Student 1: İlyas Eğlence – 2304517
Student 2: Onur Emirhan Çon – 2304384

EE313 ANALOG ELECTRONICS LABORATORY

2021-2022 FALL TERM PROJECT – PROPOSAL REPORT

This project aims to design a micro air conditioner that both has a heater and cooler operation. This project consists of four main parts which are the sensing unit, control unit, operation unit, and display unit. The sensing unit is perceiving the ambient temperature and transmits this data to both operation and display units. The Control unit decides the desired temperature level and sent this information to both operation and display units. The operation unit compares the data coming from the sensing unit with the data coming from the control unit and decides whether the cooling or heating operation will work. The display unit shows the ambient and desired temperature by using two different RGB LEDs to the user. While designing this project, we will use OP-Amps, resistors, relays, LEDs, RGB LEDs, diodes, potentiometer, LM35, voltage regulator, capacitors, and DC motor.

Sensing Unit

In the sensing unit, we will use LM35 to receive the ambient temperature data. LM35 gives a 10mV output per 1 °C. Our operation region is between 24 °C and 40 °C. LM35 output will be between 240 mV and 400 mV in our operation region which is very narrow. Therefore, we will amplify this output to a sufficient level. After amplification, we will convert this output to several variations to use them in different places on our circuit.

Figure 1

Control Unit

In the control unit, we will present a control system to users. By turning a potentiometer, the user can arrange the desired temperature level. To set this unit, we will use a linear voltage regulator, capacitors, resistors, and potentiometer. Moreover, like the sensing unit, we will convert the output of the voltage regulator to several variations to use them in different places on our circuit.

Operation Unit

The operation unit, which is consist of the heater and cooler systems, will compare the desired and ambient temperature level, and decide which system operates.

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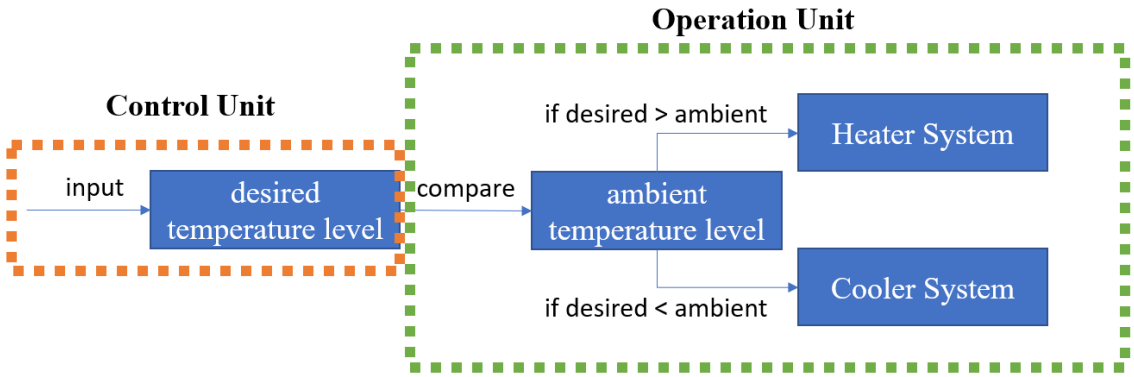

Figure 2

Heater System

When the desired temperature is higher than the ambient temperature, this system starts heating by letting the high current flows through small resistance. While the heater system is operating, the red LED is on.

Cooler System

When the desired temperature is lower than the ambient temperature, this system starts cooling by letting the DC motor works. While the cooler system operating, a blue LED is on.

Display Unit

The display unit consists of two different RGB LEDs. One of them displays the desired temperature level, while the other displays the ambient temperature. When the ambient/desired temperature is 24 °C or lower, RGB will display an only blue light. When the ambient/desired temperature is 40 °C or higher, RGB will display an only red light. When the ambient/desired temperature is 32 °C, RGB will display an only green light. When the ambient/desired temperature is between 24 °C and 32 °C, RGB displays blue and green lights with different brightness levels according to the temperature. While the temperature is rising, the brightness of green light is increasing, and the brightness of blue light will decrease. Similarly, when the desired/ambient temperature is between 32 °C and 40 °C, RGB displays green and red lights with different brightness levels. While the temperature is rising, the brightness of red light is increasing, and the brightness of green light will decrease.

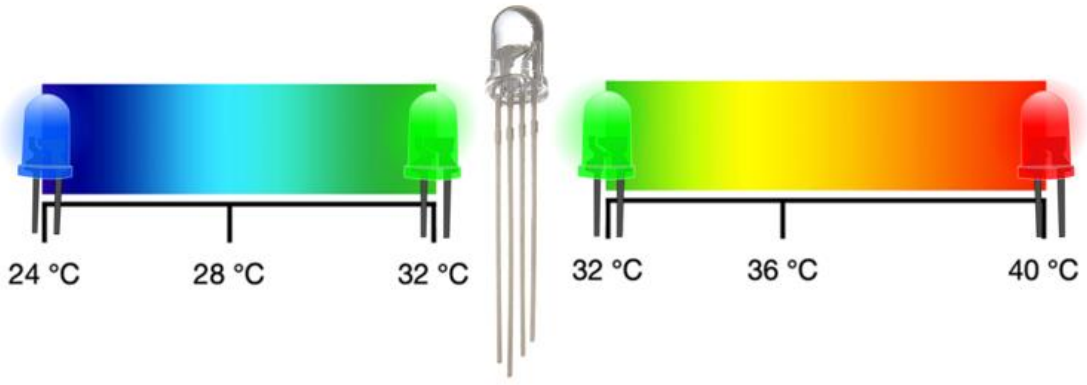

Figure 3