A Remotely Reconfigurable IoT System using Wiki Software

Takashi Yamanoue [*], Daichi Yokoyama [†], Ryoya Umeda [*],
Shota Morita [*], Takashi Ozeki [*], Noboru Nakamichi [*‡]

Abstract

Herein, an Internet of Things (IoT) system with remotely reconfigurable gateways and wireless sensor network (WSN) nodes is presented and its applications are discussed. This IoT system consists of wiki pages, bots, (defined as remotely controlled devices), and remotely reconfigurable WSN Nodes. Each bot can be used as the gateway of the WSN if the bot was connected with it. The bots/gateways and WSN nodes of the IoT system are controlled by scripts written on wiki pages that are read by the bot/gateways, which then forward the commands contained in the scripts to the WSN nodes. Each WSN node then executes the commands, obtains the resulting sensor values, and then returns those values to the bot/gateways. The bot/gateways relay the values and write them onto the wiki page. Each bot and WSN node is flexible and reconfigurable because its behavior can be changed by the script commands written onto the wiki page. Using this IoT system, we created a measurement system to evaluate activity levels of group work in a classroom. After developing the measurement system, we found it was possible to adjust the sampling rate for obtaining sensor values simply by rewriting the script on the wiki page without directly manipulating the WSN.

Keywords: Sensor Network, IoT, Bot computing, Wiki.

1 Introduction

A typical Internet of Things (IoT) system consists of Internet servers, Internet edge gateways, and devices with sensors/actuators that are connected to those gateways by wires or wireless networks. When the number of components making up an IoT system becomes very large, powerful managers must be used to administer them effectively. This issue is complicated by the fact that sensor/actuator-equipped devices may be placed in a wide variety of natural areas such as mountains, fields, rivers, the deep sea, and even outer space. Alternatively, they can be found in urban settings, such as the tops of buildings and towers, inside buildings, or even within small spaces inside machines. As a result, it is often hard, and sometimes even impossible, for a manager to directly monitor and operate such devices. Nevertheless, IoT system managers still

---

[*] Fukuyama University, Fukuyama, Japan
[†] Graduate School of Engineering, Fukuyama University, Fukuyama, Japan
[‡] ANKR DESIGN Inc., Tokyo, Japan

[13] I2C-Bus, https://www.i2c-bus.org

[14] MonoStick, https://mono-wireless.com/jp/products/MoNoStick/

[15] NetNucleus Cloud Hub,
     https://www.tjsys.co.jp/embedded/netnucleus-cloudhub/index_j.htm

[16] PukiWiki, http://pukiwiki.sourceforge.jp/

[17] Raspberry Pi, https://www.raspberrypi.org/

[18] TAOS, TSL2560, TSL2561 Light to Digital Converter;
     https://cdn-shop.adafruit.com/datasheets/TSL2561.pdf

[19] TWELITE DIP, https://mono-wireless.com/jp/products/TWE-Lite-DIP/index.html

[20] Ward Cunningham, Wiki Wiki Web, http://c2.com/cgi/wiki?WikiWikiWeb

[21] Wikipedia, http://www.wikipedia.org/

[22] Windows update, https://en.wikipedia.org/wiki/Windows_Update.

[23] Xively, https://xively.com

[24] ZigBee Aliance, http://www.zigbee.org