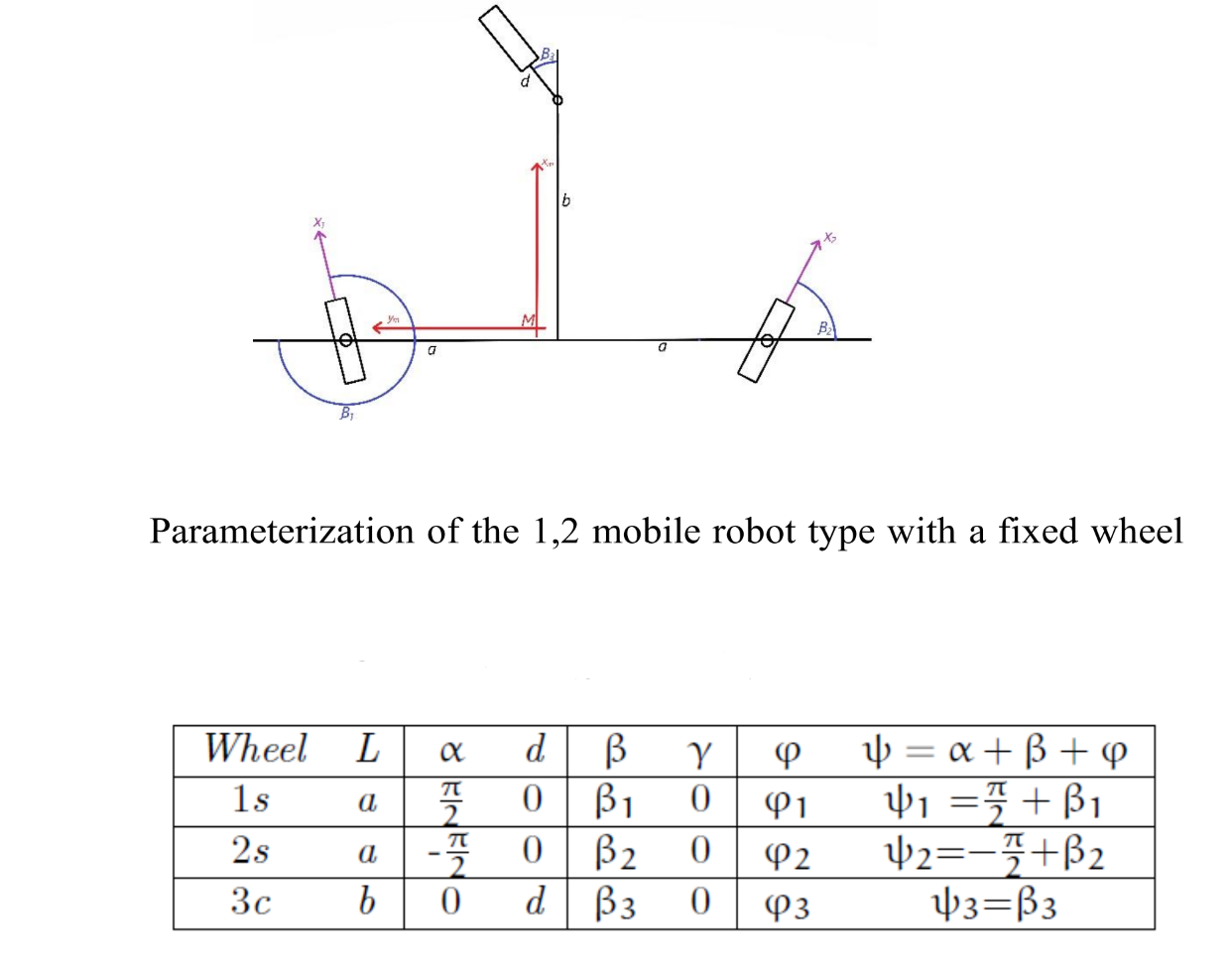
Kinematic model computation

Robot frame and parameter table (as defined currently):



Configuration vector:

q = [x y θ β1 β2 β3 φ1 φ2 φ3]

We define some equivalences to have everything in terms of β:

sin(ψ1) = sin( β1 + π/2 ) = cos( β1 )

sin(ψ2) = sin( β2 - π/2 ) = -cos( β2 )

cos(ψ1) = cos(β1 + π/2 ) = -sin( β1 )

cos(ψ2) = cos( β2 - π/2 ) = sin( β2 )

Now we define J1, J2, C1 and C2:

From we obtain :

Now we turn into an upper triangular matrix (reduced row echelon form):

And now we get a base of the kernel of to obtain :

Then is:

We can multiply everything by to finally obtain:

Now, before obtaining S(q) we need to calculate the E and D matrices:

Finally:

, with

The S(q) presented in the previous’ year report is as follows:

Text, letter

Description automatically generated

The main difference lies in the first 3 rows, where an additional reduction appears to be made but there is no apparent way to obtain these values.