**Hackathon Challenges 2017**

**Electronic Visibility Gauge Results:**

Detection method: Visual light from a camera

Detection Target: Generated Light Source – Horizontal

Detection Range: 4 inches (More testing needed.)

Out of ten consecutive tests, how many results were within the margin of error? When consecutive tests were performed and the camera was not moved – results were consistent.

URL for source code and other documentation:

<https://github.com/K7TRY/MAF-Electronic-Visibility-Gauge>

Who is on your development team? SmoresAndLEDs - Hanna Moxham, Amanda Panell, Jordan Anderson, David Allwein, Rachel Allwein, Phil Braun,

Device Used: Camera

Model: Arducam, X000VGJ8BL, Aducam 5 Megapixels…2 and Raspberry Pi 3

<http://www.arducam.com/tag/raspberry-pi/>

Blue LED came from a Kuman Kits, X0015OWB99.

The camera was tested without blockage, and then tested with a clear two-layer plastic parts bag to simulate fog. The source light was an LED placed four inches away to simulate a light on a remote building or pole. The RGB camera setting was used. An overall light intensity reading was taken. A count of lit up pixels was then taken 10 times and a result averaged to give a baseline. The future tests counted the lit up pixels and compared it to the baseline score to give a percent increase.

The theory is that fog will disperse more light, thus, more pixels will be lit up. Fog is not necessarily brighter. So, when a fog simulator was used (the plastic bag), the 120% increase of lit up pixels compared to the baseline – meant there is fog.

Autodesk Fusion 360 was used for case design. A prototype could be built with a 3D printer but not for a production unit. A plastic box may be better than metal for deployment. A snap-together box, which does not require tools to open, could be used.

For future testing, a second sensor could be added to compare with. The TSL2591 High Dynamic Range Light Sensor, Adafruit TSL2591, X0016EAB77, could be tested. The theory, in daylight, the IR readings (at 850 nm) should go down with dust, fog, smog, or smoke is in the air. The same device also, provides other ambient light level readings.

<https://cdn-shop.adafruit.com/datasheets/TSL25911_Datasheet_EN_v1.pdf>

Another theory to test is: Will the blue light diminish faster than other colors when there is airborne particulates and fog? If so, that may be a better data item to use.

Another test to try: A red laser was also tested. The light was too small that we had to test with. Our camera could not detect the light well. A more powerful green laser needs to be tried and a larger test target used. The laser should send light across an area to a wall, and then the sensor or camera near the wall would then look at the light landing on the wall. The theory is that the laser light will be more spread out when there is fog and particulates. Also, will other colors shift when interrupted?