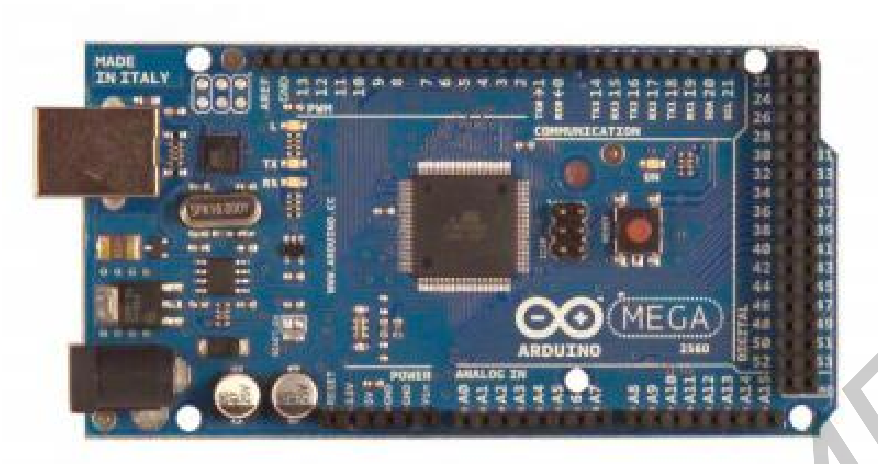

Fig. 1 - General view of the Arduino microcontroller unit

The advantages of a microcontroller unit include the following features:
- low power consumption;
- high frequency of up to 16 MHz;
- the presence of up to 54 digital, 16 analog and 14 PWM outputs;
- an integrated programmer with USB interface;
- automatic selection of power supply;
- the built-in protection of the microcontroller;
- a small size module;
- communication outputs;
- open cross-platform development environment;
- the simplicity of development and application;
- low supply voltage, thereby reducing the risk of use;

The specialized developing environment is used to programming. The programming language which is used is easy in application and learn thanks to the fact that it is similar to the programming language C++. The unit is connected to the PC using the standard USB and doesn't requires special equipment since the programmer function is implemented at the block.

Digital and analog outputs of microprocessor unit can be used as inputs. The complex feedback implemented using optoelectronic devices are optical pairs. This will add to the system flexibility and additional functionality.

The system is provided secure emergency power-off to prevent damage to personnel.

The operation of the system can be made both in standalone mode and by transmission operations from PC.

Laboratory-methodical complex will fully evaluate contemporary methods of management of electronic systems and obtain the necessary skills to work with microprocessor blocks.

ELECTROMAGNETIC RADIATION SHIELDING

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Electromagnetic fields are present everywhere in our environment. Some objects emit electromagnetic radiation at high level that can affect human health.

Radiation is a broad term used to describe energy emanated in the form of waves or particles. Radiation in the form of waves is referred to as electromagnetic radiation. Electromagnetic radiation of sufficient energy can cause atoms to become electrically charged, or ionized, and is referred to as ionizing radiation. Lower energy electromagnetic radiation is referred to as non-ionizing radiation. All electromagnetic radiation combined can be represented in an array known as an electromagnetic spectrum. Electromagnetic radiation emanates from both natural and human-made sources.

Electromagnetic radiation is assumed to have effect on biological objects. Mostly electromagnetic fields effect on biological objects is dielectric heating. There are publications which support the existence of complex biological effects of weaker non-thermal electromagnetic fields. Fundamental mechanisms of the interaction between biological material and electromagnetic fields at non-thermal levels are not fully understood.

Biological effects are measurable responses to a stimulus or to a change in the environment. The body has sophisticated mechanisms to adjust to many and varied influences we encounter in our environment. But the body does not possess adequate compensation mechanisms for all biological effects. Changes that are irreversible and stress the system for long periods of time may constitute a health hazard. An adverse health effect causes detectable impairment of the health of the exposed individual or of his or her offspring; a biological effect, on the other hand, may or may not result in an adverse health effect.

