Overall project management report

Deliverable D6.3

List of Partners:	ETH Zurich, CH	(ETH Zurich)
	Hocoma AG, Volketswil, CH	(HOCOMA)
	University of Ljubljana, SI	(UL)
	Universitat de Barcelona, ES	(UB)
	Neurological Clinic Bad Aibling, DE	(NKBA)

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Abstract: This report presents an overview of the MIMICS project management activities for the three year duration of the project.

Project Number: 215 756

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1 Introduction

The MIMICS project officially started on January 1st 2008, following the signature of the Grant Agreement n°215756 with the European Commission.

The present deliverable summarizes the major tasks undertaken in WP6 for the management and coordination of the project together with a summary of the overall project management details in terms of deliverables, dissemination outcomes and key meetings.

2 Project management

2.1 Objectives

The following major objectives are targeted by WP6 as specified in the DoW:

- **Objective 1** → coordinate the overall technological progress, administration and finances of the project

- **Objective 2** → communicate with the consortium and the European Commission

- **Objective 3** → coordinate and supervise all partners to realize deliverables and milestones according to the work plan

- **Objective 4** → establish a framework for the efficient dissemination of the results

3 Major Achievements

The following major tasks have been achieved in line with the above objectives.

3.1 **Towards Objective 1:** "Coordinate the overall technological progress, administration and finances of the project"

3.1.1 Management structure

A management structure was established for successful collaborative work amongst the partner, Figure 1. The project coordinator R. Riener and the project manager M. Simnacher were supported by the project management committee (PMC). The PMC consisted of each work package (WP) leader:

- WP1 (System specification and hardware setup)   R. Riener
- WP2 (Multimodal immersive interactive display environment)   M. Slater
- WP3 (Multi-sensorial data processing and decision making)   M. Munih and M. Mihelj
- WP4 (Experimental evaluation)   F. Müller
- WP5 (Dissemination and exploitation)   L. Lünenburger
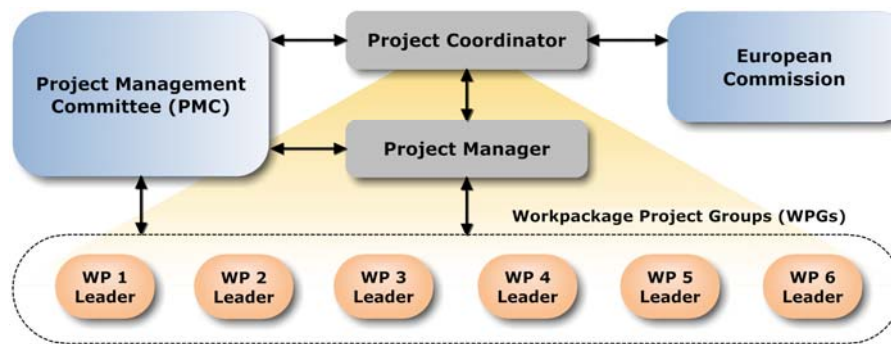- WP6 (Project management)   M. Simnacher

Figure 1 Project management structure

3.1.2 Quality plan

A quality plan (Deliverable D6.1 *Quality Assurance Plan*) was prepared to clearly define the personal responsibilities for the execution of the project tasks, for supervision of the project tasks and for documentation of the supervision. As the quality plan was regularly updated at the PMC meetings, it gave a clear and actual status of the project.

3.1.3 Project meetings

During the duration of the project several overall project meetings, PMC meetings, workshops and two review meetings were held as the main forum for interaction between groups, Table 1.

Table 1 Key MIMICS meetings and workshops.

Project General Assembly Meetings	
[1]	Kick-off Meeting, Volketswil, Switzerland, January 2008, hosted by Hocoma
[2]	MIMICS Meeting, Barcelona, Spain, June 2008, hosted by UPC
[3]	MIMICS Meeting, Zurich, Switzerland, February 2009, hosted by ETH Zurich
[4]	MIMICS Meeting, Ljubljana, Slovenia, September, 2009, hosted by UL
[5]	MIMICS Meeting, Bad Aibling, Germany, March 2010, hosted by NKBA
[6]	MIMICS Meeting, Ascona, Switzerland, September 2010, hosted by ETH Zurich
PMC Meetings	
[1]	MIMICS PMC Meeting, Barcelona, Spain, June 2008, hosted by UPC
[2]	MIMICS PMC Meeting, teleconference, via Skype, November 2008
[3]	MIMICS PMC Meeting, Barcelona, Spain, March 2009, hosted by UB

