

# IoT based Home Switch controller based on early ThunderStorm Detection

## Abstract

Over the past ten years, highly sophisticated electronic equipment has permeated our homes thanks to significant advancements in electronic technology. However, these equipments are highly vulnerable to various interferences. Many technical drawbacks are optimized over the period of time. Some interferences still exist and they are considered as a major threat to electronic appliances. Thunderstorm is one of the interferences which can lead to damage or complete destruction of electrical equipments. This occurs due to lightning striking to a nearby electric pole which causes a surge of electricity that bursts through the power lines. Over \$825 million was paid out on more than 100,000 damaged electronics claims each year due to lightning and surges. To mitigate this problem many researchers have proposed numerous methods that counteract this dire situation, but not all the solutions are cost-efficient and easy to use for general public. In this research, we proposed a cost-effective model where thunderstorms will be predicted, also based on that early anticipated data the home main switch will be automatically turned off and the thunderstorm's data will be sent to the cloud for further analysis. Also using a mobile app which is connected to the cloud server, data can be easily analyzed, make critical decisions and can control the home main switch.

## Proposed Methodology

This research various technologies are integrated in a single section including AS3539 thunderstorm detecting sensor, SIM800L miniature GSM modem, Relay, Arduino developing board and Thingspeak cloud platform. A conceptual framework of the model has been proposed in Fig 1., the entire workflow of the system is illustrated in this section.

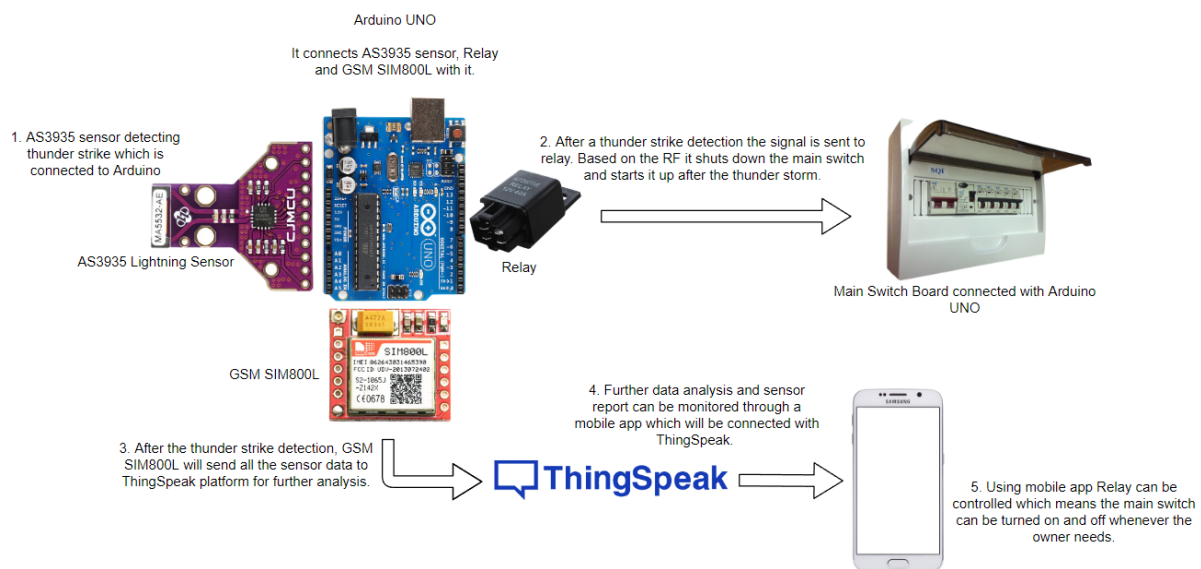


Fig: Proposed model

In this proposed model, the whole arrangement is placed near the home main switch in Arduino development board. Initially, AS3539 lighting sensor sensor will anticipate the thunderstorm in early phases by sensing electromagnetic radiation. The rapidly changing

currents of the strike cause electromagnetic pulses (pulse time 10-150ms) in the VLF (3k-30kHz) and ELF (<3kHz) radio bands. The maximum amplitude lies around 5-10KHz. When the lightning is likely to strike an alert is sent to a Relay, which will immediately turn off the home main switch. A relay module is basically an electrical switch that is operated by an electromagnet which is activated by a separate low-power signal from a micro controller. The electromagnet pulls to either open or close an electrical circuit when it is activated. So the developing board is actually sending a signal to the relay to turn off the home switch. After that, all the thunderstorm data will be transferred to the cloud for further analysis. To establish a communication channel the model incorporates a GSM module SIM800L which allows for GPRS transmission, sending/receiving SMS and making/receiving voice calls. Using this modem, all the collected sensor data will be transferred to the cloud for storing and further analysis. Thingspeak cloud platform is used for this section because it is an IoT analytics platform service that allows to aggregate, visualize, and analyze live data streams in the cloud. Data can be sent to ThingSpeak from a devices, create instant visualizations of live data, and send alerts. When all the sensor data is received by Thingspeak, it will do further analysis and make a report on it. This cloud platform offers a UI in form of mobile application and web service so that users can easily visualize the data and make decisions. In addition, an user can also control their home main switch using the Thingspeak platform by sending a message to the relay to turn on the switch. Thingspeak will send a message through SIM800L and after receiving the message to the Arduino board, it will send a voltage to the relay to turn on the main switch.