

CURRICULUM VITAE

NAME Tomonori Nagayama

ADDRESS Department of Civil Engineering
University of Tokyo
7-3-1, Hongo,
Bunkyo-ku, Tokyo, 112-0001, Japan
Phone: +81-3-5841-6144
Fax: +81-3-5841-7454



CURRENT STATUS

Associate Professor
University of Tokyo, Tokyo, Japan
Civil Engineering

ACADEMIC EDUCATION

BS University of Tokyo, Tokyo, Japan
Civil Engineering, 2000
MS University of Tokyo, Tokyo, Japan
Civil Engineering, 2002
Ph.D. University of Illinois at Urbana-Champaign, IL, USA
Civil and Environmental Engineering, 2007

AWARDS/FELLOWSHIPS

Fellowship Vodafone Graduate Fellowships, 2005/09-2006/07

Awards

2003 **Tanaka Prize** for the paper, "Identification of Non-proportionally Damped System Using Ambient Vibration Measurement and its Application to a Suspension Bridge", Journal of Structural Mechanics and Earthquake Engineering, Japan Society of Civil Engineering, 2002

2007 **ASCE Raymond C. Reese Research Prize** for the paper "Structural Identification of a Nonproportionally Damped System and Its Application to a Full-Scale Suspension Bridge," Journal of Structural Engineering, October 2005

2010 **JSCE annual incentive award** for the paper "Smart Sensor Middleware Development for Dense Structural Vibration Measurement," Journal of Japan Society of Civil Engineering, 2009.

EXPERIENCES

2002 **Research Assistant**, University of Tokyo
2002-2005 **Research Assistant**, University of Illinois at Urbana-Champaign
2006-2009 **Junior Assistant Professor**, The University of Tokyo
2009-2014 **Senior Assistant Professor**, The University of Tokyo

2014-Present **Associate Professor**, The University of Tokyo

2009- Committee on Data Informatics of the Asia-Pacific Network of Centers for Research in Smart Structures Technology

2010 National Organizing Committee and Conference Operations Committee, World Conference on Structural Control and Monitoring

2012- Program Committee , Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems, SPIE conference.

2015 Secretariat of the Scientific Committee, IABSE NARA 2015

2017 The 13th International Workshop on Advanced Smart Materials and Smart Structures Technology, Chair.

2015- Chairperson of Subcommittee for Performance-based Maintenance and Monitoring, Committee on Steel Structure, Japan Society of Civil Engineers.

HP:

<https://scholar.google.com/citations?user=g3FtWkIAAAAJ&hl=ja>

https://www.researchgate.net/profile/Tomonori_Nagayama

PUBLICATION

Theses

Nagayama, T. (2000). “Structural identification of non-proportionally damped system and application to a long suspension bridge.” Graduation thesis, Dept. of Civil Engineering, University of Tokyo, Japan (In Japanese).

Nagayama, T. (2002). “Development and performance evaluation of reflection free multi-directional wave generator,” Master’s thesis, Dept. of Civil Engineering, University of Tokyo, Japan (in Japanese).

Nagayama, T. (2007). “Structural Health Monitoring Using Smart Sensors,” Doctoral dissertation, University of Illinois at Urbana-Champaign, 2007

Refereed Journal paper

Abe, M., Fujino, Y., Nagayama, T., and Ikeda, K. (2001). “Identification of non-proportionally damped system using ambient vibration measurement and its application to a suspension bridge”, *Journal of Structural Mechanics and Earthquake Engineering, Japan Society of Civil Engineers*, 689, 261-274 (in Japanese).

Abe, M., Fujino, Y., Nagayama, T., and Vu-Manh H. (2002). “A non-iterative approach in vibration-based damage detection for a damped mechanical system.” *Journal of Applied Mechanics, JSCE*, 5, 855-862 (in Japanese).

.

Nagayama, T., Sato, S., Isobe, M., and Tsuzuki, R. (2002). "Development and performance evaluation of reflection free multi-directional wave generator." *Proc., 49th Coastal Engineering, JSCE*, 11-15 (in Japanese).

Nagayama, T., Abe, M., Fujino Y., and Ikeda, K. (2003). "Non-iterative identification of non-proportionally damped system from ambient vibration measurement and analysis of dynamic properties of a long span suspension bridge." *Journal of Structural Mechanics and Earthquake Engineering, JSCE*, 745, 155-169 (in Japanese).

Nagayama, T., Abe, M., Fujino, Y., and Ikeda, K. (2005). "Structural identification of non-proportionally damped systems and its application to a full-scale suspension bridge." *Journal of Structural Engineering*, 131(10), 1536-1545.

Ruiz-Sandoval, M. Nagayama, T., and Spencer, Jr., B. F. (2006). "Sensor development using Berkeley Mote platform." *Journal of Earthquake Engineering*, 10(2), 289-309.

Nagayama, T. Sim, S-H., Miyamori, Y., and Spencer, Jr., B. F. (2007). "Issues in structural health monitoring employing smart sensors." *Smart Structures and Systems*, 3(3), pp. 299-320.

Cho, S., Yun, C.-B., Lynch, J. P., Zimmerman, A.T., Spencer, B. F., and Nagayama, T. (2008). "Smart wireless sensor technology for structural health monitoring of civil structures." *International Journal of Steel Structures*, 8(3), pp.267-275.

