

# **Implementation of a richer library of movements for Babybot using an accurate method to generate trajectories**

## **Project Technical Report: part Two**

In the second part of our project we enriched the simple architecture implemented in the first part of the project by adding a set of routines to guide the arm in simple movements. The goal is to let the user control quasi-directly the arm to perform simple tasks. The user decides whether to move the arm directly to reach a point in the space or an object or to use a trajectory generator to reach a point in the space or an object via a sequence of anchor points.

In the trajectory mode, the arm control is provided with basic information on the outside space and it's told by the user or decides (when in learning mode) to perform a particular trajectory to reach the target. To simplify the task, these trajectories are classified in four groups: (1) reaching straight-out, (2) reaching right-to-left, (3) reaching left-to-right and (4) reaching from above. The robot arm starts its movement always from the same resting position. Therefore, the trajectory generator must bring the arm safely from the starting position into the reaching first position, which depends on the trajectory type.

From the time being, the robot is assumed to be blind to possible obstacles. The use of "smart" trajectories could be employed to avoid obstacles in a close-loop implementation of the reaching protocol. This means that the robot will use vision to detect the presence of obstacles on its preferred route to its target and will decide which trajectory suite it best to reach the target without hitting the obstacle(s). We are not going to add this feature in this project but we leave it as future work and take the opportunity to mention here the importance of our work for its possible implications in upcoming developments.

Another important consequence of this work is that the robot can learn a precision grasp of a recognized object. For a precision grasp is necessary to approach the object in the right direction and then position the wrist and hand properly to grasp the object without hitting it. This part of our project can be used during learning. The robot will attempt to reach for the target using various trajectories and will learn by experience which works best.