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A proposed software for controlling operating system-dependent functionality

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ABSTRACT

When the operating system environment temperature rises above safety, the CPU may become unresponsive or even malfunction. To address this problem, to achieve this goal a two-part system was designed. The first, consists of a controlled sensor that constantly monitors the room environment temperature and alerts the user if it rises above acceptable levels for computer use. The second part adopts a Python that uses the OS module, which provides a portable interface for OS-dependent tasks and shuts down the device to prevent it from behaving unexpectedly. A series of experiments at different temperatures demonstrated the ability of the device to alert the user.

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1. INTRODUCTION

Sensor-based real-time event monitoring is gaining popularity as the internet of things grows [1]–[13]. A temperature monitoring system with device control is required [14]. Saha *et al.* [14] described a practical prototype system for real-time monitoring systems that uses a DS18B20 temperature sensor, an Arduino Uno, and a GSM module to send and receive messages. This prototype collects and analyzes sensor data in order to provide appropriate input to a software system that autonomously controls the functions of the operating system. Monitoring the CPU temperature is critical for efficiency. Utilize information about the temperature of the CPU and changing environmental conditions. A second temperature sensor is required to monitor the thermal environment of the processor [15].

Python's OS module gives you access to the OS. A Python utility module that comes pre-installed with the OS. This module gives portable access to specific OS functions. It allows interaction with the OS. It is a standard utility module in Python System-dependent functionality is portable with this module [16]–[28]. The OS and OS.path modules provide several file system and Python operations [15], [29]. Because most temperature-aware systems rely on CPU temperature estimations or measurements, temperature projection is an essential component of them [30].

A number of related research works are described here, highlighting a comparative viewpoint based on their contributions. Research by Hassan *et al.* [31] show the result in the creation of a non-invasive, customized brain cooling device. The recommended helmet utilizes thermoelectric cooling components to keep the user's head cool to increase the operating time of the proposed system while maintaining a constant

coolant flow. Using four NTC temperature sensors, the temperature of a patient is taken. The temporal lobe artery by utilizing four temperature sensors, any inaccuracies are minimized. A desired level of system performance is the data is processed and visualized using the Arduino and Raspberry Pi. The Raspberry Pi creates a Node-Red server that uses the MQTT protocol to publish the data to the internet. Two primary goals were accomplished by the proposed ABHS: Second, the water-cooling system is intended to be adaptable and lightweight, making it appropriate for people of all ages.

Krintz *et al.* [32] investigated the possibility of forecasting external temperature using CPU temperature as part of IoT-based precision agriculture. Watering schedules, frost damage mitigation, and greenhouse management are all controlled by temperature. Simultaneous monitoring of multiple microclimates is possible using affordable single-board computers as temperature sensors. To a farm's edge cloud. The edge cloud forecasts outdoor temperatures using calibration, smoothing, and linear regression. Heat sensors and equipment are utilized to test the approach's accuracy.

Mesa *et al.* [33] utilize infrared cameras equipped with special filters to determine temperature, but not thermal power or CPU utilization. Additionally, the present experiments examine the processor's real-time responses to varying degrees of CPU load, which has a direct effect on the processor's temperature and power consumption. Additionally, CPU load affects thermal power dissipation and heat generation. Finally, the current study uses the most precise method for calculating CPU temperature and power consumption: datasheet values.

Han *et al.* [30] suggest a new and faster transient thermal simulation TILTS algorithm. Temptor is a lightweight runtime temperature monitoring app that uses internal counters to calculate runtime temperature distributions. This tool can investigate a wide range of thermal issues with high-performance microprocessors. The temptor's results input/output (I/O) load affects thermal power dissipation. Using datasheet values to calculate CPU temperature and power consumption.

Markowski *et al.* [34] created and tested an active laptop heat sink sensor. The active heat sink design required a hybrid sensor to meet the requirements. It has six thermocouples: thick-film, LTCC, and wire thermally active thick-film or LTCC flat substrates were used. Calibration of the sensor using thermoelectric wires there are 3 ways to evaluate the sensor. They seem to fit the current application.

Four sections have been created for the paper. The relevant works are described in section 1, and the proposed method and the performance indicators are discussed in sections 2. The results of the experiments and the discussion are found in section 3 while the conclusion of the work is in section 4.

2. METHOD

There are two parts to the system: a decision component and a system component with dependent functionality as shown in Figure 1. The decision-making process is aided by the Arduino microcontroller, the GSM temperature sensor, and the LCD. This component's core, as well as all of the components that link to it, is represented by Arduino.

