Virtual Reality Summative

Bradley Mackey

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Question Remarks

1. `get_raw_imu_data()` returns the raw data readings from the `.csv` file (given that it is located in the same directory), returning a 2D array of data rows.
   `sanitize_imu_data(data)` cleans the data as specified, returning a 2D array of rows of the modified data.
   `euler_to_qtrn(euler)` computes a quaternion (a, b, c, d) from a given array of Euler angles (x, y, z).
   `qtrn_to_euler(qtrn)` computes the Euler angles (x, y, z) for a given quaternion representation (a, b, c, d).
   `qtrn_conj(qtrn)` takes a quaternion (a, b, c, d) and returns its conjugate, $(a, -b, -c, -d)$.
   `qtrn_mult(qtrn_1, qtrn_2)` computes the product of 2 quaternions, returning this product (a, b, c, d).

3. For the smallest values of α (< 0.001), very little drift correction is applied and the headset is able to maintain smooth, albeit slightly misaligned motion after correction. For high values of α (0.1–1), after around 20 seconds I noticed the Euler angle around the x-axis begins to drift. This is due to the fact that as the IMU is drift corrected, drift correction rotation occurs around the x-y plane only (as z is the 'up' axis).

4. Try a few different alpha values (e.g., 0.01, 0.1, ...), investigate and comment on their effect on drift compensation in your report (5 marks).

Visualisations

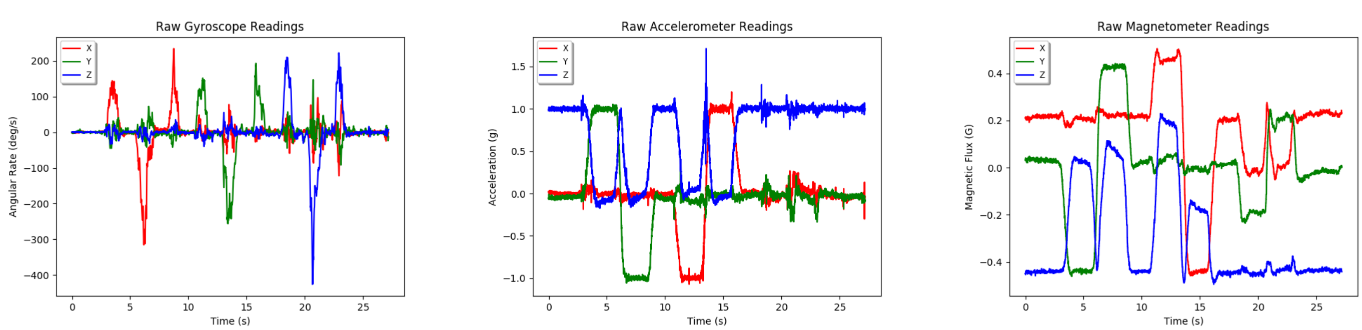

Figure 1: Raw sensor readings from the IMU.

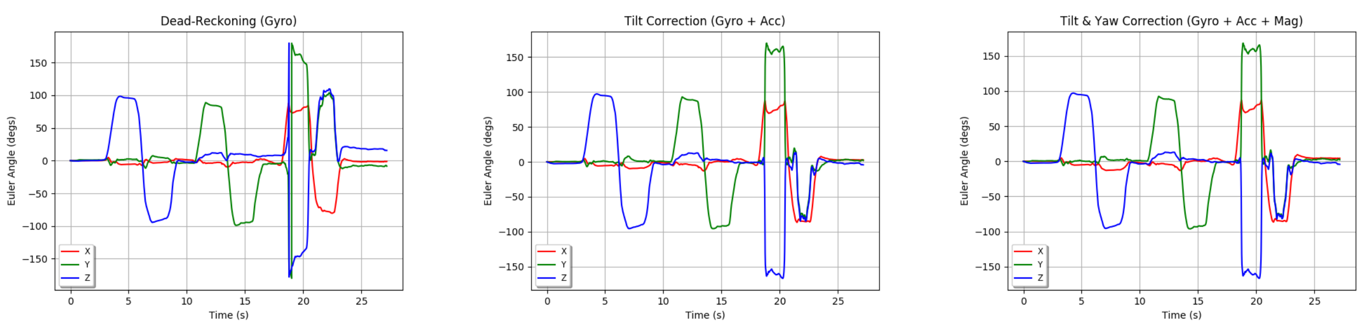

Figure 2: Euler angle readings, with and without various levels of correction.