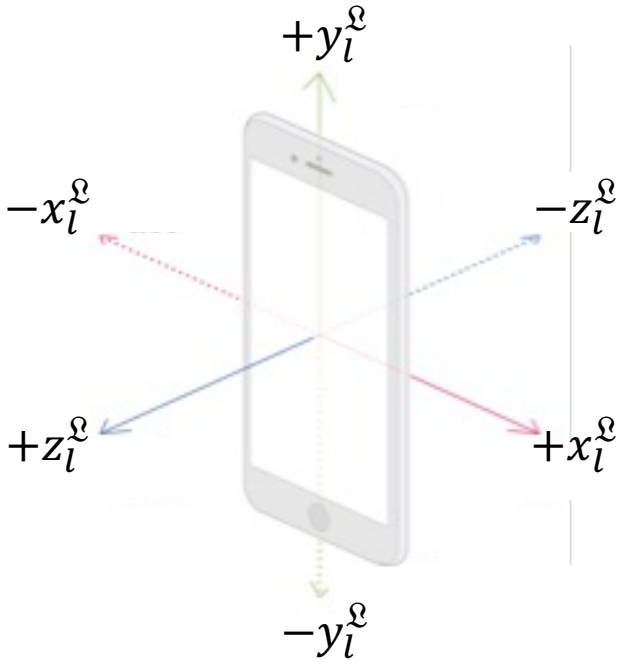

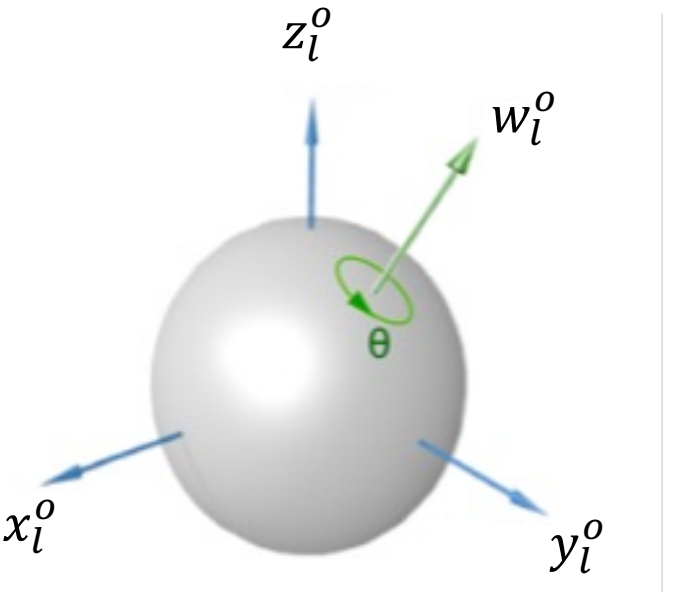

Left: $[x_l^{\Omega}, y_l^{\Omega}, z_l^{\Omega}]$ measures the acceleration readings along the x, y, z axes in the local reference frame.
Right: $[x_l^o, y_l^o, z_l^o, w_l^o]$ measures the movement and rotation of the local reference frame relative to the global reference frame. The local reference frame is fixed to the mobile device, and moves and rotates along with the device.
The local reference frame is the coordinate system of the mobile device. The axis of local reference frame changes relative to the earth when the device's orientation changes. The global reference frame is the coordinate system when the device is placed horizontally and the device's x axis points to magnetic north. Therefore, the global reference frame is fixed to the earth regardless the device moves or not.