

## Dr. Levent Onural

Bilkent University Houses 10/1  
TR-06800 Bilkent  
Ankara, Turkey

Phone: Int'l+90-312-2664082 (Home)  
Int'l+90-312-2901263 (Office)

e-mail: onural@bilkent.edu.tr  
l.onural@ieee.org

Web site: <http://www.ee.bilkent.edu.tr/~onural>

### Education

Ph.D. February 1, 1985 Electrical and Computer Eng. Dept.  
State University of New York at Buffalo  
Buffalo, NY, USA

Ph.D. Dissertation: *Digital Decoding of In-line Holograms*, February 1985.

M.S. July 20, 1981 Electrical Engineering Department  
Middle East Technical University  
Ankara, Turkey

MS Thesis: *Design and Implementation of a Microprocessor Based Discrete Fourier Transform Processor Using Winograd's Fourier Transform Algorithm*, July, 1981.

B.S. February 10, 1979 Electrical Engineering Department  
(High Honors) Middle East Technical University  
Ankara, Turkey

### Experience

#### Academic:

Dean of Engineering July 2010 - August 2016 Bilkent University

Bilkent University ranked 98th, worldwide, in Engineering and Technology by THE in (2013-2014)

Director July 2010 - August 2016 Graduate School  
of Engineering and Science  
Bilkent University

Member July 2010 - August 2016 Bilkent University Executive Board

Member July 2010 - August 2016 Bilkent University Senate

Chair July 2010 - August 2016 Faculty Executive Board  
Faculty of Engineering, Bilkent Univ.

Chair July 2010 - August 2016 Faculty Board  
Faculty of Engineering, Bilkent Univ.

Chair	July 2010 - August 2016	Executive Board Graduate School of Engineering and Science Bilkent University
Chair	July 2010 - August 2016	Graduate School Board Graduate School of Engineering and Science Bilkent University
Chair	2002-July 2010	Sponsored Projects Evaluation Committee, Bilkent University
Professor	July 1995 - Present	EEE Department Bilkent University
Associate Professor	January 1989 - July 1995	EEE Department Bilkent University
Assistant Professor	January 1987 - Dec 1988	EEE Department Bilkent University

Teaches courses on signal processing, image processing and probability theory; designed, started-up and maintained a sophisticated image/video processing laboratory, and a holographic 3DTV laboratory; contributed to the design of electronic research laboratories and undergraduate electronic laboratories. Took part in planning of complete academic and various other affairs of the EE department and the university. (The department and the university are both founded in 1986 fall.) Chaired the Sponsored Projects Evaluation Committee of the university (2002-2010). Led the Faculty of Engineering as the Dean and the Graduate School of Engineering and Sciences as the Director between July 2010 and August 2016.

#### Courses Taught at Bilkent University:

EE101 <i>Int. to Elec. and Electr. Eng.</i>	95F, 96F, 98F, 99F
EE301 <i>Signals and Systems</i>	88F
EE301 <i>Signals and Systems I</i>	91F, 92F, 93F, 95F, 96F
EE302 <i>Signals and Systems II</i>	91S, 92S, 95S, 97S, 98S, 99S, 00S
EE421 <i>Microprocessors</i>	94S
EE424 <i>Digital Signal Processing</i>	89F, 90F, 92F
EE523 <i>Digital Signal Processing</i>	87F, 88F, 89F, 90F, 92F
EE524 <i>Digital Image Processing</i>	88S, 90S, 92S, 93S, 94S, 95S, 96S, 97S, 02S, 03S
EE526 <i>Digital Signal Processing Lab</i>	91S
EE533 <i>Random Processes</i>	93S, 97F, 01S
EE636 <i>2-D Signals and Systems</i>	87S, 89S
CS421 <i>Computer Networks</i>	90S
CS512 <i>Computer Networks</i>	87S
MATH250 <i>Introduction to Probability</i>	88S, 07S
MATH255 <i>Probability and Statistics</i>	10F, 11S, 12S, 13S, 14S, 14F, 23F
EEE101 <i>Int. to Elec. and Electr. Eng.</i>	00F, 01F, 02F, 03F, 04F, 06F

EEE202 <i>Circuit Theory</i>	17F,19S,20S,20F	
EEE321 <i>Signals and Systems</i>	03F,07F,08F,09F,09S,13F,16S,18S,18F,20S,21S,21F,22F	
EEE391 <i>Basics of Signals and Systems</i>	05S,16F	
EEE424 <i>Digital Signal Processing</i>	06F,17S,22S,23S,24S	
EEE426 <i>Digital Image Processing</i>	04S, 07S	
EEE524 <i>Digital Signal Processing</i>	06F	
EEE525 <i>Advanced Signal Processing</i>	15F,18S,19S,19F,21S,22S,23S,24S	
EEE526 <i>Digital Image Processing</i>	04S,07S,08S,09S	
EEE426 <i>Digital Image Processing</i>	04S	
EEE621 <i>Fund. of 3DTV Systems</i>	05F	

Visiting (Sabbatical)	September 1994 - March 1995	ECE Department University of Toronto
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Conducted research activities and prepared research grant proposals in object based video coding

Research Assistant Professor	Dec. 1985 - Dec. 1986	ECE Department SUNY at Buffalo
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Taught a graduate course in image processing (ECE500 Special Topics in EE), did research on fractals and their applications.

Research Associate	February 1985 - June 1985	ECE Department SUNY at Buffalo
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Research Assistant	August 1981 - February 1985	ECE Department SUNY at Buffalo
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Contributed to the design and start-up of a sophisticated image processing laboratory; designed and set up a holography laboratory; wrote general and special purpose signal and image processing software.

