

## PhD Project

### Modeling and control of agricultural plants growth behavior

Agricultural engineering and precision farming are becoming more and more popular and appear as one of the key elements realizing a better world by improved efficiency working with water, fertilizer, waste water, daylight etc. In the last years the Chair of Dynamics and Control developed and published a clear understanding how to model plant growth (of maize/corn). Actually we are realizing suitable automatic control strategies improving growth and parallel minimizing water consumption and/or realizing other dynamical goals.

In the next years we want to extend and focus on integrating the newly developed knowledge into a new series of experiments. To bridge the existing gaps some important steps has to solved: automatic modeling and model adaption of individual plants, model predictive control for this kind of event-discrete systems, calculating virtual measurements required for irrigation based on real data including satellite data etc. We emulate the fields condition in our new greenhouse labs.

Beside the development of method(s) we validate our approaches using our own test equipment. In this case our handcrafted-greenhouse is fully equipped with the required PLC-based sensor and automation technologies to realize relevant measurements of (small) plants.

The next intended research development steps concentrate on

- modeling plant growth including statistical validation and/or FAO-model comparison.
- the full and reliable automation of our greenhouse including extentions with respect to the number of plants fully sensed and actuated.
- building models allowing virtual measurements of the plant using external data.
- mechatronic technologies for actuating the plants on an close-to-individual scale.

Therefore we need students from the agricultural field or mechatronics or automation and control field with a strong and shown interest in this unconventional field of research with

- i) a strong engineering programming and or automation background,
- ii) an agricultural background especially related to irrigation control, and
- iii) clear understanding about the background and implications in combination with two right hands.

If two of the three requirements are fulfilled, feel free to apply.

From the new candidate we expect that s/he is willing to become very fast an important and valuable member of our team within the Chair.

Therefore we expect

- i) a shown and strong expertise in related scientific fields to be integrated,
- ii) your ability and commitment to develop and validate NEW methods and approaches, and

iii) your willingness and commitment to write scientific contributions on a world class level.

In case of interest please provide beside the usual application material (CV, grades, ...) material stating that you have strong English language skills (TOEFL IBT better than 95, IETLS better than 6.5) and a detailed and described interest ONLY in the described research fields. Your German language skills can be (if necessary) improved by language courses in parallel (for example at the Goethe Institute, Düsseldorf) (on your cost). For further information about the requirements see also the website of the Chair SRS: [www.uni-due.de/srs/prospective](http://www.uni-due.de/srs/prospective).

Be aware about the time schedule of your DAAD-application:

application now or in September/October year 1 leads to the beginning of german language courses in May/June year 2 and start PhD research at the Chair SRS in October year 2.

In case of other application (government programs, national/university training programs):

You should be supported for more than 3,5 years. In case of support for less than 3,5 years, you should convince us based on existing international publications from the last five years.

The successful candidate is primarily directly related to:

Prof. Söffker (Scientific supervisor: Prof. Söffker)

### **About you:**

Bachelor and Master degree in Electrical or Mechanical Engineering or Information science or Mathematics, Agriculture Engineering, or Automation/Control (with strong interests in programming) (with clear related specification) necessary, deep interest in the field, excellent grades in related courses. Related and/or diverse qualifications can possibly also be very attractive.

### **About us:**

Chair SRS (Head: Prof. Söffker) at U DuE, Germany:

With a mix of coworkers and PhD students the Chair has a strong and long tradition in supervising academic trainees. The internal organization scheme will allow an improved organization of the academic work of the PhD students in guided groups. Academic qualification includes not only the PhD topic related work but also advising coworking students (Bachelor/Master level) based on individual qualification and skills etc.

The PhD students working in the group are financed by the university or by public funding, financed by industry projects, by their home countries or by DAAD scholarships.

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### Next steps:

1. Be aware of your national DAAD application deadline (which varies between February and November each year).
2. Contact Prof. Söffker directly by E-Mail (soeffker@uni-due.de, subject: DAAD-Appl. HMS) and send copy of CV, certificates, recommendation letters as well as a first proposal (2-3 pages) about your understanding of the intended topic, your intended working schedule, the state of the art in this field as well as the deduced definition of your project. A 'copy and paste'-strategy will disqualify you immediately.
3. Be aware about the time schedule of your application: DAAD example application in September/October year 1 leads to begin language courses in May/June year 2 and start PhD research in October year 2.
4. Joint improvement of the proposal: If the quality of the project proposal is finally fitting to the groups standard (=perfect) Prof. Söffker will invite you by writing the required acceptance letter.
5. The final decision is with the DAAD committees.



Chair of  
Dynamics and Control

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