

GLOBAL HRI EXAMPLE WITH NAO ROBOT

As a final demonstration of everything that was done and everything that can be done, a global example of interaction with humans is made, making a mixture of each and every one of the behavior libraries created, and using both ROS and the NAOqi modules, and all seen through the Python programming language, of course.

In this last example a game is developed. It allows Nao to interact with children, although it can be applied to any person of any age. The game consists of a combination of everything seen so far: color and object recognition, localization of the source of sound, voice recognition and synthesizing, as well as all the necessary movements to carry out interaction and play.

At all times it will be the robot the one that explains what is going to be done and the one that gives the necessary instructions to the user to understand the operation of this application. Therefore, it will work doing everything independently.

The example can be divided into the following stages:

- In the starting stage, shown in Figure 1, Nao will not be placed facing the child and with a series of colored balls located at his shores. At that moment the game will begin, and the child will be asked to choose the ball of the color he likes best and when he is prepared to warn Nao. In this way the sound library comes into play, through voice synthesis and through the location of the sound source, while waiting for the user to give the warning signal.

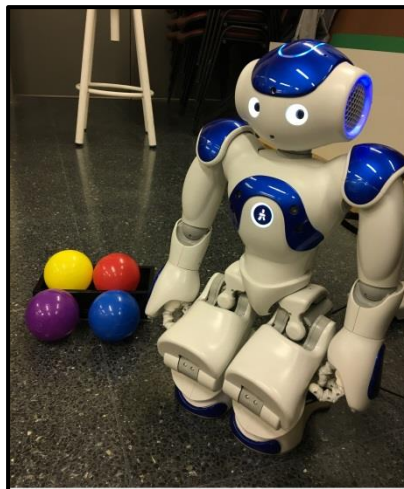


Figure 1- Initial scenario of the global interaction example

At the moment the desired signal is received, Nao will turn to look for it, so that it will not stop until it finds the speaker, as shown in figure 2.

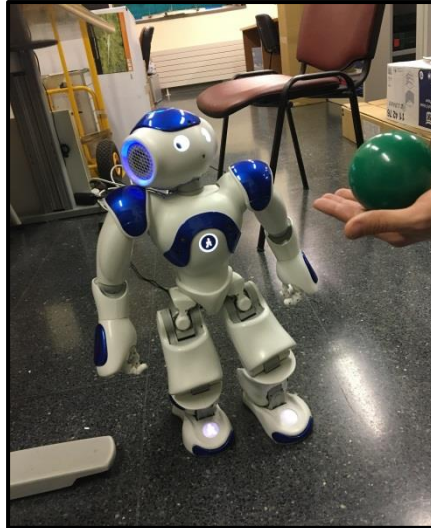


Figure 2-Nao rotating its head looking for the sound source

- Once the robot has located its target, it will ask the child to let him see the ball he has chosen, so that Nao will place his arms stretched so that the ball is deposited in his hands (as seen in the previous examples), at which time the color recognition will be performed, with the image detection library coming into play. Once the color is detected, it will be verified through simple questions, and in case the estimation has failed, the recognition will be repeated.
- As soon as the color is verified, Nao will tell the boy to move with the ball so he can follow it and stop at the moment he wants the robot to catch it, something similar to the famous "catch" game. This will use the examples seen for tracking objects and grabbing them as soon as the ball stops. In figure 3 it is possible to see what is seen from the camera of Nao as the position of the ball is detected.



Figure 3 - Image of what Nao is seeing when it detects the ball

- Finally, the moment the robot has picked up the ball, as in figure 4, it will throw it to the ground on the grounds that the color no longer likes it, and asking the child to choose a ball of another color to play again . If the child so decides, the game will be repeated again, while if the robot asks if he wants to continue playing, the child replies that no, Nao, "very sad", will stop playing. to play.

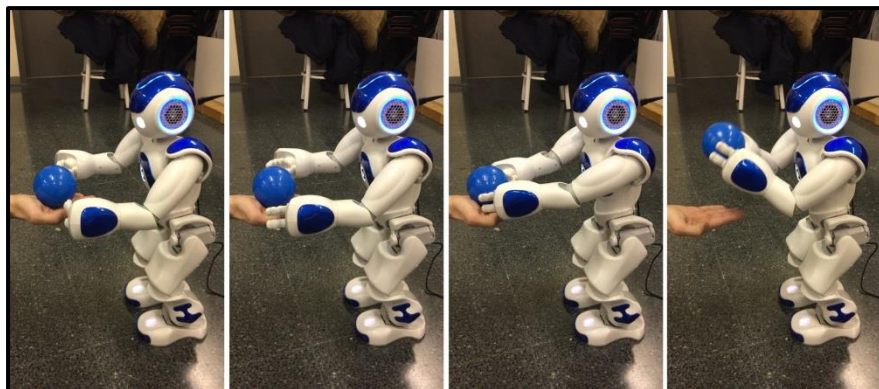


Figure 4-Nao performs the grip of the ball that is in the hands of the user

Note that all the libraries are working together, since the robot is interacting continuously through the sound library, moving to follow the ball and detecting the ball of the desired color to be able to go behind it.