Curriculum Vitae

Contact information

Name: Evgeny Belyaev
Date of birth: September 09, 1981
Place of birth: Murmansk obl., USSR
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Research interests:
–*low-complexity joint source-channel video coding*;
–*arithmetic coding*;
–*compressive sensing.*

Education

- 2015, Doctor of Technology, Tampere University of Technology, Finland
- 2009, Candidate of Science, St.Petersburg State University of Aerospace Instrumentation, Russia.
- 2005, Engineer (M.S.) in Automated Systems of Information Processing and Control, St.Petersburg State University of Aerospace Instrumentation, Russia.

Academical work experience

Period	Organization	Position	Responsibilities
2018–	ITMO University, Russia	Research fellow	Research in video coding, theses supervision, lectures and seminars
2016–2018	Technical University of Denmark	Postdoctoral Researcher	Development of video coding for drones, lectures and seminars
2015–2016	University of Oulu, Finland	Postdoctoral Researcher	Development of video coding based on compressed sensing
2011–2015	Tampere University of Technology, Tampere, Finland	Researcher	Development of low-complexity scalable video coding based on 3-D DWT, lectures and seminars, masters theses supervision
2010–2012	State University of Aerospace Instrumentation, St.Petersburg, Russia	Assistant Professor	Lectures and seminars, masters theses supervision
2010–2011	Institute for Informatics and Automation of the Russian Academy of Sciences, St.Petersburg, Russia	Research Scientist	Development of low-complexity video coding algorithms

Teaching experience

Period	Organization	Type	Course name
2019 – curr	ITMO University	Lectures, Seminars	Modern Information Theory
2017–2018	Technical University of Denmark	Lectures, Exercises	Data and Image Coding (part of the course Data coding and communication)
2014–2016	Tampere University of Technology, Tampere, Finland	Lectures, Exercises	Image Compression (part of the course Image and Video Processing Techniques)
2012	Tampere University of Technology, Tampere, Finland	Lectures, Seminars	Energy Efficient Scalable Multimedia Coding and Communication
2010–2011	State University of Aerospace Instrumentation, St.Petersburg, Russia	Lectures, Seminars	Image and Video Compression
2010–2011	State University of Aerospace Instrumentation, St.Petersburg, Russia	Seminars	Information Theory

Masters and Bachelors theses supervision

- V.Lapshina, Error-concealment for H.265/HEVC decoder, ITMO, 2021.
- E.Shubina, Human face generation from speech signal using neural networks, ITMO, 2021.
- A.Rossomakhina, Leakage detection in city heating systems based on infrared images, collected by UAV, ITMO, 2020.
- N.Zhevtyak, Neural network based video recovery from compressive sensed samples, ITMO, 2020.
- V.Zemzov, End-to-end latency minimization in UDP packet networks based on forward error correction, ITMO, 2019.
- S. Gera, Lossless image coding based on evolvable predictive coding, ITMO, 2019.
- O.Moreschini, Channel Resource Allocation For Multi-Camera Video Streaming In Vehicular Ad-Hoc Networks, TUT, 2016.
- O.Boldireva, Image Compression Based On Three-Dimensional Discrete Cosine Transform, SUAI, 2012.
- K.Kirs, Inter-Packet Forward Error Correction For Robust Audio Transmission, SUAI, 2012.

- A.Matrinyuk, Lossless Audio Compression Based On Discrete Wavelet Transform, SUAI, 2012.
- A.Tabako, Lossless Screen Video Data Compression, SUAI, 2012.
- P.Titkov, Video Data Compression Based On Three-Dimensional Discrete Cosine Transform and Motion Compensation, SUAI, 2012.
- E.Rachkovskaya, Development of Rate Control Algorithm For JPEG Standard, SUAI, 2011.
- Y.Potaka, Region Of Interest Coding In JPEG2000 Standard, SUAI, 2008.

