

Ross Cutler

I. CONTACT

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II. EDUCATION

<i>Ph.D. Computer Science</i> University of Maryland, College Park, Maryland	2000
<i>M.S. Computer Science</i> University of Maryland, College Park, Maryland	1996
<i>B.S. Computer Science, Physics, Mathematics</i> University of Maryland, College Park, Maryland	1992

III. PROFESSIONAL EXPERIENCE

Microsoft Corp.

Partner Applied Scientist 2014 – Present

- I manage IC3-AI, a team of applied scientists and engineers in the Intelligent Conversation and Communications Cloud (IC3) division of Office. IC3 develops the core infrastructure technology for Teams and Skype that makes calling and messaging possible. We focus on applying ML to improve Teams/Skype calling quality/reliability and create new user experiences. My team's technology is used by 100's of millions of users. Products shipped include: Teams, Skype.

Principal Architect 2005 - 2014

- Audio/video architect in Skype/Lync. My key focus is improving AV call quality on Skype/Lync and I lead a team of data scientists and machine learning scientists to help do that. I also lead the AV certification team, which helps make devices work great with Skype/Lync. Products shipped include: Lync, Skype, Microsoft RoundTable, Video Kinect, Polycom CX300.

System Architect 2003 - 2005

- I started an incubation group to productize the RoundTable from MSR research. Responsible for writing business plan, fundraising, camera design, video processing design, acoustic design, active speaker detection, audio quality, industrial design. Also responsible for RoundTable IP strategy and filed over 30 patents related to RoundTable.

Researcher 2000 - 2003

- In Microsoft Research I developed new technologies (hardware and software) to help people communicate (meeting room recording, teleconferencing). Started RingCam project which led to the RoundTable product. Areas of research include omnidirectional video, camera calibration, sound source localization, and event detection.

Johns Hopkins University, Baltimore, Maryland

Research Staff 1988 - 2000

- Developed data acquisition, analysis, and experiment control applications for single/multi-neuron recording in animals and humans (laboratory and operating room). Used for research and treatment of pain, Alzheimer's, and Parkinson's disease.

IV. REFEREED JOURNAL PAPERS

- 1) C. Zhang, P. Yin, Y. Rui, R. Cutler, P. Viola, X. Sun, N. Pinto, and Z. Zhang, "Boosting-based multimodal speaker detection for distributed meeting videos," *IEEE Transactions on Multimedia*, vol. 10, no. 8, pp. 1541–1552, 2008
- 2) Z. Liu, M. Cohen, D. Bhatnagar, R. Cutler, and Z. Zhang, "Head-size equalization for improved visual perception in video conferencing," *IEEE Transactions on Multimedia*, vol. 9, no. 7, pp. 1520–1527, 2007
- 3) C. BenAbdelkader, R. G. Cutler, and L. S. Davis, "Gait recognition using image self-similarity," *EURASIP Journal on Advances in Signal Processing*, vol. 2004, no. 4, pp. 1–14, 2004

- 4) I. Haritaoglu, R. Cutler, D. Harwood, and L. S. Davis, “Backpack: Detection of people carrying objects using silhouettes,” *Computer Vision and Image Understanding*, vol. 81, no. 3, pp. 385–397, 2001
- 5) R. Cutler and L. S. Davis, “Robust real-time periodic motion detection, analysis, and applications,” *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 22, no. 8, pp. 781–796, 2000