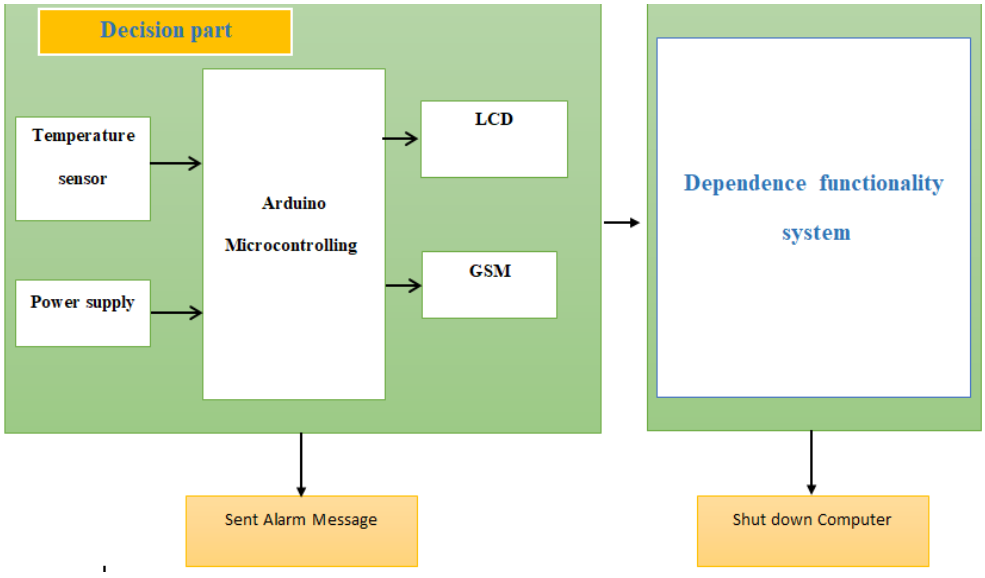


Figure 1. The system block diagram

A temperature sensor is a device that detects the temperature of the surrounding environment. The GSM model generates an alarm when the computer is turned off. The temperature was displayed on an LCD. The dependency functionality system, which represents the operating system's interface functions, is depicted in the second section. The OS module is a typical Python utility module. This module gives you access to operating system-specific functions when you're on the go. The first component, which measures the ambient temperature, starts the functioning mechanism.

The second part of the procedure begins when the temperature reaches 75 degrees Celsius. The computer's operating system is run in the second part, which also automatically shuts down the machine if the temperature sensor reaches 75 degrees. In addition, the user will be notified of an alarm. Figure 2 shows the components of the first segment.

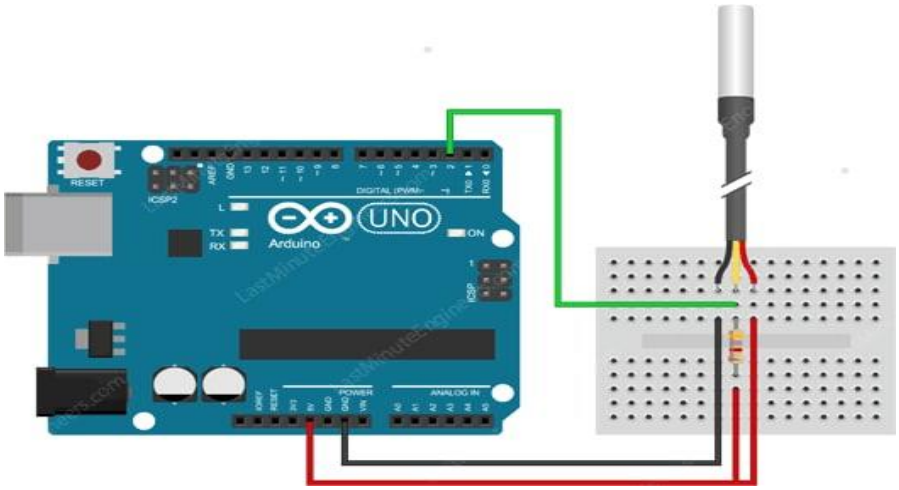


Figure 2. The components of the first segment of the system

2.1. Hardware componants

2.1.1. Arduino microcontroller board

Input and output pins include 14 digital (six PWM), 6 analog, and a 16 MHz ceramic resonator (CSTCE16M0V53-R0). Start by connecting it to a USB port, an AC adapter, or a battery. The Arduino Uno R3 was used in this study [35]–[38].

2.1.2. GSM module-global system for mobile communication

Mobile devices and computers can communicate with a GSM network through the use of a GSM module, which is a chip or circuit. As a bonus, it can be accessed online. Among the several types of liquid crystal displays, LCDs are a specific subtype. "LCD" stands for "liquid crystal display," a display technology that is utilized in computer monitors and mobile devices such as laptops, tablets, and smartphones. It displays sensor results and alarm signals for this inquiry [39], [40].

2.2. Software componants

The Arduino Uno is programmed using version 1.8.12 of the Arduino IDE. The software is compatible with Microsoft Windows, Mac OS X, and Linux. The Java-based system makes extensive use of open-source technologies such as processing [41]–[43].

a. OS module: This module is included with the standard Python library, therefore there is no need to install it separately. This module contains procedures for interacting with the operating system. We'll utilize the OS module in this tutorial to shut down the computer device after receiving an alarm from the Arduino sensor when the temperature sensor records an unacceptably high temperature [44]–[46].
b. The use case diagram illustrates how the system works. The model is made up of actors and use cases that interact with one another. Figure 3 illustrates the use case diagram with the associated relationships.