Nagayama, T. Spencer, Jr., B. F., Mechitov, K. A., and Agha, G. A. (2009). "Middleware services for structural health monitoring using smart sensors." *Smart Structures and Systems*, 5(2), pp.119-137.

Nagayama, T., Spencer, Jr., B. F., and Fujino, Y. (2009). "Smart sensor middleware development for dense structural vibration measurement." *Journal of Structural Mechanics and Earthquake Engineering*, Japan Society of Civil Engineers, 65 (2) pp.523-535 (in Japanese).

Nagayama, T., Spencer, Jr., B. F., and Rice, J. A. (2009). "Autonomous decentralized structural health monitoring using smart sensors." *Structural Control and Health Monitoring*, 16, pp.842-859.

Su, D., Fujino, Y., Nagayama, T., Hernandez, J., and Seki, M. (2009). "Vibration of reinforced concrete viaducts under high-speed train passage: measurement and prediction including train-viaduct interaction." *Structure and Infrastructure*

Engineering: Maintenance, Management, Life-Cycle Design and Performance, 1744-8980.

Nagayama, T., Moinzadeh, P., Mechitov, K.A., Ushita, M., Makihata, N., Ieiri, M., Agha, G.A., Spencer Jr., B.F., Fujino, Y., and Seo, J. (2010). "Reliable multihop communication for structural health monitoring," *Special Issue of Smart Structures and Systems on Wireless Sensor Advances and Applications for Civil Infrastructure Monitoring*, 6(5).

Sim, S.-H., Spencer, Jr., B. F., and Nagayama, T. (2010). "Multimetric sensing for structural damage detection." *Journal of engineering mechanics* 137 (1), pp.22-30.

Rice, J., Mechitov, K., Sim, S.-H., Nagayama, T., Jang, S., Kim, R., Spencer, Jr., B. F., Agha, G., and Fujino, Y. (2010). "Flexible smart sensor framework for autonomous structural health monitoring." *Special Issue of Smart Structures and Systems on Wireless Sensor Advances and Applications for Civil Infrastructure Monitoring*, 6(5).

Siringoringo, D., Fujino, Y., and Nagayama, T. (2011). "Dynamic characteristics of an overpass bridge in a full-scale destructive test." *Journal of Engineering Mechanics*.

Yun, G.J., Lee, S.-G., Carletta, J., and Nagayama, T. (2011). "Decentralized damage identification using wavelet signal analysis embedded on wireless smart sensors." *Engineering Structures*, 33(7), pp.2162-2172.

Dinh, H.M., Nagayama, T., and Fujino, Y. (2012). "Structural parameter identification by use of additional known masses and its experimental application." *Structural Control and Health Monitoring*, 19(3), pp436-450.

Jo, H., Sim, S.-H., Nagayama, T., and Spencer, Jr., B. F. (2012). "Development and application of high sensitivity wireless smart sensors for decentralized stochastic modal identification." *Journal of Engineering Mechanics*, 138(6), pp.683–694.

Asakawa, H., Nagayama, T., Fujino, Y., Nishikawa, T., Akimoto, T., and Izumi, K. (2012). "Development of a simple pavement diagnostic system using dynamic responses of an ordinary vehicle." *Journal of Japan Society of Civil Engineers, Ser. E1 (Pavement Engineering)*, 68 (1) pp.20-31 (in Japanese).

Kuroiwa, T., Suzuki, M., Saruwatari, S., Nagayama, T., and Morikawa, H. (2013). "A multi-channel bulk data collection protocol for structural health monitoring using wireless sensor networks." *IEICE Transactions on Communications (Japanese Edition)*, Vol.J96-B No.2 pp.114-123 (in Japanese).

Mizutani,T., Fujino,Y., Inomata,K., Tsujita,W., and Nagayama,T.(2013). “Trial of Rainfall Detection by Multi-fractal Analysis from Fluctuation of Electric Field around A Leaky Coaxial Cable”, *Journal of Japan Society Hydrology and Water Resources*, 26(5), PP.258-268 (in Japanese).

Su, D., Miwa A., Fujino,Y., and Nagayama,T. (2013). “Measurement and analysis of traffic-induced response of viaducts in Tokyo Metropolitan Expressway.” *Journal of Structural Engineering. A, JSCE* Vol. 59A, pp.281-289 (in Japanese).

Sung, S., Park, J., Nagayama, T., and Jung ,HJ. (2014). “A multi-scale sensing and diagnosis system combining accelerometers and gyroscopes for bridge health monitoring.” *Smart Materials and Structures* 23 (1), 015005.

Zou, Z., Nagayama, T., and Fujino, Y. (2014). “Efficient multi-hop communication for static wireless sensor networks in the application to civil infrastructure monitoring.” *Structural Control and Health Monitoring*, 21 (4), pp.603-619.

Mizutani,T., Inomata,K., Tsujita,W., Honda,R.,Fujino,Y., and Nagayama,T.(2014). “Real-Time Rainfall Detection by Analyzing Singularities of Communications Antenna Radiowave Fluctuations.” *Journal of Japan Society Hydrology and Water Resources*, Vol. 27, No.5, pp.208-218(in Japanese).