V. REFEREED CONFERENCE PAPERS

- 1) S.-W. Fu, Y. Fan, Y. Hosseinkashi, J. Gupchup, and R. Cutler, “Improving meeting inclusiveness using speech interruption analysis,” in *ACM Multimedia*, 2022
- 2) C. K. Reddy, V. Gopal, H. Dubey, S. Matuskevych, R. Cutler, and R. Aichner, “Musicnet: Compact convolutional neural network for real-time background music detection,” in *INTERSPEECH*, 2022
- 3) P. Panda, M. J. Nicholas, M. Gonzalez-Franco, K. Inkpen, E. Ofek, R. Cutler, K. Hinckley, and J. Lanier, “Alltogether: Effect of avatars in mixed-modality conferencing environments,” in *2022 Symposium on Human-Computer Interaction for Work*, pp. 1–10, 2022
- 4) G. Yi, W. Xiao, Y. Xiao, B. Naderi, S. Möller, G. Mittag, R. Cutler, Z. Zhang, D. S. Williamson, F. Chen, F. Yang, and S. Shang, “Non-intrusive Objective Speech Quality Assessment (NISQA) Challenge for Online Conferencing Applications,” in *INTERSPEECH*, 2022
- 5) L. Diener, S. Sootla, A. Saabas, S. Branets, and R. Cutler, “INTERSPEECH 2022 Audio Deep Packet Loss Concealment Challenge,” in *INTERSPEECH*, 2022
- 6) R. Cutler, A. Saabas, T. Parnamaa, M. Purin, H. Gamper, S. Braun, K. Sørensen, and R. Aichner, “ICASSP 2022 Acoustic Echo Cancellation Challenge,” in *ICASSP*, 2022
- 7) H. Dubey, V. Gopal, R. Cutler, S. Matuskevych, S. Braun, S. E. Eskimez, M. Thakker, T. Yoshioka, H. Gamper, and A. Robert, “ICASSP 2022 Deep Noise Suppression Challenge,” in *ICASSP*, 2022
- 8) M. Purin, S. Sootla, M. Sponza, A. Saabas, and R. Cutler, “Aecmos: A speech quality assessment metric for echo impairment,” in *ICASSP*, 2022
- 9) C. K. Reddy, V. Gopal, and R. Cutler, “DNSMOS P.835: A non-intrusive perceptual objective speech quality metric to evaluate noise suppressors,” in *ICASSP*, 2022
- 10) R. Cutler, A. Saabas, T. Parnamaa, M. Loide, S. Sootla, M. Purin, H. Gamper, S. Braun, K. Sorensen, R. Aichner, *et al.*, “INTERSPEECH 2021 acoustic echo cancellation challenge,” in *INTERSPEECH*, 2021
- 11) B. Naderi and R. Cutler, “Subjective evaluation of noise suppression algorithms in crowdsourcing,” in *INTERSPEECH*, 2021
- 12) R. Cutler, Y. Hosseinkashi, J. Pool, S. Filipi, R. Aichner, Y. Tu, and J. Gehrke, “Meeting effectiveness and inclusiveness in remote collaboration,” in *Proceedings of the ACM on Human-Computer Interaction*, vol. 5, pp. 1–29, ACM New York, NY, USA, 2021
- 13) B. Naderi, S. Möller, and R. Cutler, “Speech quality assessment in crowdsourcing: Comparison category rating method,” in *QoMEX*, 2021
- 14) C. K. Reddy, H. Dubey, V. Gopal, R. Cutler, S. Braun, H. Gamper, R. Aichner, and S. Srinivasan, “ICASSP 2021 deep noise suppression challenge,” in *ICASSP 2021-2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 6623–6627, IEEE, 2021
- 15) R. Cutler, B. Naderi, M. Loide, S. Sootla, and A. Saabas, “Crowdsourcing approach for subjective evaluation of echo impairment,” in *ICASSP 2021-2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 406–410, IEEE, 2021
- 16) C. K. Reddy, V. Gopal, and R. Cutler, “DNSMOS: A non-intrusive perceptual objective speech quality metric to evaluate noise suppressors,” in *ICASSP 2021-2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 6493–6497, IEEE, 2021
- 17) K. Sridhar, R. Cutler, A. Saabas, T. Parnamaa, M. Loide, H. Gamper, S. Braun, R. Aichner, and S. Srinivasan, “Icassp 2021 acoustic echo cancellation challenge: Datasets, testing framework, and results,” in *ICASSP 2021-2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 151–155, IEEE, 2021
- 18) C. K. Reddy, H. Dubey, K. Koishida, A. Nair, V. Gopal, R. Cutler, S. Braun, H. Gamper, R. Aichner, and S. Srinivasan, “INTERSPEECH 2021 deep noise suppression challenge,” in *INTERSPEECH*, 2021
- 19) C. K. Reddy, V. Gopal, R. Cutler, E. Beyrami, R. Cheng, H. Dubey, S. Matuskevych, R. Aichner, A. Aazami, S. Braun, *et al.*, “The INTERSPEECH 2020 deep noise suppression challenge: Datasets, subjective testing framework, and challenge results,” in *INTERSPEECH*, 2020
- 20) Y. Xia, S. Braun, C. K. Reddy, H. Dubey, R. Cutler, and I. Tashev, “Weighted speech distortion losses for neural-network-based real-time speech enhancement,” in *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 871–875, IEEE, 2020
- 21) R. Cutler, R. Mehran, S. Johnson, C. Zhang, A. Kirk, O. Whyte, and A. Kowdle, “Multimodal active speaker detection and virtual cinematography for video conferencing,” in *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 4527–4531, IEEE, 2020

