# Real-Time Air Quality and Weather Monitoring System Utilizing IoT for Sustainable Urban Development and Environmental Management

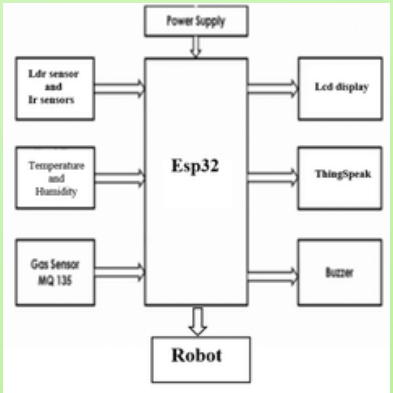
**Akash Ram Kondeti, Leelavathi Rudraksha, Silpa Chinnaiahgari, Anitha Bujunuru**

**Corresponding Author: Akash Ram Kondeti Email ID: kaakashram@gmail.com**

## 1. Introduction

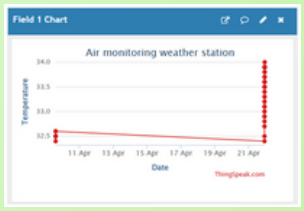
1. Traditional weather monitoring systems were bulky and limited to measuring single parameters, requiring modernization for real-time, multi-parameter data acquisition.
2. The Internet of Things (IoT) revolutionized environmental monitoring by enabling automated, reliable, and real-time data collection and processing through sensor networks.
3. Advances in technology have led to the development of compact, low-power, and portable weather monitoring devices replacing large analog systems.
4. The proposed system utilizes IoT-enabled sensors and microcontrollers to measure key environmental parameters such as temperature, humidity, gas levels, and light intensity, displaying and transmitting data to cloud platforms.
5. The system's mobility, remote control via Blynk, and real-time cloud access make it adaptable for smart environments like schools, greenhouses, and urban monitoring.

## 2. Methodology

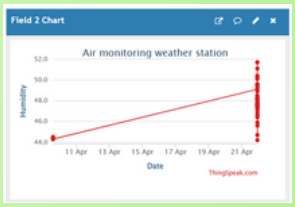



## 3. Results and Discussion

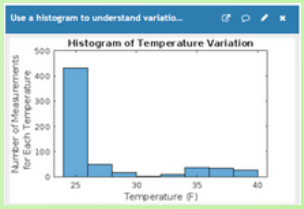
1. Accurate environmental data collection is crucial for understanding and mitigating pollution and climate impacts.
2. Recorded data showed reliable temperature variations from 32.5°C to 37°C and humidity changes from 60% to 40%.
3. Platforms like ThingSpeak and Blynk visualized clear environmental trends, with analyses revealing a negative relationship between temperature and humidity, confirming data consistency.
4. This enhances environmental analysis and helps identify pollution hotspots.
5. Challenges include battery life limitations and the need for sensor recalibration.
6. Despite these, the system's portability and advanced capabilities, such as real-time control and obstacle navigation, make it superior to traditional stationary units.
7. The system's performance is validated through close alignment of predicted and actual data, paving the way for better environmental management.



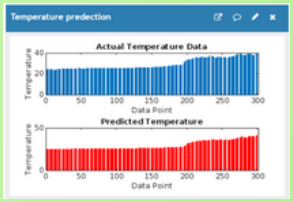

A) Temperature



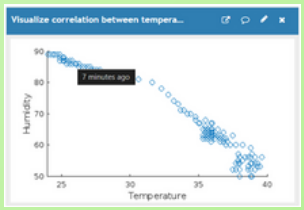

B) Humidity



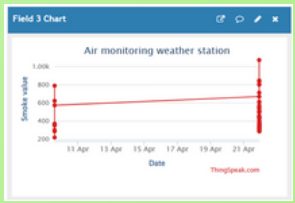

C) Temperature Variation




D) Actual temperature vs Predicated Temperature




E) Temperature vs Humidity




F) Smoke value

## 4. Conclusions

1. The developed IoT-based system effectively provides accurate and reliable real-time monitoring of environmental parameters.
2. Its portability and cloud integration make it suitable for smart city applications and sustainable environmental management.

## 5. Key References

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