

# DESIGN OF LOW-COST MICROCONTROLLER-BASED LIGHTNING MONITORING DEVICE

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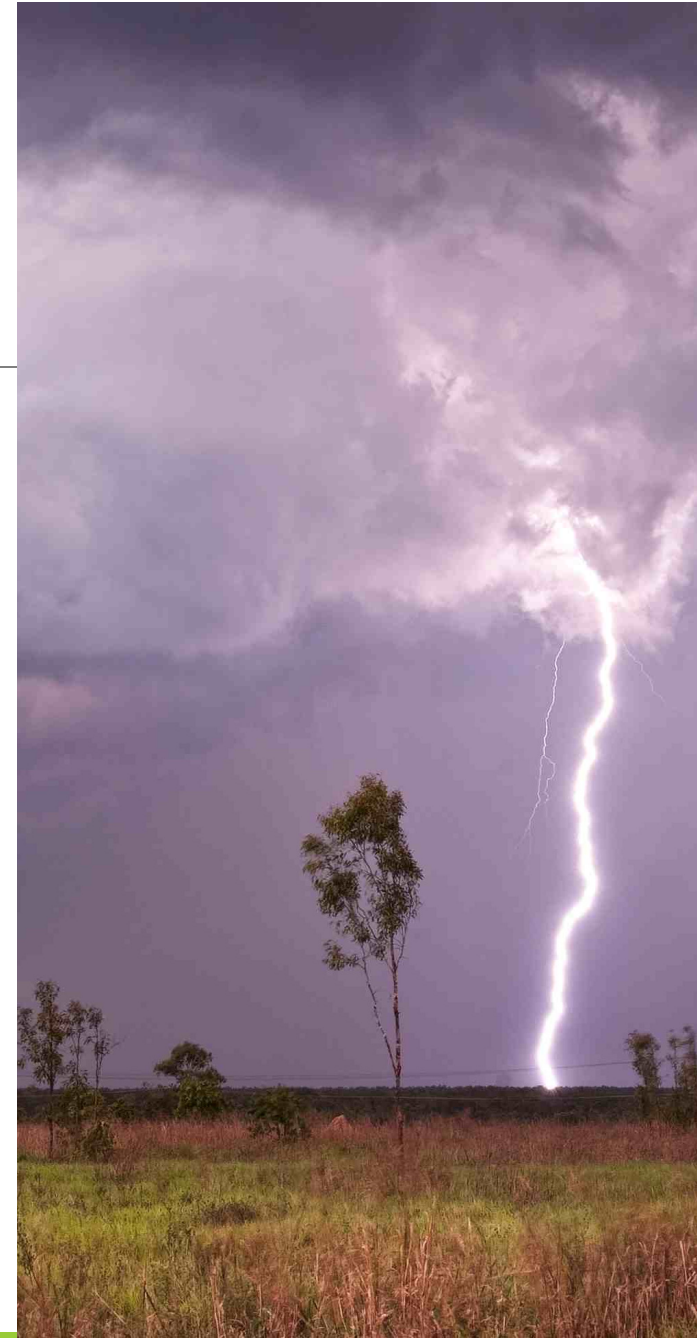
**Prof. Nick de Giesen-Tdelft**



# Outline


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- **Introduction**
  - Lightning data use
  - Lightning sensing technologies
- **System circuit**
- **Data collection and analysis**
- **Implication and Conclusion**
- **Recommendations**



# Lightning data uses


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- Safety application
  - Meteorological agencies-track severe weather
  - Insurance industry-claim investigations
  - Electric utility-Power line fault location
  - Research
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# Lightning Sensing

## Parameters

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- **Location**
  - **Intensity**
  - **Frequency**
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- A solid green horizontal bar at the bottom of the slide.