Teaching Assistant	Feb. 1979 - July 1981	EE Department METU
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Designed and supervised student experiments for the third-year electronics courses.

**Business:**

Member of the Board of Directors	Apr 2015 - Mar 2017	Tepe İnşaat Sanayi A.Ş
Member of the Board of Directors	Apr 2015 - Mar 2017	Tepe Savunma ve Güvenlik Sistemleri San.
Member of the Board of Directors	Apr 2015 - Mar 2017	Tepe Güvenlik A.Ş
Member of the Board of Directors	Apr 2015 - Mar 2017	Tepe Betopan A.Ş

Member of the Board of Directors	Apr 2016 - Mar 2017	Tepe Prefabrik İnşaat Sanayi ve Ticaret A.Ş
Member of the Board of Directors	Apr 2016 - Mar 2017	Sports International A.Ş

**Industrial:**

Hardware Design Engineer Summer 1983 Nanodata Computer Corp.

Designed a hardware multiplier which speeded up the mainframe emulator computer QM-1 of Nanodata by 15% on the average.

**Other:**

Served in the Turkish Army to fulfill the military service obligation. (July 1985 - November 1985).

**Honors and Scholarships**

- \* IEEE Turkey Section Outstanding Service Award, 2017.
- \* Bilkent University Distinguished Teacher Award, 2011.
- \* EURASIP Group Technical Achievement Award, 2011.
- \* IEEE Haraden Pratt Award, "For leadership in the worldwide promotion of the values embraced by IEEE.", 2011.
- \* IEEE Fellow, "For contributions to signal processing for optics, diffraction and holography.", 2008.
- \* IEEE Third Millennium Medal, 2000.
- \* TÜBİTAK Incentive Award (Teşvik Ödülü), 1995.
- \* İhsan Doğramacı Foundation Award, 1992.
- \* İhsan Doğramacı Foundation Award, 1991.
- \* İhsan Doğramacı Foundation Award, 1990.
- \* Fulbright Scholarship throughout the Ph.D. education in USA.
- \* Scholarship from the Scientific and Technical Research Council of Turkey (TÜBİTAK) throughout the BS and MS education.
- \* 21'st among 225000 students at the universities entrance examination, 1974.

**Professional Activities**

- \* General co-chair of 3DTV Conference (3DTV-CON) 2018, Stockholm Sweden and Helsinki Finland, Jun 2018.
- \* General co-chair of 3DTV Conference (3DTV-CON) 2017, Copenhagen, Denmark, Jul 2017.

- \* General co-chair of 3DTV Conference (3DTV-CON) 2016, Hamburg, Germany, Jul 2016
- \* General co-chair of 3DTV Conference (3DTV-CON) 2015, Lisbon, Portugal, Jul 2015.
- \* Vice-chair, COST (European Cooperation in Science and Technology) Trans-Domain Proposals Panel, 2013-2014.
- \* Guest Editor, "Feature Issue on Digital Holography and 3D Imaging", *Optics Express*, vol 22, no 23, Nov 2014.
- \* General co-chair of 3DTV Conference (3DTV-CON) 2014, Budapest, Hungary, Jul 2014.
- \* Member of the International Advisory Committee, International Conference on 3D Systems and Applications (3DSA), Osaka, Japan, June 2013.
- \* General co-chair of 3DTV Conference (3DTV-CON) 2013, Aberdeen, Scotland, Oct 2013.
- \* Member of the Advisory Board, Global 3D Tech Forum 2013, Seoul, Korea, Oct 2013.
- \* Guest Editor, "Issue on Emerging Techniques in 3-D", *IEEE J. of Selected Topics in Signal Processing*, vol 6, no 5, Sep 2012.
- \* Member of the Program Committee, 3D Stereo Media Conference (IC3D) 2012, Liege, Belgium, Dec 2012.
- \* General co-chair of 3DTV Conference (3DTV-CON) 2012, Zurich, Switzerland, Oct 2012.
- \* Member of International Advisory Board, The 4th International Conference on 3D Systems and Applications (3DSA), Hsinchu, Taiwan, June 2012.
- \* Member of the Committee, Collaborative Conference on 3D Research (CC3DR) 2012, Seoul, S. Korea, June 2012.
- \* Member of the Program Committee, 3D Image Processing (3DIP) and Applications, SPIE Conf. 8290, San Francisco, USA, Jan 2012.
- \* Member of the Program Committee, 3D Stereo Media Conference (IC3D) 2011, Liege, Belgium, Dec 2011.
- \* Member of the Steering Committee, Third International Workshop on Quality of Multimedia Experience (QoMEX), Mechelen, Belgium, Sep 2011.
- \* Member of the International Advisory Board, Collaborative Conference on 3D and Materials Research (3DMR), Jeju, S. Korea, June 2011.
- \* General co-chair of 3DTV Conference (3DTV-CON) 2011, Antalya, Turkey, May 2011.

