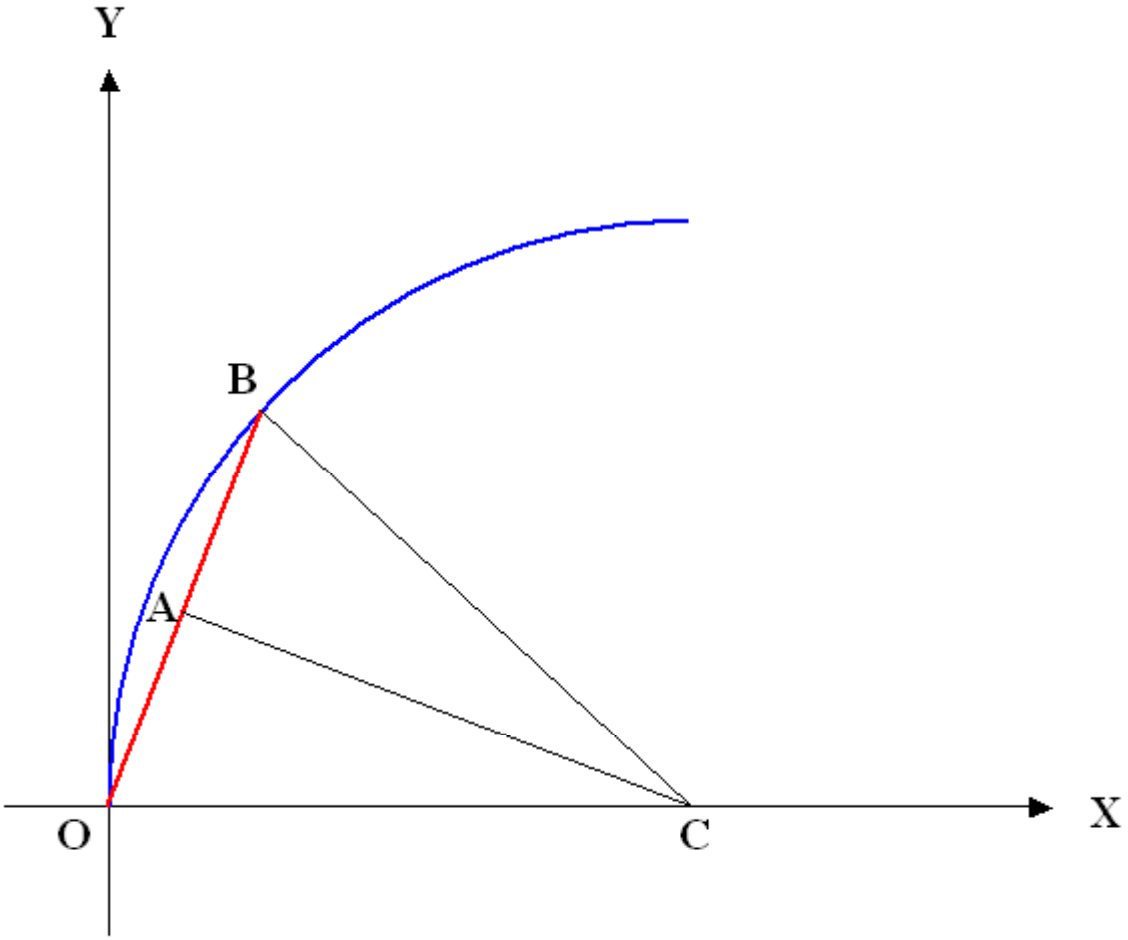

Assume the motion during the small iteration time step is the arc of a circle. This will be strictly true if the rotation rate and translation rate are constant during the time step, and a good approximation if not.

If the vehicle starts at the origin O with a forward speed and clockwise rotation, it will follow the blue arc AB during the time step.

The vehicle is moving forward and turning at the same time.

So how do we numerically integrate this?

Arc OB (blue) represents the circular path traveled.

Length of arc OB is the distance traveled (change in FWD reading) during the time step.

C is the center of the blue arc.

Angle OCB is the change in heading (change in RCW reading).

Line segment CA is the perpendicular bisector of chord OB (in red).

Therefore angle OCA is 1/2 of angle OCB.

Angle YOB is equal to angle OCA (because their corresponding sides are perpendicular).

If the time step is small enough, the length of the red chord OB will be very nearly equal to the length of the blue arc OB. In fact, in the limit as angle OCB approaches zero, they are equal.

Therefore, the vehicle motion can be approximated by first turning 1/2 of the change in RCW (ie angle YOB), then traveling a distance equal to the change in FWD (red chord OB), and finally rotating the other half of the change in RCW (angle ACB).