ACCess Granted: Inferring Mobile Device Keystrokes Using Background Accelerometer Data

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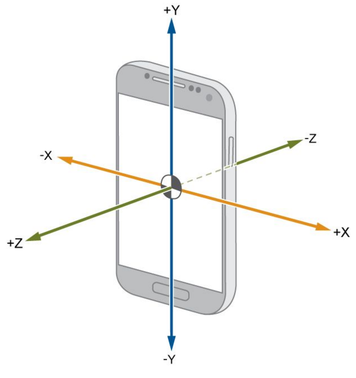
Problem

- Accelerometers are a standard component in smart devices
- No security policies on the accelerometer
- Data can potentially be used to attain private/personal information through algorithmic inferences

Accelerometers

Accelerometers record the acceleration of an object (phone, watch, etc.). They have applications in physics, engineering, and many other fields. All data is recorded on three axes: x, y, and z.



Approach

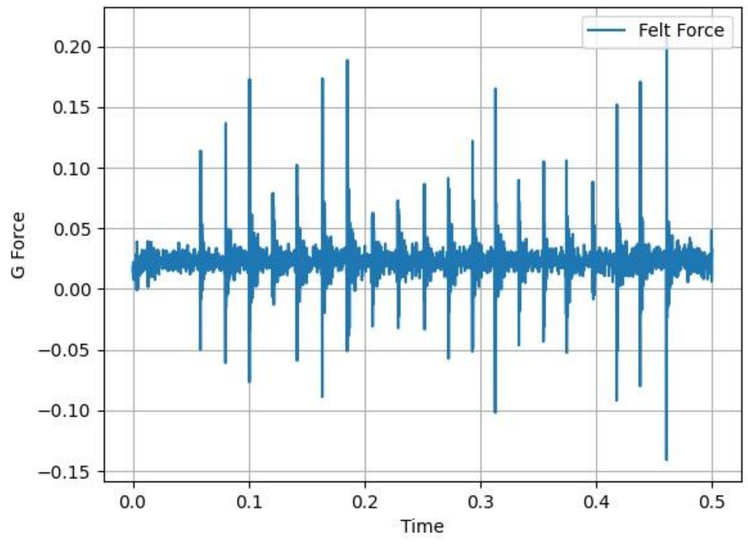
- Record raw accelerometer data in a consistent, reproducible format.
- Clean, format, and analyze data.
- Create a program based off data analysis and test functionality on unanalyzed data.

Data Collection

Data Collection Steps:

- Phone laid flat against recording table
- Stickers precisely placed on screen to keep press location consistent
- Randomized press instructions given via script
- Raw accelerometer data recorded
- Video recorded

Figure 1



Data Processing

Issues with the data:

- Noise
- Force of Presses

Scripting

- Search for spikes passing certain threshold
- Proceding points are analyzed and compared to find the peak.
- Compare neighboring peaks within a certain threshold to deduce which was the actual press.

Z-Axis

Why focus on the Z-Axis:

- Presses register stronger
- Data is cleaner
- See Figure 1

Results

Script Accuracy: 60%

Incorrect Guess Trends

- Hard presses
- Final presses

Accuracy between different people

- Press strength and consistency differs greatly
- Accuracy suffers

References/Acknowledgements

- Kröger, J. L., Raschke, P., & Bhuiyan, T. R. (2019). Privacy implications of Accelerometer Data.
- Owusu, E., Han, J., Das, S., Perrig, A., & Zhang, J. (2012). Accessory: Password Inferences using Accelerometers on Smartphones.

Future Work

- Incorrect Guess Trends
- Hard Presses and other interfering factors
- Machine Learning Implementation
- Advanced Trigonometry to expand button selection.