# Lightning Sensing

## Technologies

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Sound

Radar system

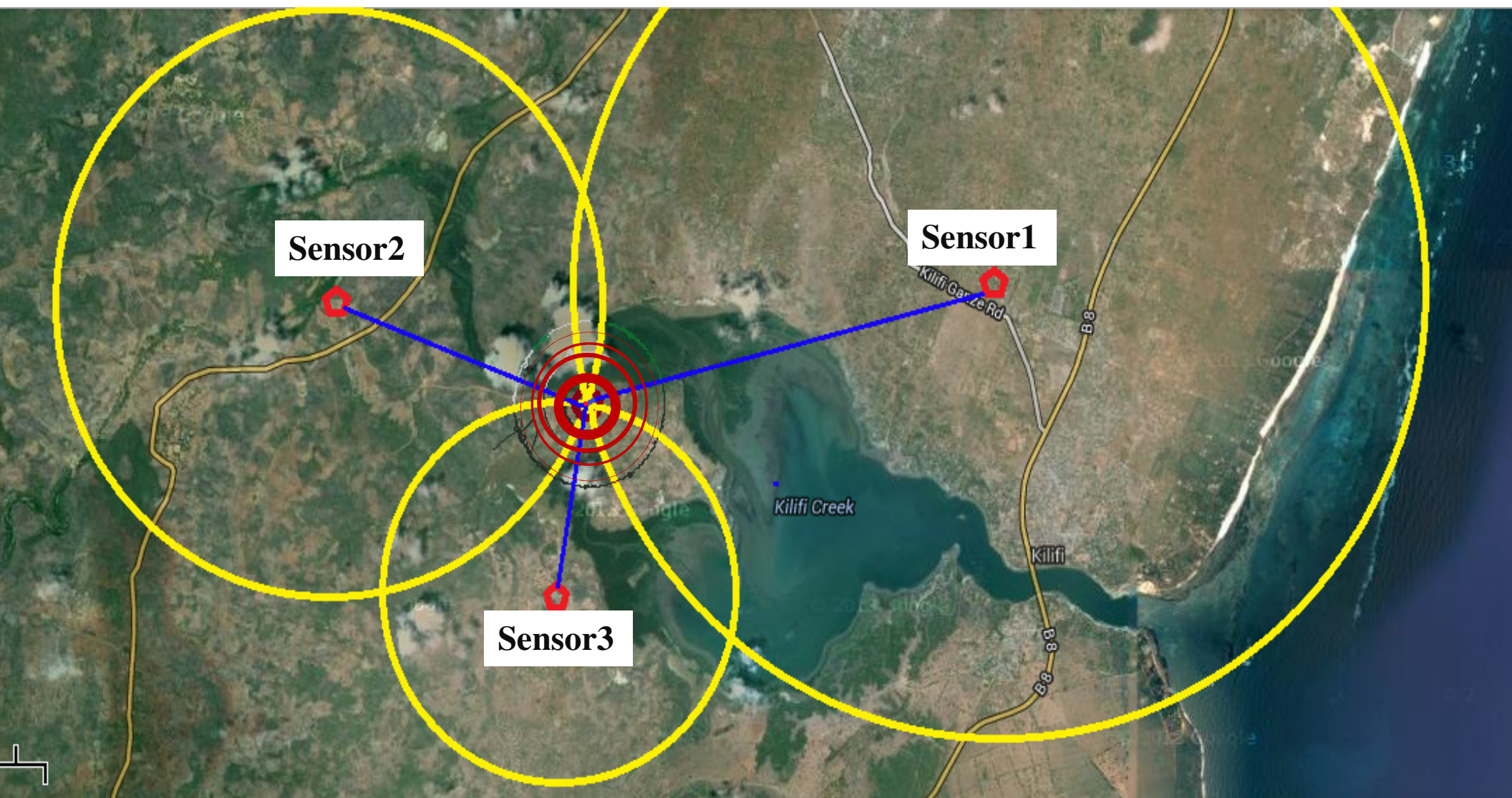
Electromagnetic (EM) radiations - Sferics

❖ EM waves obeys the Inverse square law

$$\text{Intensity} \propto \frac{1}{\text{distance}^2}$$

❖ By comparing the received attenuated energy and the rate of attenuation, distance between the sensor and the origin of a lightning strike can be determined.

