Session 14

So far, we have only reasoned in the (x,y) plane, ignoring the rotating base that will allow us to reach points in the entire space (x,y,z).

We could have maintained the study within the space (x,y) and with a change of frame, made the analogy in (x,z).

However, the calculations are tedious, so for now we will proceed as follows:

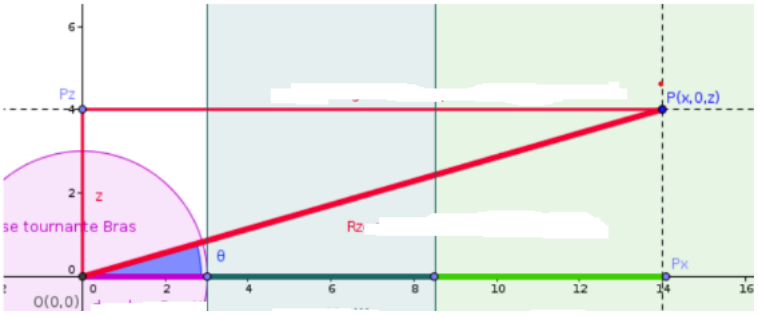
With regard to the positioning of the base of the arm, it will then be necessary to reason in the plane (x,z), we will also consider that the whole area around the arm is an active area where you can grab a handle, the position P(x,0,z) of the handle is a point known by analysis of the image from the webcam.

We then want to know from P(x,0,z), the now polar coordinates of the plane (x,z).

We are therefore looking for a distance and an angle:

- We note Rz the distance between the origin of the reference O (0 ,0,0) and the point to reach P(x,0,z).

- The angle θ corresponds to the rotary angle of the motorized arm base servomotor with respect to the Ox axis in the (x,z) plane.



Considering the triangle OPPx, we find the expression of R**z = sqrt(z^2 +x^2).**

The theta angle is then calculated quite easily within the same triangle, even in several ways. According to some researches concerning the precision of the calculation on Arduino IDE, the most judicious will be to use an asin() function allowing to have the sign of the angle, more stable than the atan() function and easier to calculate using the found Rz.

Then we have **theta = asin(z/Rz).**

Inconvenience:

All this added to the code works for certain angles neither too big nor too small.

Exceeded a certain operating range, the rotary base no longer responds, and this is exactly the problem that we are trying to solve before adding the upper section containing the gripper.