

Embedded platform for automation of Medical Devices

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This paper describes the hardware and software components of an embedded platform that may be used for the automation of medical devices. The platform is capable of capturing data from different sensors using multiple interfaces such as analog signals, USB, CAN and RS-232. This captured data may be recorded, visualized and sent through network for remote analysis.

The system is composed of a main unit based on an ARM microcontroller running Linux and a supervisor unit implemented in a low-power microcontroller running Free RTOS. This unit continuously checks the status of the main unit and gives an alarm signal in case of failure. A library was developed in C++ to provide different components that can be used for the specific control applications. For the creation of the user interfaces Embedded QT was used.

A fuzzy control mechanism was implemented to make decisions upon the acquired data and control external devices. The rules of the fuzzy controller may be easily updated and the system may be reprogrammed remotely.

As an application example the embedded platform was used to automate a portable extra-corporeal support system (ECSS). Signals such as pressure and flow are acquired through an ADC board that is attached to the main unit. Additionally SpO2 is acquired through a serial port. A target pressure, flow and SpO2 are set by the operator. The fuzzy controller is able to control these parameters by changing the centrifugal pump speed, the fraction of inspired oxygen and the gas volume.