# Lightning Network



# Problem Statement

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There is limited lightning data

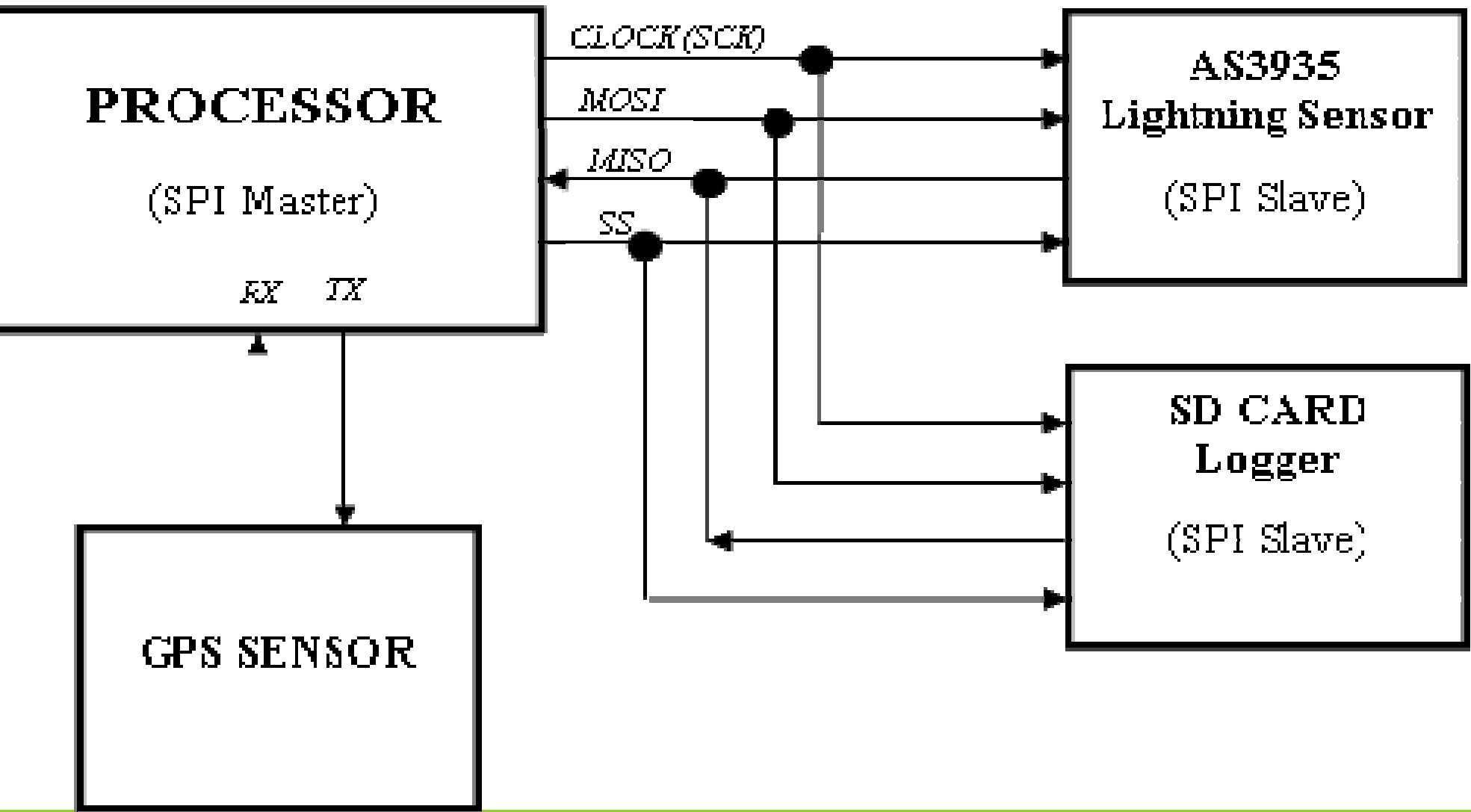
Current **Lightning networks** are the best but are very expensive

