlavan**, "Wireless Intra-Office Networks", first chapter, Advances in Local and Metropolitan Area Networks, W. Stallings (ed.), IEEE Press 1994.
17. **K. Pahlavan**, Signal Processing in Telecommunications, Chapter 22, Signal Processing Handbook, C.H. Chen (ed.), Marcel Dekker, 1988.

Journal Articles

1. Semenov, O., Agu, E., **Pahlavan, K**. and Su, Z., 2022. COVID-19 Social Distance Proximity Estimation Using Machine Learning Analyses of Smartphone Sensor Data. *IEEE Sensors Journal*, *22*(10), pp.9568-9579.
2. **Pahlavan, K**., 2021. Understanding of RF Cloud Interference Measurement and Modeling. *International Journal of Wireless Information Networks*, pp.1-16.
3. **Pahlavan, K**. and Krishnamurthy, P., 2021. Evolution and impact of wi-fi technology and applications: a historical perspective. *International Journal of Wireless Information Networks*, *28*(1), pp.3-19.

4. Dong, Z., Li, F., Li, Z. and **Pahlavan, K**., 2021. A Study of on-Body RF Characteristics Based Human Body Motion Detection. *IEEE Sensors Journal*, *22*(4), pp.3442-3454.

5. Su, Z., **Pahlavan, K**. and Agu, E., 2021. Performance Evaluation of COVID-19 Proximity Detection Using Bluetooth LE Signal. *IEEE Access*, *9*, pp.38891-38906.

6. **Pahlavan, K**., 2021. Introduction to Special Issue on 25th Anniversary of IJWIN: the First Journal Devoted to Wireless Networks. *International Journal of Wireless Information Networks*, *28*(1), pp.1-2.

7. **Pahlavan, K**., Ying, J., Li, Z., Solovey, E., Loftus, J.P. and Dong, Z., 2020. RF cloud for cyberspace intelligence. *IEEE Access*, *8*, pp.89976-89987.

8. Dong, Z., Li, F., Ying, J. and **Pahlavan, K**., 2020. A model-based RF hand motion detection system for shadowing scenarios. *IEEE Access*, *8*, pp.115662-115672.

9. Zhang, P., Su, Z., Dong, Z. and **Pahlavan, K.**, 2020, January. Complex Motion Detection Based on Channel State Information and LSTM-RNN. In *2020 10th Annual Computing and Communication Workshop and Conference (CCWC)* (pp. 0756-0760). IEEE.

10. Abujrida, H., Agu, E. and **Pahlavan, K**., 2020. Machine learning-based motor assessment of Parkinson's disease using postural sway, gait and lifestyle features on crowdsourced smartphone data. *Biomedical Physics & Engineering Express*, *6*(3), p.035005.

11. Ying, J. and **Pahlavan, K.**, 2019. Precision of RSS-based localization in the IoT. *International Journal of Wireless Information Networks*, *26*(1), pp.10-23.

12. Jamalabdollahi, M., Zekavat, S. and **Pahlavan, K.**, 2019. High-Resolution OFDM-Based Sensor Node Ranging Within In-Homogeneous Media of Human Body. *IEEE Transactions on Wireless Communications*, *18*(4), pp.2286-2298.

13. Khan, U., Ye, Y., Aisha, A.U., Swar, P. and **Pahlavan, K**., 2018. Precision of EM simulation based wireless location estimation in multi-sensor capsule endoscopy. *IEEE journal of translational engineering in health and medicine*, *6*, pp.1-11.

14. Khan, U., Makarov, S.N., Ye, Y., Fu, R., Swar, P. and **Pahlavan, K**., 2018. Review of computational techniques for performance evaluation of RF localization inside the human body. *IEEE reviews in biomedical engineering*, *12*, pp.123-137.

15. Jeong, S., Kang, J., **Pahlavan, K.** and Tarokh, V., 2017. Fundamental Limits of TOA/DOA and Inertial Measurement Unit-Based Wireless Capsule Endoscopy Hybrid Localization. *International Journal of Wireless Information Networks*, *24*(2), pp.169-179.

16. Askarzadeh, F., **Pahlavan, K**., Geng, Y., Makarov, S.N., Ye, Y. and Khan, U., 2017. Modeling the Effect of Human Body on ToA Ranging Using Ray Theory. *International Journal of Wireless Information Networks*, *24*(2), pp.140-152.

17. Nader Bargshady, Gabe Garza, **Kaveh Pahlavan,** "Precise Tracking of Things (PToT) via Hybrid 3D Fingerprint Database and Kernel Method Particle Filter", IEEE Sensors Journal, vol:16 (10), October 2016.

18. **Kaveh Pahlavan**, Prashant Krishnamurthy and Yishuang Geng "Localization Challenges for the Emergence of the Smart World" IEEE Access, vol:3, pp 1, January 2016.

19. **Kaveh Pahlavan**, Yishuang Geng, David R.Cave, Guanqun Bao, Liang Mi, Emmanuel Agu, Andrew Karellas, Kamran Sayrafian and Vahid Tarokh, "A Novel Cyber Physical System for 3-D Imaging of the Small Intestine In Vivo" IEEE Access, vol:3, pp 2730-2742, December 29, 2015.

