Internet data acquisition system for a safety cabinet for collection of specimens with airborne pathogens

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Abstract

Data acquisition system, main elements in electromedical engineering is essential for collecting data from environments and provides adequate information about physical-chemical parameters and their time dependently change (fig. 1).

The safety cabinet for the collection of specimens with airborne pathogens is an enclosure destined for the collection of sputum in conditions in which the patient, the person who assists the collection and the environment are simultaneously protected against exposure to airborne pathogens. Due to high demands and constant upgrades of information and communication technologies, it was necessary for this cabinet to develop an Internet data acquisition system having low cost and relying on new concepts . Hardware and software project developed for this cabinet is presented.

Fig. 1 Internet acquisition system for electromedical products

Material and methods – development principles

The data acquisition system via the Internet, achieves the acquisition of eight (8) analog signals on 10 bits, and transmits them via the Internet to the site www.aprilcj.ro, where they are displayed in graphic or tabular form. The data correspond to the main physico-chemical parameters of the indoor environment (temperature, humidity, airborne dust loading, air speed) and electrical operating parameters (supply voltage, supply current). Data transmission is on request. The transmission request consists of a certain SMS sent through the GSM network to the monitoring module (fig. 2).

#	I	U	P	T1	T2	US	Data
240	1.70	226.00	384.20	37.30	37.30	9.00	2021-09-21 21:34:29
239	1.50	227.00	340.50	37.20	37.20	0.00	2021-09-21 21:34:29
238	1.30	227.00	295.10	37.30	37.30	9.00	2021-09-21 21:34:29
237	1.30	227.00	295.10	37.20	37.20	9.00	2021-09-21 21:34:29
236	1.20	227.00	272.40	37.20	37.20	9.00	2021-09-21 21:34:29
235	1.10	227.00	249.70	36.80	36.80	9.00	2021-09-21 21:34:29

Fig. 2 SMS sent through the GSM network to the monitoring module

Hard project development

From a constructive point of view, the whole hard project is made on a single electronic board. On this board there is a microcontroller type PIC 18f46J11, which communicates serially with a GSM / GPRS module type SIM800C. In order to be able to connect to the Internet, a SIM card M2M (machine to machine) is used for the GSM / GPRS module. The analog signals are processed by the microcontroller's analog-to-digital converter. The acquisition board is powered by a voltage of 5V. From this voltage is obtained the voltage of 4V for powering the GSM / GPRS module and the voltage of 3.3 V for powering the microcontroller (fig. 3)

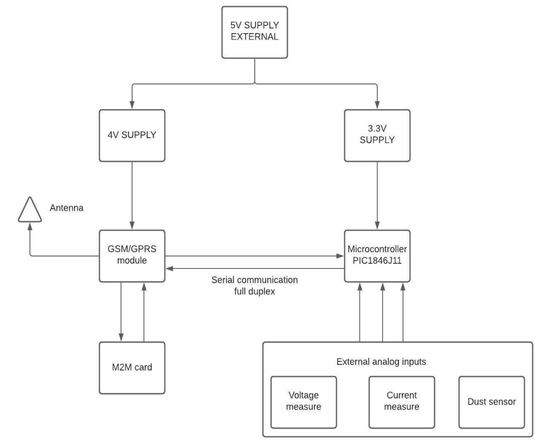

Fig. 3 Hard project

Soft project development

The logic diagram of the data acquisition board software is given in figure 4. After the general initializations and the GSM initializations, a certain SMS is expected. As long as this SMS is not received, it remains in the waiting loop. After receiving the SMS, the GpRS is initialized and the end of measurement signal is expected, which comes to 10 seconds. After the signal comes, the signals are calibrated and the message is formed so that the site accepts it. Then the connection to the site is made, and the message is sent after which the connection with the site is closed. At a transmission request, a certain number of transmissions are made. It is tested if all transmissions have been made. If they are not done, increment the transmission counter and move on to the next transmission. If all transmissions have been made, the transmission counter is initialized and the SMS waiting loop is entered. The signals are measured on interruption. For a transmission, 10 signals are measured and stored in a buffer for each second. Thus, although transmissions are made only once every 10 seconds, there is information about signals from second to second.

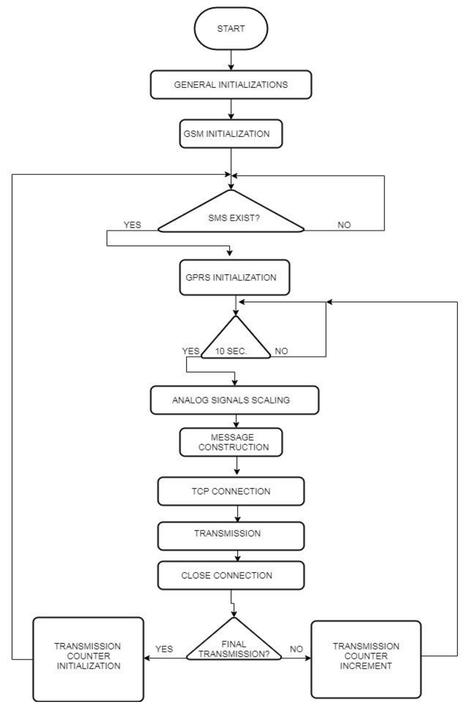

FIg. 4 Logic diagram of the data acquisition board software

Conclusions

An Internet data acquisition system has been developed that allows remote monitoring of the behavior of an electromedical product: a safety cabinet for collection of specimens with airborne pathogens

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