ROOM AUTO CONTROLLING BASED ON OCCUPANT BODY CONDITION USING ARDUINO AND RASPBERRY PI

Abstract

A cozy room should adjust its environment based on the condition of its occupants since it will indirectly affect the moods and body conditions of people inside. This study aims to develop a system for monitoring the human body condition using paired sensors on the Arduino Lilypad. The system will send the sensors data to the Raspberry Pi3 via Bluetooth to automatically control the electronic device inside the room based on the occupant body condition. The developed system will automatically turn on or turn off the electronic device when the body temperature or the heart rate is higher than the specified threshold value.

Keywords: wearable body sensor, arduino lilypad, raspberry

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INTRODUCTION

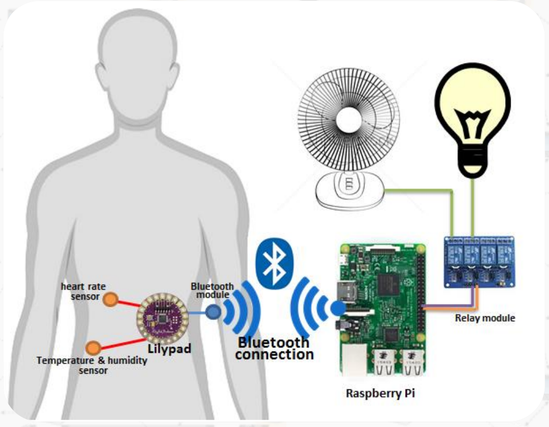

Figure 1. design system

A cozy room should adjust its environment based on the condition of its occupants since it will indirectly affect the moods and body conditions of people inside. Wearable body sensor technology can be used to monitor the human body condition when someone is active [1] [2]. One of the wearable technologies that can be used to monitor body condition is the Lilypad Arduino board[3]. The Arduino module or a single computer board such as Raspberry Pi and Beagleboard [4] can control electronic devices such as lights and air conditioners automatically on the purpose of adjusting room condition. Electronic devices on a Smart Home system that are connected to Arduino or Raspberry Pi can be controlled remotely using a mobile phone [5][6] or an Arduino based device on a wireless connection, such as WiFi, Bluetooth [7] or Zigbee [8].
This study aims to develop a system for monitoring the human body condition using paired sensors on the Arduino Lilypad. The system will send the sensors data to the Raspberry Pi 3 via Bluetooth to control the electronic device inside the room automatically based on the occupant body condition.

SYSTEM DESIGN

Figure 1 describes the system design. Wearable body sensor consists of a heart rate sensor, a temperature sensor, a humidity sensor, and an Arduino Lilypad as a regulator of sensor nodes. The heart rate sensor retrieves data and calculates the heart rate in a measure of beats per minute (BPM), and the temperature sensor measures the body temperature, and the humidity sensor measures the body/skin moisture. The Lilypad forwards the sensor data to the Raspberry Pi server via a Bluetooth connection. Raspberry Pi uses the data from the Lilypad as a parameter in controlling lights and fans in the room that are connected to a relay.
The software that works on the Lilypad is shown in Figure 2. The Arduino Lilypad reads the heart rate, temperature, and humidity. Then the keypad sends the data via Bluetooth to the Raspberry Pi.
Figure 3 displays the design of software on Raspberry Pi. The data from the keypad is sent to the Raspberry Pi via a Bluetooth connection. The Raspberry Pi save the data to a database. The latest sensor data is compared to the specified value to set the switch on the lamp and fan.