## Possible solution

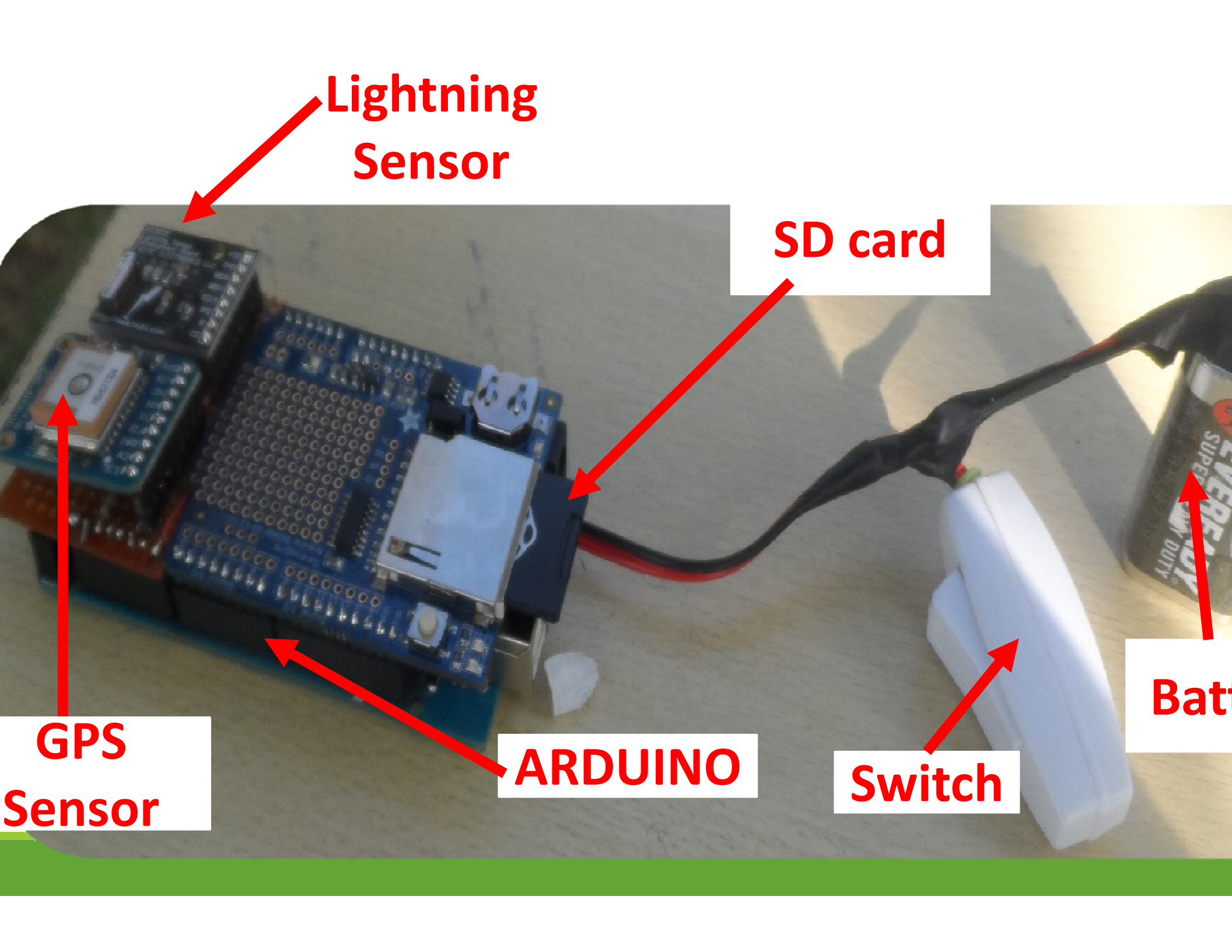
Use of micro-electronic technology to design cheaper sensors



# THE SYSTEM CIRCUIT







**Lightning  
Sensor**

**SD card**

**Batt**

**GPS  
Sensor**

**ARDUINO**

**Switch**

<u>GPS TIME</u>	<u>SENSOR STATION 1</u>	<u>SENSOR STATION2</u>
	<u>DISTANCE (KM)</u>	<u>DISTANCE (KM)</u>
6:10:25 PM	18	20
6:15:31 PM	18	-
6:21:22 PM	18	-
6:21:31 PM	-	20
6:27:25 PM	14	18
6:27:52 PM	14	-
6:28:22 PM	-	18
6:28:31 PM	-	18
6:28:52 PM	14	18
6:29:27 PM	14	27
6:30:47 PM	14	-
6:30:57 PM	14	16
6:31:07 PM	14	16
6:31:11 PM	-	10
6:31:17 PM	14	10
6:31:20 PM	6	8
6:31:27 PM	6	8
6:32:02 PM	-	6
6:32:04 PM	6	6
6:32:22 PM	6	-
6:32:32 PM	5	-
6:32:49 PM	5	5

