

CS598PS Project Proposal

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Recent years have witnessed the boost in the wearable device community, and wrist-worn smartwatches are getting popular. As opposed to the rich set of sensors and functionality, smartwatches are always suffering from short battery life, typically less than one day. This limitation prevents one of the biggest battery drainer, the smart watch's screen, to be always on. As a result, whenever the user needs to look at the watch to get the time, a tapping on the screen is required, making this most basic functionality inconvenience.

In order to remediate this issue, some new smartwatches come with a feature named activate on wrist raise, which allows the device to wake up and light up the screen automatically whenever it detects a natural flick of the wrist. This function uses the smart watch's built-in accelerometer sensor to detect the movement of the wrist. While it works quite well and hardly fails to turn on the screen whenever users indeed lift their arm to see the time, it also triggers lots of false automatic activations caused by daily unintentional wrist flicks, for example, when the user simply lifts her hand to scratch the head. These false positives drain the battery considerably.

In this project, we're interested in developing an accurate activation on wrist raise technique that significantly reduces the number of false activations while maintaining a high level of detection rate.

Our intuition is that, the movement of lifting wrist to look for time versus the movement of the hand to perform other tasks might produce different patterns in the signals captured by smart watch's motion sensors, including the accelerometer, which measures the relative acceleration, and gyroscope, which measures the relative angular velocity.

More concretely, we will pursue the following goals in this project:

Assuming that the body is stationary, our first goal is to design machine learning algorithms to effectively differentiate the motion of raising wrist to see time from other similar motions, such as lifting hand to perform other tasks.

Keeping the stationary body assumption, our second goal is to effectively differentiate the motion of raising wrist to see time among other normal activities, such as typing, writing, eating and so on.

Finally, let us relax the stationary body assumption, we still want to detect the motion of raising wrist to see time from other general human activities, such as walking, running, cycling, jumping and so on.