# The improvement of lab experiments

Education, Learning

It has been observed that in typical lab conditions where lab operators used to do experiments in the conventional way, there are so many aspects which need improvement. Lab experiments require a dedicated person who is physically present at the lab location to take care of each experiment by putting in his effort and time. Additionally, the lab operator needs to travel a certain distance in order to reach the lab location which can cost time and money. Also, some lab experiments can take a lot of time for its completion, for which the lab operator needs to wait and spend his valuable time. Many a time, the lab operator need to do hazardous experiments, which can even expose him to harmful chemicals which can be seriously dangerous to his health and is not recommended. In such situations, a wireless monitoring of the lab activity from a distant location is inevitable.

A remote monitoring of the required physical parameters such as temperature, pressure, rpm, humidity etc. of a tedious lab experiment could prove to be beneficial in such a situation. Also, the surveillance of the lab from a remote location with the help of a camera attached to the lab also gives important details about the activity taking place in the lab. With these in place, the human intervention from the lab can be reduced, and thus enhancing the safety of the people associated with the lab and also improving productivity. Also, by implementing such a remote monitoring, the use of wires needs to be reduced in order to reduce the inconvenience caused by the tangling wires. Hence a wireless transmission method is best for this purpose. Also, the wireless transmission does not have a line of sight restriction, hence the receiving equipment can be placed anywhere conveniently. Also, long distance communication does not require long wires.

This improvement to lab experiments can be beneficial for the accelerated pace of the lab experiments, and also for reducing the number of people who are employed to do the research or lab activity. Wireless communication plays a major role in the transmission of information. Wireless communication is used in the working of a variety of devices such as duplex radios, mobile phones, wireless networking etc. It is also being used in applications such as automatic garage door openers, satellite TVs, cordless laptop Mouse and GPS systems. This wireless device is in use electromagnetic energy to make communication possible. With this, short distance and long distance communication is possible.

Project Objectives: This project aims at developing a system which could monitor certain physical parameters such as temperature from a distant location with the help of a wireless channel. Additionally, the project is also aimed at getting the pictures of the lab in real time, so that the activity of the lab can be monitored clearly. The system is also proposed to be capable of comparing the images and to notify the lab operator at the remote location whenever there is any change in the lab situations. With this system implemented, the lab operator can handle part of the lab experiments at home or from a remote location, without being actually present in the lab. The system will also be designed to alert the person at the remote location of any unintended variation in the value of the specific measured physical parameter. Moreover, the laboratory experiments requires only fewer number of persons to complete it, since a person can be allocated from a remote location to monitor for any adverse conditions in the lab experiment, or for checking when to finish the experiment.

Project Outcomes : The project is expected to be capable of measuring the temperature of air with the help of the temperature sensor DS18B20 attached to the microcontroller AT89C51. The temperature value needs to be transmitted to the remote location using the RF Transceiver CC2500 connected to the microcontroller. The microcontroller is also expected to interface a camera and capture the pictures in predefined time intervals and send it to the remote location. This data is to be received by the counterpart RF Transceiver at the receiver side, and is fed to the microcontroller as input. The microcontroller upon receiving this input processes it and checks if the value of the parameter is within the allowed range and also sends back a control signal back to the transmitter section to control it. The value of the parameter is also displayed on the LCD panel attached to the microcontroller. The microcontroller is also connected to a Personal Computer to read and compare the captured images. The software Matlab is used for comparing the images captured.