- \* Member of the Program Committee, 3D Image Processing (3DIP) and Applications, SPIE Conf. 7864, San Francisco, USA, Jan 2011.
- \* Advisory Board Member, Int. Conference on 3D Systems and Applications 3DSA2010, Tokyo, Japan.
- \* General co-chair of 3DTV Conference (3DTV-CON) 2010, Tampere, Finland, June 2010.
- \* Guest Editor, "Lasers: The First Fifty Years", *Applied Optics*, vol 49, no 25, 1 Sep 2010.
- \* Member of the Steering Committee, Second International Workshop on Quality of Multimedia Experience (QoMEX), Trondheim, Norway, Jun 2010.
- \* Member of the Editorial Board of *SPIE Reviews* (2009-2012)
- \* Co-leader of 3D Immersive Interactive Media Cluster (Formerly 3D Media Cluster) (The cluster is founded by 10 EC funded 3D media related projects; the two co-leaders are elected by project coordinators. There were 17 projects in the cluster in 2010) (2008-2010)
- \* Member of the Program Committee, 3D Image Processing (3DIP) and Applications, SPIE Conf. 7526, San Jose, USA, Jan 2010.
- \* General co-chair of 3DTV Conference (3DTV-CON) 2009, Potsdam, Germany, May 2009.
- \* Guest Editor, Special Issue on 3DTV: Capture, Transmission and Display, EURASIP Journal on Advances in Signal Processing, 2009.
- \* Coordinator of European Community funded 3DTV Project (2004-2008)
- \* Chairman of the Management Committee of European Community funded 3DTV Project (2004-2008)
- \* Member of the Advisory Board of European Community funded 3DTV Project (2004-2008)
- \* General co-chair of 3DTV Conference (3DTV-CON) 2007, Kos Island, Greece, May 2007.
- \* Guest Editor, Special Section on 3DTV, Special Issue on Multiview Video Coding and 3DTV, IEEE Transactions on Circuits and Systems for Video Technology, 2007
- \* Nominated by the IEEE Board of Directors to the Position of 2005 President-elect of IEEE (2006 President)
- \* Secretary of IEEE, 2003 (Elected by the IEEE Assembly)
- \* Member, IEEE Executive Committee, 2003
- \* Director, IEEE Region 8 (Europe, Africa and Middle East) (2001-2002) (Elected by the members of IEEE in Region 8)

- \* Member, IEEE Board of Directors (highest body in IEEE) (2001-2004)
- \* Member, IEEE Assembly (2001-2002)
- \* Member, IEEE Regional Activities Board Assembly (2001-2002)
- \* Member, Editorial Board (Assoc. Editor), IEEE Trans. on Circuits and Systems for Video Technology (CSVT) (2002-2013)
- \* Member, IEEE Presidential Blue Ribbon Committee (2001)
- \* Director-elect, IEEE Region 8 (Europe, Africa and Middle East) (2000) (Elected by the members of IEEE in Region 8)
- \* Vice Chair for Student Activities, IEEE Regional Activities Board (RAB) (1998-1999) (Elected by the IEEE Regional Activities Board Assembly for 1998; re-elected for 1999)
- \* Chairman, IEEE RAB Student Activities Committee (1998-1999)
- \* General co-chairman, *IEEE 2000 International Conference on Acoustics Speech and Signal Processing ICASSP'2000*
- \* Member, IEEE Regional Activities Board (RAB) (1998-1999,2001-2002)
- \* Member, IEEE Region 8 Committee (1990,1991,1995-1998,2000-2004)
- \* Member, IEEE Region 8 Operating Committee (2000-2004)
- \* Member, IEEE Region 8 Nominations and Appointments Subcommittee (2000-2004)
- \*Chairman, IEEE Region 8 Nominations and Appointments Subcommittee (2003-2004)
- \* Member, IEEE Region 8 Strategic Planning Subcommittee (2000-2004)
- \* Chairman, IEEE Region 8 Strategic Planning Subcommittee (2003-2004)
- \* Member, Advisory Board of IEEE Potentials magazine (1998,1999)
- \* Member, IEEE Membership Development Committee (1998, 1999)
- \* Member, IEEE Regional Activities Board Operating Committee (1998, 1999)
- \* Member, IEEE Regional Activities Board Finance Committee (1999)
- \* Member, IEEE Individual Benefits and Services Committee (1999-2000)
- \* Member, IEEE Transnational Committee (2000)
- \* Member, Faculty of Engineering Board, Bilkent University, (1996-1999) (Elected by the full professors of the Faculty of Engineering)
- \* Vice Chair for Student Activities, IEEE Region 8 (1998) (Elected by the IEEE Region 8 Committee)

- \* Chairman, Student Activities Committee of IEEE Region 8 (Europe, Middle East and Africa) (1995-1998) (Elected by the IEEE Region 8 Committee)
- \* Chairman, IEEE Circuits and Systems Society Turkey Chapter (1994 - 1996) (Elected by the members of the chapter)
- \* Member, COST211ter Project Management Committee representing Turkey (1991 - 1997)
- \* Member, Technical Committee, 1999 IEEE - EURASIP Workshop on Nonlinear Signal and Image Processing (NSIP'99)
- \* Member, Steering Committee, 1999 Workshop on Image Analysis for Multimedia (WIAMIS'99)
- \* Member, International Publicity Committee, *1997 IEEE International Conference on Image Processing ICIP'97*
- \* Member, Steering Committee of *IEEE 1994 Mediterranean Electrotechnical Conference MELECON'94*
- \* Member, Advisory Committee of *IEEE Winter Workshop on Nonlinear Digital Signal Processing*, January 17-20, 1993, Tampere, Finland.
- \* Organizer and first Chairman, IEEE Turkey Section, (1990-1991). (Elected by the members of the section)
- \* Gave numerous invited talks and made keynote speeches at various conferences.
- \* Interviewed by many newspapers, radio and television stations on 3DTV technologies; appeared in many programs (live and recorded).
- \* Reviewed papers for *Journal of Aerosol Science*, *Signal Processing*, *IEEE Transactions on Signal Processing*, *IEEE Transactions on Circuits and Systems for Video Technology*, *Journal of the Optical Society of America A*, *Applied Optics*, *Optical Engineering*, *IEEE Transactions on Systems, Man and Cybernetics*, *IEEE Transactions on Circuits and Systems Part II: Analog and Digital Signal Processing*, *IEEE Signal Processing Letters*, *Optics Letters*, *IEEE Trans. on Image Processing*, *Pattern Recognition Letters*, *Elektrik*, *Journal of Electronic Imaging*, *Measurement Science and Technology*, *ETRI Journal*, *Optics Communications*, *Turkish Journal of Electrical Engineering and Computer Sciences*, *Optics Express*, *Materials*, *J. of Display Technology*, *Electronics Letters*, *Journal of the European Optical Society*, *Optics and Lasers in Engineering*, *Proceedings of the IEEE*, *Nature Communications*.

