

Computer Aided Laboratory Internal Air, Lighting and Network Control

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Abstract : In this study, Afyon Kocatepe University Dazkırı Vocational School in indoor air of the laboratory is provided lighting and computer-aided control of the outlet. Two temperature sensors to measure the internal and external temperatures of the laboratory to measure the moisture inside and outside the two humidity sensors are used. The data from the sensors are monitored in real time from the computer and can be controlled. Design made with interfaces can be done manually or automatically. Laboratory heating and heating process is also determined as the best temperature for laboratory research in the laboratory with in 20°C in automatic mode to maintain a constant. In manual mode set in the heating process is carried out by heating degree. When the media is too hot and the fan stops working and the ambient temperature reaches the desired value. The system is also used in one motion sensor. If breathing is understood that the use of students in 5 minutes when the internal environment remains to be moving all the fans at high speed for 5 minutes work. Thus, indoor air is completely renovated in the laboratory. Also, the system of electric lighting and sockets in the laboratory offers the opportunity to open and close automatically. The advantage of this lab is to give power to the outlet without the knowledge of the respondent denied that may occur will be prevented work accidents in electricity saving swill also be made clear in the evening light is prevented forgotten.

Keywords: Microcontroller, Computerized Indoor Air Control, Laboratory Automation

I. Introduction

By the increasing of the cost of production of energy, the usage of energy efficiently becomes very significant. According to investigations which have indicated that consume of the electricity changes between percent 20 to %25 for lighting. This ratio is changing in schools. The lighting in laboratory is most important. The lighting should be arranged especially for rotating device. The lighting in laboratory by using the Florence lamp may case the slipping out the view which is called stroboscopic. Each lamp operating with an alternating current source provides a light flux that varies according to the frequency of the alternating current. In an alternating current of 50 Hz, the light varies from zero to the maximum value of 100 times a second. If the fluorescent lamps and the rotating machines are in the same phase, the rotating machines under the fluorescent lamp appear to be standing or turning. Another effect is that a moving cism in movement within the field of view appears to be leapfrogging.

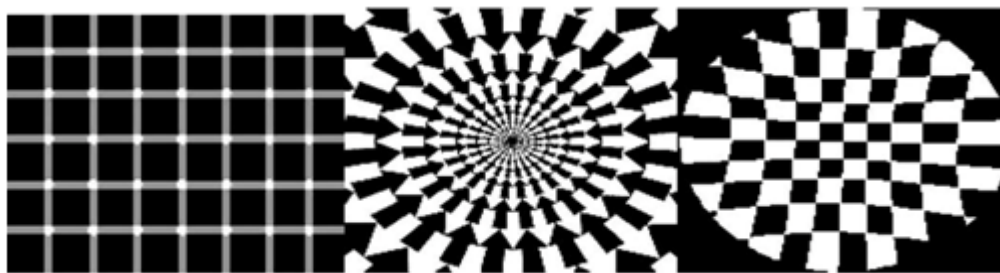


Figure 1. Stroboscopic effect

Indoor air; It is expressed as the air that takes in the buildings such as housing, work place and school [1,2]. For human health, it is not known that the indoor air may be harmful, although it is not known that the polluted outside air is harmful [3]. The quality of the interior air of houses, offices and schools where people spend a long time affects human health. The United States has set as its goal to develop projects that will address air pollution problems within the next 20 years [4]. According to the American Environmental Protection Agency (EPA) studies, the level of indoor pollutants can be about 5-100 times higher than the outdoor environment [5]. If indoor air is not controlled; Nose bleeds, coughs, difficulties in breathing, eye irritations and redness [6].

A student breathes 20,000 hours of air in school buildings until he / she finishes the university from elementary school. This rate covers at least 23% of the life span [6]. Children's respiratory tracts, protection mechanisms have not fully developed [7]. Therefore, the quality of indoor air is very important in the first grade. In the busy winter days when block lessons are made, the students are getting sleepy due to the O₂ insufficiency of the students, the excessive increase of the relative humidity and the sweat smell in the crowded classrooms. This situation affects the primary, secondary and higher education students at different rates. The situation becomes a catastrophe, especially when dust and chalk dust, which are removed from the classroom by the students in elementary schools, are added [8]. As a result of the investigations, it is necessary to have 30-50% relative humidity of the breathing air and the working environment should be at 19-20 ° C for the comfort and productivity of the people in the indoor environment. [9] Even heat and humidity affect the performance of the employees considerably.

II. Material and Methods

In the work done, the temperature of the indoor and outdoor environment and the nematem must be known. DHT22 heat and humidity sensor is used for this. Instead of using the temperature and humidity sensor individually, the DHT22 sensor, which can measure both, is preferred. The maintenance and failure rate is reduced due to the decrease in the number of sensors. The sensor can be used to measure humidity with +/- 1° C error between -40 ° C and 80 ° C and ± 5% RH between 0-100% RH. [10]. Figure 2 shows the DHT22 temperature and humidity sensor.



Figure 2: DHT22 temperature and humidity sensor [10]

The heating of the laboratory is done by heating. Electric heating is used to increase the temperature when heating is not enough. The electric heater used in Figure 3 appears. The heater has a power of 2000W and a current of 9.1A.



Figure 3: Electric heater

Window type fans are used to clean the inside air when there are no students in the laboratory. The window type fan used in Figure 4 appears. The power of the fan is 63W and the current is 0.3A.



Figure 4: Window Type Fans

The motion sensor is used to find out if the person is a student. The motion sensor used in Figure 5 appears.



