



Team Advisors

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Mission Folder: View Mission for 'Artemis'

State	Texas
Grade	8th
Mission Challenge	Technology
Method	Engineering Design Process
Students	artemis1 Artemis2 Artemis3

Team Collaboration

(1) Describe the plan your team used to complete your Mission Folder. Be sure to explain the role of each team member and how you shared and assigned responsibilities. Describe your team's process to ensure that assignments were completed on time and deadlines were met.

Our team is made up of three students from three different schools in the North Texas region, two of whom are in the Dallas area and one in Wichita Falls, TX. We met through a Chemistry class two years ago and have been working together ever since.

For two of us this is the third time participating in the eCybermission competition and we had so much fun the last two times that it was a no-brainer to submit a project again. We started our brainstorming sessions in October 2015, meeting every weekend for a couple of hours. Despite the distance between our teammates we managed to meet at least once a week, either in person or over Skype. With the help of our Team Advisor we decided to focus on lack of resources available for individuals who are deaf or hard of hearing (DHH),

Once we had identified the domain we wanted to work in, we focused on the research portion of the project. During this time we all did individual research of all things relating to DHH individuals and what type of products would be useful for their situations. Then we collaborated and combined our notes to compose a list of ideas that we could focus on. We decided to the idea of working on a 'connected' device to alert DHH people about home alarms using strobe light base or a siren.

The device detects the flickering of the strobe light (used today as an alerting signal) and the output of a gas leakage detector and sends an SMS to the residence owner who is DHH and the closest guardian of the DHH individual as well as a vibratory response to a device worn by the residence owner.

We decided to choose an Arduino hardware to create the connected device because of its versatility and ease of programming. The Arduino was hooked to a light and gas sensor. We spent weeks learning how to program using Arduino. We also attended several workshops conducted by AT&T to learn how to use AT&T IoT services to gather data from Arduino and set up alerts to send a SMS to a phone and a vibratory response to a wearable device.

To learn the Arduino code, we took it one step at a time, starting with the easiest and most familiar code and slowly stacked more code on top until we had our first working prototype of the sensor. The AT&T conducted workshops enabled us to learn how to use M2X platform for data collection and visualization and the Flow Designer platform to set triggers to send the SMS and vibratory sensation to a wearable device.

In addition to creating the sensor each team member conducted tests to prove that a DHH individual will react faster to a vibratory sensation than a visual sensation. The test documented the response time of people to a flickering strobe light and vibration.

To keep the work on track we assigned roles a few of which are listed below:

Gate Keeper:

The gatekeeper is the person who keeps the others on track by e-mailing the tasks that we must complete by the next meeting and sending out the meeting minutes. The gatekeeper is also the main researcher, and is the one in charge of outlining the mission folder and assigning specified questions to the team members. In our team Artemis1 was the most organized and was assigned to the role.

Programmer(s):

The programmers are the people who are most involved in the coding of the sensor. In our group both Artemis 2 and Artemis 3 had a large amount of Arduino parts, materials and knowledge so they were assigned the role of programmers. All three of us attended the AT&T workshops on using M2X and Flow Designer platforms.

Documentation Specialist(s):

We decided it was best to split the documents when it came to writing the documents necessary for the mission folder, so we all contributed evenly to create the best mission folder we could.

Task Time Spent:

Initial Brainstorm 3 months
Research 3 weeks
Arduino workshops 2 months
IoT workshops 1 month

Create Prototype 2 months
 Review Mission Folder 2 weeks
 Test Prototype 3 weeks
 Review and Submit Mission Folder 1 week

Uploaded Files:

- [\[View\]](#) **Team Collaboration** (By: Advisor, 02/28/2016, .docx)

The document outlines the team work conducted by team Artemis on this project

Engineering Design

Problem Statement

(1) What problem in your community did your team try to solve? Why is this problem important to your community?

There are approximately 70 million deaf people in the world. About 2% of adults aged 45 to 54 have disabling hearing loss and the rate increases to 8.5% of adults for ages 55-64. We have decided to focus on lack of proper alarming mechanisms available for individuals who are deaf or hard of hearing (DHH). Security systems (in response to an alarm at home or an impending physical danger such as a tornado warning) for hearing impaired community are not currently fool proof. The most popular systems include a single strobe light that lights up in response to an alarm or impending danger or a siren. A visual signal such as a strobe light is not the most effective mechanism especially if the person is in deep sleep mode or in a different location than where the light is mounted. The audio siren is of no use to a DHH individual. We have created the prototype of a 'connected' device to alert DHH folks of impending danger using SMS. The device detects the flickering of the Strobe light and output of a gas leakage detector and converts the light into an vibratory response in the form of an SMS to the DHH individual and a closest guardian.

With the advent of IoT (Internet of Things) and mobile technology, we can create a device which is considerably cheaper and can be deployed into millions of homes very easily. We are excited to use the power of technology and Internet of Things to keep millions of DHH individuals safe. By connecting the alarming devices to the internet and to each other, a variety of more effective signals such as SMS or to a wearable device may be sent. By using technology to protect physically disabled we believe that we are serving an under served community.

(2) List at least 10 resources you used to complete your research (e.g., websites, professional journals, periodicals, subject matter experts).

Resources:

1. Lin FR, Niparko JK, Ferrucci L. Hearing loss prevalence in the United States. [Letter] Arch Intern Med. 2011 Nov 14; 171(20): 1851-1852.
2. Centers for Disease Control and Prevention (CDC). Identifying infants with hearing loss - United States, 1999-2007. MMWR Morb Mortal Wkly Rep. 59(8): 220-223.
3. Vohr B. Overview: infants and children with hearing loss—part I. Ment Retard Dev Disabil Res Rev. 2003;9:62–64.
- 4.Arduino
<http://store-usa.arduino.cc/products/a000066>
5. PhotoCell
<https://www.adafruit.com/products/161>
- 6.Gas Sensor
<http://www.seeedstudio.com/depot/Grove-Gas-SensorMQ2-p-937.html>
- 7.Internet
http://linksprite.com/wiki/index.php5?title=CC3000_WiFi_Shield_for_Arduino
- 8.Sensor Shield
<http://www.seeedstudio.com/depot/Grove-Base-Shield-p-754.html>
9. M2X Platform
<https://m2x.att.com/>
- 10, Flow Designer
<https://flow.att.com/>

(3) Describe what you learned in your research.

Research on deaf and hard of hearing population

Our research concentrated on the number of DHH citizens in America, and the demographics on the age in which they became deaf/hard of hearing. We learned that approximately 2-3 children out of every 1000 children born in the US are born deaf, and there are approximately 70 million deaf people in the world. About 2% of adults aged 45 to 54 have disabling hearing loss and the rate increases to 8.5% of adults for ages 55-64. And the numbers just increase with age.

Research on existing solutions for the problem –

Currently there is no product that matches the functionality of Artemis, but there are few security systems that work for some DHH citizens. Security systems for hearing impaired community are not currently fool proof. ADT offers their system, Pulse, it includes a single strobe light that lights up during an alarm. The problem with this is that a heavy sleeper will not wake up to the blinking light and also alarms for tornado warnings are not known. To solve this, our team has designed Artemis, a device that will vibrate when the alarm goes off. Artemis will help the deaf community by providing an effective way for the DHH community to be alerted, saving their lives.

