**Department of Electronic and Telecommunication Engineering, University of Moratuwa**

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1. What roll angle is estimated by the KF when the Zumo robot is placed on its local-y axis upwards?

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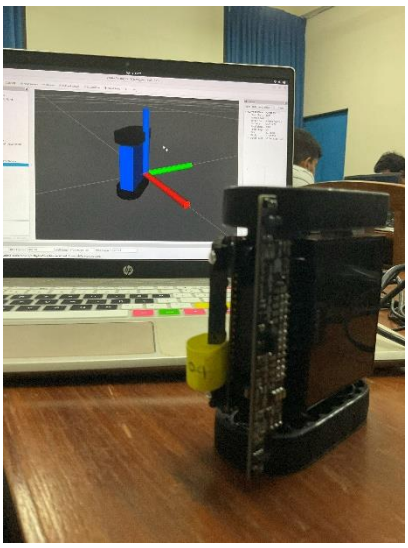
[zumo_imu_kf_node-1] m_StateY_vec[2] 0.999744
[zumo_imu_kf_node-1] m_StateZ_vec[2] 0.016582
```



Roll angle = $\tan^{-1}(0.999744 / 0.016582)$
= 89.0497

2. What did you observe for the final step of the procedure? Give your reasons for the observation.

   Every gyroscope and accelerometer has a small inherent offset or bias in its readings. Over time, this bias can accumulate, causing the sensor to register non-zero values even when it is not moving. This is especially noticeable in gyroscopes as they measure angular velocity, and even small biases can lead to large orientation errors when integrated over time. Since predicted state is updated from the current state and the next predicted state is predicted based on previously predicted value without being corrected by any other measurement value. So predicted state is drifting over time. With the Kalman predicted state we get stable values for predicted state.