#### Research Grants:

- \* Bilkent team leader and workpackage leader in Real 3D, a project funded by European Community under FP7 (Bilkent budget share is EUR 373,870) (2008-2011). Successfully completed.



- \* Contributor to 3DPHONE, a project funded by European Commission under FP7 (2008-2011). Successfully completed.
- \* Coordinator of Integrated Three Dimensional Television - Capture, Transmission and Display (3DTV) funded by European Commission under FP6, 19 institutions from 7 countries, 180 researchers, 48 months, EC support is 6.15 MEUR, 2004-2008. Successfully completed.
- \* Contributor to MUSCLE, a project funded by European Commission under FP6. Successfully completed.
- \* Principal investigator of a grant from TÜBİTAK to participate in the European Commission COST211ter *Redundancy Reduction Techniques for Coding of Video Signals in Multimedia Services*. A sum equivalent to US\$300,000 was received from TÜBİTAK. With additional matching funds from the Bilkent University, the total spending in 1991 - 1998 was about US\$600,000. Successfully completed
- \* NSERC (Canada) Foreign Researcher Award. Can\$12,000 for six months (Sep 1994 - Feb 1995). To do research on *Object and Model based Coding of Video Sequences* at University of Toronto. Successfully completed.
- \* Principle investigator of a grant from ASELSAN Corp to develop a laboratory prototype of an automated vision based printed circuit board testing instrument; July 1988 - December 1989; equivalent to US\$15,000. Successfully completed.
- \* Bilkent University Grant to design and start-up an image processing laboratory; January 1987 - December 1988; US\$50,000. Successfully completed.

## Patents

Rule-based moving object segmentation , US 6,337,917 , 8 January 2002.

Apparatus and Methods for Holographic Display, US 9,501,036, 22 November 2016.

System and Method for Displaying and Capturing Holographic True 3D Images. Filed as PCT (Dec 2014) via Turkish Patent Office, Ref: PCT/TR2014/000492; US Patent 10,379,496, granted on 13 Aug 2019.

Wide Viewing Angle Holographic Video Camera and Display Using a Phase Plate. Filed as PCT (Jul 2015) via Turkish Patent Office, Ref: PCT/TR2015/000282; US Patent 10,409,221, granted on 10 Sep 2019. European Patent granted on 28 Jan 2021.

## Publications

### Book:

- [1] L. Onural *3D Video Technologies: An Overview of Research Trends*, 93 Pages, Bellingham, Washington, USA, SPIE Press, ISBN 9780819480972, 2011.

**Edited Book:**

- [2] H. M. Ozaktas, L. Onural, Eds. *Three-Dimensional Television - Capture, Transmission, Display*, 629 pages, Springer, ISBN 978-3-540-72531-2, 2008.

**Journal Papers:**

- [3] L. Onural and P. D. Scott, "Digital Decoding of In-line Holograms for Imaging Fractal Aggregates", *Electronics Letters*, vol 22, No 21, pp. 1118-1119, 9 October 1986.
- [4] L. Onural and P. D. Scott, "Digital Decoding of In-line Holograms", *Optical Engineering*, vol 26, no 11, pp. 1124-1132, November 1987.
- [5] M. Karaman and L. Onural, "New Radix-2 Based Algorithm for Fast Median Filtering", *Electronics Letters*, vol 25, no 11, pp. 723-724, 25 May 1989.
- [6] M. Karaman, L. Onural and A. Atalar, "Design and Implementation of a General Purpose Median Filter Unit in CMOS VLSI", *IEEE J. of Solid State Circuits*, vol 25, no 2, pp. 505-513, April 1990.
- [7] L. Onural and P. D. Scott, "Digital Decoding of In-line Holograms", in *SPIE Milestone Series 21, Selected Papers on Holographic Particle Diagnostics* Editor: C. S. Vikram, pp. 264-272, Optical Engineering Press, Nov 1990. (Reprint of item [3])
- [8] E. Atalar, L. Onural, "A Respiratory Motion Artifact Reduction Method in Magnetic Resonance Imaging of the Chest", *IEEE Trans. on Medical Imaging*, vol 10, no 1, pp. 11-24, March 1991.
- [9] L. Onural, "Generating Connected Textured Fractal Patterns Using Markov Random Fields" *IEEE Trans. on PAMI* vol 13, no 8, pp. 819-825, August 1991.
- [10] L. Onural, M. T. Özgen, "Extraction of 3-D Object Location Information Directly from In-line Holograms Using Wigner Analysis", *Journal of the Optical Society of America A*, vol 9, no 2, pp. 252-260, February 1992.
- [11] L. Onural, "Diffraction From a Wavelet Point of View", *Optics Letters*, vol 18, no 11, pp. 846-848, June 1, 1993.

