Measurement and Simulation of Energy Use in a School Building

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Abstract: This paper presents the development of a wireless temperature monitoring system and the application of measurement data for computer model validation, and its application to the simulation of energy use in a school building in Cacak, Serbia. The system for temperature monitoring was realized with a GPS/GPRS (Global Positioning System/General Packet Radio Service) system for low power data acquisition, using an MSP430 Texas Instruments microcontroller. With respect to heat loss analysis, the continual measurement of ambient and inside temperatures with a sampling time of one hour has been performed. For the simulation, DesignBuilder software is used. The simulation model, which reproduces the temperature measurement of school buildings, was developed and tested for energy analysis. Results are used to develop generalized guidelines for the determination of the efficiency of energy saving measures and the evaluation of low-energy buildings.

Keywords: temperature measurement; energy efficiency; low power microcontroller; DesignBuilder simulation

1 Introduction

High-energy consumption is one of the most serious problems in the world today. Recently, this topic has encompassed not only economic but also ecological and social importance. School buildings are typical structures, and their optimal energy consumption is a matter of public interest. Defining measures to improve the energy efficiency of school buildings is very important. There are several reasons for the implementation of priority measures for the energy optimization of school facilities: the number of these buildings, the need to maintain ambient comfort during the day and during most of the year, and the large amount of thermal and electrical energy used to maintain that comfort. Schools usually have a high level of energy consumption due to their considerable heating requirements