Industrial work experience

Period	Organization	Position	Responsibilities
2020–2021	ITMO University & Huawei (St.Petersburg) joint research project	Head of the team from ITMO side	Imrovement of video coding system based on H.265/HEVC
2009–2011	JSC "Television and radio communication", St.Petersburg, Russia	Science consultant	Development of video compression algorithm based on 3-D DCT for video surveillance systems
2007–2010	Intel Corporation, Communication Technology Lab, St.Petersburg, Russia	Research Engineer	Development of rate control for low-memory H.264/AVC video codec (Wireless Display project)
2006–2007	Alarity Corporation, St.Petersburg, Russia	Software Engineer	Optimization of MPEG-2 encoder/decoder
2004–2006	XVD Corporation, St. Petersburg, Russia	Software Engineer	Development of motion estimation and arithmetic coding for MPEG4-like codec
2002–2004	JSC 'Techpribor', St. Petersburg, Russia	Software Engineer	Development of airborne equipment

Winning Awards/Grants

Period	Title	Source
2018-2021	Grant, Research in the field of video compression	ITMO Fellowship and Professorship Program (Project 5-100)
2019-2020	Grant, Research on a hardware oriented multi-alphabet arithmetic coding for future video compression	The National Natural Science Foundation of China
2013–2016	Exemplary Reviewer 2013, 2015, 2016	IEEE Communications Letters
2016-2017	Grant, Development of a hardware oriented highly efficient entropy coding techniques for image, video and data compression	The National Natural Science Foundation of China
2013	Finalist, Grand Video Compression Challenge	30th Picture Coding Symposium
2013	Grant, Development of a hardware oriented highly efficient wavelet-based image compression algorithms	The National Natural Science Foundation of China
2012-2014	Grant, Energy efficient joint source-channel video coding in heterogeneous networks	Tampere Doctoral Program in Information Science and Engineering (TISE), Finland
2011	Best paper award	The 11th International Conference on Next Generation Wired/Wireless Advanced Networking
2011	Demonstrating A Viable Wireless Display Solution	Intel Corporation Recognition Award
2011	Grant, Energy efficient video compression based on wavelet filtration and adaptive arithmetic coding	The National Natural Science Foundation of China
2008-2009	Grant, Development of energy efficient video compression algorithms for digital video broadcasting	Russian Foundation of support of small business in scientific and technical area

Keynote speaker

1. 7th International Workshop on Communication Technologies for Vehicles, Saint-Petersburg, Russia, 2014.

Books editorial

1. M.Jonsson, A.Vinel, B. Bellalta, E. Belyaev (Eds.), *7th International Workshop on Multiple Access Communications, Proceedings Series: Lecture Notes in Computer Science*, vol. 8715, XII, 138 p., 61 illus, 2014.

Journal papers

1. M.Georgiev, E.Belyaev, and A.Gotchev, A general framework for depth compression and multi-sensor fusion in asymmetric view-plus-depth 3D representation // *IEEE Access*, 2020.

2. Lin Yan, Kai Liu, Evgeny Belyaev, Revisiting Sparsity Invariant Convolution: A Network for Image Guided Depth Completion // *IEEE Access*, 2020.

3. Guang Li, Kai Liu, Chongyang Ding, Wenwen Ding, Evgeny Belyaev and Fei Cheng, A New Method for Mapping Active Joint Locations of Skeletons to preshape space for action recognition // *International Journal of Pattern Recognition and Artificial Intelligence*, 2020.

4. Chongyang Ding, Kai Liu, Fei Cheng, Evgeny Belyaev, Spatio-Temporal Attention on Manifold Space for 3D Human Action Recognition, *Applied Intelligence*, 2020.

5. Boyang Chen, Kai Liu and E.Belyaev, An Efficient Hardware Implementation of Multi-alphabet Adaptive Arithmetic Encoder Based on Generalized Virtual Sliding Window // *IEEE Transactions on Very Large Scale Integration Systems*, vol.28, iss.5, pp.1326-1330, 2020.

