Introduction

- The Study of weather is as old as creation, influence on the lives people:
  - 1. Cultures
  - 2. Habits
  - 3. Attitudes
  - 4. Behaviors

- Importance of weather measuring:
  - 1. Induced environmental disasters
  - 2. Improve agricultural productivity

- Weather elements:
  - 1. Temperature
  - 2. Wind Speed
  - 3. Humidity
  - 4. Rainfall
  - 5. Atmospheric Pressure

- In ancient times weather were monitor by human experiences:
  - 1. Over the cloud
  - 2. Over the movement of the wind

- Modern days

  Metrological

Methods:

- The nodes are equipped with different types of sensors for measuring ambient temperature, humidity, Anemometer (wind speed meter), and flame detector, and gas detector.
- The node’s information gets transmitted to central controller wirelessly.
- At the central controller, the sensor nodes information gets processed and displayed on a web portal.

Aim and Objectives

- The goal of this project is to develop a distributed sensor network for monitoring weather in outdoor applications.
- The sensor network contains two main subsystems:
  1. Sensor Nodes: The nodes can be deployed in different locations to gather weather and ambient information.
  2. Central Controller: Where all sensor nodes information is processed and displayed for operator.

- Each weather station sensor node is equipped with the following sensors:
  - 1. Temperature/Humidity Sensor
  - 2. Flame Detect Sensor
  - 3. CO Level Sensor
  - 4. Wind Speed Sensor

- The goal for the sensor nodes is to record different variables in environment for weather forecast and to detect certain natural events.
- Each sensor’s data needs to be characterized and corresponding threshold values need to be identified for certain “events”.
- The certain events that we are interested include:
  - 1. Fire disasters
  - 2. Storms

Software

The cloud web application is developed based on Partial IDE software and it can display the location of sensor nodes, as well as real-time temperature, humidity, and wind speed at each sensor nodes. It can also display alarms whenever the flame or carbon monoxide are detected.

Understanding Natural Events

- Each natural event has certain characteristics that can be identified by a combination of individual sensors in each node:
  - During fire disasters:
    - Due to the presence of fire, a significant amount of infrared (IR) waves will be emitted.
    - The Carbon Monoxide (CO) level in the air increases.
    - The ambient temperature in environment increases.
    - By combining flame detector sensor, ambient temperature sensor, and CO level sensor data, we can distinguish the presence of fire in an environment.
  - During storms:
    - Wind speed in environment significantly increases.
    - The ambient humidity level in environment increases.
    - By combining wind speed sensor and ambient humidity sensor, we can distinguish storms.

Results

- The device was built and carried out for testing; the system was found to be working properly.
- After each measurements were conducted results for temperature, humidity, and wind speed were compared with the local Weather Channel.