- [12] H. M. Ozaktas, B. Barshan, D. Mendlovic and L. Onural, "Convolution, Filtering, and Multiplexing in Fractional Fourier Domains and Their Relation to Chirp and Wavelet Transforms", *Journal of the Optical Society of America A*, vol 11, no 2, pp. 547 - 559, February 1994.
- [13] L. Onural, G. Bozdağı and A. Atalar, "New High-resolution Display Device for Holographic Three-dimensional Video: Principles and Simulations", *Optical Engineering*, vol 33, no 3, pp. 835 - 844, March 1994.
- [14] L. Onural, "Diffraction From a Wavelet Point of View- Reply", *Optics Letters*, vol 19, no 6, p. 424, March 1994.
- [15] M. İ. Gürelli and L. Onural, "On a Parameter Estimation Method for Gibbs-Markov Random Fields" *IEEE Trans. on PAMI*, vol 16, no 4, pp. 424 - 430, April 1994.
- [16] G. Bozdağı, A. M. Tekalp and L. Onural, "3-D Motion Estimation and Wireframe Adaptation Including Photometric Effects for Model-Based Coding of Facial Image Sequences", *IEEE Trans. on Circuits and Systems for Video Technology*, vol 4, no 3, pp. 246 - 256, June 1994. (Among the most cited CSVT papers in 2006 since 1990.)
- [17] L. Onural and M. B. Alp, M. İ. Gürelli, "Gibbs Random Field Model Based Weight Selection for the 2-D Adaptive Weighted Median Filter", *IEEE Trans. on PAMI*, vol 16, no 8, pp. 831 - 837, August 1994.
- [18] G. Bozdağı, A. M. Tekalp and L. Onural, "An Improvement to MBASIC Algorithm for 3-D Motion and Depth Estimation", *IEEE Trans. on Image Processing*, vol 3, no 5, pp. 711 - 716, September 1994.
- [19] L. Onural and M. Kocatepe, "Family of Scaling Chirp Functions, Diffraction, and Holography", *IEEE Trans. on Signal Processing*, vol 43, no 7, pp. 1568-78, July 1995.
- [20] M. İ Gürelli and L. Onural, "A Class of Adaptive Directional Image Smoothing Filters" *Pattern Recognition*, vol 29, no 12, pp.1995-2004, December 1996.
- [21] M. A. Kutay, H. M. Ozaktas, O. Arikan and L. Onural, "Optimal Filtering in Fractional Domains" *IEEE Trans. on Signal Processing*, vol 45, no 5, pp. 1129-1143, May 1997.
- [22] L. Onural, M. F. Erden and H. M. Ozaktas, "Extensions to common Laplace and Fourier Transforms" *IEEE Signal Processing Letters*, vol 4, No 11, pp. 310-311, Nov 1997.

- [23] L. Onural and P. D. Scott, "Digital Decoding of In-line Holograms", in *SPIE Milestone Series 144, Selected Papers on Holographic Interferometry: Principles and Techniques*, Editors: R. S. Sihori and K. D. Hinsch, pp. 647-655, Optical Engineering Press, 1998. (Reprint of item [3])
- [24] A. Alatan and L. Onural "3-D Motion Estimation of Rigid Objects for Video Coding Applications Using an Improved Iterative Version of the E-matrix Method" *IEEE Signal Processing Letters*, Vol 5, no 2, pp. 36 - 38, February 1998.
- [25] A. A. Alatan and L. Onural, "Estimation of Depth Fields Suitable for Video Compression using 3-D Structure and Motion of Objects" *IEEE Trans. on Image Processing*, vol 7, no 6, pp. 904 - 908, June 1998.
- [26] A. Alatan, L. Onural, M. Wollborn, R. Mech, E. Tuncel and T. Sikora "Image Sequence Analysis for Emerging Interactive Multimedia Services - The European COST 211 Framework" (Invited Paper) *IEEE Trans. on Circuits and Systems for Video Technology*, Vol 8, No 7, pp. 802-813, November 1998. (Among the most cited CSVT papers in 2006 since 1990.)
- [27] E. Tuncel and L. Onural, "Utilization of the Recursive Shortest Spanning Tree Algorithm for Video Object Segmentation by 2-D Affine Motion Modelling" *IEEE Trans. on Circuits and Systems for Video Technology*, Vol 10, No 5, pp 776-781, August 2000.
- [28] L. Onural, "Sampling of the Diffraction Field" *Applied Optics*, Vol 39, No 32, pp 5929-5935, November 2000.
- [29] İ. Ş. Yetik, H. M. Ozaktas, B. Barshan and L. Onural, "Perspective Projections in the Space-frequency Plane and Fractional Fourier Transforms", *J. Optical Society of America A (JOSA A)*, Vol 17, No 12, pp 2382, December 2000.
- [30] L. Onural, "Some Mathematical Properties of the Uniformly Sampled Quadratic Phase Function and Associated Issues in Digital Fresnel Diffraction Simulation", *Optical Engineering*, vol 43, no 11, pp 2557-2563, November 2004.
- [31] L. Onural, "Impulse Functions over Curves and Surfaces and Their Applications to Diffraction" *J. Math. Anal. Appl.*, vol 322, pp 18-27, October 2006.
- [32] V. K. Sainov, Z. I. Kharizanova, E. V. Stoikova, K. M. Ozaktas, and L. Onural, "Technique for reconstructing a Surface Shape for Measuring Coordinates," *J. Opt. Technol.*, vol 73, pp 466-470, July 2006. (translation from the Russian original, *Opticheskii Zhurnal* 73, 49-54, July 2006.)
- [33] V.Kh. Sainov, Zh.I. Kharizanova, E.V. Stoikova, Kh.M. Ozaktas and L. Onural, "Technique for Reconsturacting a Surface Shape for Measuring Coordinates," *Opticheskii Zhurnal* 73, 49-54, July 2006 (In Russian).

