

ABSTRACT

The habilitation thesis reveals the scientific and professional achievements accumulated during 2001 and 2015. This time period corresponds with my activity beginning as a member in the Applied Electronics Department of the ETTI Faculty from the Technical University of Cluj-Napoca.

In the above mentioned time period, I was involved in the department's research activities having realized more than 50 research contracts from which 14 as a director or as a contract responsible person.

As a result of the above research activity, I have published 59 scientific papers from which 6 are published in ISI magazines, 10 in ISI conference proceedings volumes and 20 in BDI conference proceedings volumes. In addition, I have published 5 books as a single author with the subject related with this habilitation thesis – the AVR microcontroller. The other 2 published books are related with the main research domain: the measurement transducers mounted in the hydro-technical buildings.

Almost all the research activities in which I was involved were finalized with apparatus or equipment with practical destination.

The habilitation thesis reveals information regarding the practical applications realized by myself with the AVR microcontrollers. The applications' description is divided in 4 chapters, as follows: frequency, time and duty cycle measurement of the signals, analog signal measurement, acquiring digital data and analog and digital signal generation with AVR microcontrollers, and every chapter is further more divided in four sections.

In the first chapter, regarding the time measurement, the contributions revealed consist in frequency measurement of the vibrating wire transducers, frequency, time period and duty cycle measurement of the digital signals and respectively, time and frequency measurement of the analog signals. From the scientifically point of view, regarding those measurement procedures, there have been published 7 articles from which the [26], [67], [76] and [79] are being ISI indexed and the [57] and [59] article are indexed in IEEE Xplore. On this domain, two books [18] and [74] were published, and a part of this data was the basis of

the PhD thesis [75]. As a supplementary fact, the above mentioned books cover a major part of the second chapter.

The second chapter presents the obtained results when analog data is acquired with the help of AVR microcontrollers. Thus, there are presented different applications regarding the resistive transducers measurement, capacitance measurement, signal analysis involving the TSL1412S image sensor and the active energy measurement of a dissipative load with 6 resistive elements. The scientific results regarding those applications were published in 21 technical papers as follows: three papers in the EDN ISI indexed magazine [5], [13] and [60], four papers in ISI conference proceedings volumes [23], [46], [65], [68] and six papers in ISI conference proceedings volumes [2], [3], [6], [8], [9] and [58]. Also, the [7] and [62] PhD thesis are partially based on those applications.

In the third chapter, digital data acquiring procedures are being revealed. In the first section of the chapter are being presented different aspects regarding the data acquisition from the built systems, mounted inside and outside of a hydro-technical building, the galvanic separation on the RS485 communication network and a way to supply voltage using solar panels where the measurement points are far away of a normal voltage supply grid. The other presented applications in this chapter present distance measurement using triangulation procedures with laser telemeters (AMS200) and temperature measurement (LM92), data acquisition from the displacement transducers with quadrature output and data acquisition of digital signals with higher or lower time evolution. The scientific effects of the above applications were presented in [15] and [16] are ISI conference proceedings volumes and [4], [61], [63] și [66] are indexed in the IEEE data base. An article regarding the data acquisition of quadrature signals is in press for the following issues of the EDN magazine. It is good to be mentioned that the ASM200 laser telemeter distance measurement, correlated with the temperature measurement using LM92 sensors, can be viewed as a new data base, which can be taken into consideration in the safety analysis regarding the operation of the Ruienii underground hydroelectric plant. This application was implemented inside the CEE54/2006 Infosoc project.

In the last chapter are being presented aspects regarding the research in signal generation, both digital and analog, with AVR microcontrollers. Thus, there are presented data regarding signal generation with a single AVR microcontroller,

signals used for sensor control in the measurement procedures (TSL1412S, AccuStar, etc), excitation signal generation for vibrating wire transducers, analog signal generation and control and command signal generation using the PWM modulator. For this application there is presented even the controlled element, an electronic switch with higher than 2500A current ratings. This electronic switch is used for current pulse generation in a sintering application. I have published an article inside the EDN magazine regarding control signal generation for the TSL1412S image sensor [13] and the [10] paper is based on the rotation speed control for a motor using PWM modulation, both articles being ISI indexed. Aspects regarding the 2500A electronic switch were revealed in the BDI article number [11]. It is good to be mentioned that this scientific paper made possible to gather some measurements which represented the scientific basis for the ISI papers [52] and [53] and also for the [51], [54] and [73] PhD thesis.

During the above time period I was strongly involved in the teaching activity. Proving this, there are 10 papers with strong didactical content [35], [36], [37], [38], [39], [40], [41], [42], [43] and [44], four of the above papers being BDI indexed.

All the scientific achievements, correlated with the material basis gathered, will represent a good way to continue the research activity: a 2D positioning system with high accuracy, an optical apparatus for optical pendulums measurement, an apparatus dedicated to the spectral analysis of the vibrating wire transducers, data image acquisition with the CCD3041F sensor, a voltage supply for the sintering application, an apparatus able to measure and follow the behavior of cracks in the hydro-energetic buildings and, the last but not the least, creating intelligent sensors.