Hornarbakhsh, A., Nagayama, T, Rana, S., Tominaga, T. Hisazumi, K., and Kanno, R. (2015). “Damage identification of belt conveyor support structure using periodic and isolated local vibration modes”, *Smart Structures and Systems*, 15(3), pp.787-806.

Su, D., Shimada,Y., and Nagayama,T.(2015).“Stress evaluation and fatigue prediction of a steel girder bridge incorporating vehicle-bridge interaction analysis”, *Journal of structural engineering.A*, 61A(0), pp.451-462(in Japanese).

Takeda,T., Nagayama,T., Mizutani,T., and Fujino,Y. (2015). “Seismic response characterization of a curved rigid-frame bridge using three dimensional nonlinear dynamic analysis, *Journal of Japan Society of Civil Engineers*, 71(4), I_641-I_649(in Japanese).

Mizutani,T., Inomata,K., Fujino,Y., and Nagayama,T.(2015). “Experimental Studies on Accurate Estimation of Rainfall Intensity from Electric Field Fluctuation of Surface Wave Mode around Leaky Coaxial Cable.” *IEICE TRANSACTIONS on Communications*, B 98 (12), pp.1289-1297(in Japanese).

Kim, R. E., Li, J., Spencer, B.F. Jr., Nagayama, T., and Mechitov, K.A. (2016). “Synchronized sensing for wireless monitoring of large structures”, *Smart Structures and Systems*, 18(5), pp 885-909

Sun, Z. Nagayama, T., Su, D., and Fujino, Y. (2016). "A damage detection algorithm utilizing dynamic displacement of bridge under moving vehicle." *Shock and Vibration*, 2016.

Nakamura, N., Mizutani, T., and Nagayama, T. (2016). "Evaluation of Ultimate Strength of Railway Viaducts with Columns Reinforced with Spiral Rebars Using Nonlinear Dynamic Analysis." *Journal of Japan Society of Civil Engineers*, Ser. A1 (Structural Engineering & Earthquake Engineering (SE/EE)), *JSCE*, 72 (4), I_213-I_223(in Japanese).

Sun, Z. Nagayama, T., and Fujino, Y. (2016). "Minimizing noise effect in curvature-based damage detection." *Journal of Civil Structural Health Monitoring*, 6(2), pp 255-264.

Narazaki, Y., Nagayama, T., and Su, D. (2016). "Development of a stiffness reduction evaluation method for RC columns during earthquakes based on acceleration measurements." *Journal of Structural Engineering. A, JSCE*, Vol. 62A, pp.212-225(in Japanese).

Nakasuka, J., Mizutani, T., Yamamoto, Y., Uchida, M., Su, D., Nagayama, T., and Fujino, Y. (2016). "Analysis of large amplitude vibration mechanism of Shinkansen PRC girder bridges and the long-term trend of their structural characteristics." *Journal of Structural Engineering. A, JSCE*, Vol. 62A, pp.42-49(in Japanese).

Su, D., Sano, S., Tanaka, H., Nagayama, T., and Mizutani, T. (2016). "Train localization by mutual correction of acceleration and interior sound." *Journal of Structural Engineering. A, JSCE*, Vol. 62A, pp.571-584(in Japanese).

Sun, Z. Nagayama, T., Nishio, M., and Fujino, Y. (2017). "Investigation on a curvature - based damage detection method using displacement under moving vehicle." *Structural Control and Health Monitoring*, e2044. <https://doi.org/10.1002/stc.2044>.

Zhao, B.Y., Nagayama, T., Toyoda, M., Makihata, N., Takahashi, M., and Ieiri, M. (2017) "Vehicle model calibration in the frequency domain and its application to large-scale IRI estimation", *Journal of disaster research*, 12(3), pp. 446-455.

Nagayama, T., and Zhang C. (2017) A numerical study on bridge deflection estimation using multi-channel acceleration measurement, *Journal of Structural Engineering A, JSCE*, 63A, pp.209-215 (in Japanese).

Nagayama, T., Reksowardojo, A.P., Su, D., and Mizutani, T. (2017) "Bridge natural frequency estimation by extracting the common vibration component from the responses of two vehicles", *Engineering Structures*, 150, pp. 821-829.

Wang, H., Nagayama, T., Zhao, B., and Su, D. (2017) "Identification of moving vehicle parameters using bridge responses and estimated bridge pavement roughness", *Engineering Structures*, 153, pp.57-70.

Suzuki, M., Nagayama, T., Ohara, S., and Morikawa, H. (2017) "Structural Monitoring Using Concurrent Transmission Flooding", *the IEICE Transactions on Communications (Japanese Edition)*, J100-B,(12), pp952-960 (in Japanese).