6. E.Belyaev, M.Codreanu, M.Juntti, and K.Egiazarian, Compressive Sensed Video Recovery via Iterative Thresholding with Random Transforms // *IET Image Processing*, vol.14, iss.6, pp.1187-1199, 2020.

7. Lin Yan , Kai Liu, E. Belyaev, Meiyu Duan, RTL3D: Real-time LIDAR-based 3D Object Detection with Sparse CNN // *IET Computer Vision*, 2020.

8. E.Belyaev and S.Førchhammer, An efficient storage of infrared video of drone inspections via iterative aerial map construction // *IEEE Signal Processing Letters*, vol.26, iss.8, pp.1157–1161, 2019.

9. E.Belyaev and S.Førchhammer, Low-complexity Open-loop Coding of IDR Infrared Images having JPEG compatibility // *Journal of Real-Time Image Processing*, 2019.

10. Kai Liu, Y.Li and E. Belyaev, A High Throughput JPEG2000 Entropy Decoding Unit Architecture // *Journal of Signal Processing Systems*, pp. 1–15, 2018.

11. W. Ding, Kai Liu, E. Belyaev, Fei Cheng, Tensor-based linear dynamical systems for action recognition from 3D skeletons //*Pattern Recognition*, vol.77, iss.7, pp.75–86, 2018.

12. E.Belyaev, S.Førchhammer, Kai Liu, An adaptive multi-alphabet arithmetic coding based on generalized virtual sliding window//*IEEE Signal Processing Letters*, vol.24, iss.7, pp.1034–1038, 2017.

13. E.Belyaev, S.Førchhammer, M.Codreanu, Error concealment for 3-D DWT based video codec using iterative thresholding //*IEEE Communications Letters*, vol.21, iss.8, pp.1731–1734, 2017.

14. E.Belyaev, K.Liu, M.Gabbouj, Y.Li, An efficient adaptive binary range coder and its VLSI architecture // *IEEE Transactions on Circuits and Systems for Video Technology*, vol.25, iss. 8, pp.1435 – 1446, 2015.

15. E.Belyaev, A.Vinel, A.Surak, M.Gabbouj, M.Jonnson, K.Egiazarian, Robust vehicle-to-infrastructure video transmission for road surveillance applications, // *IEEE Transactions on Vehicular Technology*, vol.64, iss.7, pp.2991 – 3003, 2015.

16. B.Bellalta, E.Belyaev, M.Jonsson, A.Vinel, Performance evaluation of IEEE 802.11p-enabled vehicular video surveillance system // *IEEE Communications Letters*, vol.18, no.4, 2014.

17. E.Belyaev, K.Egiazarian, M.Gabbouj and K.Liu, A Low-complexity joint source-channel video coding for 3-D DWT codec // *Journal of Communications*, vol.8, no.12, 2013.

18. E.Belyaev, K.Egiazarian and M.Gabbouj, A low-complexity bit-plane entropy coding and rate control for 3-D DWT based video coding // *IEEE Transactions on Multimedia*, vol.15, iss.8, pp.1786 – 1799, 2013.

19. E.Belyaev, A.Turlikov, K.Egiazarian and M.Gabbouj, An efficient adaptive binary arithmetic coder with low memory requirement // *IEEE Journal of Selected Topics in Signal Processing. Special Issue on Video Coding: HEVC and beyond*, vol.7, iss.6, pp.1053–1061, 2013.

20. E.Belyaev, P.Molchanov, A.Vinel and Y.Koucheryavy, The use of automotive radars in video-based overtaking assistance applications // *IEEE Transactions on Intelligent Transportation Systems*, vol.14, iss.3, pp.1035–1042, 2013.

