



# 16th International Conference on Research and Education in Mechatronics REM2015

Bochum, Germany, November 18-20 2015

## Proceedings

Rolf Biesenbach and Albrecht Weinert (Ed.)

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## Volume Editors

Rolf Biesenbach  
Albrecht Weinert

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## **Preface: Proceedings of the 16th International Conference on Research and Education in Mechatronics — REM2015**

### **Aims of the REM2015 - Conference**

Welcome to the proceedings the IEEE 16th International Conference on Research and Education in Mechatronics held in Bochum, Germany, between 18th and 20th November 2015.

Since its inception in 1999, the REM conferences and workshops are a knowledge sharing platforms covering the state of the art, experiences, and new trends in the areas of research, applications and higher education in mechatronics. It gives the opportunity to exchange experiences with emerging methods and practical applications across the borders of the disciplines involved in mechatronics. REM is promoted by the International Network of Mechatronics Universities, whose goal is to exchange experiences in mechatronics research and education. Currently more than 100 research and higher education institutions in 20 countries are registered in this international network.

Along with the implementation of the Bologna process and the continuous development of knowledge in the field of mechatronics, the concept of REM was constantly improved. For example in 2012 REM jointed with the MECATRONICS conference to MECATRONICS -REM in France. In 2014 the first REM was held outside Europe in Egypt. By developing the REM concept, e.g. the sponsorship by IEEE since 2014, the REM workshops were transformed in the REM conference in 2015.

### **Sessions and Topics**

The REM2015 offers 16 sessions on 13 topics featuring some 60 papers. All papers submitted to the conference went through a tripple peer-review. A keynote speech, a special session to honour the REM Honorary President with a farewell on his way to retirement and a special session for the work meeting of the boards of Deutsche Gesellschaft für Mechatronik and the Fachbereichstag Mechatronik are also part in REM2015.

**Keynote:** Robotics and Mechatronics – from outer Space to Factory, Surgery and autonomous Mobility, Prof. Dr.-Ing. Gerhard Hirzinger

## Sessions

- |                                 |  |
|---------------------------------|--|
| • Robotics I, II, III,          | Chairs: Prof. Krzysztof Kluszczynski,<br>Prof. Ulrike Zwiers, Prof. P.G. Tulupov |
| • Mobile Robots,                | Chair: Prof. Jörg Frochte  |
| • Industrial Applications,      | Chair: Prof. Orest Ivakhiv,<br>Dr. Damian Krawczyk                               |
| • Modern Curricula,             | Chair: Prof. Martin Löffler-Mang   |
| • Vehicles,                     | Chair: Prof. Peter Eichinger   |
| • Communication,                | Chair: Prof. Jörg Wollert  |
| • Energy,                       | Chair: Prof. Nathir Rawashdeh  |
| • International Projects I, II, | Chairs: Prof. Albrecht Weinert,<br>Dr. Kenneth Rotter                            |
| • Sensors and Actuators,        | Chair: Prof. Michael Schugt  |
| • Actuators,                    | Chair: Prof. Carsten Köhn  |
| • Control,                      | Chair: Prof. Tarek Tutunji   |
| • Mechatronics Applications,    | Chair: Prof. Marco Schmidt   |
| • Mechatronics Systems,         | Chair: Prof. Christiano Marinelli  |

## Honour

When in Germany in the 1990th the first degree programs in higher education in mechatronics were established, the need for an exchange platform grew — especially when the first graduates (Diplom-Ingenieur) of these programs were ready to find their areas of responsibility in the industry. At that time, in 1999 the first REM workshop was organised in Bochum initiated by Reiner Dudziak and his fellow colleagues Werner Roddeck, Wilhelm Caninenberg, Hans-Jürgen Frieske and Friedbert Pautzke (among others). The feedback of the first REM showed very fast, that there was a strong request for such an exchange in experiences in this then still new engineering discipline of mechatronics. Encouraged by the positive feedback, the REM was established as an annual event organised by different universities in different countries. Accordingly there were workshops in Denmark, Poland, France, Sweden, Estonia, Italy, United Kingdom, Turkey, Czech Republic, Austria and Egypt. Along all these years, Prof Dudziak became a steady force to keep the REM community on track.

In 2015 the REM came back to the roots in Bochum, Germany, to honour its initiator and Honorary President Reiner Dudziak - with a farewell on his way to retirement, - selflessly joined with the hope that as President Honours he will continue supporting the REM community many more future conferences.

## **Acknowledgements**

We would like to thank all participants from all different parties and institution for their support in any way to get the conference organised and especially:

- The REM2015 sponsors: IEEE — Institute of Electrical and Electronics Engineers, Hochschule Bochum, Gesellschaft der Förderer der Hochschule Bochum e.V., Deutsche Gesellschaft für Mechatronik e.V., Fachbereichstag Mechatronik, scienLab.
- The presidium of Hochschule Bochum, Prof. Martin Sternberg, Prof. Thomas Nied-Menninger, Prof. Rudolf Staiger, Canceled Dr. Christina Reinhardt and Prof. Jürgen Bock to their support in any possible way.
- The faculties of Electrical Engineering and Computer Science and of Mechatronics and Mechanical Engineering.
- The members of the International Programme Committee that honoured the conference with their support. They provided the most important contribution during the review-process and helped wherever possible to improve the Conference.
- All Members of the Organising Committee and especially Mrs. Katrin Heymann and Prof. Albrecht Weinert who worked hard to get the conference set up. They were always a source of inspiration for the whole team.
- All Scientists and authors who made the conference an extraordinary exchange platform with different scopes on mechatronics
- All Session Chairs for their alacrity organising and chair the sessions
- Mrs Heike Jansen from Shaker Verlag for her professional editorial work

## **Announcement**

The next REM conference REM2016 will be held at Compiègne, France, organised by Prof. Christine Prelle, Université de Technologie de Compiègne, again, as a joint collaboration between MECATRONICS and REM.

In the name of the organisers I am extending to you the invitation to contribute to and attend this important event in the field of Mechatronics.

Bochum in November 2015

Rolf Biesenbach

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# 1 Robotics

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### Proceedings

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