College of Electrical and Mechanical
Department of Software Engineering

Software Engineering Proposal

Project Title:-Automatic Air Conditioner

Course code: SWEG2103

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1. Introduction

Air conditioning (often referred as A/C) is the process of removing heat and moisture from the interior of an occupied space to improve the comfort of occupants.

Since prehistoric times, snow and ice were used for cooling. The business of harvesting ice during winter and storing for use in summer became popular towards the late 17th century. This practice was replaced by mechanical ice-making machines.

Air conditioners, which typically use vapor-compression refrigeration, range in size from small units used within vehicles or single rooms to massive units that can cool large buildings. [1] [2]

According to the International Energy Agency (IEA), as of 2018, 1.6 billion air conditioning units were installed, which accounted for an estimated 20% of electricity usage in buildings globally with the number expected to grow to 5.6 billion by 2050. [3]

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The basic concept behind air conditioning is said to have been applied in ancient Egypt, where reeds were hung in windows and were moistened with trickling water. The evaporation of water cooled the air blowing through the window. This process also made the air more humid, which can be beneficial in a dry desert climate. Other techniques in medieval Persia involved the use of cisterns and wind towers to cool buildings during the hot season.

Shortly thereafter, the first private home to have air conditioning was built in Minneapolis in 1914, owned by Charles Gates. Realizing that air conditioning would one day be a standard feature of private homes, particularly in regions with warmer climate, David St.Pierre DuBose (1898-1994) designed a network of ductwork and vents for his home Meadowmont, all disguised behind intricate and attractive Georgian-style open moldings. This building is believed to be one of the first private homes in the United States equipped for central air conditioning.

In 1945, Robert Sherman of Lynn, Massachusetts invented a portable, in-window air conditioner that cooled, heated, humidified, dehumidified, and filtered the air.

1.1. Motivation

As air conditioning sales in Africa soar, many of the units imported there are old and inefficient, driving up electricity consumption and greenhouse gas emissions. But some countries are taking action, banning the import of used air conditioners and adopting tough energy standards. [4]

“They come in branded as new, but when they’re off-loaded it’s mostly near-end-of-life e-waste,” said Leslie Adogame, executive director of SRADev, a Nigerian nonprofit environmental health research group. “They’re certainly cheaper to buy, but they use a lot more energy and don’t meet environmental standards.”

For years, many African countries have been flooded with millions of antiquated secondhand air conditioners and refrigerators imported primarily from Europe. Nigeria and other West African countries with high summer temperatures and close proximity to European shipping ports are especially popular destinations for used cooling appliances, which arrive stuffed into containers, cargo vehicles, and even used

cars. The appliances are often broken and those that still work often consume two to three times more electricity than new models.

Since Ethiopia is one of the African country we can create a solution for this problem and by selling our product we can get currency. Also this will enhance our technological advancement

1.2. Statement of the Problem

As our investigation shows air conditioners have economical, and environmental impacts. Production of the electricity used to operate air conditioners has an environmental impact, including the release of greenhouse gases. According to a 2015 government survey, 87% of the homes in the United States use air conditioning and 65% of those homes have central air conditioning. Most of the homes with central air conditioning have programmable thermostats, but approximately two-thirds of the homes with central air do not use this feature to make their homes more energy efficient. [5]

Another investigation shows that installing air conditioning costs between $3,350 and $5,912 with most homeowners reporting spending $4,631 on average. This price is typical of installing a new AC unit to your forced air furnace. Other options include single window units or portable units for $234 to $700 or ductless mini splits for $660 to $4,500. [6]

- This implies that air conditioners are not affordable for most of Ethiopians as well as other African countries.

So we thought that we need a simple and very cheap air conditioner, especially which can be useful in the warmest and coldest regions of Ethiopia.

1.3. Objectives

1.3.1. General objective

- Its main objectives are minimizing cost and minimizing energy usage of former air conditioners.

1.3.2. Specific Objective

- Read data from the temperature sensor
- Implement the data and
- Stabilizing the weather inside our house

1.4. Scope and Limitations

In this project we are planning to make an automatic air conditioner, so that when the temperature is too high or too low, it can detect it then start working. The limitation is that since we planned to use a long coiled wire it may take time till it heats.

2. Methods

For the robot to detect room temperature and maintain it, we used the following methodology.

- Used ice, heat supplier and temperature sensor
- Read digital data from the sensors
- Used the digital data that came from the temperature sensors to start the fan or heater.
- Then if there is a hot or cold air the digital data which will be given to the fan or heater, will start the fan or heater immediately.

2.1. System description

The main brain of this project is the DFRduino, but in-order to sense the temperature we use the temperature sensor module (LM35) [1]. The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the centigrade temperature. It can measure temperature from -55 degree Celsius to +150 degree Celsius.

2.2. Component description

Table I: Components used

Component	**Description**
DFRduinoUNO	Microprocessor. We chose it because it was suitable for our project both in pin number and data processing ability.
Cables	used for connecting the sensor, fan and heater to the DFRduino
Temperature sensor	used for sensing the hotness and coldness in degree Celsius scale.(It is suitable for remote application)
Fan	used for cooling
Heater(coiled wire)	used for heating
Resistors, Transis-tors, Diode, Relay	Regulator and switch for the heater

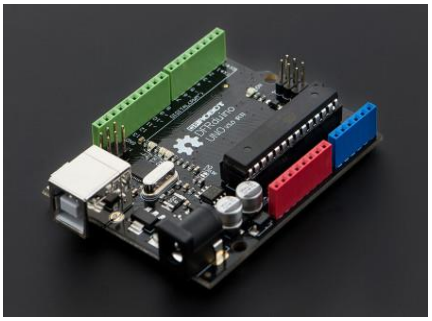

Figure 1: Dfrduino

Figure 2: temperature sensor module (LM35)

2.3. Hardware implementation

Since the temperature sensor will be connected to the DFRduino by cables, it will send data to the DFRduino. Next the DFRduino will implement the data and then send it to the fan or heater. Automatically they start working.

[1] LM35: a device used to measure temperature

2.4. Application of Results

At first when we started this project, we expected the following results.

- The sensors to read digital data and send it to the DFRduino
- The DFRduino to implement the data it received from the sensor
- Then transferring the data to the fan or heater
- Then the fan/heater works effectively

2.5. Discussion and Further work

We think that our project is successful, because it fulfilled the objectives we set before we started doing the project and moreover, we obtained all results we expected at first. Even though we think that our project is successful, there were things we couldn't achieve due to many reasons: Making the system to show the value in degree Celsius using LCD[2].

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[2] LCD: liquid crystal display, a device for visual out put

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