21. E.Belyaev, A.Vinel, K.Egiazarian and Y.Koucheryavy, Power Control in See-Through Overtaking Assistance System // *IEEE Communications Letters*, vol.17, iss.3, pp.612–615, 2013.

22. A.Vinel, E.Belyaev, K.Egiazarian and Y.Koucheryavy, An overtaking assistance system based on joint beaconing and real-time video transmission // *IEEE Transactions on Vehicular Technology*, vol.61, iss.5, pp.2319–2329, 2012.

23. Kai Liu, E. Belyaev, Jie Guo, VLSI Architecture of Arithmetic Coder Used in SPIHT // *IEEE Transactions on Very Large Scale Integration Systems*, vol.20, iss.4, pp.697–710, 2012.

24. A.Ukhanova, E.Belyaev, Le Wang and S. Forchhammer, Power consumption analysis of constant bit rate video transmission over 3G networks // *Computer Communications*, vol.35, iss.14, pp.1695–1706, 2012.

Conferences

1. C. Ding, K. Liu, J. Korhonen, E. Belyaev, Spatio-Temporal Difference Descriptor for Skeleton-Based Action Recognition // *AAAI Conference on Artificial Intelligence*, (35)2, 1227-1235, 2021.

2. E.Belyaev, Compressive Sensed Video Coding having JPEG compatibility // *IEEE International Conference on Image Processing (ICIP)*, 2020.

3. E.Belyaev, Fast Recovery of Compressive Sensed Images via Multiple Thresholding Operators // 26th IEEE Conference of Open Innovations Association FRUCT, 2020.

4. E.Belyaev and S.Førchhammer, Drone Infrared Video Coding Using Virtual View Generated from Iteratively Constructed Aerial Map and Historical Data // *EUSIPCO 2019: Signal Processing, Computer Vision and Deep Learning for Autonomous Systems*, 2019.

5. E.Belyaev and S.Førchhammer, Drone HDR Infrared Video Coding via Aerial Map Prediction // *IEEE International Conference on Image Processing* (ICIP), 2018.

6. E.Belyaev, C.Mantel, and S.Førchhammer, Low-complexity Compression of High Dynamic Range Infrared Images with JPEG compatibility //*IEEE Visual Communications and Image Processing (VCIP)*, 2017.

7. E.Belyaev, C.Mantel, and S.Førchhammer, High bit depth infrared image compression via low bit depth codecs //*SPIE Optical Engineering + Applications, Infrared Remote Sensing and Instrumentation XXV*, 2017.

8. E.Belyaev, S.Moreschini, A.Vinel, Uncoordinated Multi-user Video Streaming in VANETs using Skype //*IEEE International Workshop on Computer Aided Modeling and Design of Communication Links and Networks*, 2017.

9. U.Wijewardhana, E.Belyaev, M.Codreanu and M.Latva-aho, Signal Recovery in Compressive Sensing via Multiple Sparsifying Bases //*Data Compression Conference*, 2017.

10. M.Georgiev, E. Belyaev, A.Gotchev, Depth map compression using color-driven isotropic segmentation and regularised reconstruction //*Data Compression Conference*, 2015.

11. E. Belyaev, A.Vinel, Target packet loss selection for inter-packet loss protection for video streaming over VANETs // *2014 IEEE ehicular Networking Conference*, 2014.

12. E. Belyaev, Adaptive Window Size Selection for Efficient Probability Estimation in Binary Range Coder of the 3-D DWT Video Codec // *7th International Workshop on Multiple Access Communications*, 2014.

13. E.Belyaev, A.Vinel, M.Jonsson, and K.Sjoberg, Live Video Streaming in IEEE 802.11p Vehicular Networks: Demonstration of an Automotive Surveillance Application // *IEEE International Conference on Computer Communications*, 2014.

14. A.Vinel, E.Belyaev, B.Bellalta, and H.Hu, Live Video Streaming in Vehicular Networks // *6th International Workshop on Communication Technologies for Vehicles*, 2014.

