Abstract

This paper presents an accessible approach to an efficient, intelligent, Internet of Things (IoT) enabled thermostat to be used, instead of the usual, naive thermostats that are currently in a reasonable price range on the market. The current means by which most of the population control their house temperature is to use a simple, straight-forward thermostat that is simply reactive to only the temperature it records and the temperature set point of the user. The time we live in allows us to consider new approaches to temperature control that greatly reduce the production costs and enables greater control over how we choose to spend energy in this direction.

With the help of fuzzy logic and the microcontrollers we now have at hand, it is possible to create a thermostat that is first of all affordable, accessible through the Internet and most of all intelligent, adapting to its environment based on o larger number of factors such as humidity and the rate at which the temperature rises or decreases. The presented application uses two types of microcontrollers, the ESP8266 that has 802.11 b/g/n wireless capabilities and a full TCP and UDP stack built on it and the Attiny85 developed by Atmel. The ESP8266 provides the memory and computational power to drive the fuzzy logic engine while the Attiny85 is used to perform tasks like actuating a relay, act as an interface between the ESP8266 and a radio receiver, and collect data from sensors and send it through radio signals. The general architecture follows an agent-like pattern, having a central unit (ESP8266), where the fuzzy engine and user interaction software (low level webserver) is running and one or more "reporters" which are placed around the environment. The "reporters" have the task to read temperature and humidity data and sent it to the central unit for processing. The thermostat has the capability to publish its data on a remote server, where more complex processing may take place. It can also receive commands over the Internet, enabling one to control it in a remote fashion.

This paper aims to achieve three main goals. First of all, to demonstrate that with the currently available hardware, an Internet of Things enabled thermostat can be build that would go into a price range comparable to normal thermostats. By normal, we mean thermostats that cannot be accessed through the Internet and do not have any intelligent decision making capabilities. Secondly, we aim to show that nowadays we have sufficiently powerful microcontrollers that can perform advanced enough tasks to make them suitable for an intelligent, fuzzy logic-based thermostat. Thirdly, this paper aims to show that having a thermostat that is integrated into the Internet of Things does not have to be an expensive choice and that is should be a rather ordinary feature.

Results have shown that taking this approach at temperature control makes for a thermostat that is not only cheaper, but also smarter, being able to make decisions that are based on broader range of factors which lead to a more efficient energy consumption.

The anticipated outcome of this approach is to create a new kind of thermostat that is first of all affordable, making the most of the new technologies we have, accessible through the infrastructure which the Internet provides and intelligent, giving the user an improved experience and greater energy management control.

This work is the result of my own activity. I have neither given nor received unauthorized assistance on this work.

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