



Using iPhone signals to help detect falls

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Background

Falling is one of the major health related threats to the elderly today. A lot of fall detection methods either require specialized hardware or invades people's daily lives. I am currently working on a design and implementation of an app that will be able to determine whether one has fallen and gets the person emergency care service. Smartphones and other mobile devices identify their orientation through the use of an accelerator (a small device made up of axis-based motion sensing). For this experiment, a tri-axis accelerometer would provide us with the most accurate readings which is already built into the iPhone

Accelerometer in iPhones

- Accessing readings of signals is not easy but it is still possible
- Doesn't cover as large a range
- Make an app that can process data from accelerometer
- Values reported by accelerometer is measured in increments of the gravitational acceleration, with the value of 1.0 representing an acceleration of 9.8 m/s^2 (per second) in the given direction
- Values could be positive or negative depending on direction of acceleration
- Having a version for apple watch may be best because collecting data from wrist is best
- When arm is aimed downward at a low velocity compared to moving continuously and not aimed downward

Schematics for app

- Data collection values should be small to minimize the possibility of being interrupted by outliers
- App can collect data, temporarily store it and process it
- Would need to experiment to see which frequency would be best to collect data for walking and falling
- Can have at least two reading modes
- One that is manual and another that is continuous
- The continuous would be best where it could collect data for every 5-10 seconds

Reading on iPhone

Walking: Impact on ground from shoes when moving from low to medium velocity is much less. Distance of feet from ground is also less.

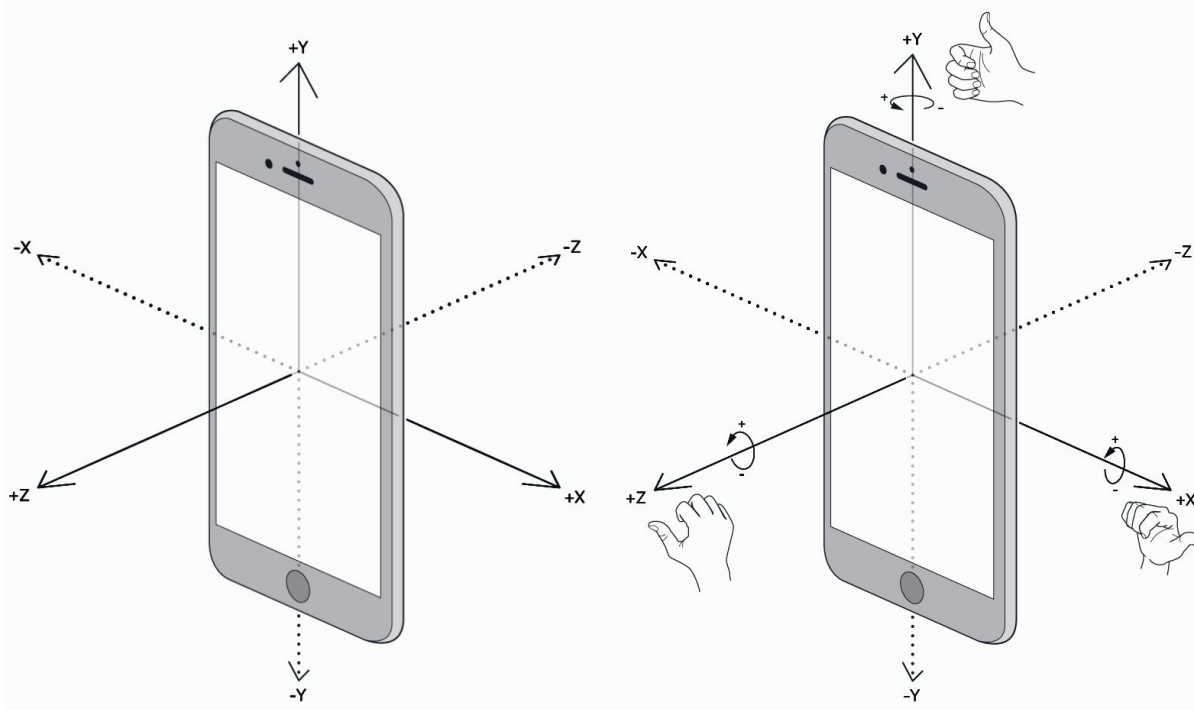
Falling: Impact on ground is much bigger thanks to more mass. Also, distance will vary depending on the person and situation

Processing of data for both scenarios should be fast if user has good connection and charged battery

Getting Processed Device-Motion data with iPhone

- App can help remove bias from other factors such as gravity when it processes data from accelerometer
- Can be built using XCode and Object C
- Apple allows for access to different formats of motion data for different events
- Raw accelerometer data is best because it lets you decide how to process it and building an app that would automatically do that and update itself would be interesting
- When it comes to configuration/calibrating of the device, the `UIRequiredDeviceCapabilities` key of its `Info.plist` file must be configured. Instructions on how to do this is available in the [Information Property List Key](#) reference online.
- Also doing this helps prevent the app from crashing

Understanding how sensors work



Left: sensor axis for
accelerometer

Right: gyroscope

Benefits of iPhone

Although it is expensive, many people still buy it and it has so many features that could be very helpful. App would be user friendly and easily accessible.



Sources

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