20. Yishuang Geng and **Kaveh Pahlavan** "Design, Implementation and Fundamental Limits of Image and RF Based Wireless Capsule Endoscopy Hybrid Localization" IEEE Transactions on Mobile Computing, vol:PP(99), pp 1, September 28, 2015.

21. Yishuang Geng, Jin Chen, Ruijun Fu, Guanqun Bao and **Kaveh Pahlavan** "Enlighten Wearable Physiological Monitoring systems: On-body RF Characteristics Based Human Motion Classification Using a Support Vector Machine" IEEE Transactions on Mobile Computing, vol:PP(99), pp 1, April 28, 2015

22. Guanqun Bao, **Kaveh Pahlavan** and Liang Mi "Hybrid Localization of Micro-robotic Endoscopic Capsule inside Small Intestine by Data Fusion of Visual and RF Sensors" IEEE Sensors Journal, vol:15(5), pp 2669-2678, May 24, 2015.

23. Y. Ye, **K. Pahlavan,** G. Bao, P. Swar and K. Ghaboosi "Comparative Performance Evaluation of RF Localization for Wireless Capsule Endoscopy Applications" International Journal of Wireless Information Networks, vol:21 (3), pp 208-222, July 2014.

24. J. He, Y. Geng and **K. Pahlavan** "Toward Accurate Human Tracking: Modelling Time-of-Arrival for Wireless Wearable Sensors in Multipath Environment" IEEE Sensor Journal, vol:14 (11), pp 3996-3774, September 2014.

25. S.T. Goh, S.A.R. Zekavat, **K. Pahlavan** "DOA-Based Endoscopy Capsule Localization and Orientation Estimation via Unscented Kalman Filter" IEEE Sensors Journal, vol:14 (11), pp 3819-3829, January 2014.

26. J. He, Y. Geng, Y. Wan, S. Li and **K. Pahlavan** ,"A Cyber Physical Testbed for Environment Virtualization of Wireless Access and Localization in Body Sensor Networks", IEEE Sensors Journal, vol:13 (10), pp 3826-3836, October 2013.

27. Jie He, **Kaveh Pahlavan**, Shen Li and Qin Wang , "A Testbed for Evaluation of the Effects of Multipath on Performance of TOA-based Indoor Geolocation", IEEE Trans on Instrumentation and Measurements, vol:62 (8), pp:2237-2247, Aug. 2013..

28. Ruijun Fu, Guanqun Bao, Yunxing Ye, "Heterogeneous Cooperative Localization for Social Networks" Springer, IJWIN, Special Issue on Recent Advances on Indoor Geolocation, Vol (20), No(4), Pages 294-305, Dec. 2013.

29. Yishuang Geng, Jie He, Kaveh Pahlavan, " Modeling the Effect of Human Body on TOA Based Indoor Human Tracking", Springer, IJWIN, Special Issue on Recent Advances on Indoor Geolocation, Vol (20), No(4), pp 306-317, Dec. 2013

30. **K. Pahlavan**, G. Bao, Y. Ye, S. Makarov, U. Khan, P. Swar, D. Cave, A. Karellas, P. Krishnamurthy, K. Sayrafian, "RF Localization for Wireless Capsule Endoscopy", **invited paper**, special issue on localization, International Journal of Wireless Information Networks, Springer, Vol 19, No 4, December 2012.

31. **Kaveh Pahlavan**, Yunxing Ye, Ruijun Fu and Umair Khan, "Challenges in Channel Measurement and Modeling for RF Localization Inside the Human Body" **invited paper,** IGI special issue on ICL-GNSS, *International Journal on Embedded and Real-Time Communication Systems (IJERTCS)*, 3(3), 18-37, July-September, 2012..

32. Y. Ye, P. Swar and **K. Pahlavan** "Accuracy of RSS-Based RF Localization in Multi-Capsule Endoscopy," **invited paper**, *Wireless Health special issue, International Journal of Wireless Information Networks*, Vol. 19, No 3, Springer, August 2012.

33. R. Fu, Y. Ye, N. Yang, K. Pahlavan, "Characteristic and Modeling of Human Body Motions for Body Area Network Applications", **invited paper**, *Wireless Health special issue, International Journal of Wireless Information Networks*, Springer Vol 19, No 3, August 2012 .

34. Nader Moayeri , Jalal Mapar, Stefanie Tompkins and **Kaveh Pahlavan** (Editors), "Localization and Tracking for Emerging Wireless Systems", Special Issue, IEEE Wireless Communications, April 2011.

35. **K. Pahlavan**, F. Akgul, Y. Ye, T. Morgan, F. A.-Shabdiz, M. Heidari, C. Steger, "Taking Positioning Indoors: Wi-Fi Localization and GNSS", InsideGNSS, vol. 5, no. 3, May, 2010

36. F. O. Akgul, **K. Pahlavan**, "A Novel Statistical AOA Model Pertinent to Indoor Geolocation", *Journal of Geographic Information System*, vol.2, no.1, pp.45-48, January, 2010

37. M. Heidari and **K. Pahlavan**, "Identification of the Absence of Direct Path Component in Indoor Localization Systems," IEEE Transactions on Wireless Communications, July 2009.

38. Ferit Ozan Akgul, **Kaveh Pahlavan**, "A New Spatial Path Persistency Model for TOA-based Indoor Geolocation", *IEEE Communication Letters*, vol.13, no.4, March 2009.

