

Motion Measurement of a Motorcycle Using IMUs

Junji Hirasawa

1) Ibaraki KOSEN (College of Technology), Mechanical and Control Engineering
866 Nakane, Hitachinaka, Ibaraki, 312-8508, Japan (E-mail : hirasawa@ibaraki-ct.ac.jp)

KEY WORDS: Vehicle dynamics, Motorcycle, Dynamic model, Acceleration sensor, Roll angle (B1)

In this paper, a novel method for measuring the roll angle of a motorcycle is proposed. Acceleration data from two IMUs are used to estimate the roll angle. First, the relationship between the centrifugal force acting on a two-mass system and the position of its center of gravity is analyzed. Next, this concept is applied to a motorcycle in a turn, demonstrating that the roll angle can be calculated from the outputs of two biaxial accelerometers. Finally, the method is validated using experimental data from actual riding tests. Future work includes evaluating the accuracy of the method and performing measurements at higher sampling frequencies.

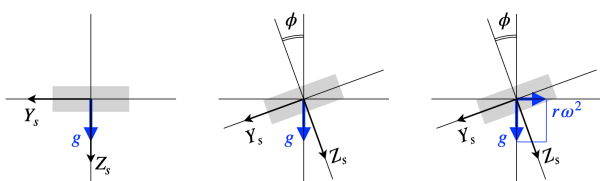


Fig.1 Measurement of the inclination angle using an acceleration sensor

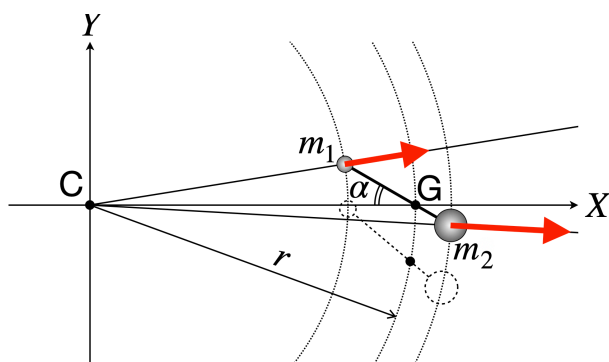


Fig.2 Centrifugal forces work on two mass points

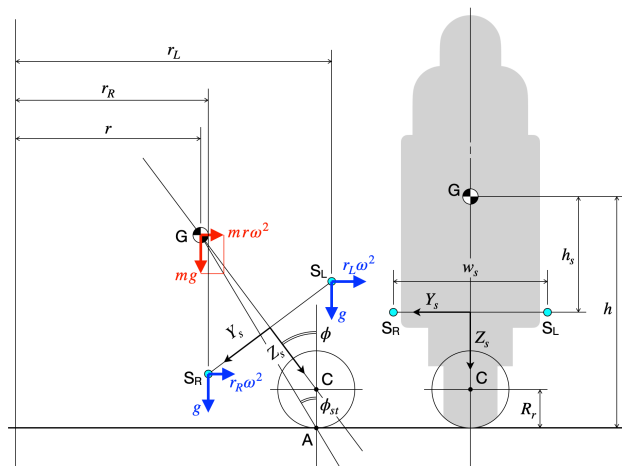


Fig.3 Schematic diagram of two acceleration sensors mounted on the motorcycle with rolling motion

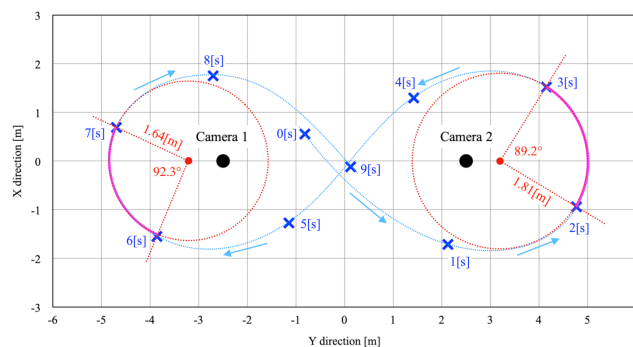


Fig.4 Running trajectory on an 8-shaped course

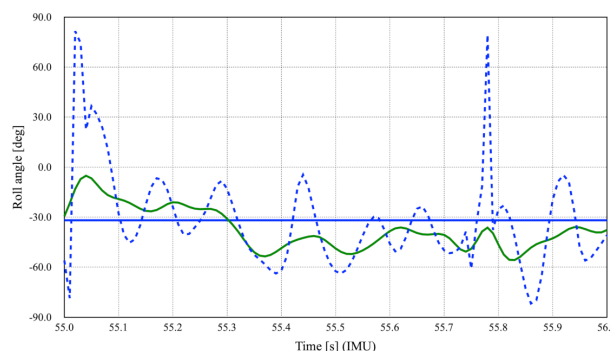


Fig.9 Experimental results(roll angle, 2-3[s])

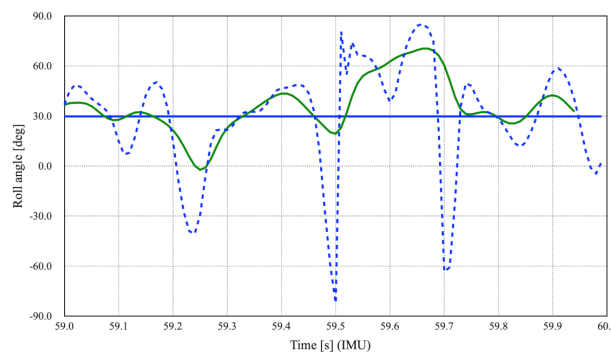


Fig.12 Experimental results(roll angle, 6-7[s])