Research for tools that could help us create Artemis –

Once we had decided that we wanted to build the prototype of a device to address gaps in the security of the DHH community, we were introduced to Arduino and IoT (Internet of Things). Arduino is an open source programming microcontroller. Internet of Things is the network of physical technology, that can communicate/connect via internet, to transfer or collect information. In our project we used an open source Internet of Things platform provided by AT&T to collect the data from the device and act on the data. The IoT platform consists of 2 products - AT&T M2X and AT&T FlowDesigner. M2X is a software used to chart real-time data, and store and manage the data from

the devices.6 FlowDesigner is a new rapidly growing development and deployment software, used to mobilize data to other devices such as phones and wearable device.

Experimental Design

(4) Develop a design statement. Be sure to describe what exactly your device should be able to do. Do not describe HOW it's going to do what it needs to do.

Our testing shows that under simulated conditions (Deaf and Hard of Hearing) in deep sleep or away from the flickering light signal, the response to a vibration (delivered via SMS) is 20X faster than the response to a flickering strobe light. The reaction to light signal gets worse with age, and it is with age that individuals are more susceptible to deafness.

Based on this testing, Artemis should be a reliable connected device that will convert gas leakage and alarm signals (such as a flickering strobe light) from a home based security system into a haptic response such as SMS. An SMS alert can also be sent to the guardian(s) or local authorities. Artemis will help by providing an affordable, effective mechanism for the DHH community to be alerted, saving their lives.

Artemis Design Principles are -

1. Create a device that can detect gas leakage and flickering strobe light (indicative of an impending danger).
2. Gather, Store, Visualize the data from the sensors
3. Analyze the data
4. Distribute the notification to multiple end points

(5) Determine the criteria for a successful solution and identify constraints for your design. Discuss what the device must have in order to accomplish its job and the restrictions of the device (i.e. the size, the cost, the weight, etc.).

Criteria for a successful solution -

1. Convert gas leakage detection and flickering strobe light detection into SMS and haptic response to a wearable device.
2. Store and visualize the data provided by the gas and light detector
3. Fire off a trigger in response to the flickering light and gas detection.
4. The trigger should send SMS to multiple pre configured phone numbers and a haptic response to another microcontroller

Constraints on the device -

1. The device is based on Arduino micro controller
2. Arduino has limited number of sensors that can be used for the prototype.
3. The Arduino sensors must be close to the sources. For example - the light sensor must be mounted within a 5 ft. vicinity of the strobe light.
4. The final solution should be cheap and easily available

(6) Identify the relevant variables you will use to test your prototype or model and explain how you will measure your variables.

Please see the uploaded document named Relevant Variables. We uploaded the document since it contains images.

Build Prototype or Model

(7) Develop a design and list the materials you used in your design. Include technologies you used (e.g., scientific equipment, internet resources, computer programs, multimedia, etc.).

Please see the uploaded document names BuildPrototype. We uploaded the document since it contains images that depict the design of the Artemis

(8) Explain how you built your prototype(s) or model(s). Include each of the steps in your process.

Please see the uploaded document names BuildPrototype. We uploaded the document since it contains images that depict the design of the Artemis

Test Prototype or Model

(9) Describe the data you collected and observed in your testing (use of data tables, charts, and/or graphs is encouraged).

Please see the uploaded document names TestPrototype. We uploaded the document since it contains images that depict the graphs of the data collected

(10) Analyze the data you collected and observed in your testing. Does your data support or refute your design statement? Do not answer with yes or no. Explain your answer using 'Our data supports/refutes the design statement because...'

Please see the uploaded document names TestPrototype. We uploaded the document since it contains images that depict the graphs of the data collected

(11) Explain any sources of error and how these could have affected your results

The sources of error could be related to the distance between the site of gas leakage sensor and the mounted detector or the light sensor and the mounted detector.

The source of error could be in the calibration of these sensors to get a stable value as a control while the sensor is not in the "active" mode. We overcame this error by running calibration scripts to obtain stable values for both the light sensor and gas leakage sensor.

Another source of error is the lack of WiFi that could prevent the device to load values on the M2X platform. This prototype uses Wifi since it was the the cheapest option to create the prototype. In the production version of the product, we would use a SIM card to allow connections over cellular.

Drawing Conclusions

(12) Interpret and evaluate your results and write a conclusion statement that includes the following: Describe what you would do if you wanted to retest or further test your design. Evaluate the usefulness of your prototype or model. What changes would you make to your prototype or model for the future, if any?

The results from the M2X platform clearly show that

1. Our device Artemis successfully detects gas leakage and flickering strobe lights (indicative of an alarm).
2. The results from the M2X data stream clearly shows that when a gas leakage or flickering strobe light is detected a trigger is activated.
3. The trigger then via the Flow Designer platform fires off a text message which alerts the deaf or hard of hearing individual and their respective guardian.
4. The text message clearly identifies the location of the alarm for quick action to the alarm.

Our project has successfully shown that a modern advances in technology of Internet of Things can be used to create a successful, cost effective and reliable device to inform deaf and hard of hearing individuals of impending danger in their homes. Our project is proof of how the world is being revolutionized by Connected devices

Some of the changes we would make in the future model will be to make the device cellular capable. We would also integrate the mechanism of notification into a mobile app which is TTY capable.

Uploaded Files:

- [[View](#)] **Relevant Variables** (By: Advisor, 02/28/2016, .docx)
This document outlines the variables and their measurement in this project
- [[View](#)] **Test Prototype** (By: Advisor, 02/28/2016, .docx)
This document outlines all the testing and the measurement related to this project
- [[View](#)] **Build Prototype** (By: Advisor, 02/28/2016, .docx)
This document contains all the details of building the prototype by team Artemis

Community Benefit

(1) How could your design help solve your problem and benefit your community? Describe next steps for further research/design and how you have or how you could implement your solution in the future.

Background Statistics:

1. Approximately 2-3 children out of every 1000 children born in the US are born deaf, and there are approximately 70 million deaf people in the world. About 2% of adults aged 45 to 54 have disabling hearing loss and the rate increases to 8.5% of adults for ages 55-64. And the numbers just increase with age.

Current Problem Affecting The Community :

Security systems for hearing impaired community are not currently fool proof. ADT offers their system, Pulse, it includes a single strobe light that lights up during an alarm.

Deficiencies in the current system are :

1. When a person is in deep sleep he/she may not respond to the blinking light in time.
2. The blinking light maybe in a completely different room than the person and he/she may not see the blinking light.
3. Tornado sirens and alerts are not picked up.
4. Smoke or fire alarms may not be part of the system.

Artemis has been designed to overcome the above deficiencies. Artemis is the prototype for a security system for the hearing impaired that converts and sends an alert via a vibration to a wearable device and a SMS message to the individual.

