

# Arturo Baltazar Herrejón

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## RESEARCH INTERESTS

Quantitative Nondestructive Evaluation (QNDE) of materials, advanced methods of QNDE using ultrasound, experimental nonlinear acoustics, instrumentation, mechanics of interfaces, development of automatic and robotic systems for nondestructive quality control and statistical quality control.

## EDUCATION

**Ph.D.** Department of Industrial, Welding and System Engineering. The Ohio State University, Columbus, OH.

**M.Sc. in Materials Science**, Universidad Michoacana, Morelia, México.

**B.S. in Mechanical Engineer**, Universidad Michoacana, Morelia, México.

## EMPLOYMENT HISTORY

08/2006–Present. Researcher. Robotics and Advanced Manufacturing Program, Cinvestav-Saltillo, Saltillo, Mexico

08/2002. Researcher-Professor. Instituto Tecnológico de Hermosillo, Sonora, México

01/2000- 06/2002. Research Engineer. Adler Consulting Inc., Columbus, Ohio.

## RESEARCH PAPERS

1. **Baltazar, A.**, Rokhlin and C. Pecorari. "On the relation between ultrasonic and micromechanical properties of contacting rough surfaces". J. Mech. Phys. Solids Vol. 50 , 1397-1416, 2002.
2. Rokhlin, S.I., **A. Baltazar**, B. Xie, J. Chen and R. Revenue. " Method for monitoring environmental degradation of adhesive bonds". Materials Evaluation, Vol. 60/Num 6, 2002, pp. 795-801, 2002.
3. **Baltazar, A.**, Wang, L ; Xie, B ; Rokhlin, S. I. "Inverse ultrasonic determination of imperfect interfaces and bulk properties of a layer between two solids". The Journal of the Acoustical Society of America, 114, no. 3, pp. 424-435, 2003.
4. Rokhlin, S.I, B. Xie, and , **A. Baltazar** "Quantitative ultrasonic characterization of environmental degradation of adhesive bonds". J. Adhesion Sci. Technol. Vol. 18, No 3, pp. 327-359, 2004.
5. Kim, J-Y, **A. Baltazar**, and S.I. Rokhlin. "Ultrasonic assessment of rough surface contact between solids from elastoplastic loading-unloading hysteresis cycle". J. Mech. Phys. Solids Vol. 52, pp. 1911-1934, 2004.
6. Kim, J-Y , **A. Baltazar**, J.W. Hu and S.I. Rokhlin. "Hysteric acoustic nonlinearity of pressed interfaces". International Journal of Solids and Structures, Vo. 43, Issue 21, pp. 6436-6452, 2006.
7. **Baltazar, A.**, J-Y Kim and S.I. Rokhlin. "Ultrasonic determination of real contact area of randomly rough surfaces in elastoplastic contact", Revista Mexicana de Física, Vol. 52(1), pp. 37-47, 2006.
8. **Baltazar, A.**, J. Espina, I. Ramos-Torres and G. Gonzalez-Aguilar. "Effect of Methyl Jasmonate on properties of intact tomato fruit monitored with destructive and nondestructive tests". Journal of Food Engineering, 80 (4), pp. 1086-1095, 2007.