- [34] L. Onural, "Projection-Slice Theorem as a Tool for Mathematical Representation of Diffraction", *IEEE Signal Processing Letters*, vol 14, no 1, pp 43-46, January 2007.
- [35] L. Onural, "Exact Analysis of the Effects of Sampling of the Scalar Diffraction Field", *J. Optical Soc. of America A*, vol 24, no 2, pp 359-367, February 2007.
- [36] L. Onural and H. M. Ozaktas, "Signal Processing Issues in Diffraction and Holographic 3DTV", *Signal Processing: Image Communication*, vol 22, no 2, pp 169-177, February 2007.
- [37] G. B. Esmer, V. Uzunov, L. Onural, H. M. Ozaktas and A. Gotchev, "Diffraction Field Computation from Arbitrarily Distributed Data Points in Space", *Signal Processing: Image Communication*, vol 22, no 2, pp 178-187, February 2007.
- [38] L. Onural, "Television in 3-D: What Are the Prospects?", *Proceedings of the IEEE*, vol 95, no 6, pp 1143-1145, June 2007.
- [39] L. Onural and T. Sikora, "Introduction to the Special Section on 3DTV ", *IEEE Tr. on Circuits and Systems on Video Technology*, vol 17, no 11, pp 1566-1567, November 2007.
- [40] L. Onural, A. Gotchev, H. M. Ozaktas and E. Stoykova, "A Survey of Signal Processing Problems and Tools in Holographic Three-Dimensional Television", (Invited Paper) *IEEE Tr. on Circuits and Systems on Video Technology*, vol 17, no 11, pp 1631-1646, November 2007.
- [41] M. Janda, I. Hanak and L. Onural, "Hologram Synthesis for Photorealistic Reconstruction", *J. Optical Soc. of America A*, vol 25, no 12, pp 3083-3096, December 2008.
- [42] G. A. Triantafyllidis, A. E. Çetin, A. Smolic, L. Onural, T. Sikora, and J. Watson "3DTV: Capture, Transmission, and Display of 3D Video", (Editorial) *J. on Advances in Signal Processing*, vol 2009, Article ID 585216, 2 pages, 2009.
- [43] F. Yaraş, H. Kang and L. Onural, "Real-Time Phase-Only Color Holographic Display System Using LED Illumination", *Applied Optics*, vol 48, no 34, pp H48-H53, December 2009.
- [44] H. Kang, F. Yaraş and L. Onural, "Graphics Processing Unit Accelerated Computation of Digital Holograms" *Applied Optics*, vol 48, no 34, pp H137-H143, December 2009.
- [45] K. Köse, A. E. Çetin, U. GÜDÜKBAY, L. Onural, "3D Model Compression Using Connectivity-Guided Adaptive Wavelet Transform Built Into 2D SPIHT", *J. Visual Communication and Image Representation*, vol 21, no 1, pp 17-28, January 2010.

- [46] E. Sahin and L. Onural, "A Comparative Study of Light Field Representation and Integral Imaging", *The Imaging Science Journal*, vol 58, no 1, pp 28-31, Feb 2010.
- [47] R.W. Boyd, R. Athale, L. Onural and W. Seka, "Lasers: The First Fifty Years", (Editorial), *Applied Optics*, vol 49, no 25, pp LF1, 1 September 2010.
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- [197] E. Ulusoy, L. Onural, H. M. Ozaktas, "İkili Uzamsal Işık Modülatörleri Kullanan Holografik Üç Boyutlu Televizyon Ekranları için Sinyal İşleme (Signal Processing for Three-Dimensional Holographic Television Displays that Use Binary Spatial Light Modulators), 18. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU), pp 41-44, Diyarbakır, Turkey, Apr 2010.
- [198] E. Şahin, L. Onural, H. Kang, "Holografik Stereogramların Değişken Boyutlu Bölütler Kullanılarak Geri Çatım Kalitelerinin Arttırılması (The Reconstruction Quality Improvement of Holographic Stereograms via Variable Size Segmentation) 18. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU), pp 169-172, Diyarbakır, Turkey, Apr 2010.
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- [200] T. J. Naughton, C. Falldorf, L. Onural, P. Ferraro, C. Depeursinge, S. Krueger, Y. Emery, B. M. Hennelly, M. Kujawińska, "Capture, Processing, and Display of Real-world 3D Objects Using Digital Holography: Results from a European Funded Project" (Invited Paper), 9th Euro-American Workshop on Information Optics (WIO), Helsinki, Finland, Jul 2010.
- [201] T.J. Naughton, C. Falldorf, L. Onural, P. Ferraro, C.D. Depeursinge, S. Krueger, Y. Emery, B.M. Hennelly, and M. Kujawińska, "3D Capture, Processing, Display, and Perception with Digital Holography: Results from a European-Funded Project", *Digital Holography and Three-Dimensional Imaging*, OSA, Tokyo, Japan, May 2011.
- [202] F. Yaraş, H. Kang, L. Onural, "Circularly Configured Multi-SLM Holographic Display System", in *Proceedings of 2011 3DTV Conference: The True Vision Capture, Transmission and Display of 3D Video (IEEE)(3DTV-CON)*, May 2011.
- [203] M. Paturzo, A. Pelagotti, A. Geltrude, M. Locatelli, P. Poggi, R. Meucci, P. Ferraro, E. Stoykova, F. Yaraş, A. Özgür Yöntem, H. Kang, L. Onural, *Infrared Digital Holography Applications for Virtual Museums and Diagnostics of Cultural Heritage, SPIE Proceedings: Optics for Arts, Architecture and Archeology III*, vol. 8084, pp. 80840K-1 - 80840K-6, Munich, Germany, May 2011. (doi.org/10.1117/12.890039)

