

Dr. Iain Matthews

BEng(Hons), PhD, MIET

Personal Details

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Date of birth: 31st December 1972

Nationality: British

Employment

2007– Weta Digital
Wellington, New Zealand
Special Projects R&D (Independent contractor). Face and eye tracking for movie visual effects. Marker detection. Performance-driven facial animation.

2001– Carnegie Mellon University
Pittsburgh, PA, USA
Systems Scientist (Faculty) in Robotics Institute. Face tracking and modelling. Human identification from a distance. Audio-visual speech recognition and synthesis. Virtualized Reality. Denso intelligent car. Improved face identification from video. Expression based intent recognition.

2000–2001 Carnegie Mellon University
Pittsburgh, PA, USA
Post-doctoral fellow in Robotics Institute. Face identification and expression analysis.

1999–2000 Carnegie Mellon University
Pittsburgh, PA, USA
Post-doctoral fellow in Human-Computer Interaction Institute. Face and gaze tracking.

1998–1999 University of East Anglia
Norwich, UK
Research Associate. Signing avatar for the deaf project. Lecturing in multimedia engineering.

Education

1994–1998 University of East Anglia
Norwich, UK
PhD. *Features for Audio-Visual Speech Recognition.* Using computer vision to add lipreading to speech recognition.

1991–1994	University of East Anglia Norwich, UK	BEng (Hons) . <i>Electronic Engineering</i> , first class. Final year project: Electronic focusing for optical systems.
1989–1991	City College Norwich, UK	A-level . Physics, Maths.
1989–1991	Hewett School Norwich, UK	A-level (simultaneous with above). Technology.
1985–1989	Long Stratton High School Norfolk, UK	GCSE . Design and Technology, English Language and Literature, French, Geography, Maths, Physics, Technology.

Research Grants

- *Collaborative Research DHB: Coordinated Motion and Facial Expression in Dyadic Conversation*, PI Boker, Cohn, Baker, Co-PI Matthews, National Science Foundation, 1/1/2006–12/31/2008, \$174,354.
- *Facial Expression Analysis by Computer Processing*, PI Cohn, Kanade, Co-PI Baker, Matthews, National Institute of Mental Health, 5/1/1995–4/30/2011, \$922,510.

Professional Memberships

- Member of the Institution of Engineering and Technology (IET).
- Member of Institute of Electrical and Electronics Engineers (IEEE).

Professional Duties

- Reviewer for the following journals:
IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), IEEE Transactions on Systems, Man, and Cybernetics, IEEE Transactions on Multimedia, IEEE Transactions on Image Processing, IEEE Transactions on Intelligent Transportation Systems, International Journal of Computer Vision (IJCV), Computer Vision and Image Understanding (CVIU), Speech Communication, Real-Time Imaging, Computer Speech and Language, Applied Signal Processing, Optical Engineering.
- Reviewer for the following conferences:
IEEE conference on Computer Vision and Pattern Recognition (CVPR), IEEE conference on Multimodal Interfaces (ICME), British Machine Vision Conference (BMVC), Beyond Patches workshop.
- Reviewer for University of Pittsburgh Steven Manners Faculty Development Award 2005.
- Session chair for the 1999 conference on Audio-Visual Speech Processing.
- Area chair for the British Machine Vision Conference 2005.

Awards Received

- Douglas Lewin Prize. Awarded yearly for highest degree mark. (final year degree)
- IEE Prize for Outstanding Performance in Part 1 Finals. (second year degree)

Additional Information

- Accomplished C/C++ and Matlab programmer on all major platforms.
- Administrator level Unix on Linux, Mac OS X, IRIX and Solaris.
- Sys-admin for 30 user, 40 cpu, 10 TB, multi-platform lab cluster.
- Demonstrated many real-time image processing systems.
- Completed metalworking and lathe / milling classes in RI machine shop.
- Full, clean, UK and US driving & motorcycle licence.
- Completed levels 1+2+3 of the California Superbike School.

Showcase

- Developed custom camera synchronisation (genlock) system with timecode generator for Hitachi HV-F31 high resolution 1394 camera. Joint work with Bart Nabbe.
- Demonstrated real-time 3D face tracking and gaze estimation for an intelligent driver safety system. Collaboration with DENSO Corporation at the Intelligent Transportation Systems (ITS) World Congress, Nagoya, Japan, 2004.
- Constructed current installation (third) of the 48 synchronised cameras Virtualized Reality™ lab for Prof. Takeo Kanade, CMU Robotics Institute 2003.
- Demonstrated 'Tele-Graffiti', a remote sketch-based interaction system at ICCV'2001.
- Featured in New Scientist article on Tele-Graffiti, 14th July, 2001.
- Invited member of the audio-visual speech team at the annual six-week summer Workshop 2000, CLSP, Johns Hopkins University.
- Technical Adviser / Support and Demonstrator for the Technopolis Roadshow. A Norfolk County Council funded initiative to publicise a bid for an IT focused library for Norwich, 1998.
- Demonstrated simple real-time lipreading system at BBC Tomorrows World Live event, Birmingham NEC, 1997.
- Featured in New Scientist article on computer lipreading, 17th May, 1997.