- 22) B. Naderi and R. Cutler, "An open source implementation of ITU-T recommendation P.808 with validation," in *INTER-SPEECH*, 2020
- 23) J. Pool, E. Beyrami, V. Gopal, A. Aazami, J. Gupchup, J. Rowland, B. Li, P. Kanani, R. Cutler, and J. Gehrke, "Lumos: A library for diagnosing metric regressions in web-scale applications," in *Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining (KDD)*, pp. 2562–2570, 2020
- 24) G. Mittag, R. Cutler, Y. Hosseinkashi, M. Revow, S. Srinivasan, N. Chande, and R. Aichner, "DNN No-Reference PSTN Speech Quality Prediction," in *ICASSP*, 2020
- 25) C. K. Reddy, R. Cutler, and J. Gehrke, "Supervised classifiers for audio impairments with noisy labels," in *INTERSPEECH*, 2020
- 26) C. K. Reddy, E. Beyrami, J. Pool, R. Cutler, S. Srinivasan, and J. Gehrke, "A scalable noisy speech dataset and online subjective test framework," in *INTERSPEECH*, 2020
- 27) A. R. Avila, H. Gamper, C. Reddy, R. Cutler, I. Tashev, and J. Gehrke, "Non-intrusive speech quality assessment using neural networks," in *ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 631–635, IEEE, 2019
- 28) J. Gupchup, E. Beyrami, M. Ellis, Y. Hosseinkashi, S. Johnson, and R. Cutler, "On design of problem token questions in quality of experience surveys," in *2018 Tenth International Conference on Quality of Multimedia Experience (QoMEX)*, pp. 1–3, IEEE, 2018
- 29) J. Gupchup, Y. Hosseinkashi, P. Dmitriev, D. Schneider, R. Cutler, A. Jefremov, and M. Ellis, "Trustworthy experimentation under telemetry loss," in *Proceedings of the 27th ACM International Conference on Information and Knowledge Management (CIKM)*, pp. 387–396, 2018
- 30) J. Gupchup, Y. Hosseinkashi, M. Ellis, S. Johnson, and R. Cutler, "Analysis of problem tokens to rank factors impacting quality in voip applications," in *2017 Ninth International Conference on Quality of Multimedia Experience (QoMEX)*, pp. 1–6, IEEE, 2017
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- 32) H. S. Malvar, L.-w. He, and R. Cutler, "High-quality linear interpolation for demosaicing of bayer-patterned color images," in *2004 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, vol. 3, pp. iii–485, IEEE, 2004
- 33) R. Cutler, "The distributed meetings system," in *2003 IEEE International Conference on Acoustics, Speech, and Signal Processing, 2003. Proceedings.(ICASSP'03).*, vol. 4, pp. IV–756, IEEE, 2003
- 34) R. Cutler, Y. Rui, A. Gupta, J. J. Cadiz, I. Tashev, L.-w. He, A. Colburn, Z. Zhang, Z. Liu, and S. Silverberg, "Distributed meetings: A meeting capture and broadcasting system," in *Proceedings of the Tenth ACM International Conference on Multimedia (ACM MM)*, pp. 503–512, 2002
- 35) C. BenAbdelkader, R. Cutler, and L. Davis, "Motion-based recognition of people in eigengait space," in *Proceedings of Fifth IEEE International Conference on Automatic Face Gesture Recognition*, pp. 267–272, IEEE, 2002
- 36) C. BenAbdelkader, R. Cutler, and L. Davis, "Stride and cadence as a biometric in automatic person identification and verification," in *Proceedings of Fifth IEEE International Conference on Automatic Face Gesture Recognition*, pp. 372–377, IEEE, 2002
- 37) C. BenAbdelkader, R. Cutler, and L. Davis, "Person identification using automatic height and stride estimation," in *Object Recognition Supported by User Interaction for Service Robots*, vol. 4, pp. 377–380, IEEE, 2002
- 38) C. BenAbdelkader, R. Cutler, and L. Davis, "Motion-based recognition of people using image self-similarity," in *Proceedings of the 5th IEEE International Conference on Automatic Face and Gesture Recognition*, pp. 254–259, 2002
- 39) C. BenAbdelkader, R. Cutler, H. Nanda, and L. Davis, "Eigengait: Motion-based recognition of people using image self-similarity," in *International Conference on Audio and Video-based Biometric Person Authentication*, pp. 284–294, Springer, Berlin, Heidelberg, 2001
- 40) R. Cutler and L. Davis, "Robust periodic motion and motion symmetry detection," in *Proceedings IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, vol. 2, pp. 615–622, IEEE, 2000
- 41) R. Cutler and L. Davis, "Look who's talking: Speaker detection using video and audio correlation," in *2000 IEEE International Conference on Multimedia and Expo (ICME)*, vol. 3, pp. 1589–1592, IEEE, 2000
- 42) R. Cutler and L. Davis, "Real-time periodic motion detection, analysis, and applications," in *Proceedings. 1999 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR)*, vol. 2, pp. 326–332, IEEE, 1999
- 43) I. Haritaoglu, R. Cutler, D. Harwood, and L. S. Davis, "Backpack: Detection of people carrying objects using silhouettes," in *Proceedings of the Seventh IEEE International Conference on Computer Vision (ICCV)*, vol. 1, pp. 102–102, IEEE Computer Society, 1999
- 44) R. Cutler and L. Davis, "View-based detection and analysis of periodic motion," in *Proceedings. Fourteenth International Conference on Pattern Recognition (ICPR)*, vol. 1, pp. 495–500, IEEE, 1998
- 45) R. Cutler and M. Turk, "View-based interpretation of real-time optical flow for gesture recognition," in *Proceedings Third IEEE International Conference on Automatic Face and Gesture Recognition*, pp. 416–421, IEEE, 1998