39. M. Heidari and **K. Pahlavan**, "A Markov Model for Dynamic Behavior of ToA-Based Ranging in Indoor Localization," EURASIP Journal on Advances in Signal Processing, vol. 2008, Article ID 241069, 14 pages, 2008.

40. N. Alsindi, **K. Pahlavan**, "Cooperative localization bounds for indoor ultra wideband wireless sensor networks", EURASIP Journal on Advances in Signal Processing: special issue on Cooperative

Localization in Wireless Ad Hoc and Sensor Networks, vol. 2008, article ID 852509, pp. 1-13, April, 2008.

41. N. Alsindi, B. Alavi, **K. Pahlavan**, "Measurement and modeling of UWB TOA-based ranging in indoor environments," accepted to appear in IEEE Transactions on Vehicular Technology, 2008.

42. M. Heidari and **K. Pahlavan**, "A Markov Model for Dynamic Behavior of Ranging Errors in Indoor Geolocation Systems," IEEE Communication Letters, vol. 11, no. 12, pp. 934-936, December 2007.

43. N. Alsindi, X. Li, **K. Pahlavan**, "Analysis of TOA estimation using wideband measurements of indoor radio propagations," *IEEE Transactions on Instrumentation and Measurement,* October 2007.

44. N. Alsindi, B. Alavi and **K. Pahlavan**, Empirical pathloss model for indoor geolocation using UWB measurements, Electronics Letters, 29th March 2007, Vol. 43 No. 7

45. A. Hatami, B. Alavi, **K. Pahlavan**, and M. Kanaan, "A Comparative Performance Evaluation of Indoor Geolocation Technologies," invited paper, *Interdisciplinary Information Sciences*, Japan, Vol 12, No.2, 2006.

46. B. Alavi, **K. Pahlavan**, N. Alsindi, and X. Li, "Using UWB Measurements for Statistical Analysis of the Ranging Error in Indoor Multipath Environment," *International Journal of Wireless and Optical Communications (IJWOC)*, Vol.3 No.2, August 2006.

47. **K. Pahlavan**, F. Akgul, M. Heidari, A. Hatami, J. Elwell, and R. Tingley" Indoor Geolocation in the Absence of Direct Path", *IEEE Wireless Communications Magazine*, Dec. 2006.

48. B. Alavi and **K. Pahlavan**, "Modeling of the TOA based Distance Measurement Error Using UWB Indoor Radio Measurements" IEEE Communications Letters, April 2006, pp 275-277.

49. A. Ghazizahedi, X. Li, and **K. Pahlavan**, "Trends in IEEE 802.11 WLANs", IEEE VTS News, May 2005, pp 34-40.

50. M. Ylianttila, J. Makela, and **K. Pahlavan**, "Analysis of Handoff in Location-Aware Vertical Multi-Access Networks", Invited Paper, Elsevier Journal on Computer Networks, Special Issue on Wireless IP Through Integration of Wireless LAN and Cellular Networks, Vol 47, 2005, pp. 185-201.

51. M. Kanaan and **K. Pahlavan**, "A New Algorithm for TOA-based Indoor Geolocation", IEE Electronics Letters, October 2004, Vol. 40, No. 22.

52. X. Li and **K. Pahlavan**, "Super-resolution TOA estimation with diversity for indoor geolocation", IEEE Trans on Wireless Comm. Dec. 2003..

53. **K. Pahlavan**, X. Li, and J. Makela, "Indoor Geolocation Science and Technology", IEEE Comm Soc. Mag., Feb. 2002.

54. M.H. Ali and **K. Pahlavan**, "A New Statistical Model for Site-specific Indoor Radio Propagation Prediction based on Geometric Optics and Geometric Probability", IEEE JSAC on Wireless Networks, Jan 2002.

55. **K. Pahlavan**, "An overview of the center for wireless information network studies at Worcester Polytechnic Institute, MA, USA", ACM SIGMOBILE Mobile Computing and Communications Review, Volume 4 Issue 2, April 2000, pp. 41-43.

56. **K. Pahlavan**, P. Krishnamurthy, A. Hatami, M. Ylianttila, J. P. Mäkelä , R. Pichna & J. Vallström, "Handoff in Hybrid Mobile Data Networks", **invited paper**, IEEE Personal Communications Magazine, vol. 7, no. 2, April 2000.

57. R. Tingley and **K. Pahlavan**, "Measurement of the Time-Space Characteristics of Indoor Radio Channel", IEEE Trans on Instrumentation and Measurements, September 2000.

58. A. Zahedi and **K. Pahlavan**, "Capacity of a Wireless LAN with Voice and Data Services", IEEE Trans. on Communications, July 2000.

59. R. Tingley and **K. Pahlavan**, "Measurement and Modeling of Angle of Arrival", IEE Electronics Letters, Vol. 35 15 , 22, July 1999 , pp 1211 -1212.

60. **K. Pahlavan**, P. Krishnamurthy and J. Beneat, "Wideband Radio Propagation Modeling for Indoor Geolocation Applications", IEEE Communications Magazine, April 1998.

61. **K. Pahlavan**, A. Zahedi, and P. Krishnamurthy, "Wideband Local Access: WLAN and WATM", IEEE Communications Magazine, Special Series on Wireless ATM, November 1997

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66. **K. Pahlavan**, T. Probert, and M. Chase, "Trends in Local Wireless Networks", invited paper, IEEE Comm. Soc. Mag., March 1995.