Wang, H., Nagayama, T., Nakasuka, J., Zhao, B., & Su, D. (2018). "Extraction of bridge fundamental frequency from estimated vehicle excitation through a particle filter approach", *Journal of Sound and Vibration*, 428, pp.44–58. <https://doi.org/10.1016/j.jsv.2018.04.030>

Laboratory Report

Nagayama, T. and Spencer, Jr., B. F.(2007). "Structural health monitoring using smart sensors." *Newmark Structural Engineering Laboratory Report Series 001* <http://hdl.handle.net/2142/3521>,

Conference paper

Spencer, Jr., B. F., Lee, G. C., Yang, G., and Nagayama, T. (2003). "Seismic protection of non-structural components using semi-active devices." *Proc., Seminar on Seismic Design, Performance, and retrofit of Nonstructural Components in Critical Facilities*, 541-552

Nagayama, T., Ruiz-Sandoval, M., Spencer, Jr., B. F., Mechitov, K. A., and Agha, G. A. (2004). "Wireless strain sensor development for civil infrastructure." *Proc., 1st International Workshop on Networked Sensing Systems*, Tokyo, Japan, 97-100.

Mechitov, K. A., Kim, W. Y., Agha, G. A., and Nagayama, T. (2004). "High-frequency distributed sensing for structure monitoring," *Proc., 1st International Workshop on Networked Sensing Systems*, Tokyo, Japan, 101-105.

Nitta, Y., Nagayama, T., Spencer, Jr., B. F., and Nishitani, A. (2005). "Rapid damage assessment for the structures utilizing smart sensor MICA2 Mote." *Proc., 5th International Workshop on Structural Health Monitoring*, 283-290.

Nagayama, T., Rice, J.A., and Spencer, Jr., B.F. (2006). "Efficacy of Intel's Imote2 wireless sensor platform for structural health monitoring applications." *Proc., Asia-Pacific Workshop on Structural health Monitoring*, Yokohama, Japan.

Nagayama, T. and Spencer, Jr., B. F. (2006). "Implementation of structural health monitoring algorithms on smart sensor networks. *4th World Conference on Structural Control and Monitoring*.

Nagayama, T., Spencer, Jr., B.F., Agha, G.A., and Mechitov, K.A. (2006), "Model-based data aggregation for structural monitoring employing smart sensors." *Proc. 3rd Int. Conference on Networked Sensing Systems (INSS 2006)*, Chicago, IL, 203-210.

Spencer, Jr., B.F. and Nagayama, T. (2006). "Smart sensor technology: a new paradigm for structural health monitoring." *Proc., Asia-Pacific Workshop on Structural Health Monitoring*, Yokohama, Japan.

Moreu, F., and Nagayama, T. (2007). "Possibilities of Using Sensing Technology for Railroad Bridges Repair and Maintenance." *IABSE REPORTS 93*, p.520.

Moreu, F., and Nagayama, T. (2007). "Possibilities of Using Sensing Technology For Railroad Bridges Maintenance and Repair." *IABSE Symposium Report 93 (1)*, pp.335-340.

Nagayama, T., Spencer, Jr., B. F., and Fujino, Y. (2007). "Synchronized sensing toward structural health monitoring using smart sensors." *Proc., World Forum on Smart Materials and Smart Structures Technology (SMSST'07)*, Chongqing & Nanjing, China.

Nagayama, T., Spencer, Jr., B. F., and Rice, J. A. (2007). "Structural health monitoring utilizing Intel's Imote2 wireless sensor platform." *Proc., Sensor and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2007, SPIE 6529*, pp652943, San Diego, CA, USA.

Spencer, Jr. B. F., Nagayama, T., and Rice, J.A. (2007). "Structural health monitoring using smart sensors." *Proc., World Forum on Smart Materials and Smart Structures Technology (SMSST'07)*, Chongqing & Nanjing, China.

Nagayama, T., Siringoringo, D. M., and Fujino, Y. (2008). "The importance of dense monitoring of long-span bridges for its performance re-evaluation." *IABSE Congress Report 17 (16)*, pp.246-247, 2008.

Mizuno, Y., Fujino, Y., Nagayama, T., and Nishikawa, T. (2008). "Networked Sensing Platform for Civil Structures and its Prototype." *IABSE Symposium Report 94 (9)*, pp.1-6, 2008.

Nagayama, T., Spencer, Jr., B. F., and Fujino, Y. (2008). "Structural health monitoring using smart sensors." *Proc., 11th East Asia-Pacific Conference on Structural Engineering & Construction*, Taipei, Taiwan.

Asakawa, H., Fujino, Y., Nagayama, T., and Ohsumi, M. (2008). "Development and application of road monitoring system using dynamic response of vehicles." *Proc., 11th East Asia-Pacific Conference on Structural Engineering & Construction*, Taipei, Taiwan.

Mizutani, T., Fuke, Y., Fujino, Y., Nagayama, T., and Mizuno, Y. (2008). "An experimental study on precipitation measurement using leaky coaxial cables." *Proc., 11th East Asia-Pacific Conference on Structural Engineering & Construction*, Taipei, Taiwan.

Dinh, M.-H., Nagayama, T., and Fujino, Y. (2008). "Structural parameter identification by use of additional known masses and its application to damage detection." *Proc., 11th East Asia-Pacific Conference on Structural Engineering & Construction*, Taipei, Taiwan.

Ushita, M., Nagayama, T., and Fujino, Y. (2008). "A distributed autonomous active-sensing approach for structural health monitoring using smart sensors." *Proc., 11th East Asia-Pacific Conference on Structural Engineering & Construction*, Taipei, Taiwan.

Su, D., Fujino, Y., Nagayama, T., and Miyashita, T. (2008). "Local dynamic characteristics of train induced vibration of high-speed railway bridge." *Proc., 11th East Asia-Pacific Conference on Structural Engineering & Construction*, Taipei, Taiwan.