[4]	MIMICS PMC Meeting, teleconference, via Skype, November 2009
[5]	MIMICS PMC Meeting, Bad Aibling, Germany, March 2010, hosted by NKBA
[6]	MIMICS PMC Meeting, Ascona, Switzerland, September 2010, hosted by ETH Zurich
Workshops	
[1]	"Psycho-Physiological Measurement in Virtual Reality Application", January 2008, hosted by ETH Zurich
[2]	MIMICS Armeo and Lokomat Workshop, Ljubljana, Slovenia, September, 2009, hosted by UL
[3]	Reinforcement Learning in Robotics and Virtual Reality, Barcelona, Spain, January, 2010, hosted by UB
[4]	"Biocooperative Control - the Future of Rehabilitation Robotics", Ascona, Switzerland, September 2010, hosted by ETH Zurich
Project Review Meetings	
[1]	First MIMICS Project Review Meeting, Barcelona, Spain, March 2009, hosted by UB
[2]	Second MIMICS Project Review Meeting, Bad Aibling, Germany, March 2010, hosted by NKBA

3.1.4 Legal and financial issues

During the project duration the WP6 *Project management* concluded legal agreements and shared key legal and financial documents with the whole consortium. The budget distribution, money transfer and financial records were carried out and the consortium was supported for the periodic claims in accordance with EC guidelines and the Grant Agreement, Table 2.

Table 2 Legal and financial issues.

Amendment	
[1]	Prof. Mel Slater moved his affiliation from UPC (University of Catalonia) to UB (University of Barcelona). The new affiliation is still under ICREA as third party. A modification of Annex I - Description of Work has been written and replaced the former version. The European Commission agreed to our request and the change will be valid retroactive from 1st of January 2009.
Audit	
[1]	A financial audit of the MIMICS project was carried out at the ETH Zurich by Andrew Saxby and Christoph Lautenschlager (Lubbock Fine, Chartered Accountants, London), no major deviation have been addressed, November 2009.

3.2 Towards Objective 2: "Communicate with the consortium and the European Commission"

Several communication tools were established to ensure a successful collaborative work and to exchange information, Table 3.

Table 3 Communication towards the consortium and EC.

Consortium	
[1]	The project website is located at www.mimics.ethz.ch. It was an important source of information and was updated all along the project. Moreover it was used by all partners as the entrance for the project intranet.
[2]	Three newsletters were distributed to update all group members beside the general assembly meetings.
[3]	A MIMICS mailing list was set up.
[4]	Several bilateral visits on operational level took place.
EC	
[1]	Delivery of contracted deliverables with status.
[2]	Coordination for all the necessary arrangement requested for the project periodic reviews.

3.3 Towards Objective 3: "Coordinate and supervise all partners to realize deliverables and milestones according to the work plan"

3.3.1 Deliverables

All deliverables listed in the DoW have been delivered on time, only the D6.1 *Quality Assurance Plan* was with very short delay, Table 4.

Table 4 Deliverables submitted to the EC.

Del. no.	Deliverable name	Nature	Dissemination level	Due delivery date, Annex I (proj. month)	Actual / Forecast delivery date
D1.1	Requirement specifications and system design	R	CO	2	2008-02-29
D5.1	MIMICS Web site	O	PU	2	2008-02-29
D6.1	Quality Assurance Plan	R	PP	2	2008-03-31
D1.2	Hardware setup	P	PP	7	2008-07-31
D3.1	Principles and algorithms of realtime sensing of motor action and psycho-physiological state	R	CO	7	2008-07-31
D2.1	Algorithms about early multimodal (haptic, visual, acoustic) scenarios and rendering	R	RE	9	2008-10-1