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71. R. Ganesh and **K. Pahlavan**, "Statistics of Short Time and Spatial Variations Measured in Wideband Indoor Radio Channels", IEE Proceedings-H, Microwave, Antennas and Propagation, Aug. 1993.

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87. K. Zhang and **K. Pahlavan**,"An Integrated Voice-Data System for Wireless Local Area Networks", IEEE Trans. on V.T., April 1990.

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94. **K. Pahlavan**," Wireless Intra-Office Networks", Invited paper, ACM Trans. On Office Inf. Sys., July 1988.

95. **K. Pahlavan** and J. L. Holsinger,"Voice-Band Data Communication, A Historical Review: 1919-1988", invited paper, IEEE Comm. Soc. Mag., Jan. 1988.

96. **K. Pahlavan**,"Wireless Communication for Office Information Networks", IEEE Comm. Mag., June 1985.

97. **K. Pahlavan**, " Comparison Between the Performance of QPSK, SQPSK, QPR, and SQPR Systems Over Microwave LOS Channels" IEEE Trans. on Communications, March 1985.

98. P. A. Bello and **K. Pahlavan**," Adaptive Equalization for Staggered QPSK and QPR Over Frequency Selective Microwave LOS Channels", IEEE Trans. on Communications, May 1984.

Selected Key Patents

1. Alizadeh-Shabdiz, Farshid, Kaveh Pahlavan, and Nicolas Brachet. "Calculation of quality of WLAN access point characterization for use in a WLAN positioning system." U.S. Patent No. 9,363,785. 7 Jun. 2016.

2. F. Alizadeh, **K. Pahlavan**, and E.J. Morgan, Estimation of speed and direction of travel in a WLAN positioning system using multiple position estimates, **US Patent 8,103,288 B2,** Filed on June 18, 2009, Issued on **January 24, 2012.**

3. **Kaveh Pahlavan**, Nayef Al-Sindi, Bardia Alavi, Precise node localization in sensor ad-hoc networks, patent # US8005486, issued on **Aug 23, 2011**.

4. F. Alizadeh, E.J. Morgan and **K. Pahlavan**, Estimation of speed and direction of travel in a WLAN positioning system, **US Patent 7,835,754 B2,** Filed on May 6, 2006, Issued on **November 16, 2010** (further amendments also issued as US8,090,386 B2, US 2012/0100872 A1).

5. F. Alizadeh, **K. Pahlavan**, E. J. Morgan, Estimation of speed and direction of travel using the dynamic signal strength variation of multiple WLAN access points, US Patent **7,551,929**, Filed on May 8, 2006, Issued on **June 23, 2009** (further amendments also issued as US8,014,788 B2, US 7,835,754 B2, EP 2012830 B1, EP2012830A2, EP2012830A4).

6. F. Alizadeh, **K. Pahlavan**, and N. Brachet, Calculation of Quality of WLAN Access Point Characteristics for Use in a WLAN Positioning System, US Patent **7,551,579**, , Filed on May 2006, Issued on **June 23, 2009** (further amendments also issued as EP2022281 B1, EP2022281A2, EP2022281A4, EP2427004A1, US20070258409, US20090175189.)

7. F. Alizadeh and **Kaveh Pahlavan**, "Estimation of position using WLAN access point radio propagation characteristics in a WLAN positioning system" US Patent **7,515,578**, Filed on May 2006, Issued on **April 7, 2009** (further amendments also issued as EP 2022278 A2, EP2022278A4, US20070258421, US20090154371, US20110164522, US20120196621, US7515578, US7916661, US8155673).

8. **K. Pahlavan** and J.L. Holsinger, "QANI Trellis-coded signal structure", Patent number: 4660214, Filing date: Aug 1, 1985, Issue date: **Apr 21, 1987.**

9. J.L. Holsinger, C. Jotikasthira, **K. Pahlavan**, "Signal structure for data communication", Patent number: 4660213, Filing date: Nov 22, 1983, Issue date: **Apr 21, 1987.**

Sponsored and Invited Lectures

1. K. Pahlavan and J. Ying, "Indoor Geolocation Science and Technology - At the Emergence of Smart World and IoT", Invited Lecture, *California Institute of Technology*, Pasadena, California, May 4, 2018.

2. K. Pahlavan, "PBL Experiences at WPI and Future Directions for PBL in Japan", International PBL Symposium, Tokyo, Japan, January 12, 2017,

3. K. Pahlavan, "A Historical Perspective on the Evolution of the Technology and Market of Wi-Fi", IEEE Vehicular Technology conference, Boston, MA, September 7, 2015.

4. K. Pahlavan, ""Role of Localization Science and Technology in Evolution of the Smart Environment", the IEEE Smart World Congress in Beijing, China, August 10, 2015.

5. K. Pahlavan, V. Motevalli, and A. H. Levesque, "Project Based Learning and Entrepreneurship in Engineering Education for the Third Industrial Revolution", International Symposium on "How to Foster Skilled Graduates?" Tokyo, Japan, June 28, 2014.

6. K. Pahlavan, "From WLAN to Wi-Fi Localization - Evolution of a Revolutionary Technology", keynote speech, International Symposium on Wireless Sensor Networks, Tokyo, Japan, June 27, 2014.

