1 Configuration of Amcl parameters

The results so far (see update document of 12_11) did show deviations in the pose, drifting by some value as soon as the end of a straight line has been reached. This is probably due to errors in the motion model, which needs to be compensated by tuning proper parameters. **Amcl** does infact strongly rely on **odometry** and **sample motion model**, hence if errors in the odometry occurs (the error in the odometry is always presence due to the noise), this will just accumulate.
The **Kinematic motion** model in use will be **odometry motion model**; there is also a velocity motion model, not in use by AMCL. The latter tend to be less accurate (for all details see book Probabilistic Robotics p. 96).

Table 1: AMCL parameters

alpha1	Specifies the expected noise in odometry's rotation estimate from the rotational component of the robot's motion, has an effect on Figure 1.b
alpha2	same as alpha1, but for the translational component
alpha3	Specifies the expected noise in odometry's translation estimate from the rotational component of the robot's motion, Figure 1.c
alpha4	same as alpha3, but for the translational component

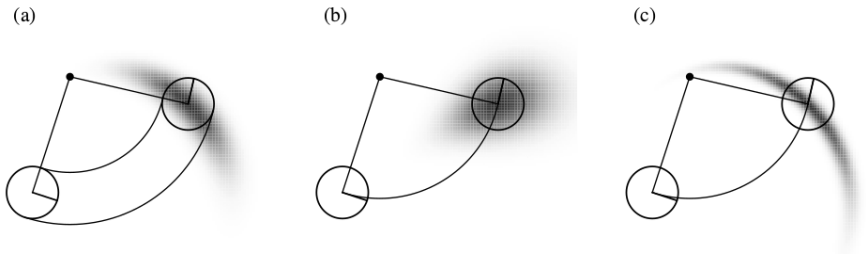

Figure 1: Velocity motion models for different noise parameters settings. Figure .b shows large translational error and small angular error, Figure .c large angular errors and small translational error
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1.1 AMCL with GMapping map

We do not tune the AMLC for both the maps, we keep AMCL params the same as the Graph Localizer and give the two map inputs for comparison (map inputs are the one changing in parameters).

This case presents a deviation (a translation) due to angular drift; therefore the first parameter that should be tuned is **alfa4**. The strategy is to put all alfas to a small value, then increase it

progressionally till the optimal.
The particles of the filter are fixed to **6000,9000**.

See this link for an answer: https://answers.ros.org/question/227811/tuning-amcls-diff-corrected-and-omni-corrected-odom-models/

Table 2: alfa parameters and results

Parameters	**Results**
alfa4=0.05	Just changing this alone did not produce considerable results at all
alfa4=0.05, alfa3=0.05	Also this combinations does not have an effect on the bearing error. The alfas here have been changed to a factor of 20.
alfa3,4=default=2, alfa1,2=0.05	Also no result in here
all alfas to 0.1	Also did not see nothing relevant
alfa1=0.005, alfa2=0.005, alfa3=0.010, alfa4=0.005	No satisfactory results
alfas=0.0001	works now, I loose global localization property with such a small values, if calling the global localization service.

Table 3: Starting from the corrected alfas = 0,0001, higher progressively alfa3, alfa4 till the optimal

Parameters	**Results**
alfa3,4=0,001 (try a factor of 10 higher)	Still get considerably good results
alfa3,4=0,01 (try a factor of 10 higher)	With those value the error is not anymore bounded to the 5 centimeters, hence we keep as a good result the value of before with alfas3,4=0,001.
minparticle = 6000, maxparticle= 9000	The tuned ones

For the update of min_ and min_d see the folder update_min_a_d under bagfiles/amcl_localization.

Table 4: Update min a/d

Parameters	**Results**
Keep min_d 0.2 and min_a = 0.25 as default values	Plot the difference in changing their values.

2 Comparing AMCL with the two different map inputs

3 Comparing Graph-Localizer with the two different map inputs

The Graph Localizer is not working with the same params as the AMCL, it should be tuned the same way as the AMCL, starting from particles, then alfas and finally update translation and rotation. We tune this on the **GMapping tuned** map.