Some of Artemis's features:

1. Detect the blinking light in current alarm system
2. Detect smoke or fire
3. Capture data, store, visualize and analyze the data
4. Distribute the data and send notifications to the DHH individuals and their guardians.

How Artemis Positively Affects The Community:

1. It will effectively notify the deaf and hard of hearing community of alerts.
2. Deaf people will be allowed to live independently with minimal stress from not being alerted of emergencies.

Future Enhancements:

1. Tornado or Disaster alert warnings.
2. Making it a wearable device
3. Sending alerts to local Emergency Departments.
4. Using cellular connection instead of our current WiFi capability.

Uploaded Files:

- [\[View \]](#) **Benefit to the Community** (By: Advisor, 02/28/2016, .pdf)

This document outlines the benefit to the community for this product

Mission Verification

(1) Does your Mission Folder project involve vertebrate testing, defined as animals with backbones and spinal columns (which include humans)? If yes, team must complete and attach an IRB approval form.

Yes

(2) Did your team use a survey for any part of your project? If yes, team must complete and attach a survey approval form.

No

(3) You will need to include an abstract of 250 words or less. As part of the abstract you will need to describe your project and explain how you used STEM (Science, Technology, Engineering and Mathematics) to improve your community

There are approximately 70 million deaf people in the world. About 2% of adults aged 45 to 54 have disabling hearing loss and the rate increases to 8.5% of adults for ages 55-64. Security systems (in response to an alarm at home or an impending physical danger such as a tornado warning) for hearing impaired community are not currently fool proof. The most popular systems include a single strobe light that lights up in response to an alarm or impending danger. A visual signal such as a strobe light is not the most effective. We have instead created a series of connected devices that can convert the light signals or gas leak detection into an SMS text to the deaf person and their guardians as well as into a vibratory response to a device worn by the individual. Our results indicate that under simulated conditions) for people hard of hearing and in deep sleep), the response to a vibratory response is 10X faster than a single strobe light in the room. Our device uses Arduino based microcontroller to detect strobe light and gas leakage and world class IoT services platform to convert the signal into a SMS and vibratory response. Our device is based on the concept of Internet of Things, a network of physical objects—devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

Uploaded Files:

- [\[View \]](#) **IRB Form** (By: Advisor, 02/16/2016, .pdf)

IRB Form



Our team is made up of three students from three different schools in the North Texas region, two of whom are in the Dallas area and one in Wichita Falls, TX. We met through a Chemistry class two years ago and have been working together ever since.

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Once we had identified the domain we wanted to work in, we focused on the research portion of the project. During this time we all did individual research of all things relating to DHH individuals and what type of products would be useful for their situations. Then we collaborated and combined our notes to compose a list of ideas that we could focus on. We decided on the idea of working on a 'connected' device to alert DHH folks about home alarms using Strobe light based or a siren and gas leakage detection

The device detects the flickering of the Strobe light (used today as an alerting signal) and the output of a gas leakage detector and sends an SMS to the residence owner who is DHH and closest guardian.

We decided to choose an Arduino hardware to create the connected device, for its versatility and ease of programming. The Arduino was hooked to a light and gas sensor. We spent weeks learning how to program using Arduino. We also attended several workshops conducted by AT&T to learn how to use AT&T IoT services to gather data from Arduino and set up alerts to send a SMS to a phone and a vibratory response to a wearable device.

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Abstract –

There are approximately 70 million deaf people in the world. About 2% of adults aged 45 to 54 have disabling hearing loss and the rate increases to 8.5% of adults for ages 55-64. Security systems (in response to an alarm at home or an impending physical danger such as a tornado warning) for hearing impaired community are not currently fool proof. The most popular systems include a single strobe light that lights up in response to an alarm or impending danger. A visual signal such as a strobe light is not the most effective. We have instead created a series of connected devices that can convert the light signals or gas leak detections into an SMS text to the deaf person and their guardians as well as into a vibratory response to a device worn by the individual. Our results indicate that under simulated conditions) for people hard of hearing and in deep sleep), the response to a vibratory response is 10X – 15X faster than a single strobe light in the room. Our device uses Arduino based microcontroller to detect strobe light and gas leakage and world class IoT services platform to convert the signal into a SMS and vibratory response. Our device is based on the concept of Internet of Things, a network of physical objects—devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

Identify the relevant variables you will use to test your prototype or model and explain how you will measure your variables.

Variables Tested -

Variables Measured	Sensor Used to Measure	Units of measurement
Flickering of the Strobe Lighting	Photocell Light Sensor	Ohms
Smoke and Gas Leakage	MQ Gas Sensor	Voltage

Details on the sensor and measurement type -

The light sensor is a photocell receptor as shown below -

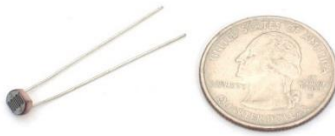


Figure 1– Photocell Sensor

A photocell's resistance changes as the face is exposed to more light. When it's dark, the sensor looks like a large resistor up to 10M Ω , as the light level increases, the resistance goes down. This graph indicates approximately the resistance of the sensor at different light levels.

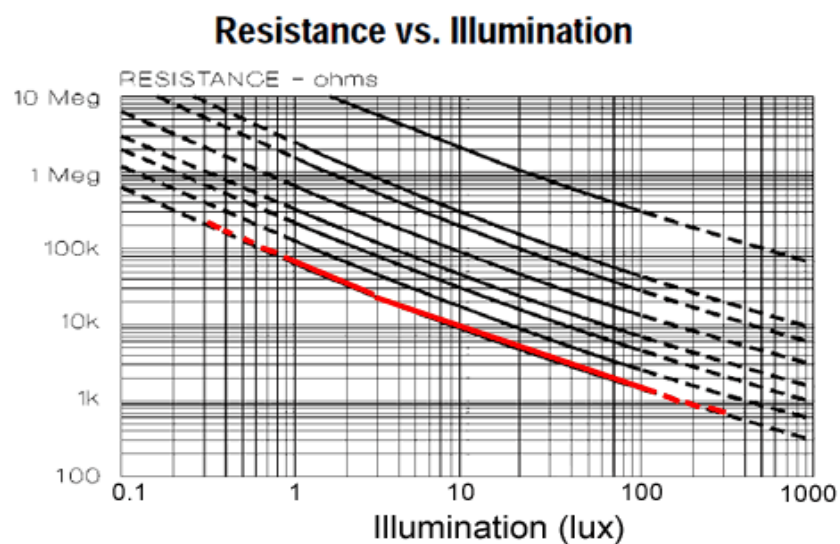
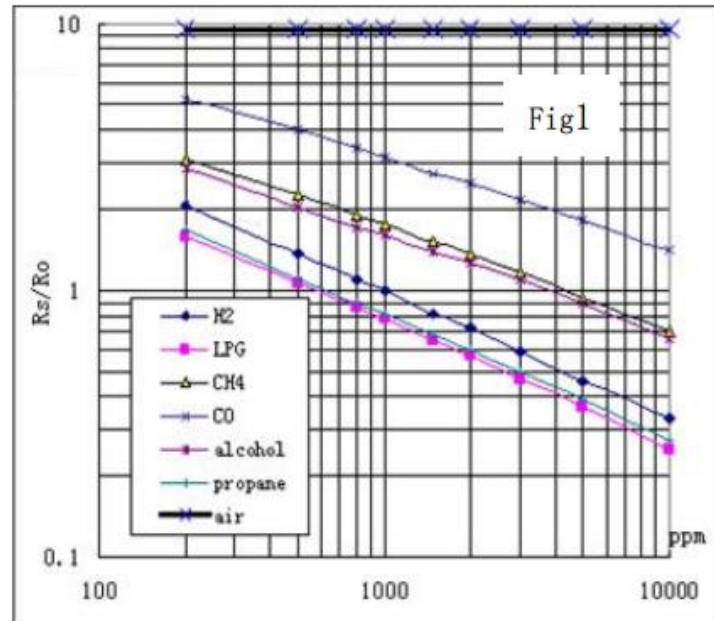