VI. WORKSHOP PAPERS

- 1) J. Chee, S. Braun, V. Gopal, and R. Cutler, "Performance optimizations on u-net speech enhancement models," in *IEEE MMSP*, 2022
- 2) G. Toderici, R. Timofte, J. Ballé, E. Agustsson, N. Johnston, F. Mentzer, Z. Sinno, A. Norkin, K. Rapaka, E. Noury, R. Cutler, and L. Versari, "CVPR Challenge on Learned Image Compression," in *CVPR Challenge on Learned Image Compression*, 2022
- 3) J. Gupchup, A. Aazami, Y. Fan, S. Filipi, T. Finley, S. Inglis, M. Asteborg, L. Carroll, R. Chari, M. Cozowicz, *et al.*, "Resonance: Replacing software constants with context-aware models in real-time communication," in *Machine Learning for Systems, NeurIPS*, 2020
- 4) H. Gamper, C. K. Reddy, R. Cutler, I. J. Tashev, and J. Gehrke, "Intrusive and non-intrusive perceptual speech quality assessment using a convolutional neural network," in *2019 IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, pp. 85–89, IEEE, 2019
- 5) J. Fang, M. Ellis, B. Li, S. Liu, Y. Hosseinkashi, M. Revow, A. Sadovnikov, Z. Liu, P. Cheng, S. Ashok, *et al.*, "Reinforcement learning for bandwidth estimation and congestion control in real-time communications," in *Machine Learning for Systems, NeurIPS*, 2019
- 6) A. Mondal, R. Cutler, C. Huang, J. Li, and A. Kuzmanovic, "Surecall: Towards glitch-free real-time audio/video conferencing," in *2010 IEEE 18th International Workshop on Quality of Service (IWQoS)*, pp. 1–9, IEEE, 2010
- 7) C. Zhang, P. Yin, Y. Rui, R. Cutler, and P. Viola, "Boosting-based multimodal speaker detection for distributed meetings," in *2006 IEEE Workshop on Multimedia Signal Processing*, pp. 86–91, IEEE, 2006
- 8) S. Leorin, L. Lucchese, and R. G. Cutler, "Quality assessment of panorama video for videoconferencing applications," in *2005 IEEE 7th Workshop on Multimedia Signal Processing*, pp. 1–4, IEEE, 2005
- 9) C. BenAbdelkader, R. Cutler, and L. Davis, "View-invariant estimation of height and stride for gait recognition," in *International Workshop on Biometric Authentication*, pp. 155–167, Springer, Berlin, Heidelberg, 2002
- 10) H. Nanda and R. Cutler, "Practical calibrations for a real-time digital omnidirectional camera," in *CVPR Technical Sketch*, vol. 20, 2001
- 11) R. Cutler, C. S. Shekhar, B. Burns, R. Chellappa, R. C. Bolles, and L. S. Davis, "Monitoring human and vehicle activities using airborne video," in *28th AIPR Workshop: 3D Visualization for Data Exploration and Decision Making*, vol. 3905, pp. 146–153, International Society for Optics and Photonics, 2000
- 12) L. Davis, E. Borovikov, R. Cutler, D. Harwood, and T. Horprasert, "Multi-perspective analysis of human action," in *In Third Int. Workshop on Cooperative Distributed Vision*, 2000, 2000
- 13) R. Cutler and L. Davis, "Developing real-time computer vision applications for intel pentium iii based windows nt workstations," in *Workstations, FRAME-RATE: Frame-rate Applications, Methods and Experiences with Regularly Available Technology and Equipment, in conjunction with IEEE International Conference on Computer Vision (ICCV)*, 1999
- 14) R. Cutler and L. Davis, "View-based detection and analysis of periodic motion," in *DARPA Image Understanding Workshop*, 1998
- 15) L. Davis, R. Chelappa, A. Rosenfeld, D. Harwood, I. Haritaoglu, and R. Cutler, "Visual surveillance and monitoring," in *DARPA Image Understanding Workshop*, 1998
- 16) R. Cutler and L. Davis, "Qualitative analysis of human actions," in *DARPA Image Understanding Workshop*, 1997

VII. ARXIV

- 1) X. Gitiaux, A. Khant, C. Reddy, J. Gupchup, and R. Cutler, "Aura: Privacy-preserving augmentation to improve test set diversity in noise suppression applications," 2022

VIII. THESES

- 1) R. G. Cutler, *On the detection and analysis of oscillatory motions in video sequences*. PhD thesis, University of Maryland, College Park, 2000

IX. POSTERS AND TECHNICAL REPORTS

- 1) R. G. Cutler, R. Duraiswami, J. H. Qian, L. S. Davis, *et al.*, "Design and implementation of the University of Maryland Keck Laboratory for the analysis of visual movement," tech. rep., 2002
- 2) R. G. Cutler, "Face recognition using infrared images and eigenfaces," tech. rep., 1996