9. **Baltazar, A.**, J.I. Aranda, G. González-Aguilar. "Bayesian classification of ripening stages of tomato fruit using acoustic impact and colorimeter sensor data", *Journal of Computers and Electronics in Agriculture*, 60, pp113–121, 2008.
10. **Baltazar, A.**, J.I. Aranda-Sanchez. "The Effect of Repeated Measurements on Bayesian Decision Regions for Class Discrimination of Time-Dependent Biological Systems". A. Gelbukh and E.F. Morales (Eds.): *MICAI 2008, LNAI 5317*, pp. 305–314, 2008.
11. Aranda, J.I., **A. Baltazar**, G. González-Aguilar. "Implementation of a Bayesian classifier using repeated measurements for discrimination of tomato fruit ripening stages". *Biosystems Engineering*, 102(3), 274-284, 2009.
12. Kim B-C, **A. Baltazar**, J-Y Kim. "Effective Properties of Multi-layered Multi-functional Composites". *Advanced Composite Materials*, 18, pp. 153–166, 2009.
13. Gonzalez-Valadez M., **A. Baltazar**, R.S. Dwyer-Joyce. "Study of Interfacial Stiffness Ratio of a Rough Surface in Contact Using a Spring Model". *Wear*, 268, Issues 3-4, pp. 373-379, 2010.  
**Factor de Impacto 1.77**
14. Manzanares-Martinez, B. F. Ramos-Mendieta, **A. Baltazar**. "Ultrasonic elastic modes in solid bars: an application of the plane wave expansion method". *The Journal of the Acoustical Society of America* , 127 (6), pp. 3503-3510, 2010.
15. **Baltazar A.**, C. Hernandez, B. Manzanares-Martinez. "Study of wave propagation in a multiwire cable to determine structural damage". *NDT& E International*, 43( 8), pp. 726-732, 2010.
16. Kim, J.-Y., **A. Baltazar**, J.-S. Lee. "Characteristics of Acoustic Nonlinearity of interfaces between contacting solid surfaces". Submitted for publication to *Modern Physics Letters B*, August 2010.
17. Armendariz J., C. Treesatayapun, **A. Baltazar**. "Estimated force feedback fuzzy-rules emulated networks controller based on hertzian contact and ultrasound. Submitted for publication to *Mechanical Systems and Signal Processing*, November 2010.
18. Balvantin, A., **A. Baltazar**. "A study of guided wave propagation on a plate between two semi-spaces with imperfect boundary conditions". Submitted for publication to *International Journal of Mechanical Science*, January 2011.

#### **PROCEEDINGS**

1. Lavrentieva, A. I., **A. Baltazar** and S. I. Rokhlin, " Ultrasonic spectroscopy of imperfect interfaces between a layer and two solids", In: *Review of progress in Quantitative Nondestructive Nondestructive Evaluation*, Vol. 17B, eds D.O. Thompson and D. E. Chimenti, (Plenum, New York), 1379-1386, 1998.
2. **Baltazar, A.**, S.I. Rokhlin and C. Pecorari, "On the relationship between ultrasonic micro-structural properties of imperfect interfaces in layered solids", in: *Review of progress in Quantitative Nondestructive Nondestructive Evaluation*, Vol. 18B, eds D.O. Thompson and D. E. Chimenti, (Plenum, New York)1463-1470, 1999.
3. Rokhlin, S. I., **A. Baltazar**, B. Xie and J. Chen, "Ultrasonic determination of environmental degradation of adhesive bonds", In: *Review of progress in Quantitative Nondestructive Nondestructive Evaluation*, Vol. 20B, eds D.O. Thompson and D. E. Chimenti, (AIP, Melville) 1082- 1089, 2000.
4. Adler L., S.I. Rokhlin and **A. Baltazar**, " Determination of material properties of thin layers using angle beam ultrasonic spectroscopy", *Ultrasonic Symposium, IEEE*, Vol. 1, pp. 701-704, 2001.