Figure 2 – Resistance measurement by the Photocell receptor

The gas sensor uses a small heater inside with an electro-chemical sensor. They are sensitive for a range of gasses and are used indoors at room temperature. The output is an analog signal and can be read with an analog input of the Arduino



Sensitivity Characteristics of the MQ2 Gas sensor

Figure 3 shows the typical sensitivity characteristics of the MQ-2, ordinate means resistance ratio of the sensor characteristics. Ordinate means resistance ratio (R_s/R_o), abscissa is concentration of gases. R_s means resistance of sensor resistance in different gases, R_o means resistance of sensor in 1000ppm Hydrogen. All test are under standard conditions.

The variables were measured using Arduino based sensors mounted on an Arduino micro controller as seen in the picture below -

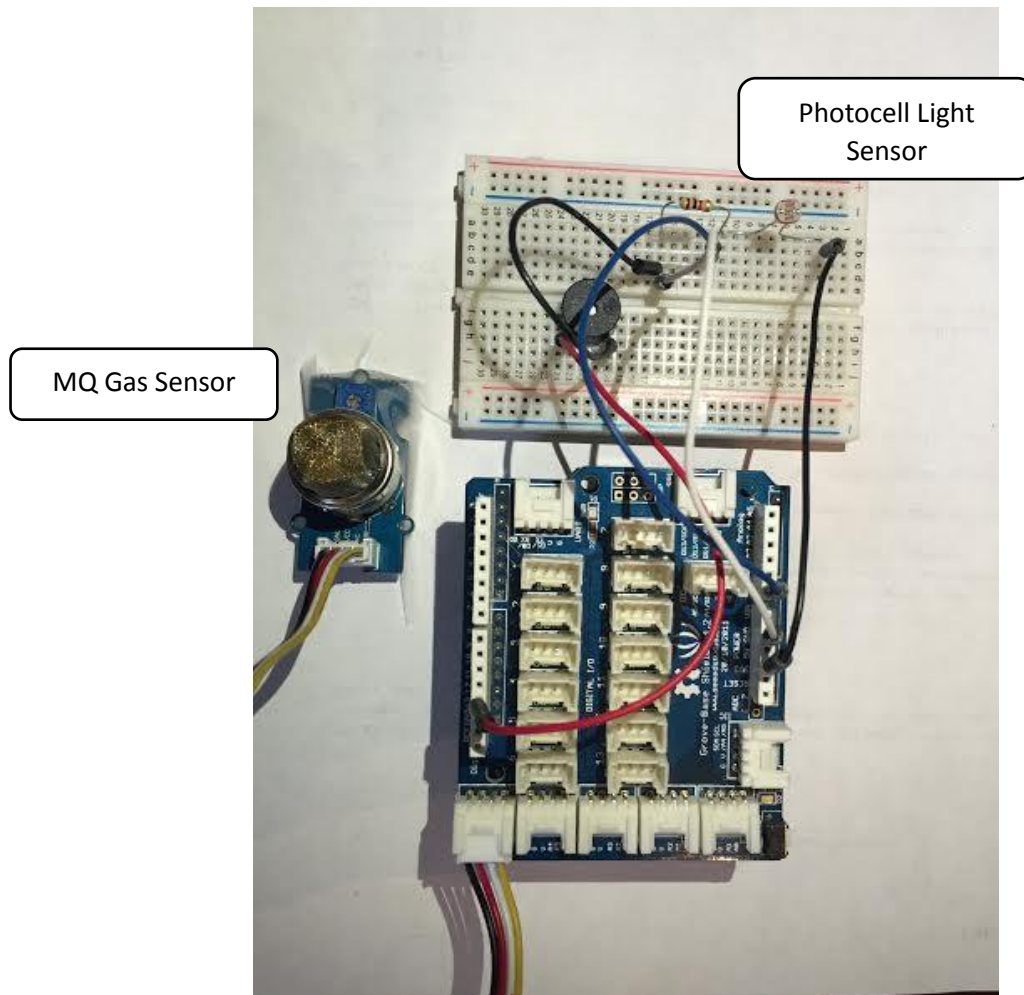


Figure 4 – Arduino Microcontroller hooked up to the gas and light sensor

Test Prototype

Describe the data you collected and observed in your testing (use of data tables, charts, and/or graphs is encouraged).

Test 1: Responsiveness to Vibratory vs Light based Alarms for individuals

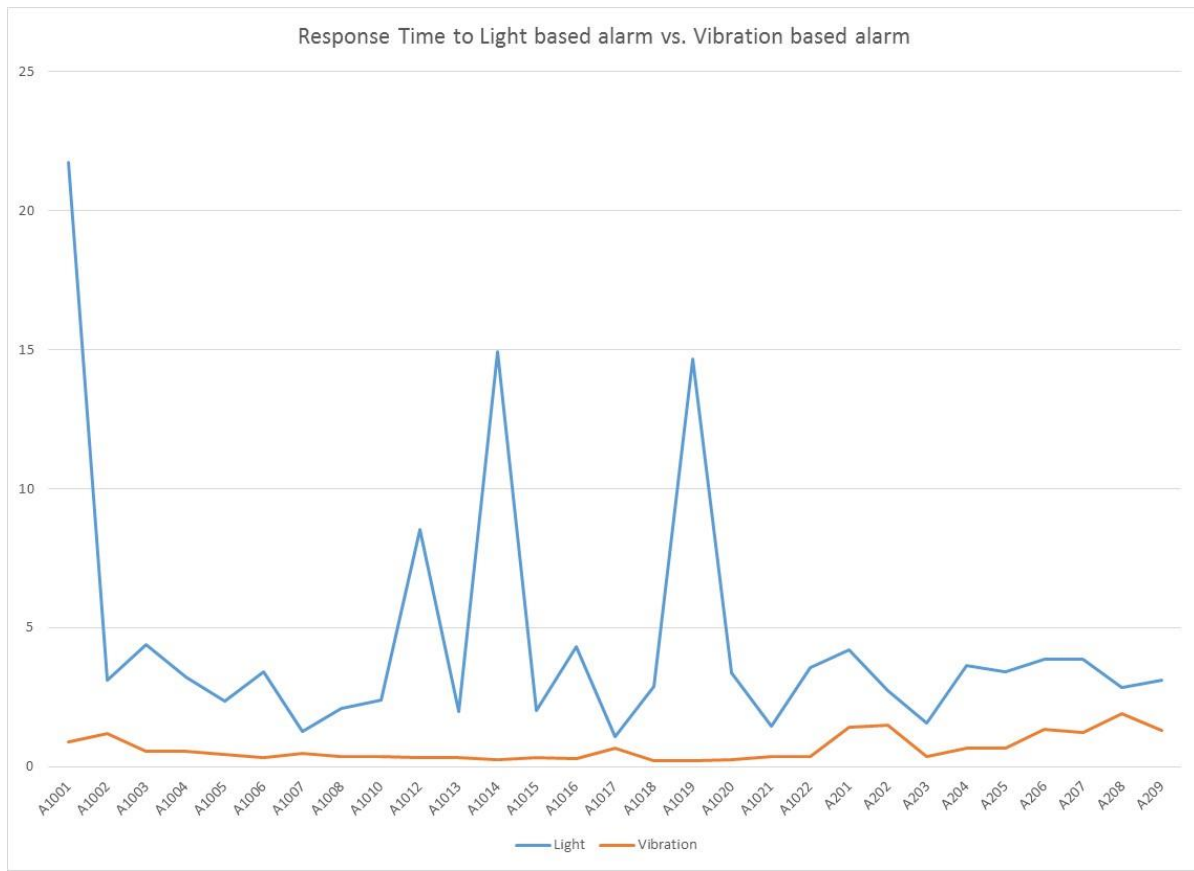
We tested the responsiveness of individuals to vibratory sense vs. a light based sense under simulated conditions. We simulated –