7. K. Pahlavan, G. Bao and L. Mi, "Body-SLAM: Simultaneous Localization and Mapping inside the Human Body", keynote speech, IEEE/ACM 8th International Conference on Body Area Networks (BodyNets), Boston, MA, September 30-October 2, 2013.

8. Kaveh Pahlavan, Yunxing Ye, Umair Khan and Ruijun Fu, "RF Localization Inside Human Body - Enabling micro-robotic navigation for medical applications", Invited Keynote Speech, IEEE ICL-GNSS, June 29-30, 2011, Tampere, Finland.

9. K. Pahlavan et. al, "Wireless Access and Localization for Body Area Networks", invited talk, University of Massachusetts, Lowell, March 9, 2011.

10. K. Pahlavan, "Channel Characterization for RF Localization Inside Human Body", invited talk, 1st Invitational Workshop on BAN Technology and Applications, Worcester, MA, June 19-20, 2011.

11. K. Pahlavan, "Evolution of Wireless LAN – from access to localization" IEEE International Symposium on Computer Networks and Distributed Systems, CNDS 2011, February 23–24, 2011, Tehran, Iran

12. K. Pahlavan, "WiFi Localization", CSIRO ICT Centre, Sydney, Australia, April 22, 2010.

13. F. Akgul, K. Pahlavan, "Location Awareness for Everyday Smart Computing", *(Invited Paper) ICT'09*, Marrakech, Morocco, May 2009.

14. K. Pahlavan, RF Localization for the Internet of Things, Keynote Speech, 50th anniversary of foundation of University of ESPOL, Guayaguil, Ecuador. August 22ed, 2008.

15. K. Pahlavan, Future and Wireless Networks, Keynote for the Wireless Networking providers of the Ecuador, Sheraton Hotel, Quito, Ecuador, August 20, 2008.

16. K. Pahlavan, RF Localization and the Internet of Things, Keynote speech, International Symposium on Wireless Pervasive Computing 2007, San Juan, Puerto Rico, Feb. 2007.

17. K. Pahlavan, F. Akgul, and A. Levesque, Localization Interface using WiFi, MIT's RFID Academic Convocation, Las Vegas, Nevda, May 1, 2006

18. K. Pahlavan, Trends in Indoor Geolocation Applications and Technologies, Sendai Security and Wireless Workshop, Sendai, Japan, Jan 24, 2006.

19. K. Pahlavan, Trends in RF Location Sensing, MIT Auto ID Laboratory, Cambridge, MA, Jan. 23, 2006. (presented by Al Levesque)

20. K. Pahlavan, Trends in Indoor Geolocation, University of Oulu, Finland, Jan 13, 2006.

21. K. Pahlavan, Overview of Wireless Networks, Olin College, Needham, MA, Dec. 7, 2004.

22. K. Pahlavan, Evolution of Wireless Networks, University of Massachusetts, Dartmouth, MA, Nov. 5, 2004.

23. K. Pahlavan, Broadband Adhoc Networks – A Historical Perspective, IWWAN, Keynote Speech, June 2, 2004.

24. K. Pahlavan, "Emergence of the Location Aware LAN-PAN-HAN Industry", IEEE Workshop on Wireless LANs, Boston, MA, Sep. 27, 2001.

25. K. Pahlavan, "Broadband and Adhoc Wireless - the Trends of the Future", IEEE ITS, Teheran, Iran, Sep. 1, 2001. (Keynote Speech)

26. K. Pahlavan, "Toward Broadband and Adhoc Networks", TEKES's NETS Workshop, Helsinki, Finland, June 15, 2001. (Keynote Speech)

27. K. Pahlavan, "What's Next in Wireless", WPI's International Corporate Leaders' Roundtable, Barcelona, Spain, April 20, 2001.

28. K. Pahlavan, "Trends in Indoor Geolocation", SAAB Workshop on Short Range Location System, Sweden, May 2000.

29. K. Pahlavan, X. Li, and J. Beneat, "LANs from Office to Home - Future Directions in Home Networking", Keynote Speech, MWCN'2000, Paris, May 2000.

30. K. Pahlavan, X. Li and J. Beneat, "An Overview of Home Networking", Plenary Speech, Finnish Workshop on Wireless Communications, Oulu, May 2000.

31. K. Pahlavan, Wireless Local Access: Past, Present and the Future, Raytheon Company, MA, Jan 12, 2000

32. K. Pahlavan, Trends in Broadband Local Access, National Taiwan University, Taipei, Taiwan, Sep 17, 1999.

33. K. Pahlavan, Evolution of Wireless Wideband Local Access, Keynote Speech: Nokia's 3ed Annual Radio Seminar: Evolution of Wireless Communications, Complementing Cellular, Helsinki, Finland, June 3, 1999.

34. K. Pahlavan, Wireless LANs, Story of Creation and Vision of the Future, Banquet Speech, IEEE DSP Workshop, May 31, 1999 Oulu, Finland.

35. K. Pahlavan, High Resolution Ultra Wideband Channel Measurement and Modeling in and Around Buildings, Invited Speaker, Gigabit Wireless Workshop, UCSD/DARPA, Jan 25-26, 1999.