Reference Contacts

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Dr. Richard Harvey
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University of East Anglia
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References

- [1] Iain Matthews, J. Andrew Bangham, and Stephen Cox. Audiovisual speech recognition using multiscale nonlinear image decomposition. In *Proc. International Conference on Spoken Language Processing*, volume 1, pages 38–41, Philadelphia, PA, October 1996.
- [2] Iain Matthews, J. Andrew Bangham, and Stephen Cox. Scale based features for audiovisual speech recognition. In *IEE Colloquium on Integrated Audio-Visual Processing, 1996/213*, pages 8/1–8/7, Savoy Place, London, November 1996.
- [3] Richard Harvey, Iain Matthews, J. Andrew Bangham, and Stephen Cox. Lip reading from scale-space measurements. In *Proc. Computer Vision and Pattern Recognition*, pages 582–587, Puerto Rico, June 1997. IEEE.
- [4] Stephen Cox, Iain Matthews, and Andrew Bangham. Combining noise compensation with visual information in speech recognition. In Christian Benoit and Ruth Campbell, editors, *Proc. ESCA Workshop on Audio-Visual Speech Processing*, pages 53–56, Rhodes, September 1997.
- [5] Iain Matthews, J. Andrew Bangham, Richard Harvey, and Stephen Cox. Nonlinear scale decomposition based features for visual speech recognition. In *Proc. EUSIPCO, 1998*.
- [6] Iain Matthews, J. Andrew Bangham, Richard Harvey, and Stephen Cox. A comparison of active shape model and scale decomposition based features for visual speech recognition. In *Proc. European Conference on Computer Vision*, pages 514–528, June 1998.
- [7] Iain Matthews, Tim Cootes, Stephen Cox, Richard Harvey, and J. Andrew Bangham. Lipreading from shape, shading and scale. In *Proc. Institute of Acoustics*, November 1998.
- [8] Iain Matthews, Tim Cootes, Stephen Cox, Richard Harvey, and J. Andrew Bangham. Lipreading from shape, shading and scale. In D. Burnham, J. Robert-Ribes, and E. Vatikiotis-Bateson, editors, *Proc. Auditory-Visual Speech Processing*, pages 73–78, Sydney, Australia, December 1998.
- [9] Iain Matthews. *Features for Audio-Visual Speech Recognition*. PhD thesis, School of Information Systems, University of East Anglia, October 1998.
- [10] Chalapathy Neti, Gerasimos Potamianos, Jeurgen Luetin, Iain Matthews, Hervé Glotin, Dimitra Vergyi, June Sison, Azad Mashari, and Jie Zhou. Audio-visual speech recognition. Technical Report WS00AVSR, Johns Hopkins University, CLSP, 2000.