5. **Baltazar, A.**, B. Xie, L. Wang and S. I. Rokhlin, "Ultrasonic determination of environmental degradation of interfacial properties in adhesives bonds", In *Review of progress in Quantitative Nondestructive Evaluation*, Vol. 21B, eds D.O. Thompson and D. E. Chimenti, (AIP, Melville), 1157-1164, 2002.
6. Rokhlin, S.I., **A. Baltazar**, B. Xie and J. Chen, "Ultrasonic characterization of accelerated environmental degradation of adhesively bonded joints", In: *Adhesive Joints: Formation, Characteristics and Testing*, Vol. 2, K.L. Mittal (Ed.). VPS, The Netherlands, 2002.
7. Rokhlin, S.I., L. Wang, **A. Baltazar**, V.A. Yakovlev and L. Adler, "Nonlinear Angle Beam Ultrasonic Evaluation of Adhesive Bonds", In *Review of progress in Quantitative Nondestructive Evaluation*, Vol. 22B Issue 1, eds. D.O. Thompson and D.E. Chimenti, (AIP, Melville), 1041-1049, 2003.  
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8. Kim, J-Y., **A. Baltazar**, J-S. Lee, "Experimental study on nonlinear acoustic properties of contacting solid interfaces". In *Proceedings of the International Conference on Advanced Nondestructive Evaluation*, Vol.2, Ed. S.S. Lee, J.H. Lee, I.K. Park, S.J. Song and M.Y. Choi, (World Scientific Publishing Co. Pte. Ltd.) pp.1255-1260, 2008.
9. Treesatayapun, C., **A. Baltazar**, A. Balvantin, J.-Y. Kim, "Thickness determination of a plate with varying thickness using an artificial neural network for time-frequency representation of Lamb waves". In *Review of progress in Quantitative Nondestructive Evaluation*, Vol. 27, eds. D.O. Thompson and D.E. Chimenti, (AIP, Melville), 619-626, 2009.
10. Hernandez, C., **A. Baltazar**, Aranda," Damage Detection in Multi-wire Cables Using Continuous Wavelet Transform Analysis of Ultrasonic Guided Waves". IEEE, Electronics , Robotics and Automotive Mechanics- CERMA, 250-255, 2009.
11. Hernandez-Salazar, C.D., **A. Baltazar**, R. Mijarez, L. Solis, "Structural Damage Monitoring on Overhead Transmission Lines Using Guided Waves and Signal Processing". In *Review of progress in Quantitative Nondestructive Evaluation*, Vol., 27, AIP Conf. Proc. 1211, 1721-1728, 2010.
12. Balvantin, A., **A. Baltazar**, J.-Y. Kim, "Ultrasonic Lamb Wave Tomography of Non-Uniform Interfacial Stiffness Between Contacting Solid Bodies". In *Review of progress in Quantitative Nondestructive Evaluation*, Vol., 27, AIP Conf. Proc. 1211, 1463-1470, 2010.
13. Armendariz,A., C. Treesatayapun, **A. Baltazar**, Development of an Estimated Force Feedback Controller Based on Hertzian Contact and Ultrasound. In IEEE International Workshop on Robotic and Sensors Environments (ROSE), 2010.
14. Armendariz,A., **A. Baltazar**, C. Treesatayapun, "Determination of Surface Mechanical Properties Using a Hertzian Contact and Ultrasound Sensor". In Proceedings of 2010 IEEE International Ultrasonics Symposium.
15. Mijarez, R., F. Martinez, **A. Baltazar**, "Real time damage detection system using guided waves in ACSR cables", In *Review of progress in Quantitative Nondestructive Evaluation*, Vol., 30, AIP Conf. Proc, 1335, 1402-1409, 2011.
16. Mijarez, R., **A. Baltazar**, "Phenomena investigation of guided waves propagation in a multiple-wire cable with gradually increasing cut depths", RILEM Bookseries, Vol. 6; Büyüköztürk, Oral, Taşdemir, Mehmet Ali Güneş, Oğuz; Akkaya, Yılmaz (Eds.). Nondestructive Testing of Materials and Structures, Ed. Springer, 2011.
17. A. Almeda, Baltazar A., C. Treesatayapun, "Implementation of efficient trajectories for an ultrasonic scanner using chaotic maps". To be published In *Review of progress in Quantitative Nondestructive Evaluation*, Vol., 31, AIP Conf. Proc. 2012.

## RESEARCH PROJECTS

### Participation as collaborator

"Technology development for inspection of interphase degradation in adhesive bonds", Participantes: **(PI)** Stan Rokhlin<sup>1</sup>, B. Xie<sup>1</sup>, **Arturo Baltazar**<sup>1</sup> y L. Wang<sup>1</sup>, <sup>1</sup>Ohio State University; Contrato: #DTFA03-98-D-00008, Otorgado por Federal Aviation Administration (FAA); Duración 1995-1999.