D4.1	First downscaled Lokomat and HapticMaster platforms ready for transfer to clinical partners	P	PU	12	2008-12-26
D5.3	Ethics proposals approved by the local ethics committees and report on medical certification	R	CO	12	2008-12-26
D6.2	Short interim report I	R	CO	12	2008-12-26
D4.2	Report of first experiments on continuous presence assessment and motivation enhancement	R	RE	18	2009-06-30
D4.3	Advanced downscaled Lokomat and HapticMaster platforms ready for clinical trials and ARMEO prototype with new features as an example of a "minimal configuration"	P	RE	24	2009-12-23
D4.4	As D4.3, but with less information, ready for public	P	PU	24	2009-12-23
D6.2	Short interim report II	R	CO	24	2009-12-23
D2.2	Algorithms about final versions of multimodal scenarios and rendering	R	CO	27	2010-03-31
D3.2	Final automatic learning principles allowing enhancement of sense of presence and the increase of motivation	R	CO	30	2010-06-30
D6.2	Short interim report III	R	CO	30	2010-06-30
D4.5	Results of rehabilitation outcome in patients and protocol for future clinical trial	R	PU	36	2010-12-23
D5.2	Special issues or book chapters on motivation and technology in international print media	R	PU	36	2010-12-23
D5.4	Plan for knowledge exploitation, incl. transfer to other industries	R	RE	36	2010-12-23
D6.3	Overall project management report	R	PU	36	2010-12-23
D6.4	Public release of the deliverables D1.1, D2.1, D2.2, D3.1, D3.2 and D4.2	R	PU	36	2010-12-23

3.3.2 Milestones

All milestones listed in the DoW have been achieved in due time, Table 5.

Table 5 MIMICS milestones.

No.	Milestone name	Due achievement date, Annex I	Achieved Yes/No	Actual / achievement date
M1.1	Requirements and (theoretical) design of the platforms Lokomat and the HapticMaster	2	Yes	2008-2-29
M1.2	Two hardware setups based on Lokomat and the HapticMaster	7	Yes	2008-7-31
M3.1	Algorithms for assessment of user's motor and psycho-physiological state ready for presence assessment in Task 4.1	7	Yes	2008-7-31
M2.1	Early multimodal (haptic, visual, acoustic) display system ready for presence assessment in Task 4.1	9	Yes	2008-10-1
M4.1	First downscaled Lokomat and HapticMaster platforms ready for transfer to clinical partners	12	Yes	2008-12-26
M5.1	Report on medical certification and ethics approvals	12	Yes	2008-12-26
M4.2	First proof that the systems increases user motivation	18	Yes	2009-06-30

M4.3	Advanced downscaled Lokomat and HapticMaster platforms and ARMEO prototype	24	Yes	2009-12-23
M2.2	Final version of the multimodal displays	27	Yes	2010-03-31
M3.2	Final automatic learning system for assessment of user's motor and psycho-physiological	30	Yes	2010-06-30
M4.4	Conclusions on rehabilitation efficiency	36	Yes	2010-12-23
M6.1	Overall project management report	36	Yes	2010-12-23

3.4 Towards Objective 4: "Establish a framework for the efficient dissemination of the results"

The continuous scientific work of all partners did lead to numerous scientific publication and media coverage. The publications covered scientific topics from biomechanical engineering and robotics to biomedical research and clinical applications. See the dissemination list in chapter 4 containing:

- Journal Publication
- Conference Proceedings
- Book chapters
- Invited talks
- Public Magazines
- Television
- MIMICS Flyer and Poster

4 Dissemination list

4.1 Journal Publications

1. R. Banz, M. Bolliger, S. Müller, C. Santelli, R. Riener, (2009) A method of estimating the degree of active participation during stepping in a driven gait orthosis based on actuator force profile matching. *IEEE Transactions on Neural Systems and Rehabilitation Engineering, vol. 17, no. 1, pp. 15-22*

2. A. Brogni, D. Caldwell, M. Slater, (2009), Touching Sharp Virtual Objects Produces a Haptic Illusion, submitted

3. A. Koenig, X. Omlin, L. Zimmerli, M. Sapa, C. Krewer, M. Bolliger, F. Müller and R. Riener, Psychological state estimation from physiological recordings in stroke patients during robot assisted gait rehabilitation, *JRRD*, accepted

4. J. Ziherl, J. Podobnik, M. Šikic, M. Munih, (2009) Pick to place trajectories in human arm training environment. *Technology and Health Care, 17(4), pp. 323-335*

5. J. Kastanis, M. Slater, 2010, "Reinforcement Learning Utilizes Proxemics: An Avatar Learns to Manipulate the Position of People in Immersive Virtual Reality", submitted

6. C. Groenegress, B. Spanlang, M. Slater. "The physiological mirror—a system for unconscious control of a virtual environment through physiological activity", The Visual Computer, Springer Berlin / Heidelberg, pp. 649-657, vol. 26, issue 6, 2010

7. D. Novak, J. Ziherl, A. Olenšek, M. Milavec, J. Podobnik, M. Mihelj, M. Munih. Psychophysiological responses to robotic rehabilitation tasks in stroke. IEEE Transactions on Neural Systems and Rehabilitation Engineering, Aug. 2010, vol. 18, no. 4, pp. 351-361.