Nagayama, T., Spencer, Jr., B. F. Ushita, M., and Fujino, Y. (2008). "Structural health monitoring systems using smart sensors," *Proc., 4th International Workshop on Advanced Smart Materials and Smart Structures Technologies*, Waseda University, Tokyo, Japan.

Castaneda, N.E., Sun, F., Dyke, S.J., Lu, C., Hope, A. and Nagayama, T. (2008). "Experimental validation of a correlation-based damage detection technique using iMote2 wireless sensors," *5th International Workshop on Structural Control and Monitoring*, Dalian, China, June 5-6.

Castaneda, N.E., Sun, F., Dyke, S.J., Lu, C., Hope, A. and Nagayama, T. (2008). "Implementation of a correlation-based decentralized damage detection method using wireless sensors," *Proc., 4th International Conference on Advances in Structural Engineering and Mechanics (ASEM08)*, Jeju, Korea, May 26-28.

Spencer, Jr. B. F., Nagayama, T., and Rice, J. A. (2008). "Decentralized structural health monitoring using smart sensors," *Proc., Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2008, SPIE 6932*, pp693202, San Diego, CA, USA.

Moreu, F., and Nagayama, T. (2008). "Use of wireless sensors for timber trestle railroad bridges health monitoring assessment." *Proceedings of the 2008 Structures Congress (ASCE): Crossing Borders*.

Nagayama, T., Ushita, M., Dinh, H. M., Fujino, Y., Spencer, Jr. B. F., Rice, J. A., Jang, S.-A. Mechitov, K. A., and Agha, G. A. (2009). "Structural health monitoring system development and full-scale bridge vibration measurement using smart sensors," *Proc. 10th International Conference on Structural Safety and Reliability*, Osaka, Japan.

Su, D., Fujino, Y., Nagayama, T., and Miyashita, T. (2009). "Local train-induced vibration in high-speed train steel bridge." *IABSE Symposium Report 96 (16)*, pp.44-53.

Yun, G.J., Lee, S.G., Carletta, J., and Nagayama, T. (2009). "Wavelet entropy based damage identification using wireless smart sensors." *SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring*.

Cho, S., Jang, S.A., Jo, H., Park, J., Jung, H.J., Yun, C.B., Spencer Jr, B.F., NAGAYAMA, T., and SEO, J.W. (2009). "Cable-stayed bridge test-bed for long-term structural health monitoring using smart wireless sensor network." *The Proceedings of the 1st International Conference on Computational Design in Engineering*.

Fujino, Y., Siringoringo, D. M., Nagayama, T., and Su, D. (2010). "Control, simulation and monitoring of bridge vibration – Japan's recent development and practice." *IABSE-JSCE Joint Conference on Advances in Bridge Engineering-II*, Bangladesh, pp.61-74.

Nagayama, T., Ushita, M., Fujino, Y., Ieiri, M. and Makihata, N. (2010). "The combined use of low-cost smart sensors and high accuracy sensors to apprehend structural dynamic behavior," *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2010, Proc. of SPIE volume 7647*, San Diego, USA.

Jo, H., Rice, J.A. Spencer Jr., B.F., and Nagayama, T. (2010). "Development of a high-sensitivity accelerometer board for structural health monitoring," *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2010, Proc. of SPIE volume 7647*, San Diego, USA.

Cho, S., Jang, S.A., Jo, H., Mechitov, K.A. Rice, J.A., Jung, H.-J., Yun, C.-B., Spencer Jr., B.F., Nagayama, T., and Seo, J. (2010). "Structural health monitoring system of a cable-stayed bridge using a dense array of scalable smart sensor network." *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2010, Proc. of SPIE volume 7647*, San Diego, USA.

Jo, H., Sim, S., Nagayama, T., and Spencer, Jr. B.F. (2010). "Decentralized stochastic modal identification using high sensitivity wireless smart sensors." *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Nagayama, T., Ushita, M., and Fujino, Y. (2010). "Efficient multihop data transport protocol for structural health monitoring and its evaluation at a full-scale bridge.", *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Yun, C.-B., Sohn, H., Jung, H.-J., Spencer, Jr., B. F., and Nagayama, T. (2010). "Wireless sensing technologies for bridge monitoring and assessment." *Bridge Maintenance, Safety, Management and Life-Cycle Optimization: Proceedings of the Fifth International IABMAS Conference*, Philadelphia, USA, 11-15 July 2010.

Siringoringo, D., Nagayama, T., Fujino, Y., Su D., and Tandian, C. (2010). "Observed dynamic characteristics of an overpass bridge during destructive testing." *Bridge Maintenance, Safety, Management and Life-Cycle Optimization: Proceedings of the Fifth International IABMAS Conference*, Philadelphia, USA, 11-15 July 2010.

Cho, S., Park, J., Jung, H.-J., Yun, C.-B., Jang, S., Jo, H., Spencer, Jr., B.F., Nagayama, T., and Seo, J.-W. (2010). "Structural health monitoring of a cable-stayed bridge using acceleration data via wireless smart sensor network." *Bridge Maintenance, Safety, Management and Life-Cycle Optimization: Proceedings of the Fifth International IABMAS Conference*, Philadelphia, USA, 11-15 July 2010.