- [204] G. B. Esmer, H. M. Özaktaş, L. Onural, "Örnekleme Yerlerinin Skalar Kırınım Deseninin Doğru Hesaplanmasındaki Etkisi", 20. *Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, pp 1-4, Fethiye, Muğla, Turkey, Apr 2012. (In Turkish)
- [205] O. Kulce and L. Onural, "Analysis of the Longitudinal Component of the Electric Field Generated by Flat and Pixelated Liquid Crystal Displays", *Proceedings of 2016 3DTV Conference: The True Vision Capture, Transmission and Display of 3D Video (IEEE) (3DTV-CON)*, Hamburg, Germany, July 2016.
- [206] L. Onural, "Design of a 360-degree Holographic 3D Video Display Using Commonly Available Display Panels and a Paraboloid Mirror", *Proc. SPIE 10126, Advances in Display Technologies VII, 101260I*, San Francisco, USA, February, 2017; doi:10.1117/12.226733 .
- [207] O. Kulce and L. Onural, "Geniş Optik Alanlarda Geleneksel Sayıl Yaklaşım Sonucunda Oluşan Bölgesel Hatanın Analizi (Local Error Analysis Arising from the Conventional Scalar Approximation in Wide Optical Fields)", 25. *Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Antalya, Turkey, May 2017. (In Turkish)
- [208] O. Kulce and L. Onural, "Phase Retrieval from Electric Field Intensity for Wide Angle Optical Fields", *OSA Imaging and Applied Optics Congress 2017*, paper CTu1B.4, San Francisco, USA, June 2017.
- [209] L. Onural, "A 360-degrees Holographic True 3D Display Unit Using a Fresnel Phase Plate", *IS&T International Symposium on Electronic Imaging 2019, Stereoscopic Displays and Applications*, paper SDA 629, pp 629-1 – 629-4, Burlingame, California, USA, January 2019; doi:10.2352/ISSN.2470-1173.2019.3.SDA-629 .

#### Other Invited Talks:

- [1] "3DTV NoE", IST SMarT Networking Event (EC), Helsinki, Finland, 22 November 2006.
- [2] "Integrated Three-dimensional Television; Capture, Transmission and Display (3DTV)", Workshop on Optical Metrology - New Ways into the Future (BIAS), Worpsswede, Germany, 8 December 2006.
- [3] "3DTV NoE", FP7 in Motion (EC), Luxembourg, 25 January 2007.
- [4] "3D Technologies: Current EC Funded R&D Activities in Europe", Concertation Meeting (EC), Brussels, Belgium, 13 November 2007.

- [5] "3DTV Research in Europe: Recent Activities and Results", 2<sup>nd</sup> 3D Broadcasting and Applications Workshop (NICT), Tokyo, Japan, 19 December 2007.
- [6] "3D Media Cluster and Recent Developments in Europe in 3DTV Related Research", 2008 International Workshop on 3D Information Technology, Seoul, Korea, 24 November 2008.
- [7] "3D Media Cluster and Recent Developments in Europe in 3DTV Related Research", ICT Event (EC), Lyon, France, 27 November 2008.
- [8] "3D Video Technologies and Future Internet", Networked Media Concertation Meeting (EC), Antwerp, Belgium, 28 April 2009.
- [9] "The 3DTV Toolbox - The Results of the 3DTV NoE", Workshop on 3DTV Broadcasting (EBU), Geneva, Switzerland, 30 April 2009.
- [10] "3D Video Technologies and Future Internet", Nem Summit (EC), St. Malo, France, 30 September 2009.
- [11] "Real 3D Solutions", International Conference on Information and Communication Technologies (NUIM), Maynooth, Ireland, 21 August 2009.
- [12] "Research Trends in Holographic 3DTV Displays", 22<sup>nd</sup> Annual Meeting of the IEEE Photonics Society, Antalya, Turkey, 5 October 2009.
- [13] "Holografik Üç-boyutlu Video Gösterimindeki Güncel Araştırmalar", 11.Ulusal Optik, Elektro-Optik ve Fotonik Çalıştayı, Ankara, Turkey, 16 October 2009.
- [14] "3D Media Research in Europe", International Conference on 3D Systems and Applications (3DSA2010), Tokyo, Japan, 19 May 2010 (Keynote speaker).
- [15] "Signal Processing Based Research Issues in 3DTV", 2010 IEEE International Workshop on Multimedia Signal Processing (MMSP2010), Saint Malo, France, 5 Oct 2010 (Plenary speaker).
- [16] "Holographic 3DTV", 2<sup>nd</sup> 3D Video-Audio Workshop, Beijing, China, 16 May 2010.
- [17] "Holographic 3DTV", Faculty of Science Seminars, Bilkent University, Ankara, 4 May 2011.
- [18] "Futuristic 3DTV: The Holographic Approach", Samsung Technology Forum, Seoul, S. Korea, 8 November 2011.

