

## Meaning of each sensor:

Acceleration in X, Y, Z axes

Gyro sensors, also known as angular rate sensors or angular velocity sensors, are devices that sense angular velocity. They sense rotation and change in orientation

The orientation sensor is a combination between the magnetic field sensor, and gravity sensors. It tells you the angle of the plane relative to the ground (pitch and roll) and the direction (compass).

EMG - electrical activity produced by skeletal muscles (muscle tension due to hand movement)

## Possible important features for each gesture

**ABOUT:** orientation and gyroscope for right hand, acc y and z for right hand. Left hand may have zero values if it is still, or an acc in y axis if the left hand is lifted each time the action is done; EMG will have some variation too, but may not be that important

**AND:** EMG (most important) and acc x for right hand. Gyroscope and orientation may not change that much. Left hand not used at all

**DEAF** - acc x and z since there is hand movement sideways and backwards, EMG due to muscle tension near the biceps/elbow joint, Gyroscope for the movement  
Left hand is completely static. Acc, emg, orientation will all be zero

**DECIDE** : Right hand acceleration in Y axis (negative since it moves downwards)  
Left hand acceleration in Y axis (positive since it moves upwards) EMG in both left and right hand, but more in the right hand. Orientation and gyroscope may not be that important since the motion is mostly vertical.

**GO OUT:** Acc z, Emg are most important in the right hand (There is inside to outside movement with fingers). Orientation and Gyroscope might not have significant values. Acc X and Acc Y are almost constant. The left hand is completely static hence acc, emg, orientation will be zero.

**HEARING:** Orientation and Gyroscope for right hand along with significant values for acc z, y. Emg will have one constant value throughout due to the folding of the fingers in the right hand. Left hand is static hence orientation, gyroscope and acceleration values are zero.

**CAN** - acc Y is most important in both the right and the left hands as we move our hands up and down. Emg similarly in the right and the left hand (Action on the right hand is symmetric to that of the left). Orientation and Gyroscope may have minimum importance here. Acc x and Acc z may have bare minimum values.

**COP** -Emg and Acc Z are the most important features in the right hand. Acc, Gyroscope and Emg are all 0 for the left hand since left hand is static.change in Orientation and Gyroscope are minimum.

**FATHER** - Right hand AccY and AccZ will have changes and can be considered important. EMGR will be important due to the bending of elbow (possibly the wiggling of fingers). Gyro and Orientation are useless since there's no radial component. Left hand readings are all 0 since there are no movements in this hand.

**FIND** - Right hand AccY and AccZ will have changes and can be considered important. EMGR will be important due to the bending of elbow and movement of the fingers. Gyro and Orientation are useful since there's some radial component. Left hand readings are all 0 since there are no movements in this hand.

**Acceleration** - Mean, Variance, Root mean square (RMS), Zero-crossing rate (ZCR), Absolute difference (ABSDIFF)

**Orientation:** • First 5-FFT coefficients: the first 5 of the fast-Fourier transform coefficients are taken since they

capture the main frequency components, and the use of additional coefficients did not improve the accuracies.

- Spectral energy: the squared sum of spectral coefficients divided by the number of samples in a window.

As the orientation-related features, the following

features are extracted from each accelerometer axis, resulting in a total of 12 features:

- Standard deviation: square root of variance.
- Root mean square (RMS)
- Zero-crossing rate (ZCR)
- Absolute difference (ABSDIFF)

**Gyroscope** - Standard deviation, RMS, ZCR and ABSDIFF

**EMG** - RMS, SD, Integrated EMG(IEMG) ,Mean Absolute Value (MAV) ,Mean Absolute Value (MAV) , Variance, Zero Crossing