1. Individual who is deaf or hard of hearing (by using ear plugs on the test subjects to block out the noise)
2. Individual in deep sleep or at a distance from the strobe lighting (by placing eye mask on the test subjects)
3. Vibratory response by placing a cellphone in a vibratory setting in the subjects hand
4. Flickering strobe light (simulating an alarm system) – placed at a 3 ft distance from the test subject.

All the test subjects logged on a Google Form created for this project. All permissions obtained were stored on Google Drive created for the project.

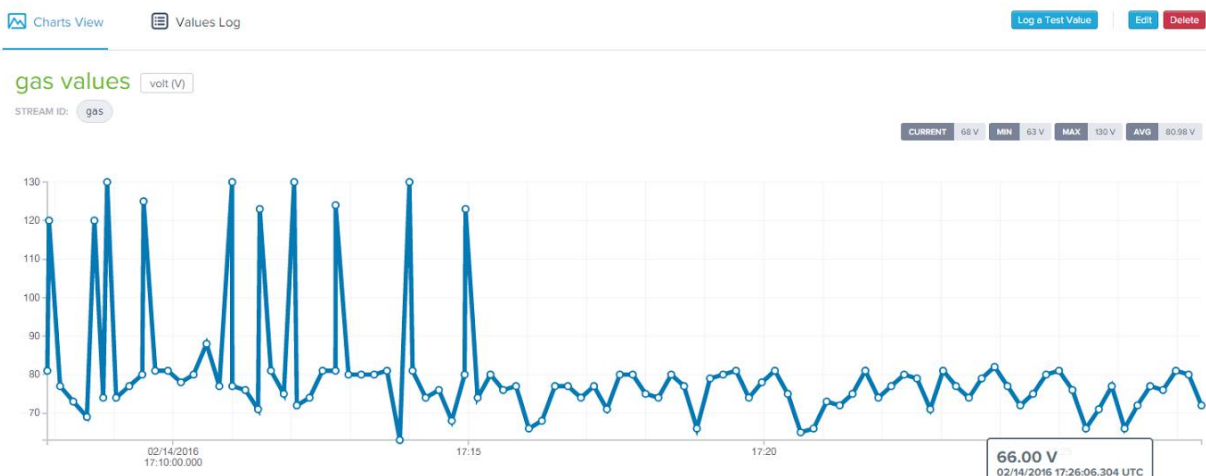
The following graph is a representation of the responsive time for individuals when exposed to Strobe Lighting based alarm or a vibration based alarm.

The results clearly show that on an average, an individual reacts 10 – 15X faster to a vibration alarm vs. a light alarm.



M2X platform is used to chart real-time data, and manage the data from the devices.

Response Time



Individual ID's of Test Subjects

Figure 3 – Gas Values captured by the M2Q gas sensor

M2X is used to capture the output values from the gas sensor. When a flame is lit by the sensor (to mimic the gas leakage), output value spikes in the range of 120 – 130. The background values in the absence of the gas leakage or fire is in the range of 60-80. The graph clearly shows the difference between detecting a gas leakage and control signals.

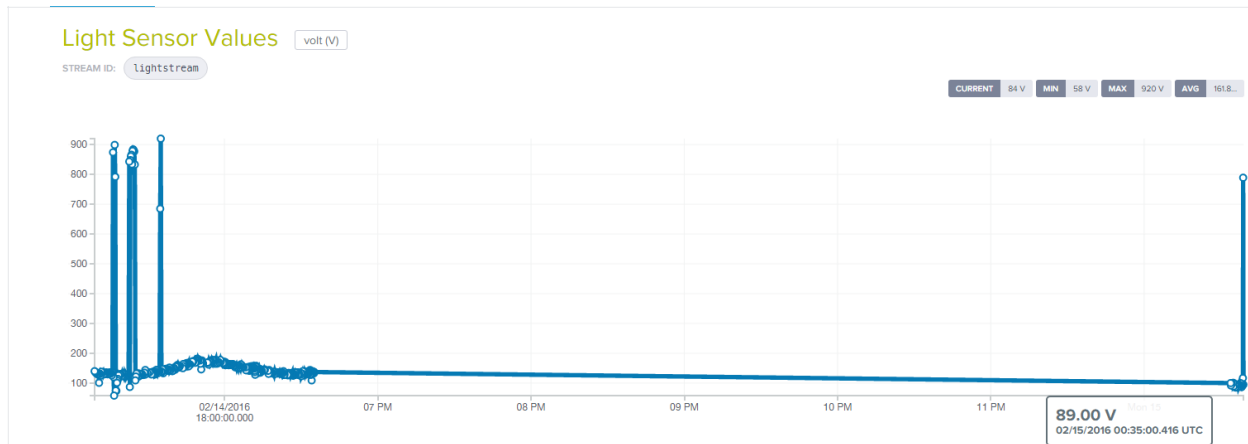


Figure 4 – Light sensor based values captured.

M2X is used to capture the output values from a light sensor that is detecting a flickering strobe light. When the flickering strobe light is detected by the sensor (simulating the alarm system), the output value spikes in the range of 800 – 900 units. The background values in the absence of the flickering light is in the range of 100 or below. The graph clearly shows the effectiveness of the light sensor to capture the flickering of a strobe lighting.

