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## Stefan Kopp

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Artificial Intelligence Group  
Faculty of Technology  
University of Bielefeld  
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### Education

#### Ph.D., Computer Science & Engineering

University of Bielefeld, Germany.  
Thesis: *Synthesis and Coordination of Speech and Gesture for Virtual Multimodal Agents*, advisor Prof. I. Wachsmuth. Major fields: Embodied Conversational Agents, Artificial Intelligence, Cognitive Science, Computer Animation.  
Graduation: February 2003, Summa cum laude.

#### M.S. (Diploma), Applied Computer Science in the Natural Sciences

University of Bielefeld, Germany.  
Thesis: *A Knowledge-based Approach to Modeling Connections for the Virtual Assembly*, advisors Prof. I. Wachsmuth and Dr. B. Jung.  
Major subjects: Artificial Intelligence, Computer Graphics, Neuroinformatics, Physics.  
Graduation: March 1998, “with distinction”.

#### German Abitur

Hans-Ehrenberg-Gymnasium, Bielefeld, Germany.  
Graduation: April 1993, grade point average 1.5, best student award.

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### Professional Development

Oct 2005-Oct 2006: *Research Fellow*

Research Group “Embodied Communication in Humans and Machines”, Center for Interdisciplinary Research (ZiF), Bielefeld.

Oct 2004- : *Assistant Professor / Wissenschaftlicher Assistent*

A.I. Group, Prof. I. Wachsmuth, Faculty of Technology, University of Bielefeld.

Feb 2004-Aug 2004: *Postdoctoral Fellow*

School of Communication & Department of Computer Science, Prof. J. Cassell, Northwestern University, Evanston, IL; Fellowship in the Postdoc-Programme of the German Academic Exchange Service (DAAD).

Apr 1998-Sept 2004: *Research Assistant & Faculty Staff*

A.I. Group, Prof. I. Wachsmuth, Faculty of Technology, University of Bielefeld.

Oct 1995-Oct 1997: *Junior programmer*

Collaborative research center *Situated Artificial Communicators* (SFB 360), project section *Concept Dynamics*, Prof. I. Wachsmuth & Dr. B. Jung, University of Bielefeld.

### **Projects**

*Speech-Gesture Alignment*, subproject of SFB 673 *Alignment in Communication*, Principal Investigator, 2006-2010.

European integrated project *PASION*, *Principal Co-Investigator*, 2006-2009.

*NUMACK*, Northwestern University (Evanston, IL), project management, 2004.

*Avatar MAX*, University of Bielefeld and Heinz-Nixdorf-MuseumsForum (Paderborn), Principal Investigator, 2003-2005.

*Max - the Multimodal Assembly eXpert*, University of Bielefeld, 1999-2005.

*Systemintegration für Künstliche Kommunikatoren*, University of Bielefeld, SFB 360, subproject D3, 2002-2005.

*Concept Dynamics*, University of Bielefeld, SFB 360, subproject C1, 1997-2004.

*Virtual Constructor*, University of Bielefeld, 1997-2001.

### **Scientific committees**

Program committee *Intelligent Virtual Agents* 2007, Paris.

Program committee *KI-07*, 2007, Osnabrück.

Program committee *Autonomous Agents and Multi-Agent Systems* 2007, Hawaii.

Program committee *Intelligent Virtual Agents* 2006, Los Angeles, USA.

Program committee *Intelligent Virtual Agents* 2005, Kos, Greece.

Program committee *Autonomous Agents and Multi-Agent Systems* 2006, Japan.

Program committee Int. Conf. on *Intelligent Agent Technology* (IAT-06)

Program committee *International Gesture Workshop* 2005, France.

Program committee AAAI-05 Workshop on *Modular Construction of Human-like Intelligence*, USA.

Program committee Workshop *Multimodal Corpora: From Multimodal Behaviour Theories to Usable Models* at the 2006 Int. Conf. on Language Resources and Evaluation (LREC 06)

Active reviewer for several international conferences or journals on Artificial Intelligence, Language Resources, Virtual Agents, Multimodal Interfaces, Humanoid Robotics, Computer Animation, and Computer Graphics.