8. D. Novak, M. Mihelj, M. Munih. Psychophysiological responses to different levels of cognitive and physical workload in haptic interaction. Robotica, 2010, DOI: 10.1017/S0263574710000184.

9. D. Novak, M. Mihelj, M. Munih. Dual-task performance in multimodal human-computer interaction: A psychophysiological perspective. Multimedia Tools and Applications, 2010, DOI: 10.1007/s11042-010-0619-7.

10. J. Ziherl, D. Novak, A. Olenšek, M. Mihelj, M. Munih. Evaluation of upper extremity robot-assistances in subacute and chronic stroke subjects. Journal of Neuroengineering and Rehabilitation, 7:52, 2010.

11. D. Novak, M. Mihelj, J. Ziherl, A. Olenšek, M. Munih. Psychophysiological measurements in a biocooperative feedback loop for upper extremity rehabilitation. Submitted to IEEE Transactions on Neural Systems and Rehabilitation Engineering.

12. D. Novak, M. Mihelj, M. Milavec, M. Munih.. Psychophysiology and adaptive discriminant analysis for task difficulty adaptation. Submitted to Applied Ergonomics.

13. R. Riener, M. Munih. Guest editorial special section on rehabilitation via bio-cooperative control. IEEE trans. neural syst. rehabil. eng., Aug. 2010, vol. 18, no. 4, pp. 337-338.

14. T. Koritnik, A. Koenig, T. Bajd, R. Riener, M. Munih. (2010) Comparison of visual and haptic feedback during training of lower extremities. Gait & Posture. in press

15. A. Duschau-Wicke, A. Caprez, R. Riener. (2010) Patient-cooperative control increases active participation of individuals with SCI during robot-aided gait training. J. NeuroEngin and Rehab (JNER) 7:43.

16. R. Riener, L. Lünenburger, I.C. Maier, G. Colombo, V. Dietz. (2010) Locomotor Training in Subjects with Sensori-Motor Deficits: An Overview of the Robotic Gait Orthosis Lokomat. Journal of Healthcare Engineering 1, pp. 197-216.

17. A. Duschau-Wicke, A. Morger, H. Vallery, R. Riener. (2010) Adaptive Patientenunterstützung für die Rehabilitationsroboter. Automatisierungstechnik at, 58, pp. 260-268.

18. K. Brütsch, T. Schuler, A. Koenig, L. Zimmerli, S. Merillat, L. Lünenburger, R. Riener, L. Jäncke, A. Meyer-Heim. (2010) Influence of virtual reality soccer game on walking performance in robotic assisted gait training. J. NeuroEngin and Rehab (JNER) 7.

19. A. Koenig, D. Novak, M. Pulfer, X. Omlin, E. Perreault, L. Zimmerli, M. Mihelij, R. Riener. "Real-time control of cognitive load in neurological patients during robot-assisted gait training", Transactions on Neural Systems and Rehabilitation Engineering, submitted

20. A. Koenig, X. Omlin, J. Bergmann, L. Zimmerli, M. Bolliger, F. Müller, R. Riener. "Controlling Patient Participation during robot-assisted Gait Training", Journal of NeuroEngineering and Rehabilitation, submitted

21. F. Müller. Mit dem Roboter das Spiegelei-Braten üben. (2010) Ärztliche Praxis: NeurologiePsychiatrie 12_2010, pp. 29-33

4.2 Conference Proceedings:

1. T. Koritnik, T. Bajd, M. Munih. Lower-extremities training in virtual reality augmented by sound and sensory electrical stimulation. Proceedings of the 7th Mediterranean Congress of Physical and Rehabilitation Medicine, Portoroz, Slovenia, September 18-21, 2008, pp. 43-44.

2. T. Koritnik, T. Bajd, M. Munih. Virtual mirror for assessment and training of lower extremities. Proceedings of the 5th Regional Central European Conference of the International Society for Prosthetics and Orthotics, Portoroz, Slovenia, September 2008, pp. 19-21.