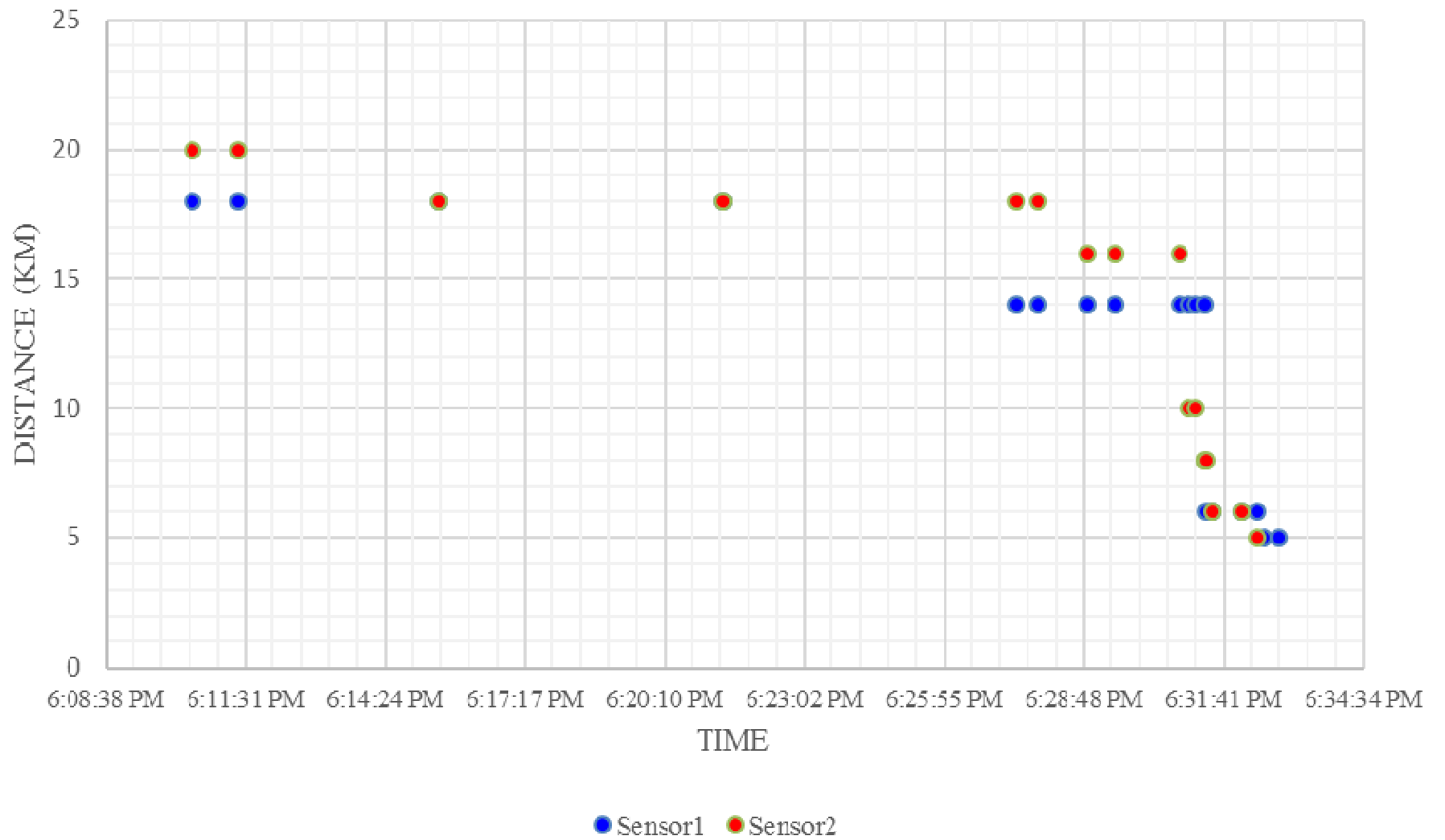
## SET of DATA

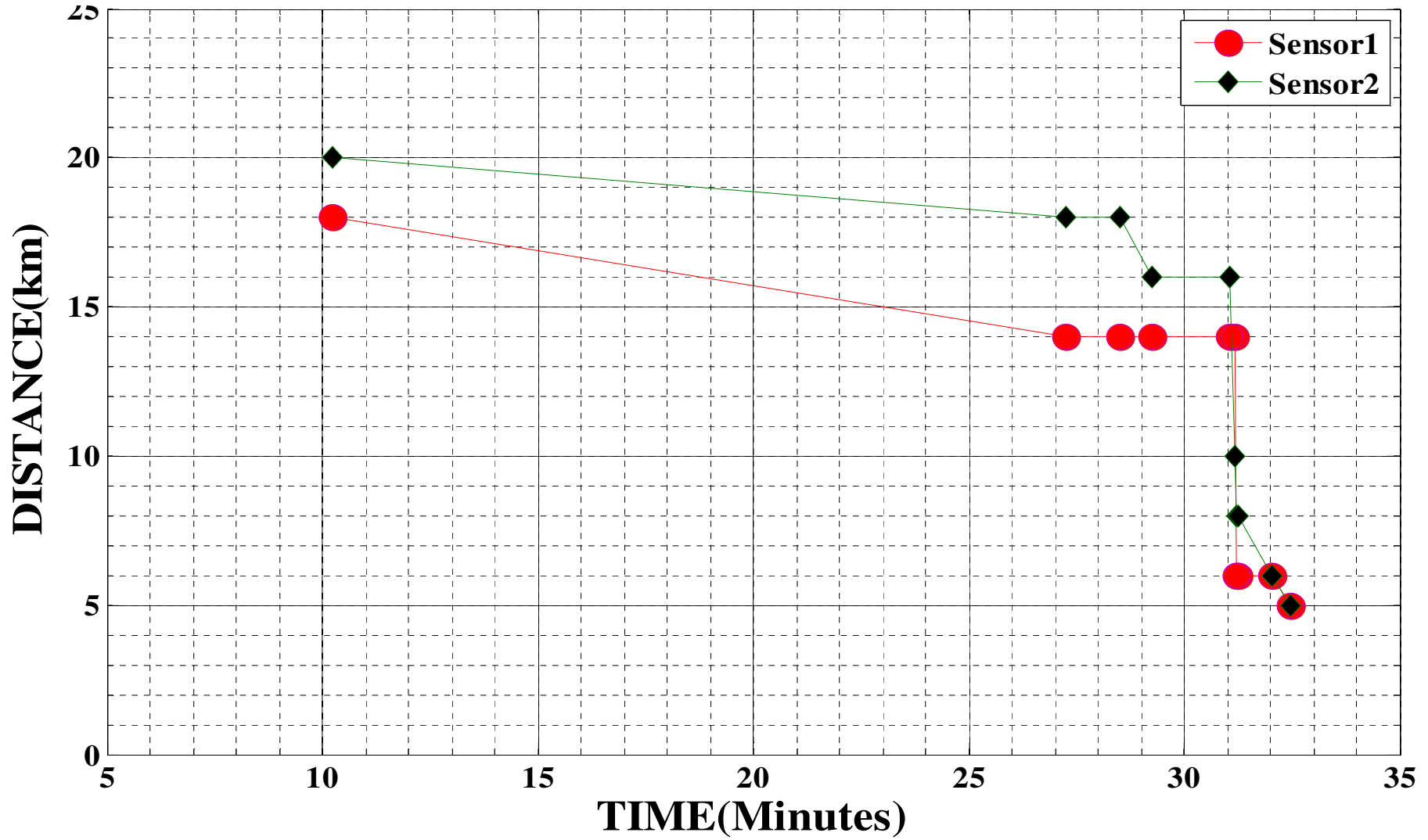
### LOCATION :

**Oraimutia, Nyandarua**

**Date: 3<sup>rd</sup> MAY 2014**


- **Two sensor stations on the same location, 1 meter apart**





## IMPLICATIONS AND CONCLUSION

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- **A framework has been developed that incorporates use of microcontroller and sensor to gather frequency and distance of lightning strikes.**
  - **It is possible to gather lightning data of an area without the need of expensive lightning network.**
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## RECOMMENDATION AND FUTURE WORKS

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- More research needs to be done to improve the accuracy of the sensor station
- The platform created can be used to design a lightning network

**THANKS**

**QUESTIONS AND  
COMMENTS**

