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Mykhajlo Poliakov

PhD, professor NU «Zaporizhzhia polytechnic»

APPLICATION OF PERIPHERAL DEVICES SIMULATORS

Laboratory courses for the study of microcontrollers (MK) until recently used available simulators that display only the status of the resources (registers, memory) of the MK. This causes difficulties when debugging interaction programs with the control object and the operator, which require simulation of electro mechanics and indication devices. Objective - to describe the experience of studying MK using integrated simulators of MK and peripheral devices.

In 2020, in the training laboratory courses on the use of microcontrollers in the departments of electrical and electronic devices and radio engineering and telecommunications, freely distributed simulators UnoArduSim and EdSim51DI were used. The screens of these simulators contain configuration elements of peripheral devices and dynamic circuits for their connection to the microcontroller. The Peripherals for EdSim51DI are ADC, Comparator, Four 7-segment LED Displays, LCD Module, UART, Keypad, LED Bank, Bi-directional Motor, Switch Bank, DAC (output displayed on oscilloscope). UnoArduSim I/O Devices are Serial Monitor, Software Serial, SD Disk Drive, Shift Register Slave, Configurable SPI Slave, Two-Wire I2C Slave, '1-Wire' Slave, One-Shot, Programmable 'I/O' Device, TFT Display, Digital Pulser, Analog Function Generator, Stepper Motor, DC Motor, Servo Motor, Piezo Speaker, Slide Resistor, Push Button, Coloured LED, 4-LED Row, 7-Segment LED Digit, Analog Slider, Pin Jumper.

The topics of the laboratory work were the study of the simulator interface, program structure, commands, procedures and functions of the programming language, the simplest techniques for configuring and controlling sensors, actuators, and indicating devices. The display of programming results in animation by the actuator on the simulator screens increases students' interest in the topic under study and stimulates independent experiments on programming microcontroller systems.