3. A. König, K. Brütsch, L. Zimmerli, M. Guidali, A. Duschau-Wicke, M. Wellner, A. Meyer-Heim, L. Lünenburger, S. Köneke, L. Jäncke, R. Riener. Virtual environments increase participation of children with cerebral palsy in robot-aided treadmill training. Proceedings of "Virtual Rehabilitation 2008", Vancouver, British Columbia, Canada, pp. 121-126 (2008)

4. A. König, M. Bolliger, M. Wieser, R. Riener. Controlling physiology during robot automated treadmill training. Submitted to Technically Assisted Rehabilitation (TAR) Berlin 2009

5. M. Mihelj, J. Podobnik, M. Munih. HEnRiE -- Haptic environment for reaching and grasping exercise. Proceedings of the 2nd Biennial IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics Scottsdale, AZ, USA, October 19-22, 2008

6. M. Mihelj, J. Podobnik, M. Munih. Virtual physiotherapist based on a haptic system for training of reachnig and grasping. Book of Abstracts, 7th Mediterranean Congress of Physical and Rehabilitation Medicine, Portoroz, Slovenia, September 18-21, 2008.

7. L. Jensterle, M. Mihelj, M. Munih. Vodenje haptičnega vmesnika zasnovano v okolju Matlab xPC Target (Control of haptic interface in Matlab xPC Target). ERK 2008,

Seventeenth International Electrotechnical and Computer Science Conference, Portoroz, Slovenia, September 29 - October 1, 2008.

8. J. Podobnik, M. Marko, J. Činkelj. HARMiS - hand and arm rehabilitation system. SHARKEY, Paul (ed.). The 7th International Conference on Disability, Virtual Reality and Associated Technologies with Artabilitation, 8-11 September 2008, Maia, Portugal. Proceedings. Reading: University of Reading, School of Systems Engineering, 2008, pp. 237-244.

9. I. Kastanis, M. Slater. Guiding users in virtual reality rehabilitation environments using a machine learning decision system, *INRS 2009*

10. A. Koenig, L. Somaini, M. Pulfer, T. Holenstein, X. Omlin, M. Wieser, R. Riener. Model-Based Heart Rate Prediction during Lokomat Walking, *IEEE EMBC 2009, Minneapolis, USA, September 2009*

11. A. Koenig, C. Binder, J. v. Zitzewitz, X. Omlin, M. Bolliger, R. Riener, Voluntary gait speed adaptation for robot-assisted treadmill training, *IEEE ICORR 2009, Kyoto, Japan, June 2009*

12. T. Koritnik, A. Koenig, T. Bajd, R. Riener, M. Munih, Haptic training of lower extremities enhanced by visual modality. *ICORR 2009, IEEE ICORR 2009, Kyoto, Japan, June 2009, pp. 431-435*

13. M. Mihelj, D. Novak, M. Munih, Emotion-aware system for upper extremity rehabilitation. *Virtual rehabilitation 2009: International conference, Haifa, Israel, June 29 - July 2, 2009. [New York]: IEEE, cop. 2009, pp. 160-165*

14. M. Munih, R. Riener, G. Colombo, L. Lünenburger, F. Müller, M. Slater, M. Mihelj, MIMICS : multimodal immersive motion rehabilitation of upper and lower extremities by exploiting biocooperation principles. *ICORR 2009, IEEE ICORR 2009, Kyoto, Japan, June 2009,* pp. 127-132.

15. M. Munih, D. Novak, T. Bajd, M. Mihelj, Biocooperation in rehabilitation robotics of upper extremities. . *ICORR 2009, IEEE ICORR 2009, Kyoto, Japan, June 2009,* pp. 425-430.

16. D. Novak, M. Mihelj, M. Munih, Using psychophysiological measurements in physically demanding virtual environments. *Lecture Notes on Computer Science, part 1, pp. 490-493 (INTERACT 2009, 12th IFIP TC13 Conference on Human-Computer Interaction, August 24-28, 2009, Uppsala, Sweden)*

17. D. Novak, J. Ziherl, A. Olensek, J. Podobnik, M. Mihelj, M. Munih. Robotska rehabilitacija z navidezno resničnostjo in psihofiziološkimi meritvami (Robotic rehabilitation using virtual reality and psychophysiological measurements). *Proceedings of the 12th International multiconference INFORMATION SOCIETY 2009, 12 - 16 October 2009, Ljubljana, Slovenia. Ljubljana: Jožef Stefan Institute, 2009, part A, pp. 423-426*

