Development of a modular Home automation system

Home automation is still living its early days not only in Hungary but throughout the whole world, despite the fact that the technology needed is already available. Although the presently built high standard office and public buildings are often automated, control systems in homes are still stuck on the level of thermostats and air-conditioning devices. Regardless of the financial obstacles, the main reason for this is the lack of a unified automation system that controls electronic devices in order to achieve higher level of comfort or safety and security. Although there are devices on the market which can attain some features of the above, however, they are only compatible with devices of the manufacturers' own, thus making unified control impossible.

We aim at analyzing the possibilities and utilities of the theoretical solutions with the help of a completely self-designed and self-built home automation development environment. The system used for these tests comprises a central unit and more peripheral units that serve measurement and control purposes.

Our work consisted of the throughout design and development of the central unit, as well as the implementation of the system software. Beside of providing monitoring possibilities to the user, the spectacular LCD screen, as well as USB, Bluetooth and the TCP server running on the central unit, make controlling the system easy. The communication with the peripheral units is possible by either the 2.4GHz radio or the twisted pair bus. A universal port had been designed on the panel in order to make attaching diverse interfaces possible. We also found it important that besides the well-known and frequently-used interfaces like RS-485, we test new options that are specifically designed for building automation purposes. Such option is the KNX system, for the test of which we designed a KNX card, attachable to the devices. The hardware is directly powered from 230V, thus throughout the design of the hardware's power system we paid attention to develop proper protection against electrical shock.

The peripheral units can optionally be equipped with two of the followings: gas/CO/CO_2/alcohol sensors. For the comfort of the user, a temperature and humidity sensor is responsible. Two relays can be used for controlling attached devices. The communication with the central unit is provided by the 2.4GHz radio, and the universal port.

Our research lines up the advantages and disadvantages of the communication interfaces applicable in the field of home automation. We also test the modularity and the scalability of the system, and also assign the possibilities of implementing the theoretical solutions.