Investigating magnetic fields with your phone - you can do it too!

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Introduction
The Earth has a dynamic magnetic field. Magnetic objects (for example metal pipes or culverts) cause disturbances in the magnetic field. Modern cellphones have a magnetometers in them (so that they have a compass capability).

CrowdMag: An app installed on your phone that utilizes the phone’s built in magnetometer. We use it to collect magnetic data.

Motivation: We collect magnetic data in order to improve navigation and be able to find metallic objects that we’d want to locate (for example, barrels in a field or buried pipes), also the data from this research can help understand when they are getting too close to vehicles like tractors or cars. In terms of navigation this can help understand their surrounding, especially if other sensors are not working (like cameras in the dark or GPS in a tunnel).

Methodology

Step one: Download the CrowdMag app.

Step two: Identify traverse location to collect data

Step three: Get out there and collect data by walking along the traverse!

Step four: Email data to yourself and open in Excel

Step five: Make data graphs and calculate some statistics

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<tr>
<th>Methodology</th>
<th>Result</th>
<th>Statistics</th>
<th>Graph</th>
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Results

• When I went about collecting my data I was going to download the app and start collecting data but it didn’t work as planned.
• We discovered that some phones (like mine) don’t work with the CrowdMag App!
• My mentors sent me an Android test phone and that worked for collecting data.
• I was able to collect some data around my house and gain experience with working on actual data using Excel (making plots, calculating statistics).
• Here are some examples of my results:

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<th>Step five: Make data graphs and calculate some statistics</th>
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Conclusion

• You can use your phone to collect magnetic data (although I discovered some phones don’t work)
• Magnetometers can measure magnetic variations caused by metal objects like tractors, metal pipes, power lines and bridges.
• I had some issues while collecting research.
• One issue I had was my original phone didn’t work with CrowdMag, I got zero values.
• Another challenge was the time frame in which to complete the project.

Acknowledgements

Thanks to the RECCS 2020 team for this opportunity – looking forward to an in-person experience next summer.