Figure 5: Motion sensor

The PIC18F4550 microcontroller is used to convert analog data from the temperature, humidity and motion sensors used in the system to digital data and send it to the computer. Figure 6 shows the microcontroller and USB card. The data coming from the card is sent to the computer via USB and the relay card is checked by processing the data coming from the computer.

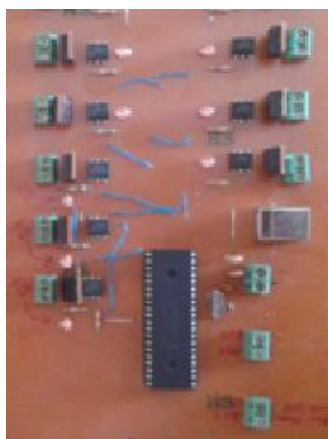


Figure 6: Micro-controller and USB card

The outcome of micro-inspector is 5 V when it gives the permission for passing weak current. The device of heating which is using in the system is 9.1 ampere. So for this purpose the role cart has used. The role cart can inspect the current of electricity till 10 ampere. Thus the electricity heating devise has been inspecting by role cart.



Figure 7: Relay card

The C# programme of interface is shown in figure 8. The system can be accessed either manual or automatic choices. The automatic choice has been arranged according to 20 degrees of temperature inside room. So the temperature 20 degrees has been tried be fixed. For the internal atmospheric humidity, the ventilation starts when the humidity passes %50 therefore the humidity will be reduced. When the manual system is chosen, the desired temperature and humidity can be arranged. The possible change in boundary of temperature is 17-25°C and the boundary humidity would be change between 30-70 %. If these boundaries are acceding, the ventilation system starts. When the temperature goes down the heater starts working. If the arranged density of humidity increases in interior ambience, the ventilation starts. Otherwise the ventilation never works. There are two groups of lamp in laboratory. The system is testing each lamp individual one by one. Therefor the unnecessary lamp would be cut off so the sufficient will increased. The lamp with low electricity can be controlled by roll board. During the testing of more consuming different electricity could by stroboscopic to prevent over consuming energy. In this study the plug sockets are divided into groups. Frist group are dealing with tables of experiment electricity on the other hand the second group of plug sockets will control the another sockets. By using the interface with two groups of plug sockets can be controlled. To which group of plug sockets would provide by electricity, the wanted group will be found in the interface by clicking the bottom open. For shutting it can be clicked for shut. The control of plug sockets is important in laboratory. This system does not provide the ability for the student to have experiments without exist of responsible person. If the responsible person during the break time or leaving period brings the bottom of plug sockets to shut so the casualty or any damage of student would be obstructed. The students particularly do their assignment for getting marks when the responsible person is off. Therefore the shock of electricity may be occurred. By this study the danger under these circumstances will be prevented.

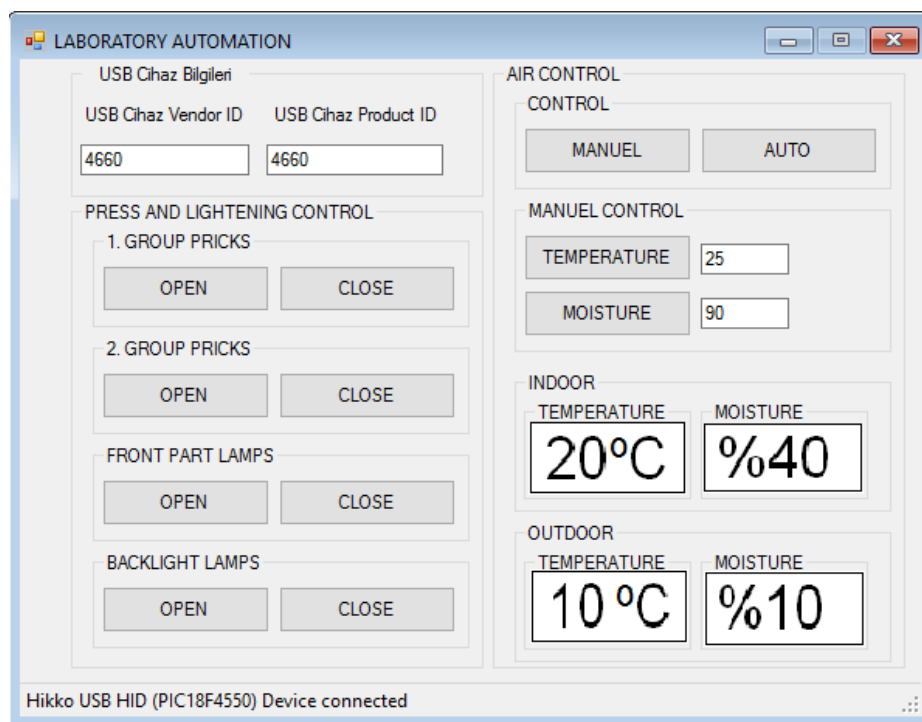


Figure 8: Interface

III. Conclusion

beings spend most their time inside buildings so they get disease which effect their performance. The ventilating would be significant, particularly at school, classroom and laboratory where the students get their educational activities. The humidity and temperature make the learning most difficult. According to this study and investigation, the conditions of temperature and humidity of the lab has been provided property under property (ideal) circumstances. So the efficiency of learning has been increased. Also the designed system can test the plug sockets. The forgotten lights would be controlled by this project therefore the efficiency of energy will be provided. The control of plug sockets will be carried out just by computer. Without advising or desire of responsible person, the system is never determined so there is not possibility to get electricity shock.

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