Hints for combining accelerometer and gyro readings into the Kalman Filter

1. Assuming a glove with an accelerometer, standing still, then it's quite easy to convert the 3 accelerometer readings to an attitude reading (roll, pitch). (See page 6 & 7 of notes). This is in the Euler frame (i.e. with respect to our normal horizontal and vertical perception).

2. The results from (1) will have to be converted to Quaternions. This is via the large matrix on page 10.

3. So the state equation is for the Quaternions : $q_{k+}1 = A.q_k$ (q is x in the notes)

4. Make initial estimate for q_0 = (1,0,0,0) amd P_0 = Identity matrix (see bottom page 11)

5. Repeat the following until stopped measuring: (k is the counter)

    a. Read the gyro
    b. Read the accelerometer
    c. Make new matrix 'A' with the gyro data
    d. Calculate $\widehat{x_k}\sim \ and \quad P_k\sim$ as in eqn 2, page 11 of notes
    e. Compute Kalman gain
    f. Convert measured acceleration to Euler angles, and then to Quaternions. This is z in step 4. Giving new estimate for $\widehat{x_k}$. This is the output.
    g. Compute step 5.
    h. Go to step (a) above

6. Once you have this, then the output is a vector with all corrected quaternions. This has to be converted back to Euler. See page 11