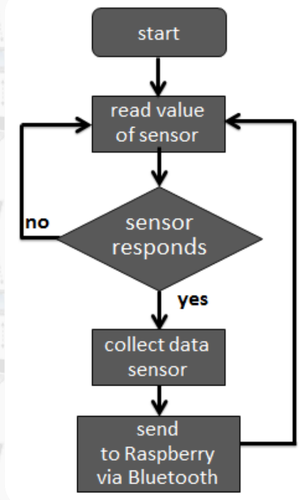

Figure 2. flowchart of wearable boy sensor

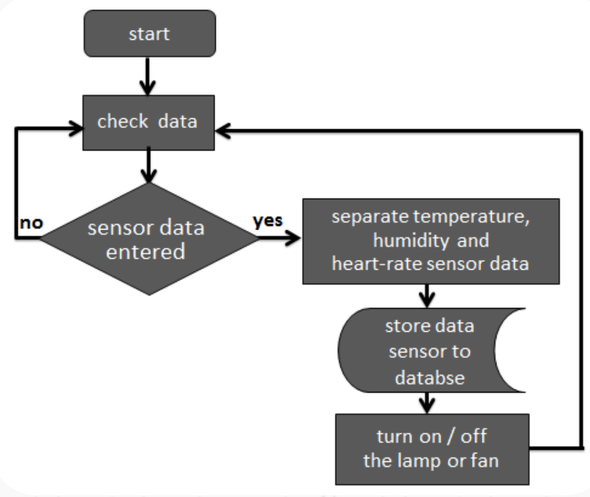

Figure 3. flowchart of Raspberry Pi

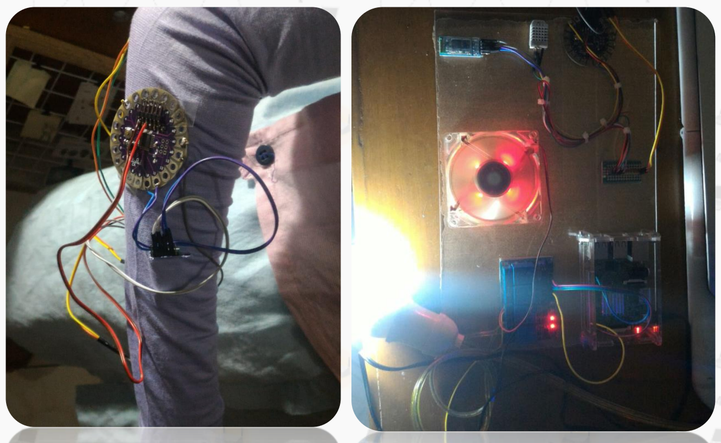

Figure 4. prototype of wearable body sensor for controlling room

Figure 5. web page from Raspberry

RESULT AND DISCUSSION

The system is evaluated by installing a wearable body sensor mounted on the arm as shown in Figure 4. Arduino Lilypad gathers room humidity, body temperature, and heart rate data and sends them to Raspberry Pi. The data can be seen by accessing the Raspberry Pi webpage as shown in Figure 5.
The system uses a comparison of the parameters with a predetermined reference value in controlling a fan and lamps in the room. The Raspberry will turn on the fan when the body temperature rises to 32°C and humidity above 70%. When the body temperature is below 32°C and humidity below 70% the fan will be turned off. The Raspberry Pi controls the lamps according to the person heart rate. The heart rate of an adult when he awakes is 60-100 bpm depend on his activity [9]. During sleeping, a slow heart rate around 40–50 bpm is common and considered to be normal [10]. The light is turned off when the measured heart rate is smaller than 60 bpm which indicates that the person using wearable sensor bodies is in full rest. When the person starts his activity, the heart rate will rise, and the system will turn on the lights when the heart rate exceeds 60 bpm.

CONCULISION

In this paper, a system for controlling electronic devices based on the monitored person body and room condition has been created. The Arduino Lilypad gathers the body and room condition and then sends the data to Raspberry Pi using Bluetooth. Raspberry Pi turns on and off the lamps and fan based on the parameters obtained from Arduino. When the body temperature and humidity are above the specified values, the system turns on the fan automatically. When the heart rate is above 60 bpm, the system turns on the lamp and turns off the lamp if the heart rate is below 60 bpm.

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