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Control of servo motors with speech recognition aided linear predictive coding by using zigbee communication

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Abstract

Generally, global warming raised by greenhouse gas emissions is a great threat. New technologies are evolving that can reduce carbon emissions significantly, one of them is fuel cell. Fuel cell combines hydrogen and oxygen to produce electricity through an electrochemical reaction. Because the by products are only water and heat, there are no carbon emissions and as generation continues to shift away from coal and towards natural gas, fuel cells will not only dramatically reduce CO_2 emissions but also combine with power plants burning a less carbon-intensive fuel. Cathodes that have Cobalt are known for their ability to act under high-temperature conditions in solid oxide fuel cells (SOFCs). In this paper, the investigation of results and effects are presented for various studies on the cobalt-free anode and cobalt-free nanofiber cathode development. The polarization resistance of SOFC cathodes, which is one of the important characters in determining the cathodic performance, revealed the importance of nanofiber for this process in this investigation

Keywords: communication with ZigBee, control of servo motors, linear predictive coding, speech recognition.

1. Introduction

The electronics industry is creating new inventions day by day to make life easier. One of the new invention is ZigBee technology which has IEEE 802.15.4 internet protocol. It consumes very little energy and can be on standby mode easily. The coordinator, router and end devices of ZigBee can be used to connect different types of electronics equipment. The electronics equipment in all areas can communicate with each other by means of this technology [1-7]. For example, the electronic devices in the house communicate with each other; refrigerators, ovens, dishwashers as well as the shelves in the shopping mall. Cooking in the oven may be the news for the dishwasher will work. Because of decreasing the products on the shelves of market, shelves can order new products from the supplier [4-10]. The router ZigBee device may increase the range of communication to kilometers by creating different meshes.

In this study, communication is provided wirelessly between PC, and servo motors which are established to the Arduino Duemilanove to run the wheels of the toy car. The commands are sent to the receiver (end) XBee device by the coordinator XBee device which is connected to the PC via the USB dongle. According to the user commands, the direction of the toy car turns to the right or left [1, 10].

MatLab speech recognition with LPC theory is used for commands which are sent by the user to the PC. The user gives commands using the external microphone [1, 11]. Other spoken forms of commands can be predicted by the LPC. It is the main characteristic of the LPC. It works with the principle that the following sample can be approximated from the previous one. It is linear and time-varying (LTV) system [12]. There is another program which provides connecting and sending the output commands of MatLab to the coordinator XBee device via dongle, its name is XCTU Program. Firstly, each XBee device is set by this program as coordinator, router or end device then they can be used for the wireless communication.

2. Materials and methods

In this project, two XBEE devices (one is coordinator and one is end device), XCTU and MatLab Programs, a PC and an external microphone are used. Toy car wheels and servo motors and driver control circuit of motors are also used, the materials can be seen in Fig. 1 [10-11]. Code was created by taking sound samples

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from people with different sound types. People were asked to say "right" and "left".

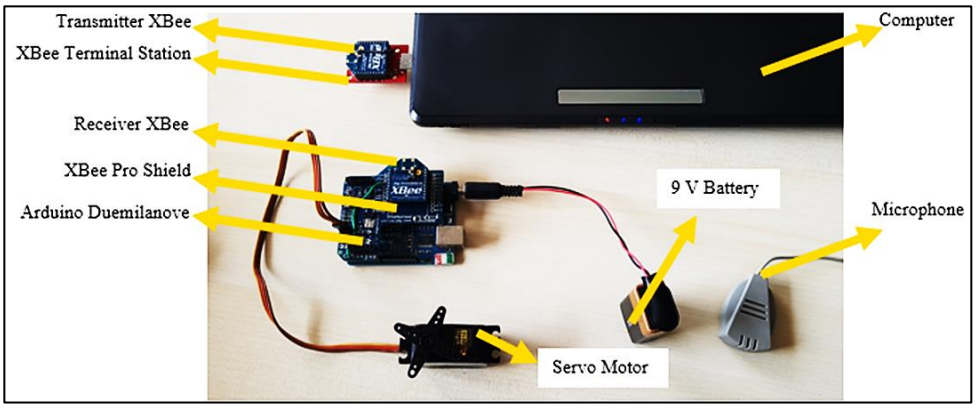

Figure 1. Materials for communication.

The LPC algorithm on MatLab is used for speech recognition. The LPC takes into account the sound properties as well as the human larynx and mouth structure. LPC is based on the output of a linear and time-varying system which is stimulated by periodic impulses or random noise. This system can be expressed as inverse Z transform applied linear filter transfer function. The LPC works with the principle that the next sample can be approximated from a previous sample. For more information Ref. [10-11] can be read.

3.Conclusion

This study was successful at 80% rate. Because an average of 80 correct estimates were obtained in every 100 trials. This error may be caused by the microphone or the LPC code has not been improved. The way people speak words is also important. The diction of every person is not perfect. People who pay attention to detail while taking samples may not have paid the same attention when trying.

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