15. E.Belyaev, M.Georgiev, K.Egiazarian, and M.Gabbouj, A combined DCT/DWT asymmetric multi-view video coding for real-time applications // *Eighth International Workshop on Video Processing and Quality Metrics for Consumer Electronics*, 2014.

16. E.Belyaev, K.Egiazarian and M.Gabbouj, A real-time simulcast multi-view wavelet video coding based on skipping of spatial subbands // *8th International Symposium on Image and Signal Processing and Analysis*, 2013.

17. A. Vinel, E.Belyaev, O.Lamotte, M.Gabbouj, K.Egiazarian and Y.Koucheryavy, Video transmission over IEEE 802.11p: real-world measurements // *2013 IEEE International Conference on Communications*, 2013.

18. A. Vinel, E.Belyaev and Y.Koucheryavy, Using of beaconing for robust video transmission in overtaking assistance applications // *2012 IEEE Vehicular Technology Conference*, 2012.

19. E.Belyaev, K.Egiazarian and M.Gabbouj, Low complexity bit-plane entropy coding for 3-D DWT based video compression // *The International Symposium on SPIE Electronic Imaging*, 2012.

20. E.Belyaev, A.Turlikov, K.Egiazarian and M.Gabbouj, An efficient multiplication-free and look-up table-free adaptive binary arithmetic coder // *2012 IEEE International Conference on Image Processing*, 2012.

21. E.Belyaev, A.Veselov, A.Turlikov and Kai Liu, Complexity analysis of adaptive binary arithmetic coding software implementations // *The 11th International Conference on Next Generation Wired/Wireless Advanced Networking*, 2011.

22. J. Fu, E. Belyaev and K. Egiazarian, Rate-distortion oriented joint video pre-filtering and compression // *10th Finnish-Russian University Cooperation in Telecommunications Conference*, 2011.

23. L.Wang, A.Ukhanova and E.Belyaev, Power consumption analysis of constant bit rate data transmission over 3G mobile wireless networks // *11th International Conference on Telecommunications for Intelligent Transport Systems*, 2011.

24. E. Belyaev, A.Turlikov, A. Ukhanova, Low-latency video transmission over high-speed WPANs based on low-power compression // *IEEE Wireless Communications & Networking Conference*, 2010.

25. A.Ukhanova, E.Belyaev, Soren Forchhammer, Encoder power consumption comparison of Distributed Video Codec and H.264/AVC in low-complexity mode // *The 18th International Conference on Software, Telecommunications and Computer Networks*, 2010.

26. K.Liu, Y.Li, Eugeniy Belyaev, A Novel VLSI Architecture of Arithmetic Encoder with Reduced Memory in SPIHT // *The International Symposium on SPIE Optical Engineering + Applications, part of SPIE Optics and Photonics*, 2010.

27. E.Belyaev, Low bit rate video coding based on three-dimensional discrete pseudo cosine transform // *International Conference on Ultra Modern Telecommunications*, 2010.

28. E.Belyaev, T.Sukhov and K.Liu, Scalable video coding based on three-dimensional discrete pseudo cosine transform // *The 10th International Conference on Next Generation Wired/Wireless Advanced Networking*, 2010.

29. X. Huang, A. Ukhanova, E. Belyaev, S. Forchhammer, Temporal scalability comparison of the H.264/SVC and Distributed Video Codec // *International Conference on Ultra Modern Telecommunications*, 2009.

30. E. Belyaev, A. Dogadaev and A. Ukhanova, MINMAX Rate control in near-lossless video encoders for real-time data transmission // *XII International Symposium on Problems of Redundancy in Information and Control Systems, St.-Petersburg*, Russia, 2009.

31. A. Belogolovy, E. Belyaev, A. Sergeev and A. Turlikov, Video Compression for Wireless Transmission: Reducing the Power Consumption of the WPAN Hi-speed Systems // *The 9th International Conference on Next Generation Wired/Wireless Advanced Networking*, 2009.

