

Design and Implementation of Data Acquisition System

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Abstract

Data acquisition system is a system used to acquire and record real world physical variables as a part of an experiment. Such systems have been rapidly expanded at time of cheap microcomputers and memories arrival on market. Researchers benefit of the ability to perform experiments 24 hours a day, 7 days a week, without a need of human control.

In this diploma thesis we are designing universal data acquisition system. The device collects digital and analogue data out of connected sensors. The series of configurable rules are applied on the collected data (trigger subsystem) and the result is tagged with time stamps. Such data are stored on Secure Digital memory card and optionally sent through Bluetooth serial line or ethernet to external system to be used online. Proposed system has specific timing constrains, thus firmware is designed with the RTSAD method, which is visualizing data flows between processes and functions.

The output of the thesis includes implemented prototype on hardware driven by Cortex-M3 microcontroller. We are verifying the prototype in laboratory environment with the method we have presented at IIT.SRC 2015 conference. The prototype has been used in series of real-life experiments, including data acquisition at high-altitude balloon.

During 5 hours of flight, the balloon reached the altitude of 27755 meters above sea level. In the thesis designed and implemented DAQ system was measuring acceleration, ambient temperature, ultraviolet irradiation and background radiation.

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