Session 2020

Wireless Network System for Grid with Node & End Station Development for Remote Sensing

Angela Attia, Yusuf Isa-Yusuf, Shuza Binzaid, John Attia, Warsame Ali
Electrical and Computer Engineering Department
Prairie View A&M University

Sierra Johnson
Electrical and Computer Engineering Department
Morgan State University, Maryland

Abstract

Wireless networks in the smart grid allow information to be transmitted without human to human or human to computer interaction. This research is focused on developing a communication system which uses a Wi-Fi microcontroller, end stations and a smart grid to send data to each other in a remote location. Arduino-based Peer-to-Peer Wireless Network was designed and built. For the field test, we were able to maintain communication signal between the workstation and the access point about 500 feet.

Introduction

A smart grid is a system that helps deliver electricity reliably and more efficiently through two-way communication between the utilities and the consumer It is important to monitor the loads and sources at the remote locations so that the status on the load and source may be optimally be balanced. Wireless networks is essential for the smart grid so that information can be transmitted without human to human or human to computer interaction. The objectives of this research project are to: (i) design an Wi-Fi microcontroller application for microgrid system, (ii) establish peer-to-peer connection between the workstation and access point , and (iii) to send a Wi-Fi signal over extended distances

Project Description

We designed a circuit to collect data shown in Figure 1. The Arduino program written to collect data collection program is shown in Figure 2. Solar PV and battery smart controller, shown in Figure 3, was built using Arduino to limit the minimum voltage of discharging the battery and also to limit the maximum voltage of charging battery through solar photovoltaic panel. Figure 4 show the transmitter in the Electrical Engineering Building for the Peer-to-Peer Communication

Summary and Conclusions

A Bluetooth hardware/software system using Arduino for smart charge controller was built. Furthermore, Arduino-based Peer-to-Peer Wireless Network was designed and built. In the field

test, we were able to maintain communication signal between the workstation and the access point for about 500 feet.

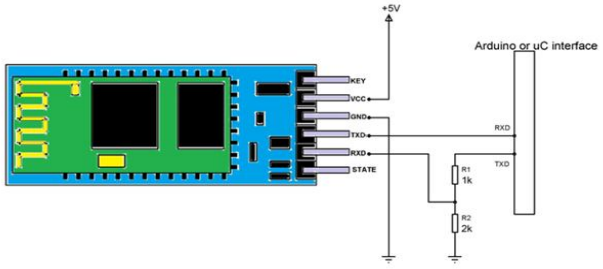

Figure 1: HC-06 Bluetooth Module

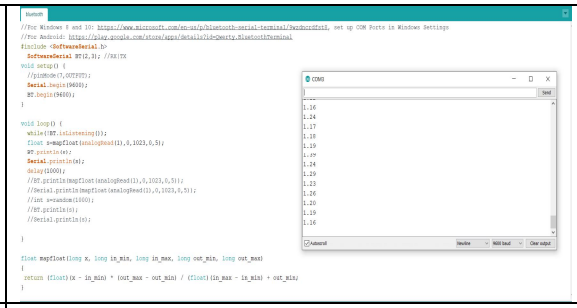

Figure 2: Arduino Program for Data Collection

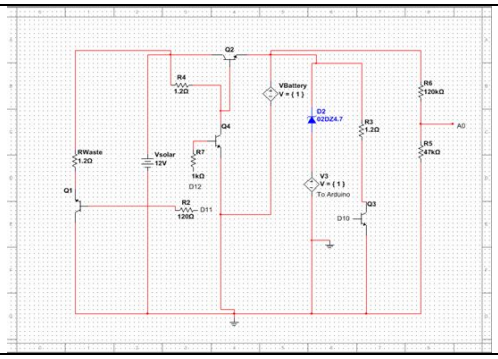

Figure 3: Schematic of the Smart solar PV and battery controller

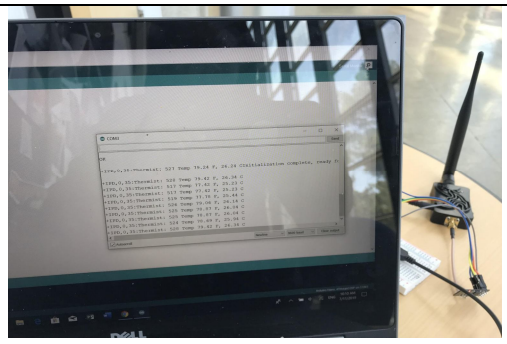

Figure 4: Transmitter in the EE Building for the Peer-to-Peer Communication

References

1. A. Hirsch, Y. Parag, and J. Guerrero, "Microgrids: A review of technologies, key drivers, and outstanding issues," *Renewable and Sustainable Energy Reviews*, vol. 90, pp. 402–411, 2018.
2. A. Lantero, "How Microgrids Work," *Energy.gov*, 17-Jun-2014. [Online]. Available: https://www.energy.gov/articles/how-microgrids-work. [Accessed: 09-Jul-2019].
3. "Foundations," *Arduino*. [Online]. Available: https://www.arduino.cc/en/Tutorial/Foundations. [Accessed: 08-Jul-2019].
4. L. Rosencrance, S. Shea, and I. Wigmore, "What is internet of things (IoT)? - Definition from WhatIs.com," *IoT Agenda*. [Online]. Available: https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT. [Accessed: 08-Jul-2019].
5. V. Beal, "Wi-Fi (wireless networking)," *What is Wi-Fi (Wireless)? Webopedia Definition*. [Online]. Available: https://www.webopedia.com/TERM/W/Wi_Fi.html. [Accessed: 09-Jul-2019].

ANGELA ATTIA AND SIERRA JOHNSON
Ms. Angela Attia and Ms. Sierra is an electrical engineering students at Prairie View A&M University and Morgan State University, respectively.

YUSUF ISA-YUSUF, SHUZA BINZAID, JOHN ATTIA, WARSAME ALI
The above named individuals are researchers in the SMART Center at Prairie View A&M University.