36. K. Pahlavan, Wideband Local Access: Present, Past, and the Future, UPC, Barcelona, Spain, June 1998.

37. K. Pahlavan, Wideband Local Access: WATM and WLAN, British Telecomm Laboratories, Strand, UK, Jan 22, 1998.

38. K. Pahlavan, A Vision for the Evolving Local Widband Networks, AT&T Research Laboratories, Red Bank, Oct. 31, 1997.

39. K. Pahlavan, "A Vision for the Evolving Local Wideband Wireless Networks", IIT Colloqium Guest Speaker, National Research Council, Ottawa, CANADA, Oct. 3, 1997

40. K. Pahlavan, "Wireless LAN's: Applications, Technologies and Directions", Keynote Speech, ICICS'97, Singapore, Sept. 11, 1997

41. K. Pahlavan, P. Krishnamurthy, A. Zahedi, "Evolving Wireless LAN Industry: Standards and Products", Invited presentation, PIMRC'97, Helsinki, Finland, September 1997

42. K. Pahlavan, P. Krishnamurthy, A. Zahedi, A. Messier, J. Robinson", Perfomance Monitoring and Deployment Tools for Wireless LANs", Mobile and Wireless Communication Networks, Paris, France, May 14, 1997.

43. K. Pahlavan, A. Zahedi, P. Krishnamurthy, "Wireless LANs", Keynote Speech, ICEE'97, Teheran, Iran, May 6, 1997.

44. K. Pahlavan, " Local Wideband Wireless Networks", ECE Distinguished Lecture Series, Iowa State University, Ames, Feb. 19, 1997.

45. K. Pahlavan, " Wideband Local Networks for Multimedia Applications", ECE Distinguished Lecture Series, University of Toronto, Canada, Jan. 7, 1997.

46. K. Pahlavan, "Wireless Networks", Workshop on: Workplace in the Informaion Age, Washington D.C., sponsored by NSF, Nov. 6, 1996.

47. K. Pahlavan, et.al, "Trends in Wireless Data Networks", IEEE VTC, Atlanta, GA, April 29, 1996.

48. K. Pahlavan, et.al, "Trends in Wireless LANs", MTT, San Francisco, CA, June, 21 1996.

49. K. Pahlavan, "Wireless Networks", SPIE, Defining the Global Information Infrastructure, Nov. 1994.

50. K. Pahlavan, "Wireless Data Communications: an Overview", Workshop on Mobility Management for Personal Communications, Washington, DC, Sep. 1994.

51. K. Pahlavan, "Wireless Data Communications", IEEE MTT, San Diego, CA, May 27, 1994.

52. K. Pahlavan, "Wireless Data Communications", Interop, Loas-Vegas, Nevada, May 6, 1994.

53. K. Pahlavan, "Overview of Wireless LANs", IEEE PIMRC, Yokohama, Japan, Sep 1993.

54. K. Pahlavan, "Wireless Data Communications", Mitre Corp., Bedford, MA, Sep. 1993.

55. A. Falsafi, M. Chase and K. Pahlavan, "Spread Spectrum for Wireless Local communications", IEEE International Symposium on Spread Spectrum Techniques and Applications, Yokohama, Japan, Nov. 1992.

56. K. Pahlavan, "Wireless Data Communications", Communications Design Seminar, Stanford University, California, Oct., 1992.

57. K. Pahlavan, "Overview of Wireless Local Area Networks", IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, Boston, MA, Oct. 1992.

58. K. Pahlavan, "Wireless Local Communications", Wireless'92, Calgary, Alberta, Canada, July 1992.

59. K. Pahlavan, "Wireless LANs", IEEE International Workshop on Portable, Mobile and Indoor Radio Communications, Siofok, Hungary, May 1992.

60. K. Pahlavan, "Wireless Office Information Networks", University of Calgary, Alberta, Canada, May 1992.

61. K. Pahlavan, R. Ganesh and S.J. Howard, "Modeling of the Indoor Radio Propagations", University of Calgary, Alberta, Canada, May 1992.

62. K. Pahlavan and J. Arnbak (from Delft Uni. of Tech. in Netherlands), "Wireless Indoor Communications", tutorial, Int. Symp. on Personal, Indoor and Mobile Radio Communications, King's College, University of London, Sep. 1991.

63. K. Pahlavan, "Research Directions for Wireless Communications", Nokia Research Center, Helsinki, Finland, Aug. 1991.

64. K. Pahlavan, "Wireless LANs for Offices and Manufacturing Environments", tutorial, Simon Fraser University and University of Victoria, British Columbia, Canada, July 1989.

65. K. Pahlavan, "Wireless Local Area Networks", tutorial, Illinois Institute of Technology, Chicago, March. 1989.

Professional Courses

1. K. Pahlavan and N. Moayeri, Localization and Tracking for Smart Devices and the Internet of Things, IEEE WCNC 2010 Tutorial, April 18, 2010.

2. K. Pahlavan, RF Localization – Principles and Applications, ESPOL University, Ecuador, August 26, 2008.

3. K. Pahlavan, WiFi and UWB RF Localization – Principles and Applications, IEEE PIMRC'06, Helsinki, Finland, Sep. 2006.

4. K. Pahlavan, Wireless Networks, Mitre Corp, Bedford, MA May 2002.

5. K. Pahlavan, "Broadband Wireless Adhoc Networks - Emergence of the LAN-PAN-HAN Industry", (1/2 day), IEEE PIMRC'02, Lisbon, Portugal, Sep. 2002.