"Ultrasonic real time monitoring of wire bonding process"; Participantes: **(PI)** Stan Rokhlin<sup>1</sup>, **Arturo Baltazar**<sup>2</sup>, B. Grimmitt<sup>2</sup>, T. Frech<sup>2</sup>, <sup>1</sup>Ohio State University, <sup>2</sup>Edison Joining Technology Center (EJTC); Contrato: #446471RP, Otorgado por EJTC; Duración: 2001-2003.

"Evaluation of Adhesive Bond Integrity of Composites"; Participantes: **(PI)** L. Adler<sup>1</sup>, C. Mattie<sup>1</sup>, G. Blaho<sup>1</sup>, C. Guo<sup>1</sup>, S.I. Rokhlin<sup>2</sup>, L. Wang<sup>2</sup>, **Arturo Baltazar**<sup>2</sup> and B. Xie<sup>2</sup>, <sup>1</sup>Adler Consultant, Inc., <sup>2</sup>Ohio State University; Contrato: #N68335-97-C-0328Topic, Otorgado por USA NAVY (S.B.I.R. Program); Duración:1998-2000.

"Nonlinear Stress Modulation Ultrasonic Method for determination of adhesive bond integrity"; Participantes: **(PI)** L. Adler<sup>1</sup>, G. Blaho<sup>1</sup>, S.I. Rokhlin<sup>2</sup>, L. Wang<sup>2</sup>, **Arturo Baltazar**<sup>2</sup> and B. Xie<sup>2</sup>, <sup>1</sup>Adler Consultant, Inc., <sup>2</sup>Ohio State University; Contrato: # NAS1-00023, Otorgado por USA NASA (S.B.I.R. Program); Duración: 2000-2003.

"Study of mechanical vibrations in structural materials and finite systems". **Participantes:** (PI) Dra. Betsabe Manzanarez Martínez<sup>1</sup>, **Arturo Baltazar**<sup>2</sup>. <sup>1</sup>Universidad de Sonora, <sup>2</sup>Cinvestav Unidad-Salttillo; Universidad de Sonora. Project granted by CONACYT 2008, CB-2008-01-104151. 2010-2013.

"Multisensory fusion of system control information in robotics and advanced manufacturing". **Participantes:** (PI) Dr. Ismael Lopez, Dra. Abril Torres, Dra. America Morales, Dr. Mario Castelán, Dr. Arturo Baltazar, todos del CINVESTAV Unidad-Salttillo. Project granted by Programa Especial de Ciencia y Tecnología e Innovación (PECITI) de Apoyos Complementarios para la Actualización de Equipo Científico 2009, Proyecto # 123996.

### Participation as Principal Investigator (PI)

"Nondestructive characterization of agricultural products", **Participantes: (PI) Arturo Baltazar**<sup>1</sup>, Gustavo Gonzalez<sup>2</sup> y Rafael García Martínez<sup>1</sup>; <sup>1</sup>Instituto Tecnológico de Hermosillo, <sup>2</sup>Centro de Investigación en Alimentos y Desarrollo (CIAD), Proyecto # 506.04-P. Project sponsored by COSNET.

"Determination of mechanical properties in Mangoes using ultrasonic spectroscopy", **Participantes: (PI) Arturo Baltazar**<sup>1</sup>, Rafael García Martínez<sup>1</sup>, Gustavo Gonzalez<sup>2</sup>, y J. I. Aranda Sanchez<sup>3</sup>, <sup>1</sup>Instituto Tecnológico de Hermosillo, <sup>2</sup>Centro de Investigación en Alimentos y Desarrollo (CIAD), <sup>3</sup>Universidad Michoacana (UMSNH). Proyecto #48085. Project sponsored by CONACYT

"Development of an Ultrasonic Technique for Monitoring Damage of Overhead Power Lines". **Team members:** (Co-PI) Stefan Hurlbaeus<sup>1</sup>, **(Co-PI) Arturo Baltazar**<sup>2</sup>, Vicente Parra<sup>2</sup>, J-Y Kim<sup>3</sup>, J. I. Aranda-Sánchez<sup>4</sup>. <sup>1</sup>Texas A&M University, <sup>2</sup>Cinvestav Unidad-Salttillo, <sup>3</sup>Georgia Technology Institute, <sup>4</sup>Universidad Michoacana (UMSNH), Project Granted by TAMU-CONACYT Initiative, 2007-2008.