32. E. Belyaev, V. Grinko and A. Ukhanova, Power saving control for the mobile DVB-H receivers based on H.264/SVC standard // *8-th Wireless Telecommunication Symposium*, 2009.

33. E. Belyaev, T. Koski, J. Paavola, A. Turlikov and A. Ukhanova. Adaptive power saving on the receiver side in digital video broadcasting systems based on progressive video codecs // *The 11th International Symposium on Wireless Personal Multimedia Communications*, 2008.

34. E. Belyaev, A. Turlikov and A. Ukhanova. Rate-control algorithms testing by using video source model // *The 15-th International Conference on Communications*, St.-Petersburg, Russia, 2008.

35. E. Belyaev, A. Turlikov and A. Ukhanova, Rate-distortion control in wavelet-based video compression systems with memory restriction // *XI International Symposium on Problems of Redundancy in Information and Control Systems*, 2007.

36. E. Belyaev, M. Gilmutdinov and A. Turlikov, Binary Arithmetic Coding System with Adaptive Probability Estimation by 'Virtual Sliding Window' // *Proc. of the 10th IEEE International Symposium on Consumer Electronics*, St.-Petersburg, Russia, pp. 194–198, 2006.

Journal papers (in Russian)

1. T.Sukhov, S.Strakhov, L.Kochin, E.Belyaev, Application and implementationa of the principle of constant color luminance in digital video coding systems // *SPIIRAS Proceedings*, vol.5, iss. 54, pp. 84–105, 2017.
2. T. Sukhov, E. Belyaev, Using of the principle of constant color brightness for video data representation // *Instrumentation*, vol. 1, pp. 55–59, 2011.
3. E. Belyaev, T. Sukhov, N. Shostacki, Video compression based on three-dimensional discrete pseudo cosine transform for surveillance systems // *Computer optics*, vol. 34, Iss.2, pp. 260–272, 2010.
4. E. Belyaev, A. Turlikov, Motion esimation algorithms for low bit-rate video compression // *Computer optics*, vol. 32, Iss.3, pp. 69–76, 2008.
5. E. Belyaev, A. Turlikov, Adaptive binary arithmetic coding for video compression // *Digital Signal Processing*, Vol.3, pp. 20–24, 2007.
6. E. Belyaev, A. Turlikov, A. Ukhanova, Adaptive arithmetic coding in JPEG2000 standard // *Information-control systems*, vol.6(31), pp. 28–33, 2007.
7. E. Belyaev, A. Turlikov, Rate-distortion control in video compression systems with memory restriction on transmitter and receiver sides // *Computer optics*, vol. 31, iss.2, pp. 69–76, 2007.

Teaching materials (in Russian)

1. E. Belyaev, S.Osipov, A. Turlikov, Information theory. Entropy encoding of discrete sources, SUAI, 2011.
2. E. Belyaev, S.Osipov, A. Turlikov, Information theory. Error-correcting coding of discrete messages, SUAI, 2011.

Patents

1. V. Chernyshev, A. Efimov, E. Belyaev, M. Tsvetkov, Wireless display encoder architecture, WO2011078721, 2011.
2. M. Tsvetkov, A. Efimov, E. Belyaev, Displaying decompressed pictures on liquid crystal displays in macroblock raster scan order, WO2011065859, 2011.
3. E. Belyaev, A. Turlikov, Method and apparatus for image quality control in video data, *United States Patent Application* 20090086813, 2009.
4. E. Belyaev, Video compression and transmission system with transmitter side memory restriction, *United States Patent Application* 20090161751, 2009.
5. N.Ageeva, E.Belyaev, S. Dvornikov, I. Okov, T. Sukhov, A. Ustinov, V. Tsvetkov, Video encoding and decoding method based on three-dimensional discrete cosine transform, RU 2557449C1, 2015.