### **Organizing committees**

General chair *Intelligent Virtual Agents* 2007, Paris, France.

Chair *Interdisciplinary College* 2007, Focus theme “Embodied Minds”, Günne, Germany.

Workshop *SAIBA/Behavior Markup Language*, Vienna, November 2006.

Workshop *Representations for Multimodal Generation*, April 2005, Reykjavik, Iceland.

AAMAS-2005 Workshop Organizer *Creating Bonds with Humanoids*, Utrecht, Netherlands.

Program/executive committee & Scholarship Chair, *Interdisciplinary College*, annually 2002-2006.

Executive committee *Interdisciplinary College* 2001, Günne, Germany.

Executive committee *German Cognitive Science Society Nat. Conf.*, Bielefeld, Germany, 1999.

**Affiliation/Membership**

SFB 673 (Collaborative Research Center) *Alignment in Communication*, Bielefeld, 2006-  
European Concerted Research Action (COST) 2102 *Cross-Modal Analysis of Verbal and Non-Verbal Communication*. 2006-2010.  
SFB 360 (Collaborative Research Center) *Situated Artificial Communicators*, Bielefeld, 2002-2005.  
Association for Computing Machinery (ACM), New York.  
German Society for Computer Science (Gesellschaft für Informatik, GI), Bonn.  
German Society for Cognitive Science (Gesellschaft für Kognitionswissenschaften, GK).  
Deutscher Hochschulverband, Bonn.

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**Teaching Experience**

As university faculty (since April 1998) at the University of Bielefeld:

**Classes (lectures & seminars) on:**

Lecture *Human-Computer Interaction*, Summer 2006, Summer 2005  
Lecture *Theoretical Computer Science (Formal Languages, Automata, Complexity & Theory of Computation)*, Winter 2006/2007, Winter 2005/2006, Winter 2004/2005  
*Multiagent systems and intelligent agents*, Summer 2006, Winter 1999/2000  
*Intelligent Algorithms*, Winter 2003/2004  
*Computer Animation and Virtual Reality*, Summer 2003  
*Cognitive Modeling for Animated Agents*, Summer 2003:  
*Computer Animation*, Winter 2002/03, *Student Award For Good Teaching*  
*Embodied Conversational Agents*, Summer 2001:  
*Multiagent Systems - a Practical Introduction*, Winter 2000/01, Winter 1998/99  
*Communication - the Link between Man and Machine*, Summer 2000  
*3D Computer Graphics*, Winter 1998/1999  
*Affective Computing*, Summer 1998

**Supervision of Master Theses:**

Oct 2006-: Haptic perception for a virtual embodied agent  
June 2006-: Muscle-based gesture animation  
June 2006-Feb 2007: Modeling multimodal feedback in a embodied conversational agent  
June 2006-Dec 2006: Modeling gender effects in speech synthesis  
Oct 2005-June 2006: Imitation learning and response facilitation  
Sept 2005-Aug 2006: Study on effects of social mimicry with a virtual agent  
Sept 2005-May 2006: Co-expressivity of speech and gesture in spatial discourse  
Feb 2005-Nov 2005: Motion capture system for humanoid animation  
Nov 2004-Jun 2005: Physics-based animation of gestures  
Sept 2004-Mar 2005: Empirical study on meaning-form relation in iconic gestures for route descriptions  
Jan 2004-Aug 2004: A scalable skinning model for articulated characters  
Nov 2003-Apr 2004: Geometry feature extraction for MPEG4-compliant face animation  
Mar 2003-Jan 2004: Dialog model for multimodal presentation agents with small-talk capabilities  
Feb 2003-Aug 2003: Empirical study on the segmentation of multimodal utterances  
Nov 2002-Jul 2003: Camera-based recognition of emotional facial expressions  
Oct 2002-Jun 2003: Emotion dynamics for communicative agents  
Oct 2001-Apr 2002: Cognitive architecture for intelligent agents  
Aug 2001-Feb 2002: Turn-taking model for conversational agents

