Pole docking equations.

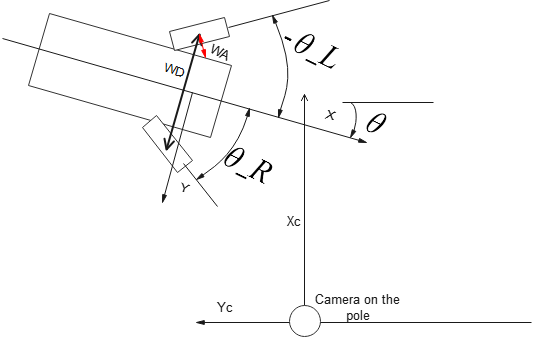
Two distinct situations:

Right and left climb.

# Right climb:

## Report geometry

The report geometry is:



Assumptions:

For the entire pole docking process, the steering angles are exactly opposing,

. This assumption implies that the wheel touch line remains always parallel to the robot local Y.

The following distance are defined:

|  |  |
| --- | --- |
| WA | Length of wheel connection arm (about 6cm) |
| SD | Distance between robot steering joints |
| WD | Distance between wheel touch points |
|  | Robot yaw, w.r.t. shelf line |
|  | Steering angle. |

The target is expressed in robot body coordinates as

## Steering to the target

The robot targets towards

When the wheels are straight, this is very simple:

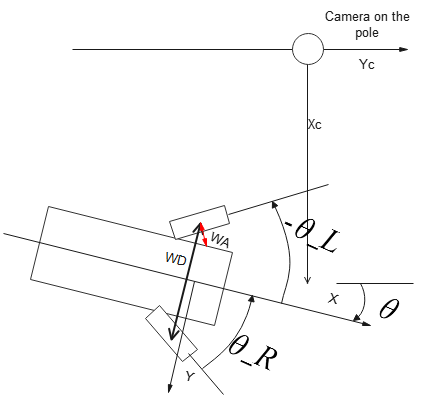
Right distance =

Left distance =

Comments:

* The expressions above neglect that distance the wheel travels about WA. As this distance is automatically compensated by the wheel speed driver
* We have at the denominator. For small values of , there will be also a lot of skidding. Therefore, the voiding of for large steering angles

## Left climb.



We have here (simply both the Xc and the Yc axes are negated)

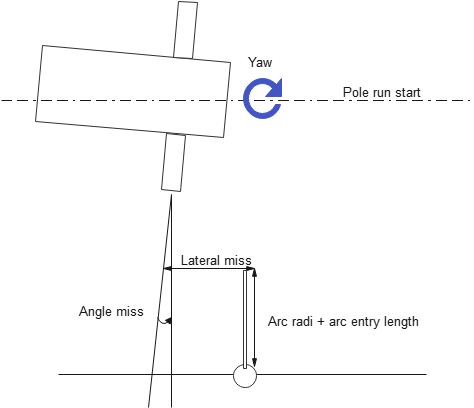
# The final approach

The robot approaches the pole start run line.

It has no more maneuvering options, so it just checks precision.

If precise enough, go on climb; otherwise straighten wheels and restart maneuver

## Right travel error calc



The angle miss is the robot’s relative yaw.

We have (assuming that the angle miss is small, otherwise the calculation is anyway irrelevant)

## Left travel error calc

A screenshot of a computer

Description automatically generated with low confidence

We have (assuming that the angle miss is small, otherwise the calculation is anyway irrelevant)