

# Implementation of Discontinuous Heating for Heat-Saving in “Intelligent Home”

Yevgeniya Syrevitch, Anna Loboda, Sergey Stets

**Abstract** - In this paper one of the approaches for implementing low-cost, scalable, and effective discontinuous heating is given.

**Keywords** - Discontinuous Heating, Arduino, ZigBee.

## I. INTRODUCTION

As known “intelligent home” (“smart house”) is understood as a way to automate human’s life by remote control of different electronic devices in a building. Along with this task “smart house” techniques are assumed to be nature resources-friendly, effective, economic, low-cost, non-polluting. Heating allows our houses to be warm and comfortable. Many problems occur using either central or local heating. Effective heating should consider several parameters: premises’ size, desired temperature outside temperature. However a deeper problem exists: heat loss that results in temperature decreasing and in excessive heating effort. What are the reasons? Hollow spaces, open windows, clogged pipes. According to the above, we can state the target of our work: effective control of heat loss on a base of cheap, scalable, secure “smart house” system with an ability to detect “bottlenecks” in heating cycle. This paper covers questions of low-cost scalable design.

## II. ZIGBEE AND ARDUINO IN SMART HOUSES

Among various ways of connecting devices in a smart house we consider wireless technology to be the best. After comparing several interfaces and protocols we decided to use ZigBee. It occupied earlier empty niche of air interfaces which was occupied with more expensive decisions with high technical characteristics, such as Wi-Fi and Bluetooth. Thus, developers had to raise expenses at simple tasks or to create their own transfer protocols and program stacks for the organization of personal wireless networks that also affected cost of a finite product and its time-to-market. As a result novelty and interest of the market were often lost.

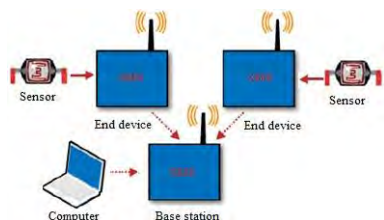


Fig.1 Connecting sensors to a computer

Arduino is an open architecture platform, built on a microcontroller Atmel AVR. It includes supporting chips for  
Yev. Syrevitch, A. Loboda, S.Stets - Kharkov National University of Radioelectronics, Lenina Av. 14, Kharkov, 61166, UKRAINE, E-mail: syr-jane@rambler.ru

programming and has compatibility with many units. The software is cross-platform. The cost of boards is between 20 and 30 \$, depending on a version and functions. Arduino and xBee perfectly interact together in wireless sensor systems. ZigBee can work and without an exterior microcontroller, but its usage brings advantages, i.e. logical information processing, extent entries and outputs, fast prototyping and as much more possibilities for connection of additional exterior devices, such as motors, GPS, LCD etc. For a data interchange a serial port is used, and by default it works with 9600 bods.

## III. IMPLEMENTATION

For our network we consider a star topology. To implement the network xBee Series2 Pro radio modules were chosen. Since the network is organized as a star topology, each target device communicates with a coordinator by sending data read from the sensor and giving commands to actuators. The coordinator is connected to a computer via USB, and the software installed on the PC will receive the value of the coordinator and pass it on to the server. Arduino, connected to xBee, is also connected to actuators that move valves to control heating. The advantage of the system: you can easily add a variety of sensors and actuators.

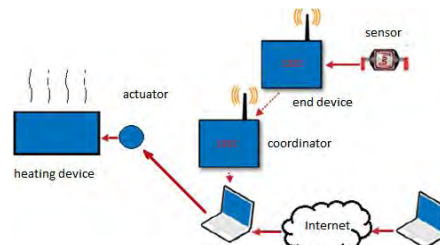


Fig.2 Remote control of heating

## VI. CONCLUSION

To measure temperature and light, you can use cheap sensors: LM35DT (temperature), GL3516 light. Data transfer is based on program realization. Remote control is possible by adding a simple program to a PC with Internet. Further publications will give detailed information about calculation of “bottlenecks” in heating cycle.

## REFERENCES

- [1] Шатунов М. Штрапенин Г. Интеграция технологии ZigBee в электронные устройства: Компоненты и технологии. - Минск, 2005. - №10 (130). - С.130-134
- [2] F. L. Lewis. Wireless Sensor Networks / Automation and Robotics Research Institute, The University of Texas at Arlington / Internet resource: <http://arri.uta.edu/acs/networks/WirelessSensorNetChap04.pdf>