See the embedded file with the values obtained from the Light Sensor and the Gas sensor



DataFilesForArtemis
.xlsx

Once the values are captured and identified, appropriate M2X trigger fires to distribute the data and inform via Vibratory response – in this case using SMS

Following are the snap shots of the Text sent upon detection of a dangerous condition

●●●● AT&T 4G 11:03 AM ⓘ 68%
< (24) +1 (248) 246-5905 Details

Text Message
Today 11:00 AM

WARNING:Home alarm
triggered Check security
system. Notification sent
to the guardian

●●●● AT&T 4:52 PM
< (24) +1 (248) 246-5

Text Message
Today 4:51 PM

Gas Leakage detected
the master bedroom.
Check the security
system. Notification se
to the guardian

 Text Message Send

4:52 PM ⓘ 22%
) 246-5905 Details

Message
Today 4:51 PM

ected in
room.
rity
ation sent

 Text Message

age Send

Analyze the data you collected and observed in your testing. Does your data support or refute your design statement? Do not answer with yes or no. Explain your answer using 'our data supports/refutes the design statement because...'

Our data clearly supports the design statement because-

1. Artemis is able to collect data related to a gas leakage and a strobe light based alarm.
2. We are able to gather, store and analyze data using M2X platform
3. We are able to distribute the data and inform DHH (Deaf and hard of hearing individuals) and their guardians of the alarms getting activated using vibratory response, in form of SMS.

Build Prototype

Develop a design and list the materials you used in your design. Include technologies you used (e.g., scientific equipment, internet resources, computer programs, multimedia, etc.).

The design of the product Artemis is based on Arduino Microcontroller. The Arduino motherboard is attached to the light and gas sensors and a Wi-Fi shield to be able to connect to the data collection and visualization platforms. **Artemis is designed to collect, store, and visualize the data, which helps with data analysis and distribution to identified end points.**

List of Materials -

- Arduino UNO Rev 3 Microcontroller (1)
<http://store-usa.arduino.cc/products/a000066>
- LinkSprite CC3000 WiFi Shield for Arduino (1)
<http://store.linksprite.com/cc3000-wifi-shield-for-arduino/>
- PhotoCell (CDS cell Photoreceptor)
<https://www.adafruit.com/products/161>
- SeeedStudio - Grove - Gas Sensor(MQ2) - Leakage Detecting Potentiometer - DIY Maker Open Source BOOOLE
http://www.amazon.com/gp/product/B017KCHGIE?psc=1&redirect=true&ref=oh_aui_detailpage_o07_s00#biss-product-description-and-details

To write the code and collect the data, following utilities were needed

- Laptop/Desktop Computer (1)
- Arduino Sketch
- Access to AT&T M2X - <https://m2x.att.com/>
- Access to AT&T Flow Designer - <https://flow.att.com/>

Step 1: Build the Prototype

The following design shows how the Photocell and MQ Gas Sensor were connected to the Arduino board.

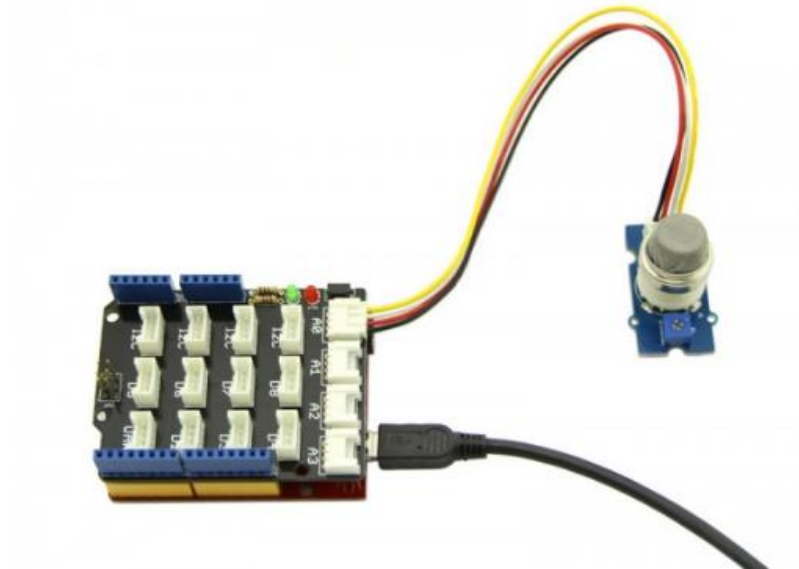


Figure 1 – Gas Sensor connected to Arduino

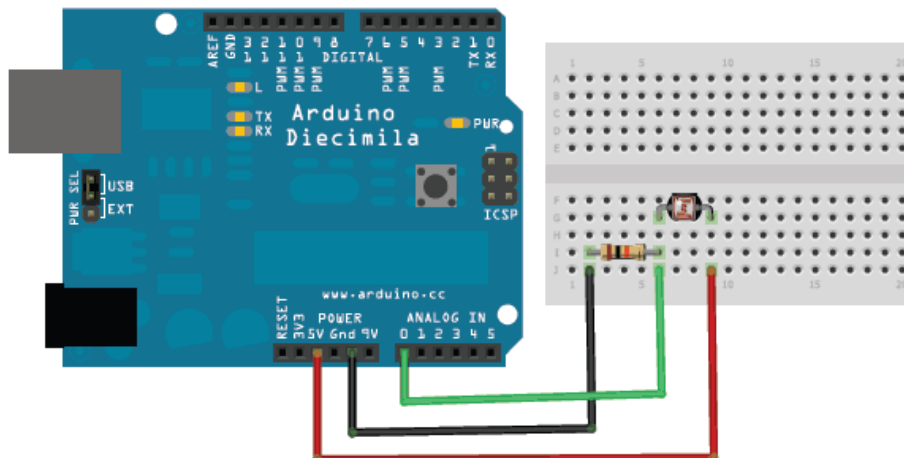
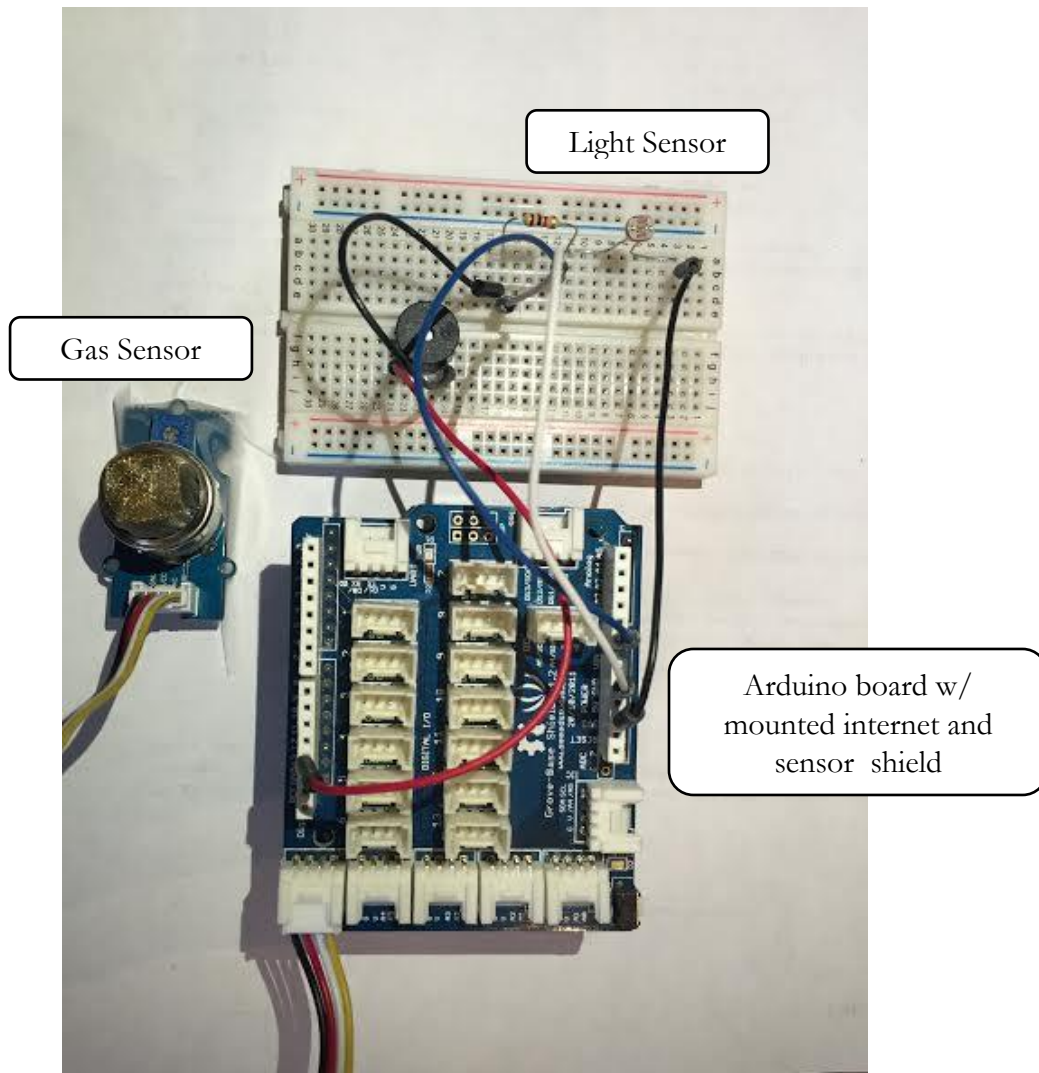