18. J. Podobnik, M. Mihelj, M. Munih. Upper limb and grasp rehabilitation and evaluation of stroke patients using HenRiE device. I*Virtual rehabilitation 2009: International conference, Haifa, Israel, June 29 - July 2, 2009. [New York]: IEEE, cop. 2009, pp. 173-178*

19. J. Podobnik, M. Munih. Robotic system for rehabilitation of upper extremities. *Proceedings of the Eighteenth International Electrotechnical and Computer Science Conference - ERK 2009, 21-23 September, 2009, Portorož, Slovenija. Ljubljana: IEEE Region 8, Slovenian Section of the IEEE, 2009, part B, pp. 213-216*

20. M. Sapa. Symposium "Hirn – Mensch – Maschine", *St. Mauritius Therapieklinik, 30-31/10/2009*

21. M. Sapa. „Herzratenvarianz bei neurologischen Rehapatienten in Abhängigkeit von Medikation und Begleiterkrankungen" *Gemeinsame Jahrestagung der Deutschen*

Gesellschaft für Neuro-traumatologie und Klinische Neurorehabilitation e.V. und der Deutsche Gesellschaft für Neurorehabilitation e.V. (DGNKN & DGNR), 3.-5.12.2009

22. J. Ziherl, M. Munih. Pick to place trajectories in human arm training environment. *World Congress on Medical Physics and Biomedical Engineering, 7-12 September, 2009, Munich, Germany, (IFMBE proceedings, vol. 25). Heidelberg: Springer, 2009, pp. 440-443*

23. A. Pomés, M. Slater. 2010, "A Virtual Umbilical Chord", Body Representation in Physical and Virtual Reality with Application to Rehabilitation. Frontiers in Neuroscience

24. M. Gonzalez-Franco, D. Perez-Marcos, B. Spanlang, M. Slater. "The contribution of real-time mirror reflections of motor actions on virtual body ownership in an immersive virtual environment", Virtual Reality Conference (VR), 2010 IEEE, pp.111-114, 20-24 March 2010

25. M. Munih, D. Novak, J. Ziherl, A. Olenšek, J. Podobnik, T. Bajd, M. Mihelj. Robotic rehabilitation tasks and measurements of psychophysiological responses. In: Proceedings of ICRA 2010, pp. 4360-4365.

26. D. Novak, M. Mihelj, J. Ziherl, A. Olenšek, M. Munih. Measuring motor actions and psychophysiology for task difficulty estimation in human-robot interaction. In: Proceedings of Measuring Behavior 2010, pp. 269-272.

27. D. Novak, M. Mihelj, J. Ziherl, A. Olenšek, M. Munih. Adaptivna senzorna integracija na osnovi biomehanskih in fizioloških meritev v rehabilitacijski robotiki (Adaptive sensory integration of biomechanical and physiological measurements in rehabilitation robotics). In: Proceedings of Information Society 2010, pp. 357-360.

28. D. Novak, J. Ziherl, A. Olenšek, M. Mihelj, M. Munih. Patient state assessment in virtual rehabilitation using adaptive discriminant analysis. Presented at Body Representation in Physical and Virtual Reality with Application to Rehabilitation, abstract publication pending.

29. J. Ziherl, D. Novak, A. Olenšek, M. Munih. Haptic assistance in virtual environments for motor rehabilitation. In: Proceedings of Eurohaptics 2010 (Lecture notes on computer science), pp. 117-122.

30. R. Riener. Motor and Cognitive Restoration in Virtual Worlds, Body Representation in Physical and Virtual Reality with Application to Rehabilitation, 2010. Frontiers in Neuroscience

31. A. Koenig, A. Caruso, M. Bolliger, L. Somaini, X. Omlin, M. Morari, R. Riener. "Model-Based Heart Rate Control during Robot-Assisted Gait Training", ICRA conference 2011, Shanghai, China, submitted

32. A. Koenig, X. Omlin, L. Zimmerli, R. Riener. „Virtual Environments in Neurological Gait Rehabilitation for Automated Control of Physical Activity", Technically Assisted Rehabilitation conference (TAR) 2011, Berlin, submitted