Park, J.W., Cho, S., Jung, H.-J., Yun, C.-B., Jang, S. A., Jo, H., Spencer, Jr., B. F., Nagayama, T., and Seo, J.-W. (2010). "Long-term structural health monitoring system of a cable-stayed bridge based on wireless smart sensor networks and energy harvesting techniques.", *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Dinh, H.M., Nagayama, T., Fujino, Y., Sakurai, N., and Nakayama, H. (2010). "Boundary condition identification of a real-life bridge by use of additional known masses." *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Tandian, C.H., Fujino, Y., Nagayama, T., Siringoringo, D., and Su D. (2010). "Response variability among identical expressway bridges under moving vehicles." *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Mizutani, T., Fujino, Y., Inomata, K., Tsujita, W. Nagayama, T., Nishikawa, T., Shikai, M., and Sumi, K. (2010). "Leaky coaxial cable usage for monitoring real-time heavy rain." *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Su, D., Fujino, Y., Nagayama, T., and Yamazaki, S. (2010). "Identification of cable damping characteristics of a long-span cable-stayed bridge" *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Lin, T.H., Hung, S. L., Fujino, Y., and Nagayama, T. (2010). "Study of energy harvesting technology in structural health monitoring." *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Nagayama, T., Jung, H.-J., Spencer, Jr., B. F., Jang, S.A., Mechitov, K. A., Cho, S., Ushita, M., Yun, C.-B., Agha, G. A., and Fujino, Y. (2010). "International collaboration to develop a structural health monitoring system utilizing wireless smart sensor network and its development on a cable-stayed bridge." *Proc. of 5th World Conference on Structural Control and Monitoring*, Tokyo, Japan.

Jo, H., Sim, S., Nagayama, T., and Spencer Jr., BF, (2010). "Decentralized Stochastic Modal Identification using High-sensitivity Wireless Smart Sensors." *Proceedings of 5th World Conference on Structural Control and Monitoring 5WCSC M-10466*. pp. 12-14. Tokyo, Japan.

Nagayama, T., Ushita, M., and Fujino, Y. (2010). "High-throughput multihop wireless sensor network using multiple RF channels and its application to suspension bridge monitoring." *Proc. of 3rd Asia-Pacific Workshop on Structural Health Monitoring*, Tokyo, Japan.

Siringoringo, D., Fujino, Y., Nagayama, T., and Wenzel, H. (2011). "Vibration Characteristics of an Overpass Bridge During Full-Scale Destructive Testing." *Procedia Engineering 14*, pp.777-784.

Nagayama, T., Ushita, M., and Fujino, Y. (2011). "Suspension bridge vibration measurement using multihop wireless sensor networks." *Proc. of 12th East Asia-Pacific Conference on Structural Engineering and Construction*, Hong Kong, China.

Jo, H., Sim, S., Mechitov, K., Kim, R., Li, J., Moizadeh, P., Spencer, Jr, BF., Park, J.W., Cho, S., Jung, H.J., Yun, C.B., Rice, J.A and Nagayama, T. (2011). "Hybrid wireless smart sensor network for full-scale structural health monitoring of a cable-stayed bridge." *SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring*.

Su, D., Siringoringo, D., Nagayama, T., and Fujino, Y., (2011). "Monitoring and visual inspection of New Jersey reference bridges." *International Conference on Structural Health Monitoring of Intelligent Infrastructure*, SHMII-5.

Kuroiwa, T., Suzuki, M., Saruwatari, S., Nagayama, T., and Morikawa, H. (2011). "Scheduling for fast bulk data transfer in wireless sensor networks." *Technical report of IEICE, USN2011-16* (in Japanese).

Kuroiwa, T., Suzuki, M., Nagayama, T., and Morikawa, H. (2011). "Design of a MAC Protocol with Busy ACK for High Throughput Bulk Transfer in Wireless Sensor Networks." *IEICE Society Conference 2011*, B-19-3, (in Japanese).

Kuroiwa, T., Suzuki, M., Yamashita, Y., Saruwatari, S., Nagayama, T., and Morikawa, H. (2012). "A multi-channel bulk data collection for structural health monitoring using wireless sensor networks." *Communications (APCC), 2012 18th Asia-Pacific Conference on*, pp.295-299.

Li, J., Nagayama, T., Mechitov, K. A., and Spencer, Jr., B. F. (2012). "Efficient campaign-type structural health monitoring system using wireless smart sensors." *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2012, Proc. of SPIE volume 8345*, San Diego, USA.

Kim, R. E., Nagayama, T., Jo, H., and Spencer, Jr., B. F. (2012). "Preliminary study of low-cost GPS receivers for time synchronization of wireless sensors." *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2012, Proc. of SPIE volume 8345*, San Diego, USA.

Su, D., Nagayama, T., Sun, Z., and Fujino, Y. (2012). "An interferometric radar for displacement measurement and its application in civil engineering structures." *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2012, Proc. of SPIE volume 8345*, San Diego, USA.

Nagayama, T., Urushima, A., Fujino, Y., Miyashita, T., Yoshioka, T., and Ieiri, M. (2012). "Dense vibration measurement of an arch bridge before and after its seismic retrofit using wireless smart sensors." *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2012, Proc. of SPIE volume 8345*, San Diego, USA.

