Li-Fi & Wi-Fi Based Drone for Weather Monitoring with Data Storage in Cloud Using IoT

Jayashree T R [a,1], Priyadarshini K[b], K. Sri Harini[c],
aAssistant Professor, Dept of Aero, Rajalakshmi Engineering College, Chennai, India
b PG Scholar, Dept of Aero, Rajalakshmi Engineering College, Chennai, India
c UG Scholar, Dept of ECE, Easwari Engineering College, Chennai, India

Abstract. In this paper a Li-Fi and Wi-Fi-based weather monitoring system is built using drone. The atmospheric conditions are monitored using the drone and the gathered information is communicated to the ground station using Li-Fi technology. The process of transfer of information involves gathering data using sensors and transfer of data using Li-Fi technology. Data is processed and sent to the receiving station by using Light Fidelity technology. The received data is uploaded to a cloud data base using Wi-Fi technology. Real time data is displayed in an android device using IOT technology. Increased used of wireless communication which used Radio Frequency leads to RF congestion. Light Fidelity system is a best alternative by using a visible light instead of Radio frequency as used by all wireless communication system.

1. Introduction

Basic Li-Fi technology consists of one power-controlled LED light and one receiver system to receive high frequency light illumination. Drones are incredibly refreshing now a day, the drones are appropriate for reconnaissance as it has numerous productive highlights. Drones have capacity to play out numerous capacities with or without controlling of human. It can possibly be utilized in far off detecting applications, observation and logical examination. The undertaking is centered on researching the limit of an affordable drone in observing an expansive and is sending back the information back to the person at the ground. The different sensors are presented in the flying drone that takes readings of moisture, temperature, elevation levels and pressing factor. The values are totally shared to the control station through Li-Fi and after that transferred to the cloud. Light Fidelity is another far-off correspondence advancement which enables a far-off data transmission.

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[1]JayashreeTR, Assistant Professor, Dept of Aero, Rajalakshmi Engineering College, Chennai, India.
Email: priyadarshini.k.2019.meav@rajalakshmi.edu.in

Light Fidelity relies upon an outstanding cutoff of strong state lighting systems to low and high with a LED blazing that's imperceptible for living vision information got by sensors with photo diode zone of bright perceivable quality.

2. Existing System

The available weather monitoring system uses radio waves to gather information. With traditional radio transmitter network access can before long be over-burden if huge information is sent, however in Light Fidelity technology information transfer rate consistently stays stable with additional wavelength in the white LED light. Radio waves cause adverse effects on the environment. RF pollution leads to carcinogenic effects on living organism. The data transfer is only through Electromagnetic radio waves or radio frequency which harms living being.

3. Proposed System

Important target of the proposed research, send data through light using LED while flying. The target of our thought is to use Li-Fi system (i.e.) to use LED light to transfer data and to screen the climate conditions such as temperature, humidity and altitude information, we gather the information's using drone and send the observed data from sensor to ground station with LiFi technology through LED light, after that the information will be transferred and store in the cloud utilizing Wi-Fi using IOT technology. The data are stored in the thing Speak cloud by MATLAB. The stored data will be displayed with time, date and location information. Data analysis of the transmitted data can also be viewed in the Cloud. An Excel report of the data can be downloaded from the cloud. In this Project we also prove this idea in a flying drone model.

4. Advantages of Proposed System

In this proposed system we are transmitting a data at a frequency of 1000 times of radio frequency spectrum through Li-Fi which cannot be hacked, to avoid this issue data are transmitted through Light Fidelity system. Information transfer rates up to 3 Gbits/sec. The fundamental benefit of this Light fidelity framework is no radiation emission, no obstruction with radio waves and it makes information security simple. We are minimizing the use of Radio frequency in which the radiation harms the living being heath conditions. The data transmitted will be stored in a cloud with time, date, altitude, longitude, latitude, Humidity value and temperature value through IOT technology. So here Light-fidelity and Wireless-fidelity technology is used together in a drone for weather monitoring. Used for Weather monitoring, Top of Buildings, used in high region, used as alternative of Wi-Fi technology, Used as alternative for Radio Frequency.