Sep 2000-Mar 2001: Speech synthesis for multimodal agents  
Dec 2000-Jun 2001: Gravity simulation in virtual environments  
Apr 2000-Oct 2000: Gait animation for virtual humans

### **Supervision of Student Projects:**

April 2006-: Towards an intelligent hallway  
Oct 2005-Feb 2006: Multimodal interaction with a conversational agent  
April 2005-Dec 2005: Spoken language interaction with a conversational agent  
May 2003-Nov 2004: Physically based body animation for virtual characters  
Apr 2003-May 2004: Presentation agent on a mobile VR platform  
Oct 2001-Nov 2002: Interactive agent with camera-based visual perception  
Sep 2001-Nov 2002: Dialogue system for the Virtual Constructor  
Oct 1999-Jul 2000: Computer animation for virtual characters

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## **Publications**

### **Refereed Journals:**

- Kopp, S. and Wachsmuth, I., "Synthesizing Multimodal Utterances for Conversational Agents", *Journal Computer Animation & Virtual Worlds*, 15(1), pp. 39-52, 2004.
- Kopp, S., B. Jung, N. Lessmann, and Wachsmuth, I., "Max - A Multimodal Assistant in Virtual Reality Construction", *KI - Zeitschrift Künstliche Intelligenz*, 4/03, pp. 11-17, 2003.
- Jung, B., Kopp, S., Latoschik, M., Sowa, T., and Wachsmuth, I., "Virtuelles Konstruieren mit Gestik und Sprache", In *KI - Zeitschrift Künstliche Intelligenz*, 2/00, pp. 5-11, 2000.

### **Refereed Conference Proceedings:**

- Simons, N., Krämer, N., Kopp, S., "The effects of an embodied conversational agent's subtle nonverbal behavior on user's evaluation and behavioral mimicry". In: Proc. 57th Annual Conference of the International Communication Association (ICA 07), San Francisco, CA, 2007.
- Bergmann, K., Kopp, S., "Verbal or visual? How information is distributed across speech and gesture in spatial dialog". In: Proc. of *brandial 2006*, the 10th Workshop on the Semantics and Pragmatics of Dialogue (SemDial-10), pp. 90-97, Potsdam, 2006.
- Kopp, S. and Graeser, O., "Imitation Learning and Response Facilitation in Embodied Agents". *Intelligent Virtual Agents 2006*, Berlin: Springer-Verlag.
- Kopp, S., Krenn, B., Marsella, S., Marshall, A., Pelachaud, C., Pirker, H., Thorisson, and K., Vilhjalmsson, H., "Towards a Common Framework for Multimodal Generation: The Behavior Markup Language". *Intelligent Virtual Agents 2006*, Berlin: Springer-Verlag.
- J. Allwood, K. Grammer, S. Kopp, and E. Ahlsen, "A framework for analyzing embodied communicative feedback in multimodal corpora", LREC 2006 Workshop on Multimodal Corpora, Genoa, Italy, May 2006.
- Becker, C., Lessmann, N., Kopp, S., and Wachsmuth, I., "Connecting Feelings and Thoughts: Modeling the Interaction of Emotion and Cognition in Embodied Agents". In: *Proceedings of the 7th International Conference on Cognitive Modeling (ICCM)*, pp. 32-37, 2006.
- Kopp, S., Gesellensetter, L., Krämer, N., Wachsmuth, I., "A conversational agent as museum guide -- design and evaluation of a real-world application". Panayiotopoulos et al. (eds.): *Intelligent Virtual Agents*, LNAI 3661, pp. 329-343, Berlin: Springer-Verlag, 2005.
- Leßmann, N., Kopp, S., "Engagement in collaborative construction tasks with Max", *AAMAS 2005 Workshop on Creating Bonds with ECAs*, July 2005, Utrecht, The Netherlands.
- Kopp, S., "The spatial specificity of Iconic Gestures", *KogWis05*, 7<sup>th</sup> International Conference of the German Cognitive Science Society, September 2005, Basel, Switzerland.