6. K. Pahlavan, "Broadband Wireless Adhoc Networks - Emergence of the LAN-PAN-HAN Industry", (1 day), IEEE PIMRC'01, San Diego, CA, Sep. 2001.

7. K. Pahlavan, Wireless LANs from Office to Home, (2-days) 3-COM, Nov 2000.

8. K. Pahlavan, "Toward Third Generation Wireless Networks", (1 day), short course, ICICS'97, Singapore, Sept. 9, 1997.

9. K. Pahlavan, "Wireless LANs" (1/2-day), Broadband'97, Framingham, MA, June 2, 1997.

10. K. Pahlavan and H. Hashemi, "Personal Communication Systems", (1-days), ICEE'97, Teheran, Iran, May 4, 1997.

11. K. Pahlavan, "Wireless Information Networks", (5-days), Technical University of Budapest, Hungary, (sponsored by the American Council on Education), Nov. 11-15, 1996.

12. K. Pahlavan, " Towards Third generation Wireless Networks", (1-day) SPIE, Boston, MA, Nov. 1996.

13. K. Pahlavan, "Trends in Wireless LANs" (1-hour), IEEE Second Workshop on Wireless LANs, Worcester, MA, Oct. 24, 1996.

14. K. Pahlavan, "Multimedia Wireless and Local data Communications", (1/2-day), IEEE PIMRC, Taipei, Taiwan, Oct. 12, 1996.

15. K. Pahlavan, "Software Tools for the Design of Wireless Networks", (5-days) University of Oulu, Finland, Sep. 2-6, 1996.

16. K. Pahlavan, "Wireless Information Networks", (3-days), Digital Equipmenth Corporation, Littletone, MA, July 9-11, 1996.

17. K. Pahlavan, "Trends in Wireless Local Networks", (1/2 day), Broadband 1996, Framingham, MA, June, 1996.

18. K. Pahlavan, "Wireless Data Communications", (1-day), IEEE WCSS'96, Long Island, New York, Nov. 1995.

19. K. Pahlavan, "Software Tools and the Design for Wireless Networks", (5 evening) IEEE Boston, Section, Nov-Dec 1995.

20. K. Pahlavan, "Wireless Data Communications", (1/2 day), PIMRC'96, Toronto, Canada.

21. K. Pahlavan, "Wireless Information Networks", SPIE, Defining the Global Information Infrastructure, Nov. 1994.

22. K. Pahlavan, Wireless Data Communications, (1/2) day IEEE 19th Conference on Local Computer Networks, Minneapolis, Minnesota, Oct. 1994.

23. K. Pahlavan, Wireless Data Communication, (1/2 day) IEEE PIMRC'94, Hague Netherlands, Sept. 1994.

24. K. Pahlavan, Wireless Data Communication, (1/2 day) IEEE International Zurich Seminar on Digital Communications, ETH Zurich, Switzerland, March 8, 1994.

25. K. Pahlavan, Wireless Data Communications, (five evenings each 2.5 hours), IEEE Boston Section, Waltham, MA, April-May 1994 (six guest speakers talked for 50% of the lectures).

26. K. Pahlavan, Wireless Information Networks, (1-day), IEEE Electro, Boston, MA, May 9, 1994.

27. K. Pahlavan, Wireless Information Networks, St. Mary University, San Antonio, Texas, May 31, 1994.

28. K. Pahlavan, Wireless Data Communications, (1/2 day), IEEE ICC, New Orleans, LA, May 5, 1994.

29. K. Pahlavan, Modern Communication and Signal Processing, (12 evenings each 2.5 hours), Locus EPSCO, Hudson, MA, Spring 1994.

30. K. Pahlavan, Wireless Data Communications, (1-day), National Tsing Hua University, Hsinchu, Taiwan, Sep. 1993.

31. K. Pahlavan, Wireless Data Communications, IEEE Electro, (1-day), Edison, NJ, April 1993.

32. K. Pahlavan, Wireless Local Area Networks, (1-day), Communication Networks Conference, Washington, D.C., 1992.

33. K. Pahlavan, Wireless Local Area Networks, (10 lectures, each 3 hours), Digital Equipment Corporation, Marlboro, MA, Spring 1992.

34. K. Pahlavan, Indoor Radio Propagation Modeling, (1/2 day), NTT, Tokyo, Japan, Nov. 1992.

35. K. Pahlavan, Elements of Personal, Indoor and Mobile Radio Communications, (5 evening lectures each 2.5 hours), IEEE Boston Section, Oct.-Nov., 1993.

36. K. Pahlavan, Wireless Local Communications, (1/2 day) University of Oulu, Finland, Aug. 1991.

37. K. Pahlavan, Wireless Networks, (1/2 Day), 16th IEEE Conference on Local Computer Networks, Minneapolis, Oct. 1991.

38. K. Pahlavan, Advances in Digital Communications, (3-Mornings), International Conference on Control and Modeling, University of Teheran, Iran, July 1990.

39. K. Pahlavan, Wireless Office Information Networks, (1/2 day), First IEEE PIMRC, King's College, University of London, Sep. 1989.