Figure 2 – Light Sensor connected to Arduino

The final design of the assembled unit is shown below –



Step 2 - Collect, Visualize and Analyze the data

Once the prototype was built, it was connected to the M2X platform to collect, visualize and analyze the data.

The images below show how M2X is set up to collect data from the light and gas sensors. Artemis is identified by a Device ID and accessed using the Primary API Key.

Artemis Edit Delete

 CREATED BY: Artemis Artemis	 DEVICE ID: bb1078f251dc2e65e39c15f2ab3f4325 Copy
 EMAIL: teamartemis16@gmail.com	 PRIMARY ENDPOINT: /devices/bb1078f251dc2e65e39c15f2ab3f4325 Copy
 MOST RECENT LOCATION: No location available	 PRIMARY API KEY: 2d99ae2ad165153ba6ad191461137f61 Copy

Figure 1 – M2X Artemis Device Set up

Step 3 – Setting up the data streams to collect the information.

This step sets up the Data Stream Unique ID for Artemis gas sensors.



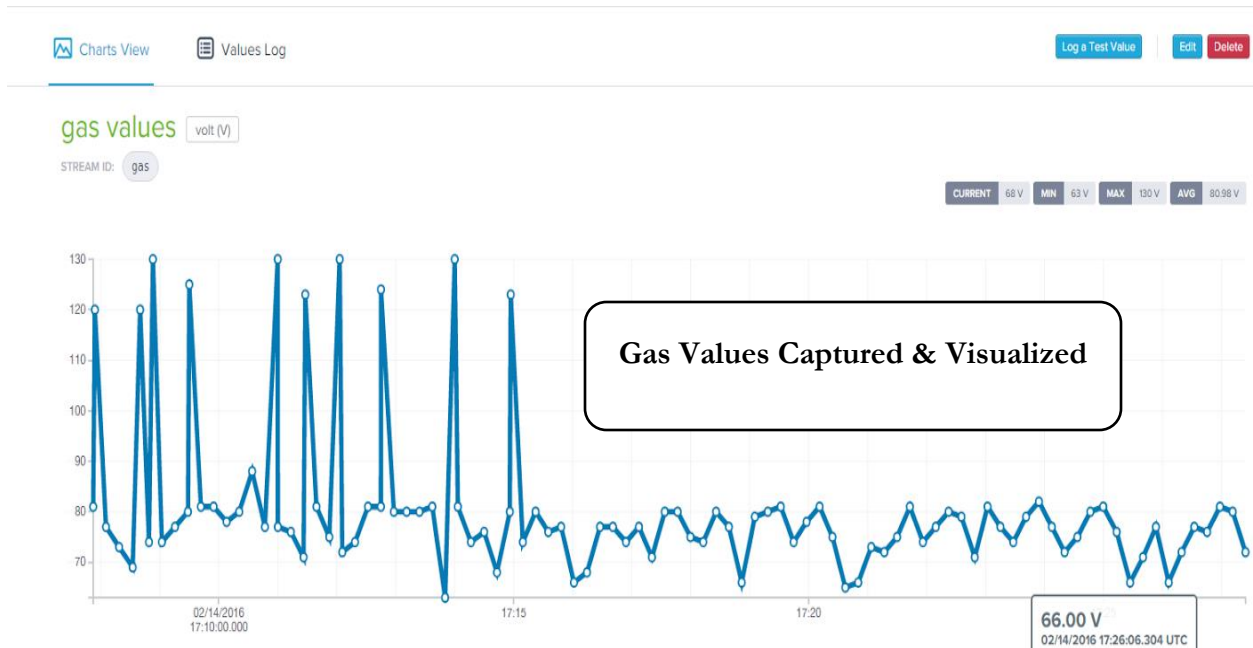
NAME	VISIBILITY	API KEY	LAST ACTIVITY	STATUS
  Artemis	 Private	2d99ae2ad165153ba6ad191461137f61	 10 seconds ago	 ENABLED
STREAMS	CURRENT	MIN within Last 30 days	MAX within Last 30 days	AVG within Last 30 days
lightstream 	97	0	1023	165.990712
gas 	63	47	507	75.363374

Figure 2 – M2X Artemis Device Set up

Step 4 - Visualization of data –



Light Sensor Values volt (V)

STREAM ID: lightstream

CURRENT 84 V MIN 58 V MAX 920 V AVG 161.8...

Step 5: Analysis of data –

M2X is used to capture the output values from a light sensor that is detecting a flickering strobe light. When the flickering strobe light is detected by the sensor (simulating the alarm system), the output value spikes in the range of 800 – 900 units. The background values in the absence of the flickering light is in the range of 100 or below. The graph clearly shows the effectiveness of the light sensor to capture the flickering of a strobe lighting.