- Kopp, S., Tepper, P., and Cassell, J., "Towards Integrated Microplanning of Language and Iconic Gesture for Multimodal Output". In Proc. of the International Conference on Multimodal Interfaces (ICMI'04), pp. 97-104, 2004.
- Tepper, P., Kopp, S., and Cassell, J., "Content in Context: Generating Language and Iconic Gesture without a Gestionary", *AAMAS 2004 Workshop on Balanced Perception and Action in ECAs*, pp. 79-86, July, 2004.
- Becker, C., Kopp, S., and Wachsmuth, I., "Simulating the emotion dynamics of a multimodal conversational agent", In Proc. *Affective Dialogue Systems (ADS'04)*, LNAI 3068, pp. 154-165, Springer-Verlag, 2004.
- Kopp, S., Sowa, T., and Wachsmuth, I., "Imitation games with an artifical agent: From mimicking to understanding shape-related iconic gestures", In A. Camurri & G. Volpe (Eds.): *Gesture-Based Communication in Human-Computer Interaction* (LNAI 2915), pp. 436-447, Berlin: Springer-Verlag, 2004.
- Jung, B., and Kopp, S., "FlurMax: An Interactive Virtual Agent for Entertaining Visitors in a Hallway", In T. Rist et al. (eds.): *Intelligent Virtual Agents 2003* (LNAI 2792), pp. 23-26, Berlin: Springer-Verlag, 2003.
- Sowa, T., and Kopp, S., "A Cognitive Model for the Representation and Processing of Shape-Related Gestures". In Franz Schmalhofer & Richard Young (Eds.): Proc. *European Cognitive Science Conference (EuroCogSci03)*, p.441, New Jersey: Lawrence Erlbaum Assoc., 2003.
- Kranstedt, A., Kopp, S., and Wachsmuth, I., "MURML: A Multimodal Utterance Representation Markup Language for Conversational Agents", *AAMAS 2002 Workshop Embodied conversational agents - let's specify and evaluate them!*, Bologna, Italy, pp. 31-36, July 2002.
- Kopp, S. and Wachsmuth, I., "Model-based Animation of Coverbal Gesture", In Proc. *Computer Animation 2002*, pp. 252-257, Los Alamitos (CA): IEEE Press, 2002.
- Wachsmuth, I., and Kopp, S., "Lifelike Gesture Synthesis and Timing for Conversational Agents". In I. Wachsmuth and T. Sowa (Eds.), *Gesture and Sign Language in Human-Computer Interaction* (LNAI 2298), pp.120-133, Berlin: Springer-Verlag, 2002.
- Sowa, T., Kopp, S., and Latoschik, M.E., "A Communicative Mediator in a Virtual Environment: Processing of Multimodal Input and Output". *Int. Workshop on Information Presentation and Natural Multimodal Dialogue*, Verona, Italy, pp. 71-74, Dec. 2001.
- Wachsmuth, I., Voss, I., Sowa, T., Latoschik, M.E., Kopp, S., and Jung, B., "Multimodale Interaktion in der Virtuellen Realität". In Proc. *Mensch & Computer 2001*, pp. 265-274, Teubner, 2001.
- Kopp, S., and Wachsmuth, I., "A Knowledge-based Approach for Lifelike Gesture Animation", In Horn, W. (ed.): *ECAI 2000 - Proc. of the 14th European Conference on Artificial Intelligence*, pp. 663-667, Amsterdam: IOS Press, 2000.
- Kopp, S., and Jung, B., "An Anthropomorphic Assistant for Virtual Assembly: Max", *Autonomous Agents'00 Workshop Communicative Agents in Intelligent Environments*, Barcelona, 2000.
- Kopp, S., and Wachsmuth, I., "Planning and Motion Control in Lifelike Gesture: A Refined Approach", In Post-proceedings *Computer Animation 2000*, pp. 92-97, Los Alamitos (CA): IEEE Computer Society Press, 2000.
- Kopp, S., and Wachsmuth, I., "Natural Timing in Coverbal Gesture of an Articulated Figure", *Autonomous Agents'99 Workshop Communicative Agents: The Use of Natural Language in Embodied Systems*, Seattle, WA, May 1999.

