Self-dependent Internet module for control and measurement

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Abstract — **This paper presents a self-dependent Internet module for control and measurement. We describe a computer-system architecture, a block diagram of functional generator, data acquisition system and working algorithm.**

The remote control is realized by computer networks and using the TCP/IP protocols. For that purpose is used "Customer-Server" architecture.

Keywords **— Remote data acquisition system, Internet**

I. INTRODUCTION

Some of methods for control and automatic diagnostic of electronic systems require different calibration signals [1-8]. This problem is successfully solved by using the functional generators. These generators produce signals with calibration parameters. Some of them are: waveform, frequency, amplitude and phase.

The remote control and automatic diagnostic require communication area to be build. An opportunity is the existing computer networks to be used. This enables realizing remote control and automatic diagnostic without building new communication networks. Internet connects points from all over the world. We may use this property for carrying out our plan.

II. ARCHITECTURE

The computer-system architecture of self-dependent Internet module for control and measurement is represented on Fig. 1 [9-17]. The system includes users, Internet, local area network (LAN), functional generator board (FG), data acquisition board (DAB), the analyzed object, microcontroller (μC) and network controller (NC).

Communications between "users and Internet", "users and local area network", "Internet and network controller", "local area network and network controller " are based on TCP/IP protocols. The world wide web pages is based on HTML and Java script languages. The HTML language utilizes building web pages. The Java script language utilizes online data processing. The users need Internet browser software. Some of them are: Netscape communicator, Internet explorer, Opera, Konqueror web browser and Mozilla.

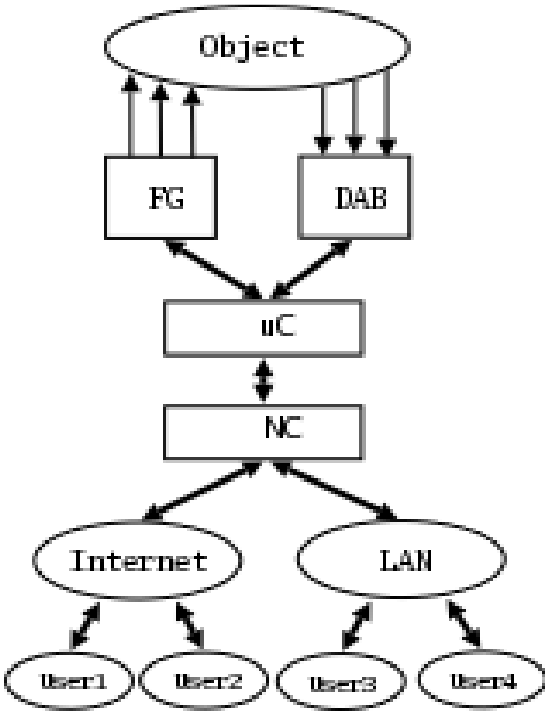

Fig. 1. The computer-system architecture of self-dependent Internet module for control and measurement.

III. USER ALGORITHM

The algorithm, which describes the processes in the user algorithm, is represented on Fig. 2. It includes login and control process. The user starts with connection to the self-dependent Internet module for control and measurement. After login the user chooses the signal type. The signal types are as follows: sinusoidal waveform, puls waveform, sawtooth waveform, triangle waveform and square waveform. The next step is selection of the signals calibration parameters. Some of them are: frequency, amplitude, phase and duty-cycle. Then the user chooses DAB channel, makes setup of the parameters and starting the measurement process. The software program makes data processing of the selected parameters. Then the data receive and display. The algorithm finishes with two options. The first option is the program returns to the main menu, so that, making a new choice of the signal type to be possible. The second option is the program goes to the end.