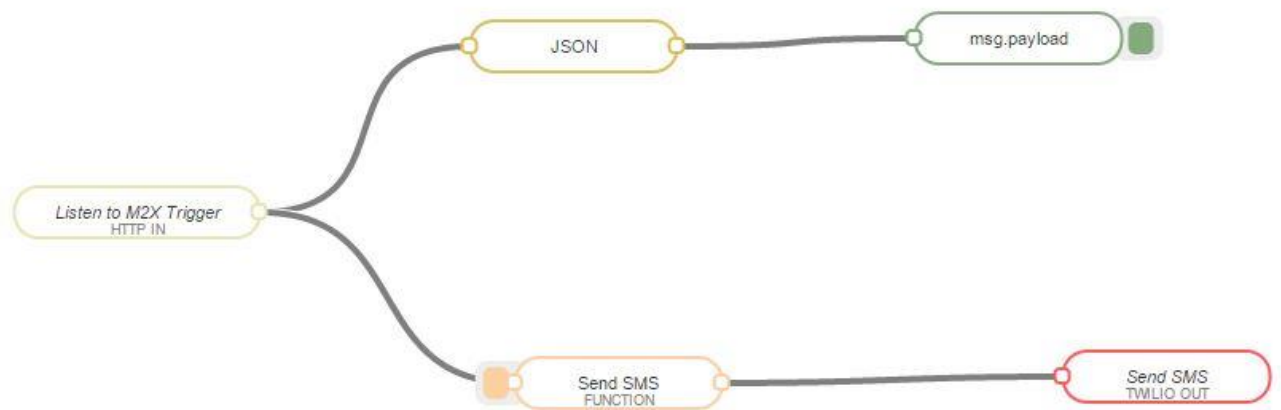
M2X is used to capture the output values from the gas sensor. When a match is lit by the sensor (to mimic the gas leakage), output value spikes in the range of 120 – 130. The background values in the absence of the gas leakage or fire is in the range of 60-80. The graph clearly shows the difference between detecting a gas leakage and control signals.

Once the range is identified a trigger is created on M2X to allow the Flow Designer software to receive the data.

Streams 2	Triggers 1	Location 0	Charts 0	Data Exports 0
Triggers	Based on the Values – Trigger identified			
NAME	STREAMS	CONDITIONS	RESET CONDITION	
LightTrigger	lightstream gas	>= 230V >= 78V		

Step 6 - Distribution of the data to end points –

Once the trigger is fired – it activates a different platform called Flow Designer which allows the notification about the gas leakage and flickering strobe lighting (which is an indication of impending danger).



The Send SMS notification will be sent to

1. The deaf and hard of hearing individual
2. Guardians
3. Emergency Services

Community Benefit

Background Statistics:

Approximately 2-3 children out of every 1000 children born in the US are born deaf, and there are approximately 70 million deaf people in the world. About 2% of adults aged 45 to 54 have disabling hearing loss and the rate increases to 8.5% of adults for ages 55-64. And the numbers just increase with age.

Current Problem Affecting The Community :

Security systems for hearing impaired community are not currently fool proof. ADT offers their system, Pulse, it includes a single strobe light that lights up during an alarm.

Deficiencies in the current system are :

- When a person is in deep sleep he/she may not respond to the blinking light in time.
- The blinking light maybe in a completely different room than the person and he/she may not see the blinking light.
- Tornado sirens and alerts are not picked up.
- Smoke or fire alarms may not be part of the system.

Artemis has been designed to overcome the above deficiencies. Artemis is the prototype for a security system for the hearing impaired that converts and sends an alert via a vibration to a wearable device and a SMS message to the individual.

Some of Artemis's features:

- Detect the blinking strobe light in current alarm system
- Detect smoke or fire
- Gather, Store and Analyze the data
- Distribute Notification via SMS to a deaf and hard of hearing individual (DHH) and their grardians

Community Benefit

How Artemis Positively Affects The Community:

- It will effectively notify the deaf and hard of hearing community of alerts.
- Deaf people will be allowed to live independently with minimal stress from not being alerted of emergencies.

Future Enhancements:

- Tornado or Disaster alert warnings.
- Making it a wearable device.
- Sending alerts to local Emergency Departments.
- Using cellular connection instead of our current WiFi capability.

Resources:

1. Lin FR, Niparko JK, Ferrucci L. Hearing loss prevalence in the United States. [Letter] Arch Intern Med. 2011 Nov 14; 171(20): 1851-1852.
2. Centers for Disease Control and Prevention (CDC). Identifying infants with hearing loss - United States, 1999-2007. MMWR Morb Mortal Wkly Rep. 59(8): 220-223.
3. Vohr B. Overview: infants and children with hearing loss—part I. Ment Retard Dev Disabil Res Rev. 2003;9:62–64.



INSTITUTIONAL REVIEW BOARD

APPROVAL FORM

Student(s) User Name(s): Artemis 1, artemis 2, artemis 3

Grade: 8 Team Advisor: Bhagyashri Chander

Team Name: ARTEMIS

Brief Description of Project: Team Artemis has created a device to assist individuals hard of hearing in case of emergencies such as fire, tornado or gas leakage. Today the alarm is usually a sound signal. Artemis device will ~~in~~ intern create a sms and a haptic signal to send to these individuals.

Team Advisor: Please sign here if the project proposed is a viable eCYBERMISSION Project in which neither animals nor humans will be harmed.

Team Advisor Approval Signature: Bhagyashri

IRB Waiver of Written Informed Consent for Human or Animal Participation

The IRB may waive the requirement for documentation of written informed consent/assent/parental permission if the research involves **only minimal risk and anonymous data collection and if it is one of the following:** (NOTE: This statement only applies to providing the written certification mentioned in 1a or 2a above).

- Research involving normal educational practices.
- Research on individual or group behavior or characteristics of individuals where the researcher does not manipulate the subjects' behavior and the study does not involve more than minimal risk.
- Surveys, questionnaires, or activities that are determined by the IRB to involve perception, cognition, or game theory and do NOT involve gathering personal information, invasion of privacy or potential for emotional distress.
- Studies involving physical activity where the IRB determines that no more than minimal risk (Daily Activity) exists and where the probability and magnitude of harm or discomfort anticipated in the research are not greater than those ordinarily encountered in DAILY LIFE or during performance of routine physical activities.

If there is any uncertainty regarding the appropriateness of waiving written informed consent/assent/parental permission, it is strongly recommended that documentation of written informed consent/assent/parental permission be obtained.

HUMAN or ANIMAL SUBJECTS

Permission Slips needed? (see above to determine) Yes ☐ No ☒

(Scan and attach slips to Mission Folder)

Check-up of Human or Animal Subjects required by Doctor, school nurse or Veterinarian? (see above to determine)

Yes ☐ No ☒

If yes, Doctor's, Nurse's or Veterinarian's (before and after experimentation) check-up must be attached to Mission Folder.

APPROVALS

Principal / Administrator Signature

Doctor or Medical Professional Signature

Science Fair Coordinator or other Science Teacher Signature

Date Reviewed

Date Reviewed

Date Reviewed

12/12/2015

12/12/2015

12/12/2015