#### **Books/book chapters:**

- Leßmann, N., Kopp, S., and Wachsmuth, I., "Situating Interaction with an Virtual Human – Perception, Action, Cognition", in Rickheit, G. and Wachsmuth, I. (eds.), *Situated Communication*, pp. 287-323, Mouton de Gruyter, 2006.
- Kopp, S., "Synthese und Koordination von Sprache und Gestik für virtuelle multimodale Agenten", *Infix DISKI-265*, Berlin: Akademische Verlagsgesellschaft Aka GmbH, 2003.

**Submitted/in preparation:**

- Kopp, S., Bonaiuto, J., Arbib, M., Wachsmuth, I., "Learning to Imitate is Key to Learning to Understand: Embodied Communication in Artificial Agents", In: Wachsmuth, I. & Knoblich, G.: Embodied Communication, Oxford Univ. Press.
  - Kopp, S., Allwood, J., Ahlsen, E., Grammer, K., Stocksmeier, T., "Modeling Embodied Feedback in a Virtual Human", In: I. Wachsmuth, *Modeling Communication With Humanoids And Robots*, Springer-Verlag.
  - Becker, C, Kopp, S., Wachsmuth, I., "Why Embodied Agents Should be Able to Cry", In: T. Nishida (ed.), *Conversational Informatics*. John Wiley & Sons.
  - Kopp, S., Tepper, P., and Striegnitz, K., Cassell, J., "Trading Spaces: How Humans and Humanoids Use Speech And Gesture to Give Directions", In: T. Nishida (ed.), *Engineering Approaches to Conversational Informatics*. John Wiley & Sons.
  - Wachsmuth, I. and Kopp, S., "Movement Simulation for Conversational Agents: The Case for Imitation", In: K. Grammar et al. (eds.), *Analog Communication*. MIT Press.
  - Kopp, S., Leßmann, N., and Wachsmuth, I., "Max – ein situierter künstlicher Kommunikator in Virtueller Realität", in G. Görz, et al. (eds.), *Handbuch Künstliche Intelligenz*, chap. 25, Addison-Wesley.
  - Krämer, N., Kopp, S., Simons, N., submitted to International Journal of Human-Computer Interaction.
  - Kopp, Krämer, N.N., Intelligence in (Inter-)Action?. Submitted to *Fusing Intelligence in Virtual Agents*, Springer-Verlag.
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**Selected Presentations**

- Kopp, S., "Formen der Mensch-Maschine-Kommunikation", invited lecture, Norddeutsches Exzellenznetzwerk (NEN), Kurs *Natur des Geistes*, Hanse Wissenschaftskolleg, Feb. 2007.
- Kopp, S., "Natürlicher Dialog mit einem konversationalen Agenten – Theorie und Praxis", invited guest lecture in Computerlinguistik, University of Hannover, Jan. 2007.
- Kopp, S., "Embodied Minds – Building Intelligent Agents in VR", invited talk, INESC-ID/Instituto Superior Técnico, Technical University of Lisbon, Dec. 2006.
- Kopp, S., "Learning to imitate is learning to understand – embodied communication for virtual humans", Final Conference, *Embodied Communication: Integrated Perspective*, Bielefeld, Sept. 2006.
- Duncan, S., Kopp, S., Sowa, T., "GP to the Max - a non-modular theory of language production in an embodied conversational agent?", Final Conference, *Embodied Communication: An Integrated Perspective*, Bielefeld, Sept. 2006.
- Kopp, S., "Imitation Learning and Response Facilitation in Embodied Agents", paper presented at IVA 06, Los Angeles, August 2006.
- Kopp, S., Marshall, A., "Towards a Unified Framework for Multimodal Generation: BML", paper presented at the IVA '06, Los Angeles, August 2006.
- Kopp, S., "How People Talk to With Max and vice versa – Conversations From a Real-World Application", invited talk, Workshop "How Humans Talk to Computers", Hanse Wissenschaftskolleg, Delmenhorst, April 2006.
- Kopp, S., "Embodied Communicative Feedback in Virtual Humans", ZiF Workshop on "Modeling Communication With Humanoids and Robots", Bielefeld, April 2006.
- Kopp, S., "Modeling speech and gesture production in artificial characters", invited talk, Univ. of Twente, The Netherlands, Dec 2005.