X. BOOK CHAPTERS

- 1) R. Cutler and K. S. Candan, "Multimedia authoring systems," in *Multimedia Database Systems*, pp. 279–296, Springer, Berlin, Heidelberg, 1996

XI. INDUSTRY PUBLICATIONS

- 1) R. G. Cutler and et. al, "Microsoft Teams and Skype for Business specifications for USB peripherals, PCs, and Microsoft Teams Room systems, versions 1-3." <https://docs.microsoft.com/en-us/skypeforbusiness/certification/test-spec>, 2016
- 2) R. G. Cutler and et. al, "Microsoft Lync Specifications for USB peripherals, PCs, and Lync room systems, versions A-F." <https://docs.microsoft.com/en-us/skypeforbusiness/certification/test-spec>, 2011

XII. INVITED TALKS

- 1) IEEE IEMCON Keynote 2022: Developing Machine Learning-Based Speech Enhancement Models for Teams and Skype
- 2) RTC @ Scale 2022: Developing Machine Learning-Based Speech Enhancement Models for Teams and Skype
- 3) Intel Speech Conference 2021: Developing Machine Learning-Based Speech Enhancement Models for Teams and Skype
- 4) INTERNOISE Keynote 2021: Developing Machine Learning-Based Speech Enhancement Models for Teams and Skype

