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Microcontroller system of an air humidity sensor

Development of a humidity control system based on the PIC16F877A microcontroller is provided. A description of the algorithm of the device action and the result of the research work are provided.

Description and specifications of the microcontroller PIC16F877A

A digital humidity sensor with an LCD display is used to measure the relative percentage of water vapor in the air. The capacitive humidity sensor HS1101 [1] is combined with a microcontroller PIC16F877A to measure humidity, and an LCD display is used to display the percentage of air humidity. For humans, there is a certain limit to the presence of water vapor in the air [2]. Relative humidity above this limit can cause problems with human health.

The microcontroller PIC16F877A is one of the most popular microcontrollers in the industry. This microcontroller is very easy to use and code. Programming this controller is also easy. One of the main advantages is that information in it can be written and erased many times because it uses FLASH memory technology. It has a total of 40 electric pin connectors and 33 input and output electric pin connectors. The microcontroller PIC16F877A is used in many microcontroller projects. The PIC16F877A has many applications in digital electronics circuits also.

The microcontroller PIC16F877A is used in a huge number of devices [3, 4]. It is used in remote sensors, security devices, home automation, and many industrial devices. It also has an EEPROM, which allows it to permanently store some information such as transmitter codes and receiver frequencies, and some other related data. The cost of this controller is low and it is also easy to operate. It is flexible and can be used in cases where other microcontrollers have never been used before, such as performing timer functions, etc.

• It has a small set of 35 instructions.

• It can operate at a frequency up to 20 MHz.

• Operating voltage is from 4.2 to 5.5 volts. If you set it to a voltage of more than 5.5 volts, it can be permanently damaged.

• It has no internal generator like other microcontrollers PIC18F46K22 and PIC18F4550.

• The maximum electric current that each port can use is about 100mA. Therefore, the electric current limit for each GPIO electric pin contact of the PIC16F877A is 10 mA.

• It is available in four IC packages such as 40-pin PDIP, 44-pin PLCC, 44-pin TQFP, 44-pin QFN.

As mentioned earlier, there are 40 electric pin contacts in the microcontroller. It consists of two 8-bit and one 16-bit timer [5]. It also has capture and comparison modules, serial ports, parallel ports, and five I/O ports.

Description of the device operation algorithm

The operation algorithm of the system was developed in the form of a chart (Fig. 1).

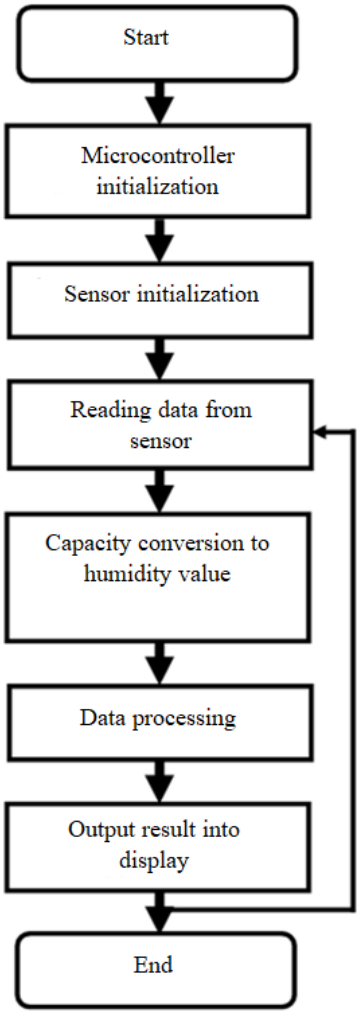

Fig. 1. Chart of the device operation algorithm

The system works as follows:

1) Start of modeling;
2) The microcontroller is initialized together with a capacitive sensor;
3) Data is read from the sensor;
4) The result is generated with variable capacitance into a pulse signal;
5) Some data processing is in progress;
6) The result of processing is shown on the display.

System modeling

After writing the code in the microC compile for PIC, it is needed to enter into the Proteus program. In the settings of the microprocessor PIC 16F877A, we load the code.

Figure 2 shows the result of the electric circuit simulation using the pulse generator in the Proteus program. The obtained simulation result is a value of relative humidity of 45%, which is the optimal value of relative humidity of the air.

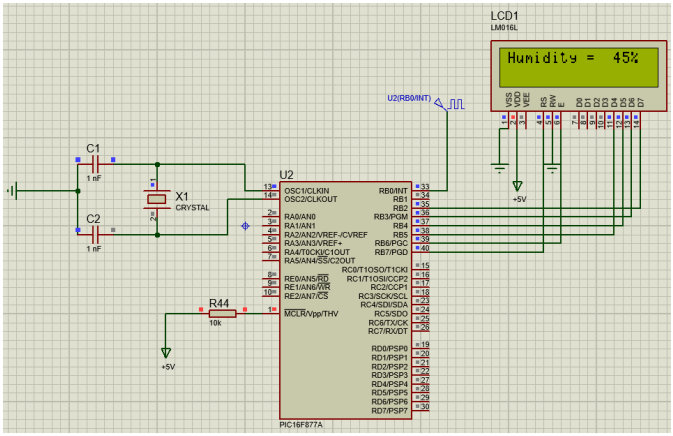

Fig. 1. The scheme of modeling the operation of the humidity sensor

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