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Cooperative Embedded Systems

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The main task of the current bachelor thesis is to develop an easy to use and flexible automated environment for simple control systems. The control system is based on intelligent independent webnodes which feature the following functions. An actor receives measured data from a distant sensor and decides upon its state according to pre-defined rules. Should any communicational problems with the sensor occur, then the actor needs to change to a security state and has to wait until it returns to normal operation. The user configures the system through a website. There is no further user interaction required when in operational mode.

During the first phase of this thesis the results from the pre-thesis have been revised, especially the communication protocol and the user concept underwent several adjustments. In the next step the concept has been implemented on a webnode prototype based on a 32-bit ARM Cortex-M3 processor.
The prototype was already equipped with some firmware modules, particularly with components of an IP protocol stack. The existing firmware has then been expanded by the following modules.
The webnode control module steers the interactions between the different nodes while the regulator module controls the behaviour of the webnode. The web unit is based on a self-developed web server which also includes a template engine. The firmware is completely written in the programming language C.

The software is implemented on a specifically designed hardware using the programming language C.

The resulting prototype of a webnode is a proof of concept and shows the practicability of the defined mechanisms. The elementary application, which seeks distant nodes, subscribes to them and refinds them after a communication interrupt, is fully functioning. The actor follows the given behavioral pattern. The system can comfortably be configured using a simply and extensible website. Further enhancements are discussed in the outlook.

A concept of a modern and intuitive user interface was developed and implemented.