XIII. PATENTS

- 1) F. Joyce, R. Cutler, E. Martin, Z. David, and D. Thang, "Reinforcement learning in real-time communications," June 28 2022. US Patent 11,373,108
- 2) R. G. Cutler, "Panoramic camera system," June 7 2022. US Patent 11,356,586
- 3) R. G. Cutler, "Dynamic detection and correction of light field camera array miscalibration," Aug. 8 2022. US Patent 11,270,464
- 4) R. G. Cutler, "Systems and methods for input interfaces promoting obfuscation of user navigation and selections," Dec. 28 2021. US Patent 11,209,979
- 5) E. Martin, J. Fang, J. H. Cho, and R. G. Cutler, "Service issue prioritisation based on impact using software telemetry," Nov. 23 2021. US Patent 11,184,218
- 6) R. G. Cutler, "Systems and methods for obfuscating user selections," Oct. 12 2021. US Patent 11,144,132
- 7) R. G. Cutler, "Systems and methods of selection acknowledgement for interfaces promoting obfuscation of user operations," Sept. 28 2021. US Patent 11,132,069
- 8) R. G. Cutler, "Systems and methods for identifying user-operated features of input interfaces obfuscating user navigation," Sept. 7 2021. US Patent 11,112,881
- 9) R. G. Cutler, "Telepresence devices operation methods," Aug. 10 2021. US Patent 11,089,265
- 10) R. G. Cutler, "Systems and methods for obfuscating user navigation and selections directed by free-form input," Aug. 10 2021. US Patent 11,086,514
- 11) R. G. Cutler, "Light field camera modules and light field camera module arrays," Aug. 3 2021. US Patent 11,082,659
- 12) R. G. Cutler, "Device pose detection and pose-related image capture and processing for light field based telepresence communications," June 13 2021. US Patent 11,064,154
- 13) S. K. Velayutham, A. Ghanaie-Sichanie, and R. G. Cutler, "Content feature based video stream subscriptions," May 18 2021. US Patent 11,012,249
- 14) R. G. Cutler and A. Kelloniemi, "Videoconferencing device and method," Mar. 16 2021. US Patent 10,951,859
- 15) R. G. Cutler, S. Srinivasan, R. Mehran, K. D. Sequeira, J. A. Gupchup, and S. K. Velayutham, "Artificially generated speech for a communication session," Feb. 23 2021. US Patent 10,930,262
- 16) M. Ellis and R. Cutler, "Network problem node identification using traceroute aggregation," Dec. 1 2020. US Patent 10,855,740
- 17) R. Cutler and R. Mehran, "Privacy image generation," Sept. 29 2020. US Patent 10,789,685
- 18) A. P. Kelloniemi, R. G. Cutler, S. Malladi, and T. A. Raussi, "Method and system of varying mechanical vibrations at a microphone," Feb. 25 2020. US Patent 10,575,110
- 19) A. P. Kelloniemi, R. G. Cutler, S. Malladi, and T. A. Raussi, "Method and system of varying mechanical vibrations at a microphone," June 2 2020. US Patent 10,674,295
- 20) R. G. Cutler, "Telepresence device," Feb. 4 2020. US Patent 10,554,928