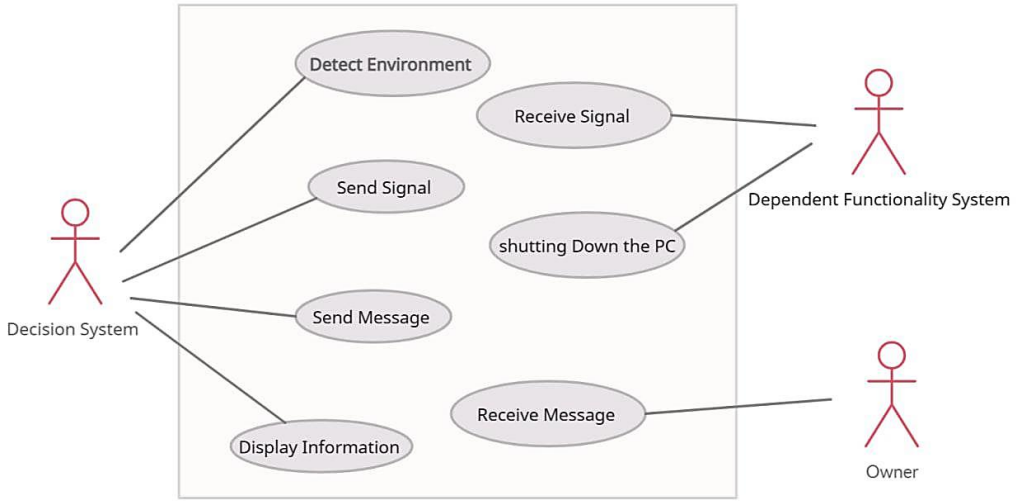
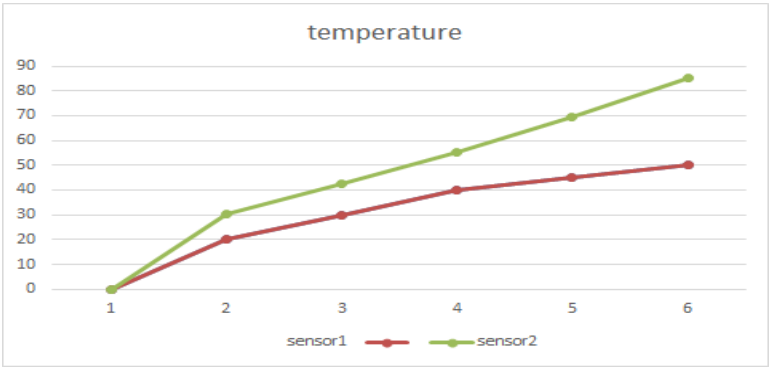


Figure 3. Use case diagram of the system

3. RESULTS AND DISSCUSSION

The system is being tested in a variety of situations. The output of sensors is depicted on an LCD in Figures 4(a), (b) and Figure 5. Example 2 of a system that is being tested the computer will shut down if the temperature rises above the preset temperature threshold. The CPU time calculated throw CPU Time=I*CPI/R. Figure 6 shows the CPU performance.



(a)

(b)

Figure 4. Example 1 of a system that is being tested, (a) the output of sensors and (b) display the output sensor

Figure 5. Example 2 of a system that is being tested

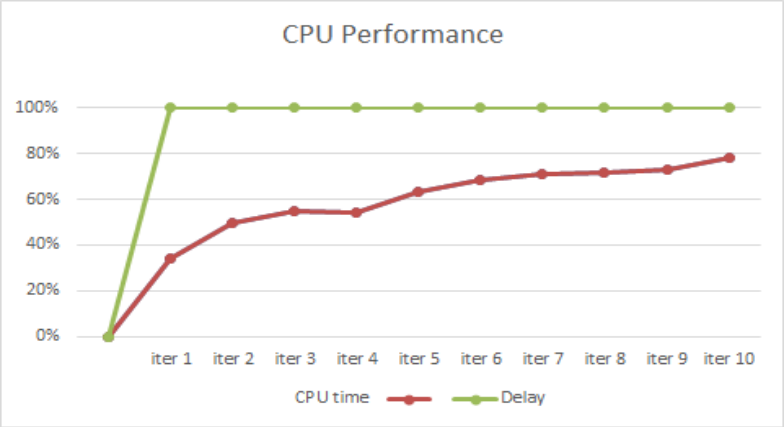


Figure 6. CPU performance

4. CONCLUSION

Real-time dependent functionality is provided by an embedded system. Determinations are made based on the presence or absence of a threshold that the system monitors. In terms of the Arduino microcontroller, it is in command of all that is happening. The GSM module is a fantastic tool for telecommunications, and the second part of the system makes use of an OS module instruction to shut down the machine when the temperature exceeds the allowable value in the first portion of the program. Tests conducted at various temperatures have demonstrated the system's efficacy.

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