Emergency Disaster Detection (ED2)

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Capstone

Objectives

Emergency Disaster Detection (ED2) is a device that responds in real time to disaster events and notifies you when a potential emergency situation takes place:

- Simulate an emergency situation
- The sensor detects the situation
- Data is then sent from the sensor to AWS
- AWS reads the data and then sends the response to the user notifying them of the emergency
- AWS will log all of the information to be used for analysis

Introduction

Natural disasters can occur at any time and even in today's world, we don't have fast enough responses to react to those situations. Not reacting quickly enough can result in tremendous loss and in some cases, it can be terminal. Whether its floods, earthquakes, or fires, ED2 looks to notify you as soon as possible so that you may safely react to the situation at hand to avoid any potential danger.

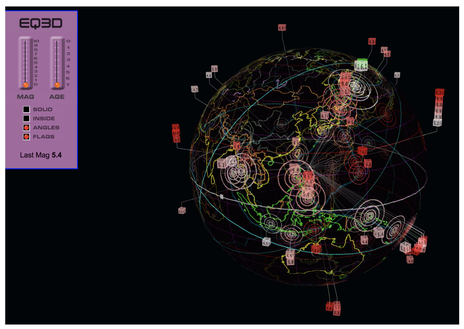

Figure 1:EarthQuake 3D is a simple and easy to use desktop display of the world's last 20 significant earthquakes. You can zoom and spin your way around the globe while viewing earthquakes in three dimensions. See at a glance up to seven days of global earthquake activity.

High Level Design

- Sensors will be connected to microcontroller boards, which will be registered with IOT Core.
- IOT Core will handle messages passed from microcontrollers and will serve as an endpoint for collecting data for reporting interfaces (web front ends) as well as alerting mechanisms (CloudWatch alarms, for demo).
- We will demo a few example scenarios of setups that will automatically respond in various events (i.e. flooding, earthquakes) and show that IOT services will allow for automated responses without human intervention.

The minimum viable product scope:

1. Minimum viable product is the raspberry pi
2. Shake raspberry pi device will be able to sense potential threat.
3. Device will be able to connect to AWS IoT to log information.
4. Device will be able to notify the intended target when a natural disaster occurs.

Motivation

We want to build a device that can not only alerts individuals in their homes, but also be used nationwide with large organizations and federal agencies to provide an earlier response time in the event of larger natural disasters. We also hope to achieve some functionality with other IoT devices in which it can start carrying out the actions needed to suppress or eradicate the emergency in its entirety.

Visualization Results

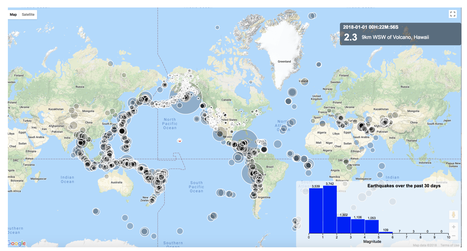

Figure 2:Google Earth map that shows all seismicity around the world with ranging from Magnitude 1-10 on the richter

Methods

Continuous integration/continuous deployment design, we will be able to continuously integrate changes made to our source code and commit it to a main branch which would be hosted within a private git repository that AWS provides which is AWS CodeCommit. After we commit new versions of the source code to CodeCommit, AWS CodePipeline which is a service that enables continuous integration and delivery will be triggered for execution of an automated workflow for continuous delivery of compiling, testing, and deploying the source code every time one member of our capstone team submits a new feature or version of the code to AWS CodeCommit.

After this initial process, AWS CodePipeline will then send the updated version of the source code to AWS CodeBuild, which is a fully managed build service that handles the tasks responsible for compiling and building the docker container image.

Visualization Results

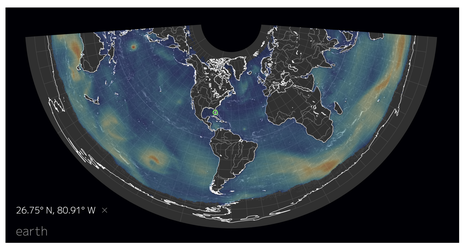

Figure 3:A visualization of global weather conditions forecast by supercomputers updated every three hours ocean surface

Conclusion

With ED2, we hope to achieve an emergency response device that can provide people the warning of an emergency before it is too late. The quicker the response time, the quicker individuals can prepare and find safety or slow/stop the emergency.

Future Considerations

For future considerations for the capstone would be exploring the enhanced version of Earthquake 3D software tool which has the most up to date version of the program and contains more features than the free edition. The Earthquake 3D software can be install locally to Windows computer where a user can get a live feed up to 30 days of earthquake waveform data from multiple seismic networks like, USGS, EMSC, Geoscience, GeoNet, BGS, and Geophone. Also, the enhanced version of the Earthquake 3D software offers new features like Earthquake Alert Sounds, custom External Earth Images, and more.

References

1. 3D Earthquake Software by Richard Wolton
2. Kilb, D. L., Peng, Z., Simpson, D., Michael, A. J., Fisher, M., & Rohrlick, D. (2012). Listen, watch, learn: SeisSound video products. Seismological Research Letters, 83(2), 281-286. https://doi.org/10.1785/gssrl.83.2.281.
3. https://earth.nullschool.net/ (Interactive Weather Model)

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Capstone Team

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