- [11] Simon Baker, Frank Dellaert, and Iain Matthews. Aligning images incrementally backwards. Technical Report CMU-RI-TR-01-03, Carnegie Mellon University, 2001.
- [12] Naoya Takao, Jianbo Shi, Simon Baker, Iain Matthews, and Bart Nabbe. Tele-graffiti: A paper-based remote sketching system. In *Proc. International Conference on Computer Vision*, July 2001.
- [13] Iain Matthews, Gerasimos Potamianos, Chalapathy Neti, and Juergen Luetttin. A comparison of model and transform-based visual features for audio-visual LVCSR. In *Proc. International Conference on Multimedia and Expo*, 2001.
- [14] Chalapathy Neti, Gerasimos Potimianos, Juergen Luetttin, Iain Matthews, Hervé Glotin, and Dimitra Vergyi. Large-vocabulary audio-visual speech recognition: A summary of the John Hopkins summer 2000 workshop. In *Workshop on Multimedia Signal Processing*, 2001.
- [15] Barry Theobald, J. Andrew Bangham, Iain Matthews, and Gavin Cawley. Visual speech synthesis using statistical models of shape and appearance. In *Proc. International Conference on Auditory-Visual Speech Processing*, pages 78–83, Denmark, 2001.
- [16] B. J. Theobald, J. A. Bangham, S. M. Kruse, I. A. Matthews, and G. C. Cawley. Towards videorealistic synthetic visual speech. In J. Winkler and M. Niranjan, editors, *Proceedings of the Workshop on Uncertainty in Geometric Computations*, pages 175–184, Sheffield, UK, 2001. Kluwer Academic Publishers.
- [17] Simon Baker and Iain Matthews. Equivalence and efficiency of image alignment algorithms. In *IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pages 1090–1097, Hawaii, 2001.
- [18] Iain Matthews, Tim Cootes, J. Andrew Bangham, Stephen Cox, and Richard Harvey. Extraction of visual features for lipreading. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 24(2):198–213, February 2002.
- [19] Barry Theobald, J. Andrew Bangham, Iain Matthews, and Gavin Cawley. Towards videorealistic synthetic visual speech. In *Proc. International Conference on Acoustics, Speech and Signal Processing*, pages 3892–3895, 2002.
- [20] Ralph Gross, Iain Matthews, and Simon Baker. Eigen light-fields and face recognition across pose. In *Proc. International Conference on Automatic Face and Gesture Recognition*, May 2002.
- [21] Ralph Gross, Iain Matthews, and Simon Baker. Fisher light-fields for face recognition across pose and illumination. In *Proceedings of the German Symposium on Pattern Recognition (DAGM)*, September 2002.
- [22] Ralph Gross, Iain Matthews, and Simon Baker. Appearance based face recognition and light-fields. Technical Report CMU-RI-TR-02-20, Carnegie Mellon University, Pittsburgh, PA, August 2002.
- [23] Simon Baker and Iain Matthews. Lucas-Kanade 20 years on: A unifying framework: Part 1. Technical Report CMU-RI-TR-02-16, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, July 2002.
- [24] Takahiro Ishikawa, Iain Matthews, and Simon Baker. Efficient image alignment with outlier rejection. Technical Report CMU-RI-TR-02-27, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, October 2002.
- [25] Simon Baker, Ralph Gross, Iain Matthews, and Takahiro Ishikawa. Lucas-Kanade 20 years on: A unifying framework: Part 2. Technical Report CMU-RI-TR-03-01, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, February 2003.
- [26] Barry Theobald, Gavin Cawley, Iain Matthews, and J. Andrew Bangham. Near-videorealistic synthetic visual speech using non-rigid appearance models. In *Proc. International Conference on Acoustics, Speech and Signal Processing*, volume V, pages 800–803, Hong Kong, 2003.
- [27] Barry Theobald, Iain Matthews, J. Andrew Bangham, and Gavin Cawley. Evaluating talking heads based on appearance models. In *Proc. International Conference on Auditory-Visual Speech Processing*, pages 187–192, St. Jorioz, France, 2003.

- [28] Iain Matthews and Simon Baker. Active appearance models revisited. Technical Report CMU-RI-TR-03-02, Robotics Institute, Carnegie Mellon University, April 2003.
- [29] Simon Baker, Iain Matthews, and Jeff Schneider. Image coding with active appearance models. Technical Report CMU-RI-TR-03-13, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, April 2003.
- [30] Barry Theobald, Gavin Cawley, John Glauert, J. Andrew Bangham, and Iain Matthews. 2.5D Near-videorealistic synthetic visual speech using non-rigid appearance models. In *Proc. British Machine Vision Conference*, pages 43–52, Norwich, September 2003.
- [31] Iain Matthews, Takahiro Ishikawa, and Simon Baker. The template update problem. In *Proc. British Machine Vision Conference*, pages 649–658, Norwich, September 2003.
- [32] Simon Baker, Ralph Gross, and Iain Matthews. Lucas-Kanade 20 years on: A unifying framework: Part 3. Technical Report CMU-RI-TR-03-35, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, November 2003.
- [33] Simon Baker and Iain Matthews. Lucas-Kanade 20 years on: A unifying framework. *International Journal of Computer Vision*, 56(3):221–255, February 2004.
- [34] Takahiro Ishikawa, Simon Baker, Iain Matthews, and Takeo Kanade. Passive driver gaze tracking with active appearance models. Technical Report CMU-RI-TR-04-08, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, February 2004.
- [35] Simon Baker, Iain Matthews, Jing Xiao, Ralph Gross, Takahiro Ishikawa, and Takeo Kanade. Real-time non-rigid driver head tracking for driver mental state estimation. Technical Report CMU-RI-TR-04-10, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, February 2004.
- [36] Simon Baker, Ralph Gross, and Iain Matthews. Lucas-Kanade 20 years on: A unifying framework: Part 4. Technical Report CMU-RI-TR-04-14, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, February 2004.
- [37] Ralph Gross, Iain Matthews, and Simon Baker. Appearance based face recognition and light-fields. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 26(4):449–465, April 2004.
- [38] Iain Matthews, Takahiro Ishikawa, and Simon Baker. The template update problem. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 26(6):810–815, June 2004.
- [39] Simon Baker, Iain Matthews, Ralph Gross, Jing Xiao, Takeo Kanade, and Takahiro Ishikawa. Real-time non-rigid driver head tracking for driver mental state estimation. In *Proc. 11th World Congress on Intelligent Transportation Systems*, October 2004.
- [40] Takahiro Ishikawa, Simon Baker, Iain Matthews, and Takeo Kanade. Passive driver gaze tracking with active appearance models. In *Proc. 11th World Congress on Intelligent Transportation Systems*, October 2004.
- [41] Simon Baker, Iain Matthews, and Jeff Schneider. Automatic construction of active appearance models as an image coding problem. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 26(10):1380–1384, October 2004.
- [42] Takahiro Ishikawa, Simon Baker, Iain Matthews, and Takeo Kanade. Passive driver gaze tracking with active appearance models. *DENSO Technical Review*, 9(2):100–109, November 2004.
- [43] Iain Matthews and Simon Baker. Active appearance models revisited. *International Journal of Computer Vision*, 60(2):135–164, November 2004.
- [44] Ralph Gross, Iain Matthews, and Simon Baker. Constructing and fitting active appearance models with occlusion. In *Proc. of the IEEE CVPR Workshop on Face Processing in Videos*, June 2004.
- [45] Jing Xiao, Simon Baker, Iain Matthews, and Takeo Kanade. Real-time combined 2d+3d active appearance models. In *IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, volume II, pages 535–542, Washington, D.C., June 2004.