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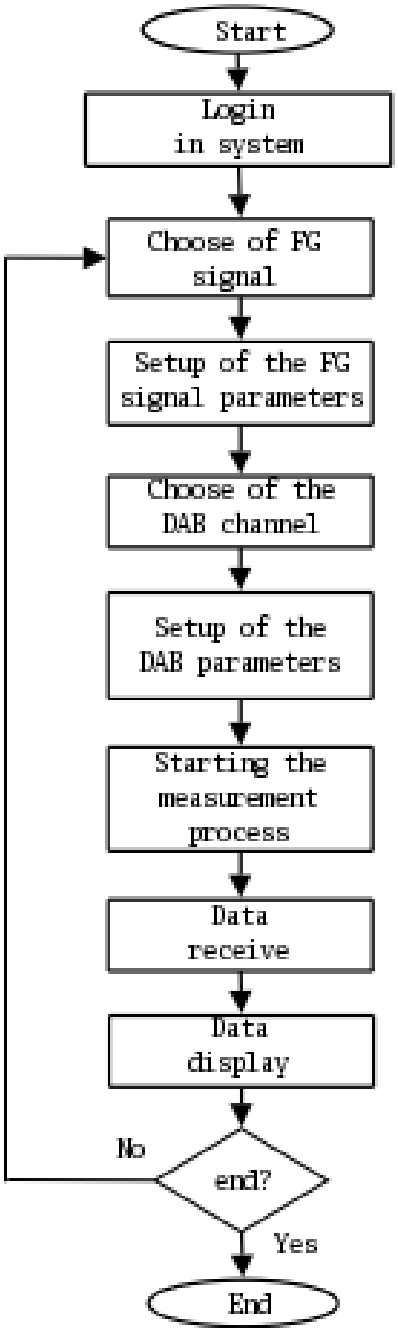

Fig. 2. Computer-system algorithm of of self-dependent Internet module for control and measurement.

IV. FUNCTIONAL GENERATOR BOARD

The functional generator board is represented on Fig. 3. The board consists of the following functional elements: microcontroller (μC), direct digital synthesizer (DDS), low-pass filter (LPF), amplifier (A) and programmable attenuator (PA).

The microcontroller receives the data from network controller (NC) and performs codes to the direct digital synthesizer and programmable attenuator. These codes define the work mode of the functional generator.

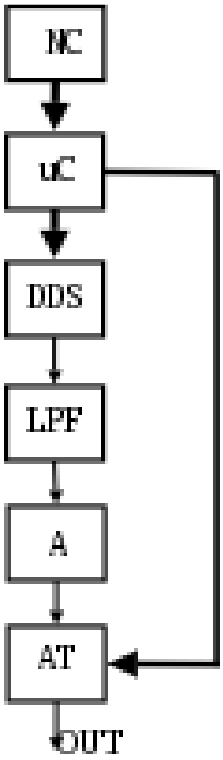

Fig. 3. Functional generator board controlled by Internet.

The parameters: waveform, frequency, phase, amplitude of the signals, generated by means of the direct digital synthesizer, may be controlled. All of them are defined by means of code sequence, produced from the microcontroller.

V. DATA ACQUISITION BOARD

The data acquisition board is represented on Fig. 4. The control board consists of the following functional elements: sensor (S), normalizing converter (NCon), analog multiplexer (Mux), programmable amplifier (PA), analog-to-digital converter (ADC), microcontroller (μC) and network controller (NC) .

It is imperative to be used a sensor for investigating the quantity if it is non-electrical. The normalizing converter is used for leveling the amplitudes of the signals in the dynamic range of the input signals. The normalizing converter consists of attenuators for signals with high amplitudes and amplifiers for low amplitude signals. One contains low-pass filters for eliminating the aliasing effect. The analog multiplexer selects only one of all input signals. The selected signal is amplified by means of the programmable amplifier. The amplified signal should be tend to the maximum value of the analog-to-digital converter range, but it must be weaker than the saturation value. The input signal mast be amplified on purpose of eliminating the quantization error. The measurement process, collecting of information and the connection with Internet is controlled by the microcontroller and network controller.

