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An Application of IOT and WSN to Monitor the Temperature of AC Transmission Line

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Abstract

With the increase in demand for power with population, power quality issue is one of the challenging areas which needs utmost attention. It is a known fact that the transmission of power takes place through transmission lines which are bare conductors and are prone to many natural situations, which degrade the quality of power and also leads to sagging of conductors. Variation in temperature is a commonly affecting parameter over these transmission lines and leads to deviation in the power flow affecting ampacity of the conductors and over a period of time leads to unwanted sag. Monitoring the temperature of transmission lines is done continuosly using LM35 temperature sensor and an application of Internet Of Things (IOT) through thingspeak application platform to track the variations. An Wireless Sensor Network (WSN) environment is created to transmit the temperature data from one node to another using NS-2 platform.

Keywords: Sag, Temperature sensor, Internet of Things (IOT), Wireless sensor Network (WSN).

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1. Introduction

Overhead transmission lines are thermally limited to the amount of electrical current it can carry, due to the physical properties of the conductor. In overhead transmission lines, resistance of the conductor is the main reason for losses. When the current in conductor tries to overcome the ohmic resistance of the line, the power is dissipated in the form of heat, leading to increase in temperature of the over head transmission line. One of the major contribution to the sagging is increase in temperature. Increase in the sagging affects the physical property of the conductor. Hence, monitoring the temperature in overhead transmission line plays vital role. LM35 temperature sensor is used for monitoring the temperature and wireless sensor network environment is used to transmit the data of temperature from one node to another using Ns-2 platform.

2. Literature Survey

The temperature sensor DS1820 is used to monitor temperature of transmission lines indoor and outdoor. The maximum current capacity of transmission lines changes with line temperature. However, the maximum current capacity can only be calculated by conductor temperature model [1]. Monitoring of transmission line is required for efficient ampacity. The sag and the conductor temperature are the two parameters defines the ampacity of overhead transmission line [2]. On everyday basis the temperature of the transmission line conductor is typically 5℃ to 15℃ above the air temperature [3]. The temperature of conductor has a very significant impact on the power flow calculations. The power flow model has depicted significant changes with and without temperature considerations. In power flow calculation procedure, the line resistances are assumed to be invariable which does

5. Results

Teraterminal is an emulator where the actual temperature and amount of sagging is displayed. CP2102 transmitter is connected between microcontroller and Teraterminal serial port. Figure 5 shows Teraterm display on screen and figure 7 shows Thingspeak application platform. It can be observed that the display showing 034054 for a 33KV line where 34 represents the amount of sagging in cm and 54 represents the temperature in °c. The output is also observed on LCD for sagging information and on LED's for temperature as shown in figure 6. 00100111 on LED's represent the temperature of 27°C. Figure 8 represents the variation in temperature and figure 9 represents the sagging variation.