- [19] “An Overview of Digital Holography Related Research at Bilkent University”, First Korea-Japan Workshop on Digital Holography and Information Photonics (DHIP), Seoul, S. Korea, 10 November 2011.
- [20] “Basics of Optical Diffraction from a Signal Processing View - Holographic Data on Integral Imaging Displays”, Global 3D Technology Forum, Seoul, S. Korea, 11 October 2012.
- [21] “An Overview of Holographic True 3D Video Display Research Using Spatial Light Modulators: Signal Processing Basics and Optical Implementations”, SID Mid-Europe Chapter Spring Meeting 2014, Istanbul, Turkey, 8 April 2014.
- [22] “Holografik Video Gösterim Teknikleri”, Elektrik Elektronik Mühendisliği Kongresi EEMKON 2015, Istanbul, Turkey, 21 November 2015 (In Turkish).
- [23] “Holographic True-3D Displays Basic Principles and Current Challenges”, International Forum on Advanced Visual Computing IFAVC 2016, Guangzhou, China, 6 July 2016.
- [24] “Lightfield vs. Holography”, Webinar debate by L. Onural (Bilkent University) and G. Weitzstein (Stanford University) organized by Optical Society of America, 29 September 2016.
- [25] “Holographic True-3D Displays Basic Principles and Current Challenges” Department Graduate Program Seminar, Dept. of EEE, Bilkent University, Ankara, Turkey, 8 November 2016.
- [26] “Dalga Yayılımı, Kırınım ve Holografi Konularına Sinyal İşleme Açısından Bir Bakış”, 26. Sinyal İşleme ve İletişim Uygulamaları (SİU 2018) Kurultayı , Çeşme, İzmir, Turkey, 3 May 2018.
- [27] “Limiting Factors for Holographic Displays”, OSA Incubator on Visual Perception in AR/VR, Panel Discussion, (virtual meeting), 22 Sep 2020.

#### Supervised

#### Ph.D. Dissertations:

- [1] Ergin Atalar, *Motion Artifact Reduction Techniques in Magnetic Resonance Imaging*, Bilkent University, July 1991.
- [2] Gözde Bozdağı, *Three-Dimensional Facial Motion and Structure Estimation in Video Coding*, Bilkent University, January 1994.
- [3] A. Aydın Alatan, *Object-Based 3-D Motion AND Structure Analysis for Video Coding Applications*, Bilkent University, February 1997.



- [4] G. Bora Esmer, *Calculation of Scalar Optical Diffraction Field from its Distributed Samples over the Space*, April 2010.
- [5] Fahri Yaraş, *Three-dimensional Holographic Video Display Systems Using Multiple Spatial Light Modulators*, May 2011.
- [6] A. Özgür Yöntem, *Three-Dimensional Integral Imaging Based Capture and Display System Using Digital Programmable Fresnel Lenslet Arrays*, December 2012.
- [7] Erdem Şahin, *Signal Decomposition Based Methods for the Calculation of Three-Dimensional Scalar Optical Diffraction Field Due to A Field Given on a Curved Surface*, May 2013.
- [8] Onur Külçe, *Transformation Techniques from Scalar Wave Fields to Polarized Optical Fields for Wide-Viewing-Angle Holographic Displays*, June 2018.

**Supervised**

**MS Theses:**

- [1] Mustafa Karaman, *Design and Implementation of a General Purpose Median Filter Unit in VLSI*, Bilkent University, October 1988.
- [2] Mehmet Tankut Özgen, *A Method for Extracting Object Related Information from In-line Holograms Using Wigner Distribution*, Bilkent University, January 1990.
- [3] Mehmet İzzet Gürelli, *Generation and Parameter Estimation of Markov Random Field Textures and a Parallel Network for Texture Generation*, Bilkent University, February 1990.
- [4] Seyfullah Halit Oğuz, *An Automated Rule Based Visual Printed Circuit Board Inspection System Which Uses Mathematical Morphological Image Processing Algorithms*, Bilkent University, February 1990.
- [5] Münire Bilge Alp, *3 - Dimensional Median Based Algorithms in Image Sequence Processing*, Bilkent University, September 1990.
- [6] Gözde Bozdağı, *Simulation of a Holographic 3-D Television Display*, Bilkent University, December 1990.
- [7] Levent Öktem, *Simulation of DigiCipher<sup>TM</sup>, an HDTV System Proposal*, Bilkent University, November 1991.

- [8] Şennur Ulukuş, *Adaptive Prediction and Vector Quantization Based Very Low Bit Rate Video Coding*, Bilkent University, July 1993
- [9] Roy Mikael Mickos, *Issues in Developing A Very Low Bit Rate Videophone Coder*, Bilkent University, December 1993.
- [10] Serkan Kıranyaz, *Regularized Motion Estimation Techniques and Their Applications to Video Coding*, Bilkent University, September 1996.
- [11] Hakkı Tunç Bostancı, *A Very Low Bit Rate Video Coder Decoder*, Bilkent University, January 1997.
- [12] Ertem Tuncel, *Utilization of Improved RSST Method for Video Object Segmentation*, August 1997.
- [13] Tolga Ekmekçi, *Video Object Segmentation for Interactive Multimedia*, November 1998.
- [14] Ersin Esen, *Semi-automatic Video Object Segmentation*, September 2000.
- [15] Gökhan Bora Esmer, *Computation of Holographic Patterns Between Tilted Planes*, June 2004.
- [16] Osman Topçu, *Reconstruction of Point Clouds Using Multi-View Orthographic Projections*, June 2006.
- [17] Can Bal, *Three-Dimensional Video Coding on Mobile Platforms*, September 2009.
- [18] Veysel Yücesoy, *Improving the Resolution of Diffraction Patterns From Many Low Resolution Recordings*, September 2010.
- [19] Onur Külçe, *Surface Reflectance Estimation from Spatio-temporal Subband Statistics of Moving Object Videos*, July 2012 (Co-supervised with Katja Doerschner).

**Professional Memberships**

- \* Institute of Electrical and Electronics Engineers (IEEE) (Fellow)
- \* Chamber of Electrical Engineers (EMO), Turkey.

**Personal**      Married, has two children; 67 years old; citizen of Republic of Turkey.