5. Results and Discussions

In this project DHT11 and BMP180 sensor used for the weather conditions and altitude information sensing. Li-Fi is fitted on the drone to transmit the weather data. The receiver station is fixed on top of a building to receive the data from drone along with Wi-Fi to upload the data to the cloud. Photo-diode is used at receiver station to sense the light and convert it into data. Cloud storage can be accessed from anywhere in the world. Cloud storage displays the aggregate, live data analysis and visualization of data which has been uploaded by the receiver station. When the drone travels above the receiver station it sends the data to the receiver station of that area. An android app is used to display the data which has been stored in the cloud. LCD display has been used in both transmitter and receiver to check the accuracy of the transmitted data and received data.
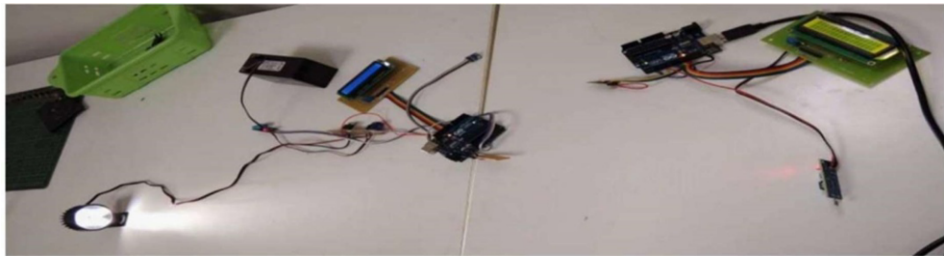

Figure 1. Data Transmission using Li- Fi technology

Figure.2 Drone is made up of Aluminum square material and Hylum sheet. Drone is tested with Li-Fi transmitter onboard and a receiver station with Wi-Fi is fixed on a building.
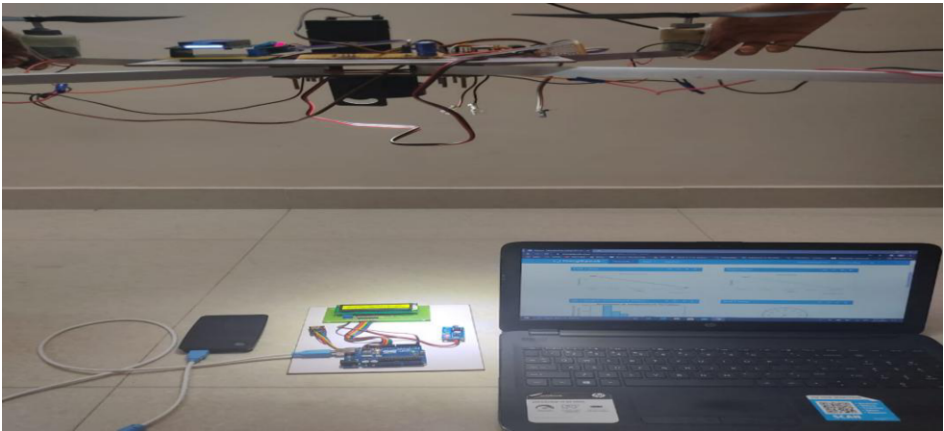

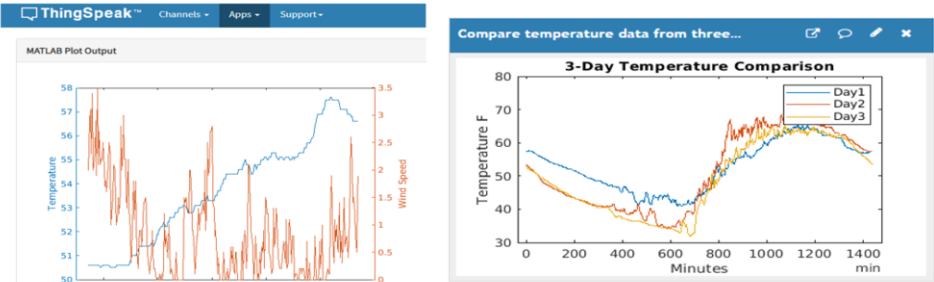**Figure 2**. Drone Quad Copter with Li-Fi technology