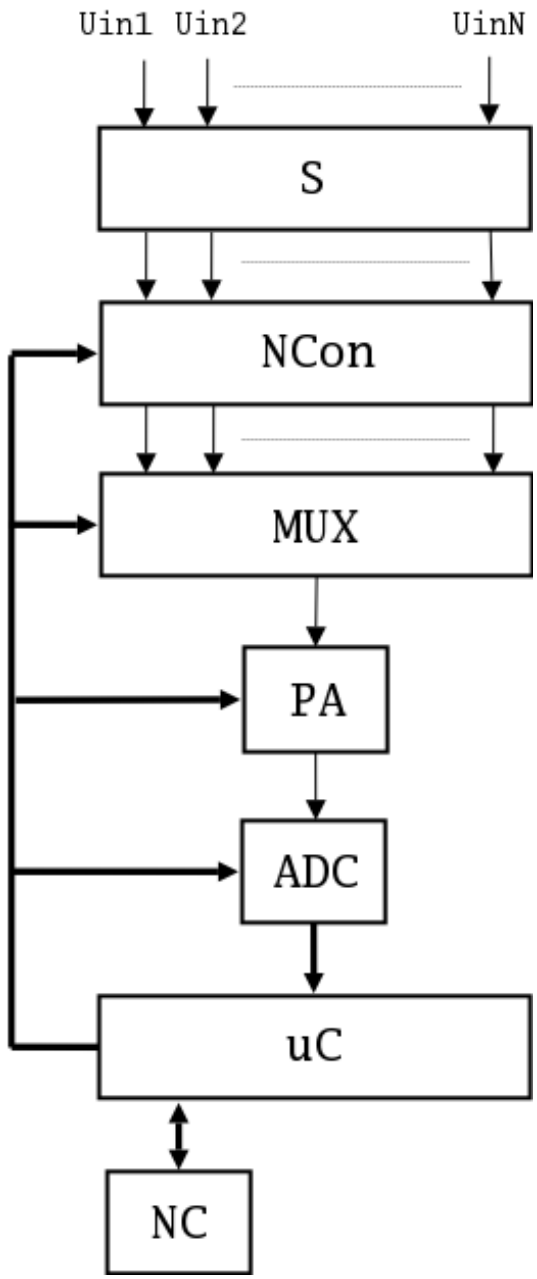

Fig. 4. Data acquisition board controlled by Internet..

IV. CONCLUSION

In this paper, we have presented a self-dependent Internet module for control and measurement. We described a computer-system architecture, block diagram of functional generator, data acquisition system and working algorithm. The remote control is realized by means of computer networks. The software algorithms are based on HTML and Java script languages.

The proposed self-dependent Internet module for control and measurement may be used for:

- remote control in industry;
- remote control in scientific research;
- remote automatic diagnostics of electronic systems, and
- distance learning education, which enable to analysis of different real objects investigation in laboratory work.

The advantages of the self-dependent Internet module for control and measurement, are:

- it is not necessary the setup of the system to be changed, when different objects are controlled,
- work flexibility,
- low cost,
- online data processing, and
- the browsing technologies enable asynchronous distance learning education with real active systems and devices.

REFERENCES

[1] A. Serdakov: Automatic control and technical diagnostics. Kiev, Technica, 1971.

[2] G. Franklin, F., J. D. Powell, M. L. Workman: Digital Control of Dynamic Systems. Stanford, Califonia.

[3] G. Mihov: Control and automatic diagnostics of micriprocesor system}. Sofia, Technical University, 1994.

[4] J. Marinov, E. Rangelova, V. Dimitrov: Technical control of radioelectronic system and device. Sofia, Technica, 1980.

[5] V. Kolriachko: Bild micriprocesor system control of REA. Moskva, Radio and sviaz, 1987.

[6] J. Marinov, E. Rangelova, V. Dimitrov: Technical control of radioelectronic system and device. Sofia, Technica, 1980.

[7] V. Karipskij, P. Parhomenko, E. Sogomonian: Technical diagnostics of control object. Moskva, Energia, 1967.

[8] V. Kolriachko: Bild micriprocesor system control of REA, Moskva, Radio and sviaz, 1987.

[9] V. Karipskij, P. Parhomenko, E. Sogomonian: Technical diagnostics of control object, Moskva, Energia, 1967.

[10] Zl. Stoilova: An access to database through Internet. In: Proc. Conf. Communication, Electronic and Computers Systems, vol. 2, Bulgaria, 2000, pp. 187-192.

[11] The Linux Serial Programming HOWTO: http://linuxdoc.org.

[12] The Linux Documentation: http://www.linux.org/docs/index.html.

[13] http://www.apache.org.

[14] http://www.php.net.

[15] http://www.linux.org.

[16] http://www.redhat.com.

[17] http://www.mysql.com.