Masterthesis
at Schneider Electric in Marktheidenfeld, Germany

General information

Today’s packaging machines cover a wide range of products in pharmaceutical, cosmetic, home care, food, beverage, dairy, tissue and paper etc. Their main task is to automate steps that happen over and over again in the packaging process in a fast and reliable way. Using state of the art technology, for example 1000 dish washer detergents can be wrapped in only one minute. This figure could move up to 2000 wrapped candies per minute, which means that the paper travels at a speed of 3 m/s.

To accomplish these goals a packaging machine distributes the control task across several components. The servomotors house the motor feedback controller along with sensors and their signal processing. The motion/logic control generates the reference values for the motor controllers; this functionality can range from pure feedforward and logics to a complex MIMO structure involving feedback from other sensors and coupling of different axis.

Schneider Electric supplies these components to machine makers, including hardware, platform and application software. While machine makers cannot change that much within the servomotors’ controller, they usually programme the motion controller using an application software with given technology functions.

Master’s theses usually touch at least one of the following areas:
- Modelling,
- Identification, parameter estimation and validation,
- Fault detection,
- Controller design, both linear and nonlinear.

Models are based on data that are collected in the laboratory or a complete machine (often both). Following the same philosophy, controllers are designed based on the developed models or on already existing ones. Followed by a validation process based on simulation, controllers will be tested in the machine or a lab setup directly.

Students of electrical engineering or computer science programmes, as well as students of mechatronics or applied mathematics programmes are mostly welcome to work on a thesis at Schneider Electric in Marktheidenfeld.

In order to complete these works successfully, a strong background in control engineering is required: this includes a basic course in control (covering modelling and control of linear systems), possibly courses on control theory, some lab-experience using Matlab/Simulink and related tools and basic programming skills in C++ or IEC 61131 type of languages (the latter is not necessary to know in advance, since this can be learned). Depending on the problem in particular, some familiarity with commissioning issues and electronics (basic wiring, taking measurements) is useful. However, there is an opportunity to learn these technicalities “on the job”.

The development department in Marktheidenfeld consists of some 100 engineers dealing with machine functionality development, software, hardware, robotics, functional safety and testing.

Applications shall include a cover letter with statement of interests and name of a reference person at the university, copy of university courses and apprenticeships done so far, including credit points, marks etc.

About Schneider Electric

As a global specialist in energy management with operations in more than 100 countries, Schneider Electric offers integrated solutions across multiple market segments, including leadership positions in Utilities & Infrastructures, Industries & Machine Manufacturers, Non-residential Buildings, Data Centres & Networks and in Residential. Focused on making energy safe, reliable, efficient, productive and green, the Group’s 144,000 plus employees achieved sales of 24.7 billion euros in 2016, through an active commitment to help individuals and organizations make the most of their energy.

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Schneider Electric Automation GmbH

Schneider Electric Automation GmbH with its main office Marktheidenfeld/Germany is part of the Schneider Electric global Industry business. With its departments Machine Solutions and System Consistency, Schneider Electric Automation is globally responsible for developing and manufacturing hardware and software products for automation solutions in machines and plants. The international activities of the department Machine Solutions are managed in Marktheidenfeld.
Masterthesis

Security for safety in industrial control systems

Students of Electrical Engineering, Mechatronics, Computer Science or Mathematics

Background While safety is an established and mature discipline, security emerged over that past years, especially with recent incidents in industrial control systems and other IT based systems. Loosely speaking, safety is about protecting the environment from the system, while security seeks to protect the system from its environment. Obviously, security issues can quickly transform into safety issues, once we are looking at security of a safety related system. Despite of this, both disciplines did not really converge in the past years. Reasons for this include, but are not limited to the following aspects:

- Risk analysis in safety is static (as long as you don't change the environment/application, it will be correct, hence your safety concept will be fine). Threat analysis in security is not static at all. Attack schemes might change because technology changes around you. Probability might increase because you are more interesting now. So your defense strategy might not be appropriate any more.
- Incident reporting: in security, you would not go public unless you have a solution in place. In safety, you are legally obliged to do so.
- Updates: safety people don't like daily patches so much, security people have to.

Goals & approach

Based on a recent work, an example should be developed to simulate an industrial system which is safety related and possibly subject to cyber attacks. The system should have the usual fault detection schemes on board in order to detect random failures in hardware/mechanics etc. Fitness for purpose of these measures shall be proven by fault injection tests. Having laid this basis it can be investigated how these measures would react to the various cyber attacks (both in theory and practice).

Interested? We are looking forward to receiving your application:
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References


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