Figure 3. Wind speed prediction with temperature data and comparison analysis of temperature

Figure.4 Separate channel is created for this project in the MATLAB thingSpeak Cloud. The channel name is Drone-Monitoring using LiFi-WiFi Communication. This channel is a private cloud which can be accessed by only authorized user. Here we can store up to 128 GB data. ThingSpeak shows the Aggregate, Live data Analysis and Visualization of the data is shown in the form of graphical representation separately as Temperature, Humidity and Altitude data.
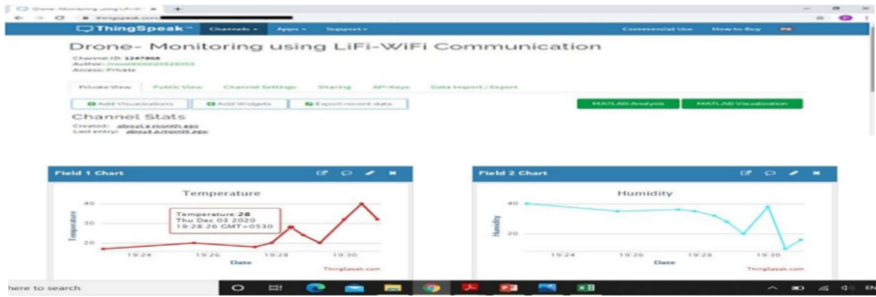

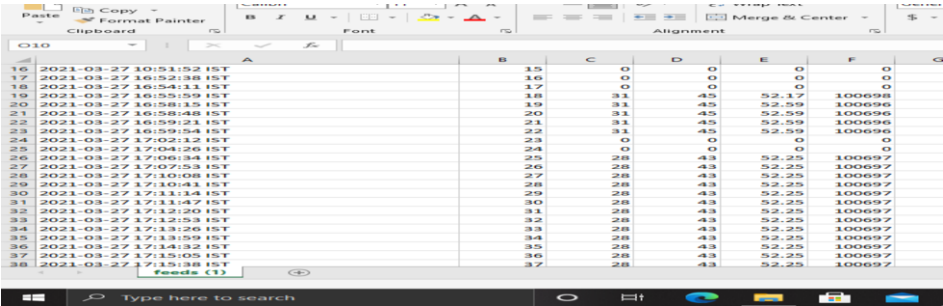**Figure 4.** Data storage in cloud ThingSpeak using IOT

Figure 5. Downloaded weather report from Cloud ThingSpeak

Figure 6 Android mobile app (ThingView) is used to show the live data analysis and Visualize the data which has been stored in the ThingSpeak cloud
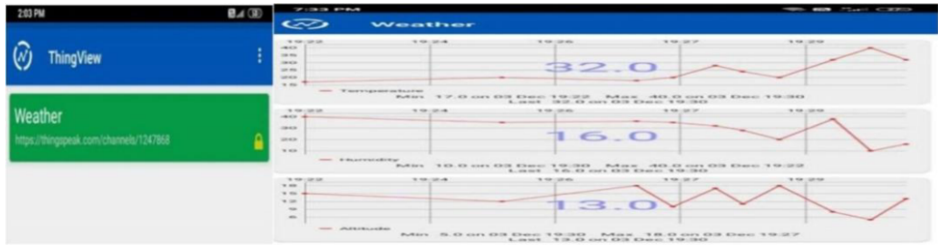
Figure 6. Weather report viewing in Thing View Free mobile app

6. Conclusion

Implementing Li-Fi technology in a flying drone to send data. In this system weather data and altitude information is successfully sent through Light Fidelity technology while flying and using Wireless Fidelity data are stored in the ThingSpeak cloud using Internet of things (IOT)technology. In this project Cloud Storage, Li-Fi, Wi-Fi & IoT technology are being used. In Future Weather forecasting, Weather prediction, Weather Alert Message and Wi-Fi replaced with Li-Fi in the receiver station can be done as future work.

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