Honarbakhsh, A., Nagayama, T., and Fujino, Y. (2012). "Damage identification of belt-conveyor support structure using global and local vibration modes." *Proc. of 5th European Conference on Structural Control*, Genoa, Italy.

Nagayama, T., Miyajima, A., Kimura, S., Shimada, Y., and Fujino, Y. (2013). "Road condition evaluation using the vibration response of ordinary vehicles and synchronously recorded movies." *Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2013, Proc. of SPIE volume 8692*, San Diego, USA.

Nagayama, T., Honarbakhsh, A., Fujino, Y., Hisazumi, K., and Tominaga, T. (2013). "Damage identification of a belt-conveyor support structure using local vibration modes: numerical study" *Proc. of East Asia-Pacific Conference on Structural Engineering and Construction-13*, Sapporo, Japan.

Mizutani, T., Hida, T., Fujino, Y., and Nagayama, T. (2013). "Detection of State Changes of RC Columns in Shaking Table Tests by Singularity Analysis of Their Acceleration Responses." *Innovation, Communication and Engineering* 1, 377.

Takeda, T., Nagayama, T., Mizutani, T., and Fujino, Y. (2013). "Seismic Response Characterization of a Curved Rigid-frame Bridge Using Three Dimensional Nonlinear Dynamic Analysis." *Innovation, Communication and Engineering* 1, 289.

Su, D., Nagayama, T., Irie, M., and Fujino, Y. (2013). "Development of a stereo camera system for road surface assessment." *SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring*.

Nagayama, T., Suzuki, M., Narazaki, Y., Morikawa, H. and Fujino, Y. (2014). "Long-span bridge vibration measurements using multihop wireless sensor networks." *Proc. of 6th World Conference on Structural Control and Monitoring*, Barcelona, Spain.

Takeda, T., Nagayama, T., Mizutani, T., and Fujino, Y. (2015). "Seismic Performance Evaluation of a Curved Rigid-frame Bridge Using Threedimensional Dynamic Analysis." *IABSE Symposium Report 104 (20)*, pp.1-8.

Nagayama, T., Suzuki, M., Narazaki, Y., Morikawa, H. and Fujino, Y. (2015). "Vibration measurement with routing-free multihop wireless sensor networks and its application to a long-span bridge." *IABSE Symposium Report 104 (6)*, pp.1-8.

Nagayama, T., Reksowardojo, A.P., Su, D. and Zhang, C. (2015). "Bridge Natural Frequency Estimation by Extracting the Common Vibration Component from the Responses of Two Vehicles.", *Proc of ANCRiSST 2015*, Urbana, Illinois USA.

Nagayama, T., Kubota, Y., and Kurata, M. (2015). "IABSE Conference Nara, 2015-Report Elegance in Structures." *STRUCTURAL ENGINEERING INTERNATIONAL*, 25(3), pp.358-358.

Makihata, N. Zhao, B., Toyoda, M., Takahashi, M, Ieiri, M., and Nagayama, T. (2016). "Large-scale road surface evaluation using dynamic responses of commercial vehicles", *Proceedings of the International Conference on Smart Infrastructure and Construction*, Cambridge, UK. 27–29 June 2016.

Suzuki, M., Jinno, K., Tashiro, Y., Katsumata, Y., Liao, C.H., Nagayama, T., Makihata, N., Takahashi, M., Ieiri, M., and Morikawa, H. (2016), "Development and field experiment of routing-free multi-hop wireless sensor networks for structural monitoring", *Proceedings of the International Conference on Smart Infrastructure and Construction*, Cambridge, UK. 27–29 June 2016.

Zhao, B., Nagayama, T., Makihata, N., Toyoda, M., Takahashi, M., and Ieiri,

M.(2016). "IRI estimation by the frequency domain analysis of vehicle dynamic responses and its large-scale application." *The 13th International Conference on Mobile and Ubiquitous Systems: Computing Networking and Services*, pp.41-46.

Faheem, M., Matsumoto, Y., Nohmi, H., Sakai, S., Su, D., and Nagayama, T. (2016). "Comparison of radar based displacement measurement systems with conventional systems in vibration measurements at a cable stayed bridge." *11th German-Japan Bridge Symposium*, Osaka, Japan; 08/2016.

Su, D., Fujino, Y., Shimada, Y., and Nagayama, T. (2016). "Stress evaluation and fatigue prediction in a steel girder bridge." *IABSE Symposium Report 106 (11)*, pp.256-263.

Sun, Z., Nagayama, T., and Fujino, Y. (2016). "Incorporating noise effect in damage detection with a curvature based method." *IABSE Symposium Report 106 (8)*, pp.506-513.

Kuleli, M., Nagayama, T., and Su, D. (2016). "Vibration monitoring of expressway viaducts and comparative analysis of their dynamic characteristics." *Mechanics of Structures and Materials: Advancements and Challenges*, pp.1469-1476.

Nagayama, T., and Zhang, C. (2016). "Bridge deflection estimation using multi-channel acceleration measurement." *Mechanics of Structures and Materials: Advancements and Challenges*, pp.1463-1468.