- [46] Changbo Hu, Jing Xiao, Iain Matthews, Simon Baker, and Takeo Kanade. Fitting a single active appearance model simultaneously to multiple images. In *Proc. British Machine Vision Conference*, pages 437–446, September 2004.
- [47] Ralph Gross, Iain Matthews, and Simon Baker. Generic vs. person specific active appearance models. In *Proc. British Machine Vision Conference*, pages 457–466, September 2004.
- [48] Barry Theobald, J. Andrew Bangham, Iain Matthews, and Gavin Cawley. Near-videorealistic synthetic talking faces: Implementation and evaluation. *Speech Communication*, 44:127–140, 2004.
- [49] Seth Koterba, Simon Baker, Iain Matthews, Changbo Hu, Jing Xiao, Jeffrey Cohn, and Takeo Kanade. Multi-view AAM fitting and camera calibration. In *Proc. International Conference on Computer Vision*, pages 511–518, Beijing, October 2005.
- [50] Ralph Gross, Iain Matthews, and Simon Baker. Generic vs. person specific active appearance models. *Image and Vision Computing*, 23(11):1080–1093, November 2005.
- [51] Ralph Gross, Simon Baker, Iain Matthews, and Takeo Kanade. Face recognition across pose and illumination. In Stan Z. Li and Anil K. Jain, editors, *Handbook of Face Recognition*, pages 193–216. Springer, 2005.
- [52] Simon Lucey, Iain Matthews, Changbo Hu, Zara Ambadar, Fernando de la Torre, and Jeffrey Cohn. AAM derived face representations for robust facial action recognition. In *Proc. International Conference on Automatic Face and Gesture Recognition*, pages 155–160, Southampton, April 2006.
- [53] Barry Theobald, Iain Matthews, and Simon Baker. Evaluating error functions for robust active appearance models. In *Proc. International Conference on Automatic Face and Gesture Recognition*, pages 149–154, Southampton, April 2006.
- [54] Ralph Gross, Iain Matthews, and Simon Baker. Active appearance models with occlusion. *Image and Vision Computing*, 24(6):593–604, June 2006.
- [55] Simon Lucey and Iain Matthews. Face refinement through a gradient descent alignment approach. In *HCSNet Workshop on the Use of Vision in HCI (VisHCI)*, November 2006.
- [56] Krishnan Ramnath, Seth Koterba, Jing Xiao, Changbo Hu, Iain Matthews, Simon Baker, Jeffrey Cohn, and Takeo Kanade. Multi-view AAM fitting and construction. *International Journal of Computer Vision*, Pending 2007.
- [57] Iain Matthews, Jing Xiao, and Simon Baker. On the dimensionality of deformable face models. *International Journal of Computer Vision*, Accepted 2007.
- [58] Barry-John Theobald, Iain Matthews, Nick Wilkinson, Jeffrey F. Cohn, and Steven M. Boker. Animating faces using appearance models. In *Workshop on Vision, Video and Graphics*, Warwick, UK, September 2007.
- [59] Barry-John Theobald, Iain Matthews, Jeffrey F. Cohn, and Steven M. Boker. Real-time expression cloning using appearance models. In *International Conference on Multimodal Interfaces*. ACM, November 2007.