ABSTRACT

The objective of the work presented in the thesis is to develop a distributed system that can be used for continuous monitoring of information remotely from different locations and sent them to a central database for integrated global applications. The application in weather forecasting is one of examples, where the system can be used. We have taken this domain of application to test the system.

For the development of the distributed system, we have used microcontroller instead of using a computer. A host pc is used only for transferring the software on the distributed system. The distributed system is developed using the Java programming language and TINI (tiny internet interface) microcontrollers. All of the circuits and codes have been developed and tested. The microcontroller used was TINI which is an internet-ready, embeddable 8051 based microcontroller board. TINI supports Java Virtual Machine with a powerful collection of hardware interfaces - I2C, CAN, 1-wire, RS-232, parallel, and Ethernet.

The distributed system has been used to acquire the weather data from remote areas. Weather monitoring and forecasting require a considerable amount of climate data. The distributed embedded system we have developed collects the data for parameters like temperature, humidity, and wind direction. The same is coded, verified and entered into the database. Such data would from time to time be selectively retrieved. They were updated and maintained for further use. The data can be statistically and synoptically analyzed for use in the preparation of weather forecasts.

The design of such system presents many technical challenges. Distributed system is more cost effective than a single computer. Computational resources in distributed system are reusable and scalable. Distributed system also provides redundancy. They can run on various operating systems, and can use various communication protocols. For inter-machine communications, TCP/IP on Ethernet is used.

As the microcontroller which we are using have Ethernet support, the system can be mounted and installed at remote locations; so it provides the ability to access difficult-to-read areas/points. The system provides solution for instant connectivity and ability to access the weather station.
The embedded system is highly accurate for monitoring and management of Weather parameters such as Temperature, Humidity, Wind Direction and Wind Speed. The Embedded system provides 24*7 monitoring and supervision.

As the embedded system is a low cost solution for long term operation; the software once installed will run throughout the life of embedded system. Software can also be upgraded easily. We have tested and installed this system for monitoring the environmental parameters in remote areas. The same is installed for monitoring the temperature of IVF laboratory in one of the Hospitals. Also we are providing the database for weather parameters to the official website of Aurangabad. We have proposed this system for temperature monitoring in laser laboratory as well.

The thesis was presented in five chapters as follows:-

**Chapter I:** This chapter introduces the concept of Monitoring through Distributed Laboratory System, types of embedded system, weather forecasting models and the theme of research work undertaken.

**Chapter II:** This chapter gives the complete details of Hardware specifications required to design and develop the Embedded System. This includes the Microcontroller, different sensors, switches used for development of the weather cock.

**Chapter III:** In this chapter focus is given on the development tools and utilities to achieve the required functionality. It also explores the technique of making our embedded system ready to install and use.

**Chapter IV:** This chapter explores the experimental work carried out and the results.

**Chapter V:** This final chapter concludes with the concise review of the research work done along with the future aspects.