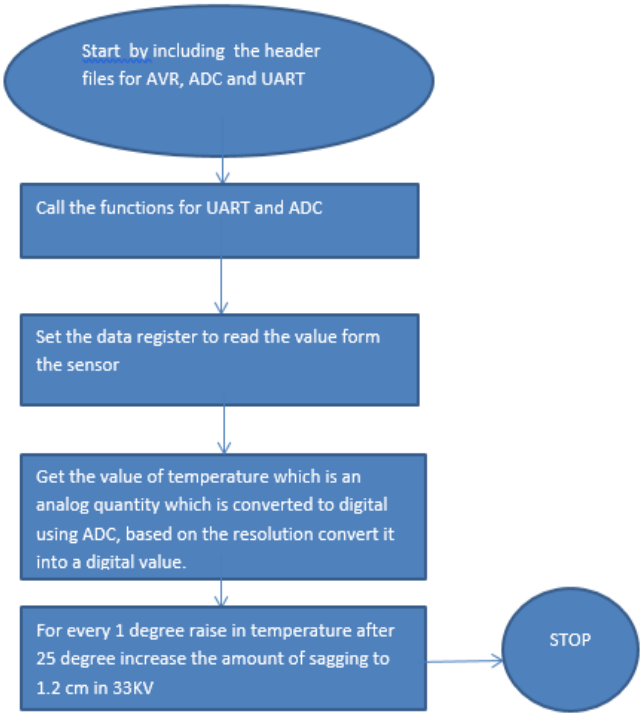

Figure 4. Flowchart representation

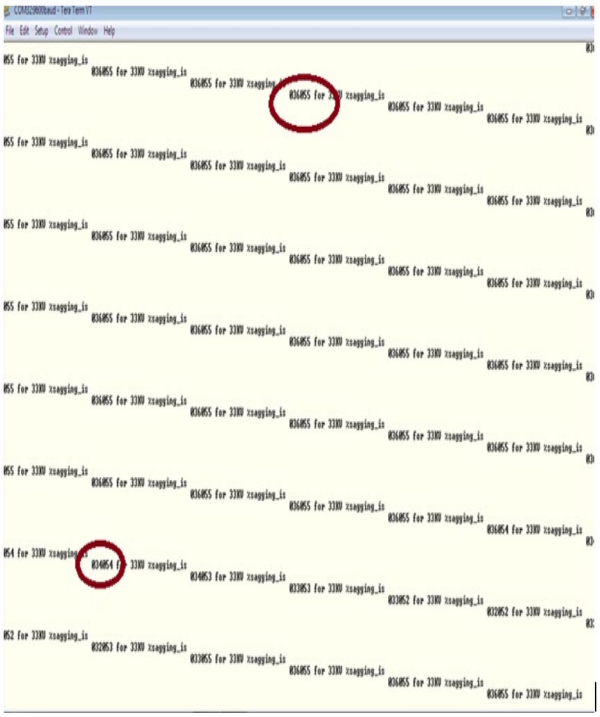

Figure 5. Tera Term showing the sagging with temperature

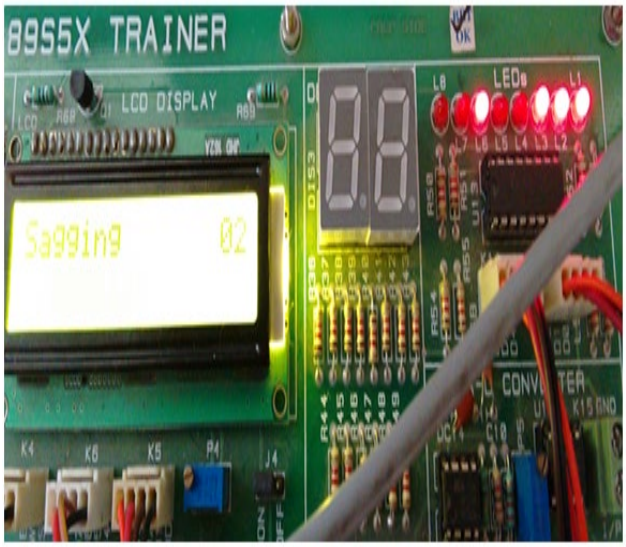

Figure 6. LCD showing the sagging and LEDs the temperature

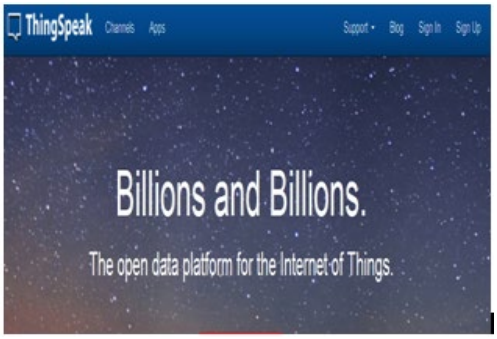

Figure 7. ThingSpeak application platform

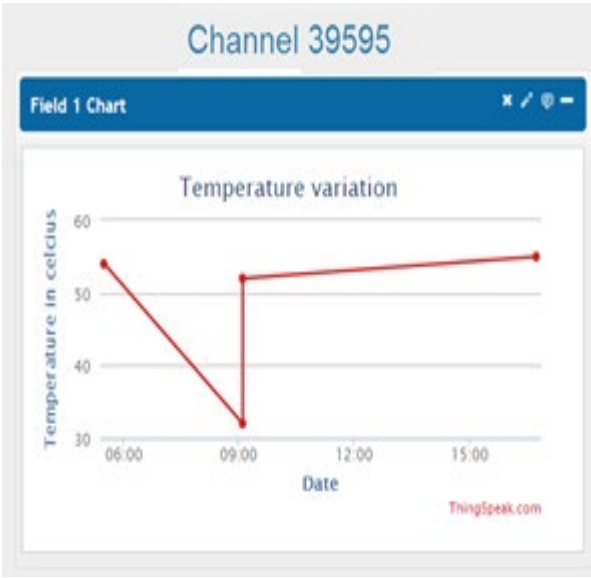

Figure 8. Graph representing temperature variation

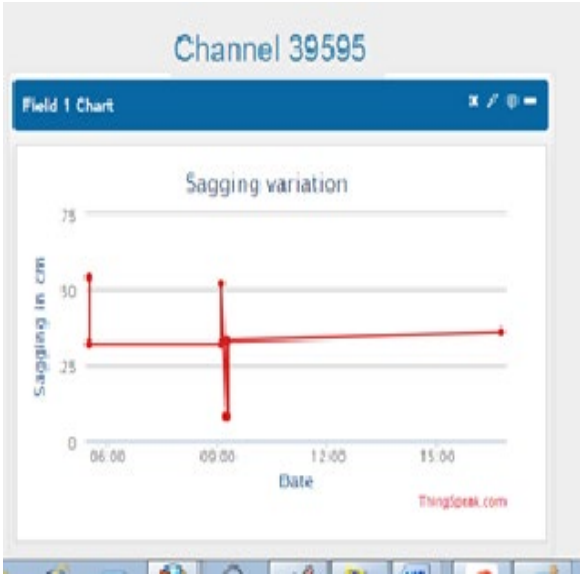

Figure 9. Graph representing sagging variation

6. Conclusion

In a over head transmission line, variation in temperature leads to deviation in power flow. The current carrying capacity of the conductor is also affected by variation in temperature, over a period of time leads to unwanted sag. Monitoring the temperature of transmission lines is done continuosly using LM35 temperature sensor and an application of IOT through thingspeak application platform to track the variations. WSN environment is created to transmit the temperature data from one node to another using NS-2 platform.

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