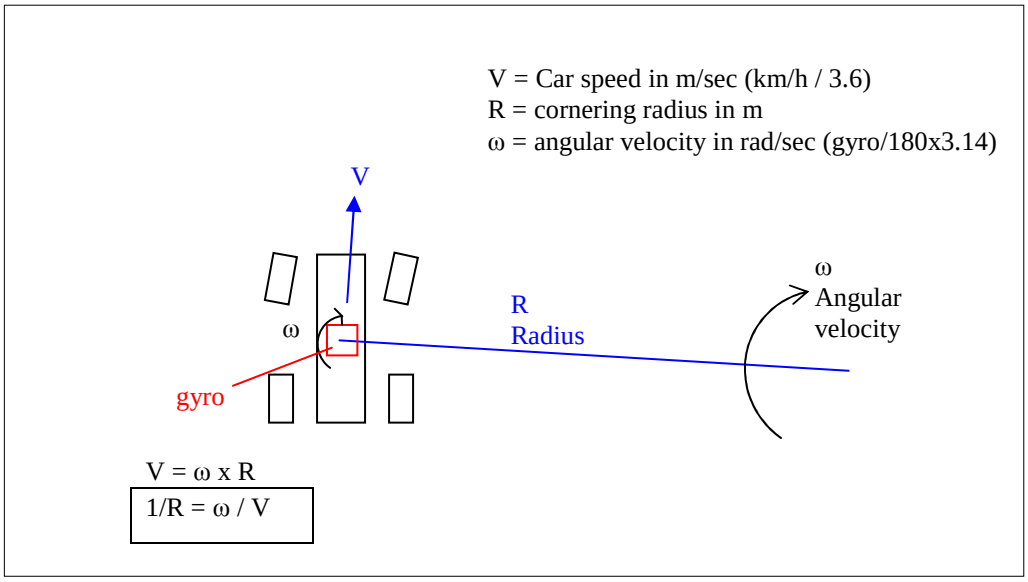
Gyro

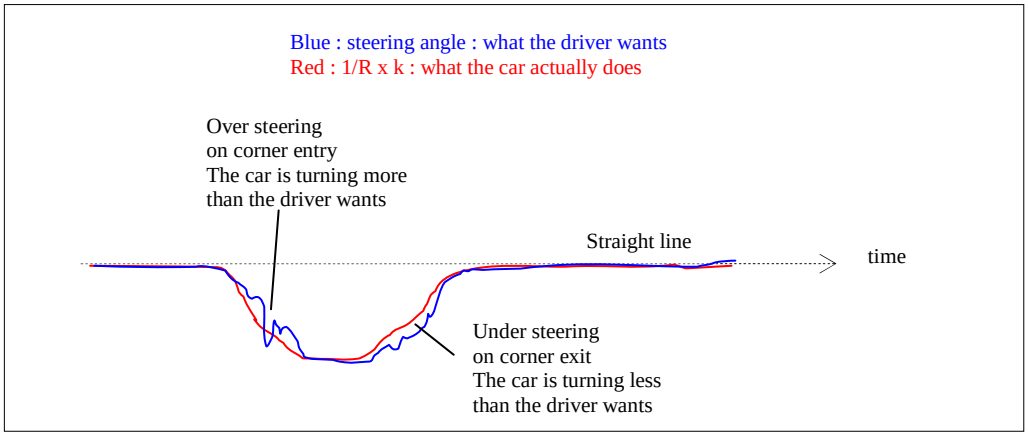
The Gyro measures angle velocity. In general, the signal is calibrated as degree per second : °/sec.

YAW
If it is mounted to measure yaw speed, it will give a better image of under or over steering than the Lateral accelerometer, because if the car is spinning on itself, the lateral G signal may be null.

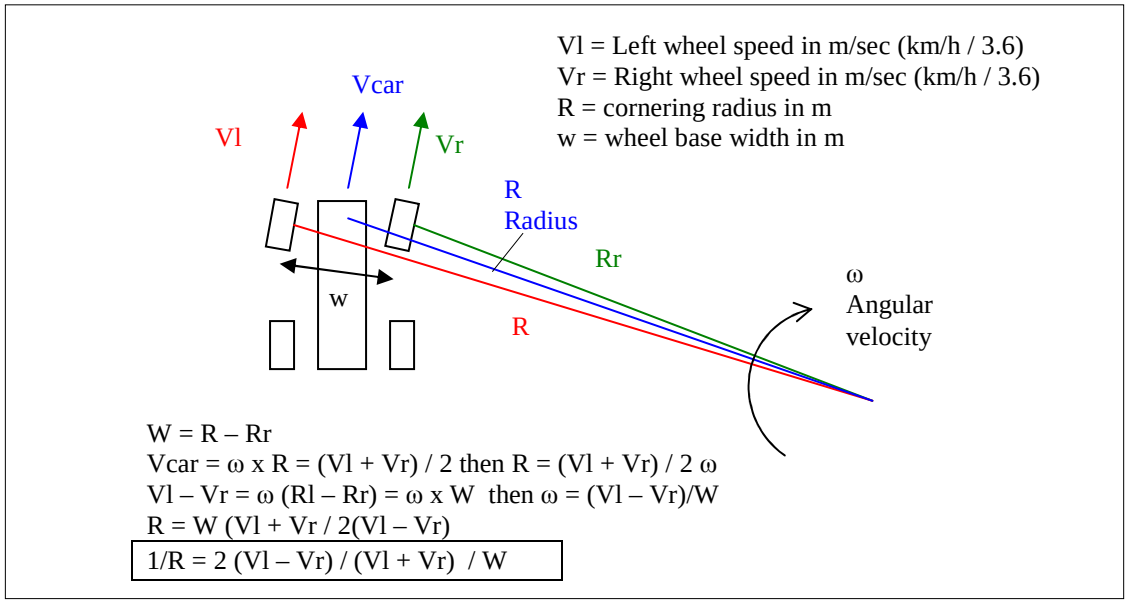
The cornering radius may be calculated :
$1/R = \omega / V$
With ω : yaw speed in rad/sec (or 3.14/180 x gyro value in °/sec)
V : car speed in m/sec