Conference Proceedings

1. Li, Z., Lei, Z., Yan, A., Solovey, E. and Pahlavan, K., 2020, January. ThuMouse: A micro-gesture cursor input through mmWave radar-based interaction. In *2020 IEEE International Conference on Consumer Electronics (ICCE)* (pp. 1-9). IEEE.

2. Ying, J., Pahlavan, K. and Li, X., 2017, October. Precision of RSS-based indoor geolocation in IoT applications. In *Personal, Indoor, and Mobile Radio Communications (PIMRC), 2017 IEEE 28th Annual International Symposium on*(pp. 1-5). IEEE.

3. Yuzhang Zang, Kaveh Pahlavan, Yang Zheng, and Le Wang, "UWB Gesture Detection for Visually Impaired Remote Control", IEEE International Symposium on Medical Information and Communication Technology (ISMICT), Worcester, USA, March 21-23, 2016.

4. Zhouchi Li, Yang Yang, and Kaveh Pahlavan, "Using iBeacon for Newborns Localization in Hospitals", IEEE International Symposium on Medical Information and Communication Technology (ISMICT), Worcester, USA, March 21-23, 2016.

5. Dan Liu, Yishuang Geng and Kaveh Pahlavan, "End-to-end Power Optimization in Non-Homogenous Relay Environment for Wireless Body Area Networks (WBANs)", IEEE International Symposium on Medical Information and Communication Technology (ISMICT), Worcester, USA, March 21-23, 2016.

6. Yang Yang, Zhouchi Li and Kaveh Pahlavan, "Using iBeacon for Intelligent In-Room Presence Detection", 2016 IEEE International Multi-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support (CogSIMA), San Diego, USA, March 21-25, 2016.

7. Luyao Niu, Yingyue Fan, Kaveh Pahlavan, Guanxiong Liu and Yishuang Geng, "On the Accuracy of Wi-Fi Localization Using Robot and Human Collected Signatures", IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, USA, January 9-12, 2016.

8. Yang Zheng, Yuzhang Zang and Kaveh Pahlavan, "UWB Localization Modeling for Electronic Gaming", IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, USA, January 9-12, 2016.

9. Lin Yao, Fang Ma and Shihong Duan, "An Object Reconstruction Algorithm for Moving Vehicle Detection Based on Three-frame Differencing", The Workshop of IEEE 2015 Smart World Congress, Beijing, China, August 10-14, 2015.

10. Guanxiong Liu, Yishuang Geng and Kaveh Pahlavan, "Direction Estimation Error Model of Embeded Magnetometer in Indoor Navigation Environment", The Workshop of IEEE 2015 Smart World Congress, Beijing, China, August 10-14, 2015.

11. Dan Liu, Yishuang Geng, Guanxiong Liu, Mingda Zhou and Kaveh Pahlavan, "WBANs-Spa: An Energy Efficient Relay Algorithm for Wireless Capsule Endoscopy", IEEE 82nd Vehicular Technology Conference (VTC), Boston, USA, September 6-9, 2015.

12. Dan Liu, Mingda Zhou, Yishuang Geng and Kaveh Pahlavan, "Power Efficient Relay Networking for BANs in Non-Homogeneous Environment", The Workshop of IEEE 2015 Smart World Congress, Beijing, China, August 10-14, 2015.

13. Julang Ying, Chao Ren and Kaveh Pahlavan, "On Automated Map Selection Problem in Indoor Navigation for Smart Devices", The Workshop of IEEE 2015 Wireless Telecommunications Symposium (WTS), New York City, USA, April 15-17, 2015.

14. Yishuang Geng and Kaveh Pahlavan, "On the Accuracy of RF and Image Processing Based Hybrid Localization for Wireless Capsule Endoscopy", IEEE Wireless Communications and Networking Conference (WCNC), New Orleans, USA, March 9-12, 2015.

15. Guanxiong Liu, Kaveh Pahlavan and Yishuang Geng, "Effects of Calibration RFID Tags on Performance of Inertial Navigation in Indoor Environment", IEEE International Conference on Computing, Networking and Communications (ICNC), Anaheim, USA, February 16-19, 2015.

16. N. Bargshady, K. Pahlavan and N. Alsindi, "Hybrid Wifi/UWB, Cooperative Localization Using Particle Filter", IEEE International Conference on Computing, Networking and Communications (ICNC), Anaheim, USA, February 16-19, 2015.Mingda Zhou, Guanqun Bao, and Kaveh Pahlavan, "Measurement of Motion Detection of Wireless Capsule Endoscope Inside Large Intestine," the 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'14), Chicago, USA, August 26-30, 2014.

17. Liang Mi, Guanqun Bao, and Kaveh Pahlavan, "Analysis of the Impact of Intestinal Motility on the Speed Estimation of Video Capsule Endoscope," the 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'14), Chicago, USA, August 26-30, 2014.

18. Guanqun Bao, Liang Mi, Yishuang Geng, Mingda Zhou and Kaveh Pahlavan, "A Video-based Speed Estimation Technique for Localizing the Wireless Capsule Endoscope inside Gastrointestinal Tract," the 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'14), Chicago, USA, August 26-30, 2014.

19. K. Pahlavan, V. Motevalli and A.H.Levesque, "Project Baswed Learning in Engineering Educationfor the Third Industrial Revolution", Interntional Symposium on University Globalization, Tokyo, Japan, June 28, 2014.

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