- Kopp, S., “Reden mit einer Künstliche Intelligenz – welche Sprache spricht der LEGO-Mann?”, invited talk, Historical Museum Bielefeld, 2005.
  - Kopp, S. & Sowa, T., “Complex gesture imitation with a virtual human”, Opening Conference of the Research Year on *Embodied Communication*, ZiF, Bielefeld, 2005.
  - Kopp, S., “How humans and humanoids use gesture to give directions”, invited talk, colloquium of the SFB/TR8 *Spatial Cognition*, Bremen, May 2005.
  - Kopp, S., “Synthetic Characters – Bodies”, invited presentation at the *ELVIS* workshop meeting, Sintra, Portugal, April 2005.
  - Kopp, S., “Multimodal generation”, presentation at the international workshop on “*Representations for Multimodal Generation*”, Reykjavik, Iceland, April 2005.
  - Kopp, S., “Modelling gestures in the MAX system”, invited presentation at the working meeting *Gesticons for Expressive Embodied Conversational Characters*, jointly organized by the EU projects NECA, MagiCster and lifeplus, and the BMBF project Virtual Human. Vienna, December 2003.
  - Kopp, S., “New human-computer interaction techniques for VR”, invited keynote at the 3<sup>rd</sup> *CAVE-Programming Workshop*. Helsinki, Finland, August 2003.
  - Kopp, S., “Imitation games with an artificial agent: From mimicking to understanding shaperelated iconic gestures”, paper presented at the *Int. Gesture Workshop (GW 2003)*. Genua, Italy, April 2003.
  - Kopp, S., “Model-based Animation of Coverbal Gesture”, paper presented at the *Int. Conference on Computer Animation*. Geneva, Switzerland, 2002.
  - Sowa, T., and Kopp, S., “A Communicative Mediator in a Virtual Environment: Processing of Multimodal Input and Output”, paper presented at the *Int. Workshop on InformationPresentation and Natural Multimodal Dialogue*. Verona, Italy, 2001.
  - Kopp, S., and Krämer, N., “Intelligent Virtual Agents”, invited class at the *Interdisciplinary College 2001*. Günne at Lake Möhne, Germany, 2001.
  - Kopp, S., “A Knowledge-based Approach for Lifelike Gesture Animation”, paper presented at the *14th European Conference on Artificial Intelligence - ECAI 2000*. Berlin, Germany, 2000.
  - Kopp, S., “Planning and Motion Control in Lifelike Gesture: A Refined Approach”, paper presented at the *Int. Conference on Computer Animation*. Philadelphia, USA, 2000.
  - Kopp, S., “Natural Timing in Coverbal Gesture of an Articulated Figure”, paper presented at the *Workshop Communicative Agents: The Use of Natural Language in Embodied Systems*, Autonomous Agents’99. Seattle, USA, 1999.
  - Kopp, S., “Ein wissensbasierter Ansatz zur Modellierung von Verbindungen für die virtuelle Montage”, *Workshop on Aggregates and Aggregation*, Collaborative Research Center *Situated Artificial Communicators* (SFB 360). Bielefeld, Germany, 1998.
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## Personal

Date of birth: 25 October 1973

Citizenship: German

Marital status: Married to Kerstin Kopp (maiden-name Schwede) since 7/10/2005

Children: Pauline Kopp (date of birth: 31/12/2006)

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