By comparing the signal of 1/R with the signal of the steering wheel angle, it is possible to detect under or over steering.
The 1/R must be multiplied by a coefficient k to match the graph of the steering wheel (k may be empirically adjusted in order to superimpose the two plots)
The steering wheel angle may be measured with a linear potentiometer on the steering rod or with a cable spring potentiometer wounded on the column.



Another method to calculate cornering radius is to use left and right front wheel speeds :

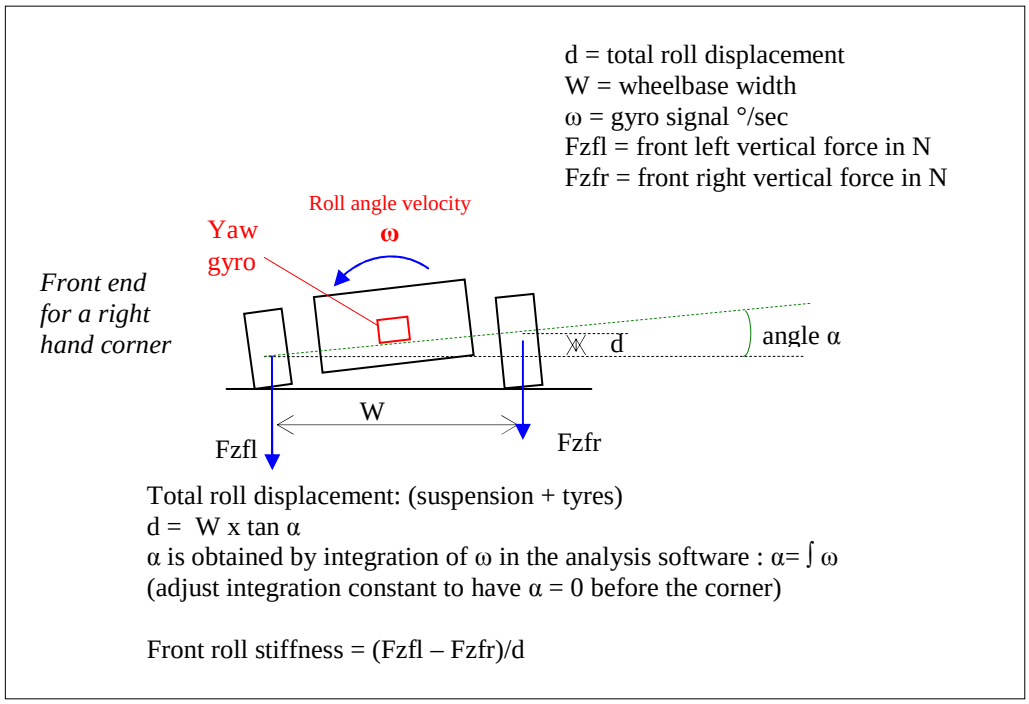


W = R – Rr
Vcar = ω x R = (Vl + Vr) / 2 then R = (Vl + Vr) / 2 ω
Vl – Vr = ω (Rl – Rr) = ω x W then ω = (Vl – Vr)/W
R = W (Vl + Vr / 2(Vl – Vr)

$$1/R = 2 (Vl – Vr) / (Vl + Vr) / W$$

ROLL or PITCH
If the gyro is mounted to measure roll or pitch, it will allow to calculate the total roll or pitch movement (dampers + tyres)
As damper displacement is a very common measurement, it will give values of the tyre deflection which are critical informations.

The gyro signal has to be integrated in the data analysis software to give the angle
Total movement = tan(angle) x Wheelbase



Total roll displacement: (suspension + tyres)
d = W x tan α
α is obtained by integration of ω in the analysis software : $\alpha = \int \omega$
(adjust integration constant to have α = 0 before the corner)

Front roll stiffness = (Fzfl – Fzfr)/d

The front and rear roll stiffness may be calculated and their ratio gives the roll stiffness balance which is a very clue data for a driver.