33. A. Koenig, M. Pulfer, X. Omlin, E. Perreault, L. Zimmerli, R. Riener. "Automatic estimation of cognitive load during robot-assisted gait training", Automed Conference 2010, Zurich, Switzerland, accepted

34. A. Koenig, X. Omlin, D. Novak, L. Zimmerli, J. Bergmann, M. Bolliger, F. Müller, R. Riener. "Virtual Environments in Neurological Gait Rehabilitation for Automated Control of Physical Activity and Cognitive Load", Body Representation in Physical and Virtual Reality with Application to Rehabilitation conference 2010, Ascona, Switzerland, accepted

35. T. Schauer, H. Schmidt, R. Riener. Methods of Automation in Medicine, Automatisierungstechnik, 58, pp. 239-240, 2010

36. A. Duschau-Wicke, J. von Zitzewitz, A. Caprez, L. Lünenburger, R. Riener. Path Control, IEEE transactions on neural systems and rehabilitation engineering, 18 (1) Pages 38-48, 2010

37. F. Müller, M. Sapa, C. Krewer, A. König, R. Riener, L. Luenenburger, L. Zimmerli, M. Bolliger. Modelling a Virtual Reality Environment for Gait Training on a Robotic Gait Trainer. Abstracts of the 2010 World Congress of Neurorehabilitation, Vienna. Published in Neurorehabil Neural Repair, OnlineFirst, published on March 12, 2010 doi:10.1177/1545968310365984

38. J. Bergmann, M. Sapa, C. Krewer, L. Zimmerli, A. König, R. Riener, F. Müller. Intrinsische Motivation beim Gangtraining in virtueller Umgebung mit dem Gangroboter Lokomat. Neurologie & Rehabilitation 2010;6:P4-05.

39. D. Dorsic, C. Krewer, J. Bergmann, A. König, L. Zimmerli, R. Riener, F. Müller. Ein Vergleich der Aktivität des paretischen und nicht-paretischen Beins von Schlaganfall-Patienten während eines Lokomat-Trainings mit virtueller Realität. Neurologie & Rehabilitation 2010;6:P1-05.

4.3 Book chapters

1. A. Koenig, R. Riener. "The Human in the Loop". In: Neurorehabilitation Technology Editors: V. Dietz, Z. Rymer, T. Nef, Springer publishing group 2010 (in press)
2. R. Riener. "Technology of the robotic gait orthosis Lokomat". In: Neurorehabilitation Technology. Editors: V. Dietz, Z. Rymer, T. Nef, Springer publishing group 2010 (in press)

4.4 Invited talks:

1. M. Munih, T. Bajd. Robotics in rehabilitation. Proceedings of the 7th Mediterranean Congress of Physical and Rehabilitation Medicine 2008, Portoroz, Slovenia, pp. 3-5.

2. J. Kastanis. Reinforcement Learning as a Paradigm for Interaction in Virtual Environments, Opening of the EVENT lab, Barcelona, December 2008

3. R. Riener. Machines for Rehabilitation of Lower Extremities. 3rd International EURON UMH Robotics Winter School on Rehabilita-tion Robotics, 2008 Elche, ESP:

4. R. Riener. The Future of Rehabilitation Robotics. Euroacademia Multidisciplinaria Neurotraumatologica (EMN) 2008, Heidelberg

5. R. Riener. Patient-Interactive Robots for Rehabilitation. 5th International Conference on Electrical and Power Engineering, EPE 2008, Iasi, Romania:

6. R. Riener. Roboterunterstützte Bewegungstherapie. Forum Neuroradiologicum 2008, Ludwigshafen

7. R. Riener. Kooperative Roboter effektivieren die Bewegungstherapie. Jahrestagung 2008 „Neurorehabilitation, Wien

8. A. Kloenig. "MIMICS -Multimodal Immersive Motion Rehabilitation with Interactive Cognitive Systems", IEEE Cogsys, Karlsruhe 2008,

9. M. Mihelj. Emotion-aware system for upper extremity rehabilitation. Workshop on Affective *Brain-Computer Interfaces 2009, Amsterdam, Netherlands*

10. M. Munih. Upper extremity rehabilitation using robotics and VR, *International Neurorehabilitation Symposium 2009, Zürich, Switzerland, February 12-14, 2009*

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4.7 Project flyer and poster

Poster describing MIMICS objectives **[pdf]**

Promotional flyer describing MIMICS **[pdf]**