It is not disputed that electromagnetic fields above certain levels can trigger biological effects and short-term exposure to very high levels of electromagnetic fields can be harmful to health. Experiments with healthy volunteers indicate that short-term exposure at the levels present in the environment or in the house do not cause any apparent detrimental effects. Exposures to higher levels that might be harmful are restricted by national and international guidelines. The current public concern is centered on whether long-term low level exposure can evoke biological responses and influence people's well-being.

The Institute of Electrical and Electronics Engineers (IEEE) and many national governments have established safety limits for exposure to various frequencies of electromagnetic energy based on is the specific absorption rate (SAR, W/kg), mainly based on International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines, which guard against thermal damage.

These safety limits require electromagnetic radiation shielding to be applied when necessary. Shielded enclosures generally surround a product's circuitry in all sides. On the other hand, it is not uncommon to find shields that don't surround the entire product. Often a shield partially covers only a few circuits. These shields may be penetrated by unfiltered wires and sometimes consist of a single plate of metal.

It is convenient to divide enclosure or component shields into 3 categories: electric-field shields, magnetic-field shields and shielded enclosures. The best shielding strategy in any given application depends on a number of factors including the electrical characteristics of the circuit or system being shielded, physical constraints (e.g. size, weight and accessibility) and cost.

A perfectly conducting enclosure that completely surrounds a given volume prevents anything within that volume from electrically coupling to anything outside that volume. This type of enclosure is called a Faraday cage. Electric fields generated within the volume either terminate on objects within the enclosure or on the inner surface of the enclosure wall. Free charge on the enclosure relocates itself as needed to exactly cancel the fields within or external to the enclosure. Most metallic enclosures without significant seams or apertures provide excellent electric field shielding over a wide range of frequencies.

The key concepts for practical electric field shielding are choosing a location that will intercept the stronger field lines and choosing a suitably conductive shield material. For static electric fields, almost any material will look like a conductor since the free charge can slowly transfer itself. However for high-frequency electric fields, the conductivity of the shield material must be high enough to allow the charge to move quickly back and forth.

It is often desirable to combine shielding function with structural or other functions. While metal shields can often be used to combine functions in this manner, often the use of metal parts has definite disadvantages. Where weight is a factor, metal parts are often too heavy. Also metals cannot be molded into highly convoluted shapes. When a lightweight or highly complex shaped part is desired, it is preferable to use a composite material. Such conductive composites generally comprise a thermosetting or thermoplastic matrix containing a conductive material.

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MICROCIRCULATION PARAMETERS INVESTIGATION

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The role of microcirculatory disfunction is increasingly being recognized in the pathogenesis of many disease conditions. This is the subject of considerable studies to determine the exact nature of these disturbances. The techniques for investigating microcirculatory function have evolved almost exponentially over the last 75 years.

The term «microcirculation» describes the network of small vessels embedded within the organs that are responsible for the distribution of blood and the fluid exchanges within the tissues. Thus, microcirculation differs from macrocirculation, which is formed by larger vessels that transport blood to and from the organs.

The main functions of the microcirculation include the regulation of blood flow and tissue perfusion, blood pressure, delivery of oxygen and other nutrients and removal of CO_2 and other metabolic waste products, and body temperature. Therefore, microcirculation is a complex system that plays an important role in the hemodynamics of the body, by regulating blood pressure and venous return to the heart. It regulates the balance between oxygen demand and supply of parenchymal cells. In addition, microcirculation interacts extensively with the immune system and the body's defense mechanisms.

With the constant improvement of diagnostic tools, scientists and physicians have realized that many problems affecting patients may occur in the microcirculatory system. The most significant issues related to monitoring microcirculation parameters.

Nowadays the methods of noninvasive diagnostic of microcirculation parameters are acknowledged to have