HVAC System

The main purpose of the HVAC system is to maintain a constant temperature and humidity that is ideal for a library. Care must be taken to maintain an ambience that is suitable for both the books that the library preserves and the people who visit.

Control of temperature and relative humidity is critical in the preservation of library and archival collections because unacceptable levels of these contribute significantly to the breakdown of materials.

A stable temperature of 21 deg Celsius is to be maintained in a library with a relative humidity in the range of 30%-50%.[1] Humidity and temperatures below the recommended range is also preferred for the preservation of books but since it is not comfortable for people inside library,a temperature of 23 deg Celsius and 30%-50% humidity is perpetuated.

* In our project, we check for the current temperature in the room from the sensor as well as the temperature forecast every six hours and we compare it with the target temperature that is 23 deg Celsius. The various conditions that we look into are:
* An array of temperatures of every hour in a day is stored.
* Average of temperatures for every 6 hours is recorded and saved as the forecast temperature.
* Depending on the time of day, the current room temperature (sensor reading) is compared with the forecast and a decision is made as to which appliance out of the two, heater or cooler has to be working. If the sensor temperature is greater than the forecast, then we know that the cooler has to be turned on for that duration of 6 hours and the heater has to be turned on if the vice versa happens. This ensures that during winter only the heater will be working and during summer, the cooler and hence saves energy.
* If the forecast gives a higher than target temperature and the current temperature is lower than the target, then we take no action and keep both the cooler and heater turned off as the environment would take care of bringing up the current room temperature to target. The same decision is made when the forecast is lower and the current temperature is higher than the target. This is an efficient way of reducing the energy consumption.
* Every fixed interval, the sensor temperature is recorded and compared with the target temperature.
* Since the human body as well as a lighted bulb radiate heat energy, we have considered the effect of the presence of people and light on the room temperature and lowered the target temperature accordingly. The rise in temperature of the room is considered to be 0.1 deg C per person and 0.5 deg C per LED.

Burglar Alarm System

The burglar alarm system is designed to detect intrusion or unauthorized entry of a person after the working hours of the library. The PIR motion sensor detects for any movement at library during the closing hours and alerts the buzzer to turn on, which further indicates to the librarian that there has been an illicit entry of a person into the library. The buzzer stops when it has been turned off manually by the librarian.

1 : <https://www.nedcc.org/free-resources/preservation-leaflets/2.-the-environment/2.1-temperature,-relative-humidity,-light,-and-air-quality-basic-guidelines-for-preservation>