Zhao, B.Y., and Nagayama, T. (2017). "IRI estimation by the frequency domain analysis of vehicle dynamic responses." *Procedia Engineering 188*, pp9-16.

Wang, H., Nagayama, T., and Su, D. (2017). "Vehicle parameter identification through particle filter using bridge responses and estimated profile." *Procedia Engineering 188*, pp64-71.

Zhao, B.Y., Nagayama, T., and Su, D.: Road Profile Evaluation Using Multiple Dynamic Responses from Ordinary Vehicles, *Proc of ANCRiSST 2017*, Tokyo, 2017.

Takeda, T., Mizutani, T., Nagayama, T., and Fujino, Y.: Reproduction of Tower-girder Pounding Response and Local Damage Evaluation of Long-span Bridge Using Multi-scale Model, *Proc of ANCRiSST 2017*, Tokyo, 2017.

Kato, S., Nagayama, T., Su, D., Hisazumi, K., and Tominaga, T.: Identification of a Cross-sectional Vibration Mode of a Belt Conveyor Structure Using Acoustic Loading, *Proc of ANCRiSST 2017*, Tokyo, 2017.

Thiyagarajan,J.S., Su, D., Tanaka,H., Zhao, B.Y., and Nagayama,T.: Inverse Analysis for Rail Track Profile Estimation from In-service Railway Vehicle, *Proc of ANCRiSST 2017*, Tokyo,2017.

Wang,H., Nagayama, T., and Su. D.: A Bridge Weigh-in-Motion Method by Moving Force Identification Using Augmented Particle Filter from Measured Bridge Acceleration and Inclination Data, *Proc of ANCRiSST 2017*, Tokyo, 2017.

Kuleli, M., and Nagayama, T.: Identification of the Rubber Bearing Characteristics Using Aftershock Response Measurement of the Kumamoto Earthquake, *Proc of ANCRiSST 2017*, Tokyo, 2017.

Nagayama, T., Suzuki, M., Zhang, C., and Su. D.: High-accuracy Wireless Sensor Development and Its Application to Deflection Estimation of a Steel Box Girder Bridge, *Proc of ANCRiSST 2017*, Tokyo, 2017.

Su, D., Nagayama, T., Nakazawa, J., and Wakisaka, D.: Vibration Characteristics of a Long Span Cable-Stayed Bridge Identified by Multipoint Wireless Sensors Measurement, *Proc of ANCRiSST 2017*, Tokyo, 2017.

Su, D., E, Jonathan., and Nagayama, T.: Load Rating of a Steel Bridge by Inclination Measurement, *IABSE Symposium Report 109(62)*,pp. 639-646,2017.

Nagayama, T. and Zhang, C.: Deflection estimation of a steel box girder bridge using multi-channel acceleration measurement, *IABSE Symposium Report 109 (41)*, pp.1656-1663,2017.

Others

Nagayama, T., Abe, M., and Fujino, Y. (2000). “Structural health monitoring of a long suspension bridge based on ambient vibration measurement.” *Proc., 27th annual conference of JSCE, Kanto Division* (in Japanese), outstanding performance award.

Nagayama, T., Abe, M., and Fujino, Y. (2000). “Structural identification of a non-proportionally damped system and its application to a long suspension bridge.” *Proc., 55th annual conference of JSCE* (in Japanese).

Fujino, Y., Abe, M., Nagayama, T., and Ikeda, K. (2003). “Detection of unsteady aerodynamic forces in a suspension bridge from ambient vibration monitoring.” *Wind Engineering, Japan Association for Wind Engineering*, 94, 37-49 (in Japanese).

INVITED LECTURES

Shantou University, “Structural health monitoring using smart sensors” Mar. 2007.

2008 ANCRiSST short course on smart wireless sensor technology and applications, Korean Advanced Institute of Science and Technology, Daejeon, Korea, Sept. 2008.

CURRENT RESEACH PROJECT

Structural monitoring using wireless sensor networks: Wireless sensor nodes capable of communication, synchronization, and structural response measurement without the need of external power are expected to enable capturing structural behavior in detail. This research project develops the first wireless sensor nodes capable of capturing structural behavior such as micro-tremor responses, structural inclination, deflection, and others for months to years only using batteries. With the developed nodes, various civil structures have been monitored. The monitoring data have been used in various purposes including the identification of the cause of structural vibration, the estimation of structural properties, and the evaluation of vehicle loads. Data assimilation techniques have been employed to integrate the simulation and the dense measurement.

Road condition evaluation using vehicle dynamic responses: A smartphone-based Dynamic Response Intelligent Monitoring System (iDRIMS) has been developed to conduct road evaluations with high efficiency and reasonable accuracy. iDRIMS estimates the International Roughness Index (IRI) based on vehicle responses measured with an iOS application, which obtains three-axis acceleration, angular velocity, and GPS with accurate sampling timing; resampling based on the sampling theory is implemented. Employing the half car vehicle model together with the data assimilation technique, this response-based profile estimation method can perform even better than expensive conventional profilers depending on conditions. This development is now being extended to implementation involving a large number of commercial vehicles.

<http://vims.sakura.ne.jp/>

<http://www.bridge.t.u-tokyo.ac.jp/nagayama/iDRIMSResampler.pdf>