"Interaction of guided ultrasonic elastic waves with imperfect interfaces and cracks between two hollow cylinders axially joined". **Team members: (PI) Arturo Baltazar**<sup>1</sup>, Vicente Parra<sup>2</sup>, J-Y Kim<sup>3</sup>, J. I. Aranda-Sánchez<sup>4</sup>, Alberto Ruiz<sup>4</sup>, Elisa Martínez<sup>5</sup>, <sup>1</sup>Cinvestav Unidad-Salttillo, (CIAD), <sup>3</sup>Georgia Technology Institute, <sup>4</sup>Universidad Michoacana (UMSNH), <sup>5</sup>Instituto de Investigaciones Electricas (IIE), Granted by CONACYT. Investigación Básica, Proyecto #58951. 2008-2010.

"Nonlinear guided wave interaction with a circumferential imperfect interface between two hollow cylinders". **Team members: (PI) Arturo Baltazar**<sup>1</sup>, J-Y Kim<sup>2</sup>, Jorge I. Aranda-Sánchez<sup>3</sup>, Betsabe Manzanarez Martínez<sup>4</sup>, Felipe Ramos Mendieta<sup>4</sup>, <sup>1</sup>Cinvestav Unidad-Salttillo, <sup>2</sup>Georgia Technology Institute, <sup>3</sup>Universidad Michoacana (UMSNH), <sup>4</sup>Universidad de Sonora, Granted by SEP-CONACYT 2009. Investigación Básica, Proyecto #134564. 2011-2012.

“Buried Pipeline Active Sensing and Damage Detection using Piezoelectric Nanocomposites”. **Team members: (CO-PI) Arturo Baltazar<sup>1</sup>, (CO-PI) Ken Loh<sup>2</sup>, J-Y Kim<sup>3</sup>**. <sup>1</sup>Cinvestav Unidad-Salttillo; <sup>2</sup>University of California; <sup>3</sup>Georgia Technology Institute. Granted by 2011 UC MEXUS-CONACYT Collaborative Research Grants. 2011-2013.

## THESIS DIRECTOR

### Master in Science

1. “Caracterización de señales acústicas para el control de calidad de tomate sonorense por medio de redes neuronales probabilísticas”, Carlos Arenas, 2005. Tecnológico de Hermosillo. México.
2. “Estudio para la aplicación de la técnica no destructiva de respuesta acústica al impacto en el control de calidad en la fruta del tomate”, Javier Espina, 2005. Instituto Tecnológico de Hermosillo.
3. “Análisis estadístico de mediciones repetidas para determinar el efecto de tratamientos alternativos de pos-cosecha en el almacenamiento del fruto de tomate”, Isidro Ramos, 2006. Instituto Tecnológico de Hermosillo.
4. “Determinación de daño estructural en cables metálicos trenzados usando ondas ultrasónicas guiadas”. Cesar Hernández Salazar. 2009CINVESTAV-Unidad Saltillo.
5. “Tomografía ultrasónica de discontinuidades en placas metálicas usando ondas Lambs”. Antonio Balvantin García. 2009. CINVESTAV-Unidad Saltillo.
6. “Sistema de control con retroalimentación de fuerza estimada mediante reglas difusas emuladas con redes para un sensor basado en contacto hertziano y ultrasonido”. Jorge Alberto Armendáriz Silva. 2010. CINVESTAV-Unidad Saltillo.
8. “Desarrollo de un sistema c-scan de inspección ultrasónica basado en trayectorias caóticas”. José Alejandro Almeda Rivas. 2010. CINVESTAV-Unidad Saltillo.

### PhD.

1. “Helical Ultrasonic Reconstruction of Discontinuities with Variable Stiffness”. PhD student Antonio Balvantin García. 2009-2012. CINVESTAV-Unidad Saltillo.