- 21) A. Tandon, R. Aichner, R. Cutler, and S. Velayutham, "Video display modification for video environments," Jan. 7 2020. US Patent 10,531,046
- 22) R. G. Cutler, A. P. Sinclair, J. A. Kauffman, and A. Krantz, "Enhanced discovery for ad-hoc meetings," Oct. 1 2019. US Patent 10,432,676
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- 25) R. Cutler and R. Mehran, "Privacy image generation system," Jan. 15 2019. US Patent 10,181,178
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- 29) A. Tandon, R. Aichner, R. Cutler, and S. Velayutham, "Video display modification for video conferencing environments," Jan. 23 2018. US Patent 9,876,988
- 30) A. Tandon, W. Verthein, S. Velayutham, and R. Cutler, "Collaboration environments and views," Nov. 7 2017. US Patent 9,813,255
- 31) R. Cutler and R. Mehran, "Privacy camera," Aug. 8 2017. US Patent 9,729,824
- 32) O. A. Whyte, R. Cutler, A. Bhattacharjee, A. P. M. Kowdle, A. Kirk, S. T. Birchfield, and C. Zhang, "Active speaker location detection," Apr. 11 2017. US Patent 9,621,795
- 33) R. G. Cutler, A. P. Sinclair, J. A. Kauffman, and A. Krantz, "Enhanced discovery for ad-hoc meetings," Mar. 28 2017. US Patent 9,609,066
- 34) R. G. Cutler, "Boundary binaural microphone array," Dec. 6 2016. US Patent 9,516,417
- 35) S. C. Forbes, R. Cutler, T. M. Moore, J. T. Buch, and A. J. Bawcutt, "Virtual contact identifier," Jan. 19 2016. US Patent 9,241,078
- 36) R. Cutler and R. Mehran, "Privacy camera," Sept. 1 2015. US Patent 9,124,762
- 37) R. G. Cutler, "Satellite microphones for improved speaker detection and zoom," June 30 2015. US Patent 9,071,895
- 38) J. Watson, S. Leorin, and R. G. Cutler, "Automatic video framing," July 8 2014. US Patent 8,773,499
- 39) R. G. Cutler, "Capture device movement compensation for speaker indexing," June 10 2014. US Patent 8,749,650
- 40) R. Cutler, "Removing near-end frequencies from far-end sound," June 3 2014. US Patent 8,744,069
- 41) R. G. Cutler, "Satellite microphone array for video conferencing," May 6 2014. US Patent 8,717,402
- 42) R. G. Cutler, "Mute control in audio endpoints," Dec. 31 2013. US Patent 8,620,653
- 43) R. G. Cutler, "Techniques for detecting a display device," Dec. 24 2013. US Patent 8,614,734
- 44) R. G. Cutler, "Microphone array for a camera speakerphone," Sept. 3 2013. US Patent 8,526,632
- 45) C. Zhang, P. A. Viola, P. Yin, R. G. Cutler, X. Sun, and Y. Rui, "Identification of people using multiple types of input," Aug. 13 2013. US Patent 8,510,110
- 46) R. G. Cutler, "Endpoint echo detection," July 16 2013. US Patent 8,488,745
- 47) R. Cutler, "Reducing echo," Apr. 30 2013. US Patent 8,433,061
- 48) R. G. Cutler, "Eye gaze reduction," Apr. 30 2013. US Patent 8,432,432
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