

FROG

FUN ROBOTIC
OUTDOOR GUIDE

Deliverable: D4.3

**Library of Behaviours and Demonstrator of Adaptive Robot
Behaviour System**

Consortium

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1. Introduction

This deliverable will present the library of behaviours of the FROG robot. It will present how various behaviours FROG can perform to execute a basic tour. A basic behaviour scenario for the FROG robot is presented in deliverable D4.1. Section 2 will discuss the library of behaviours presented based on the web interface of the FROG. Using this web interface all the behaviours can be executed stand-alone. Section 3 presents the demonstrator of the adaptive robot behaviour system. The demonstrator will be a movie that demonstrates an example of the use of the behaviour library to build (a part) the tour for the Royal Alcázar.

2. The FROG behaviour library

This section will present the different behaviours of the FROG robot that were implemented for the autonomous tours in the Royal Alcázar in June and September 2014.

The behaviour library consists of audio clips, speech (robot character and tour guide), videos, eyes and arm animations, and navigation specific behaviours (e.g. go to different waypoints, detect persons and approach). An overview of the implemented behaviours can be found in Figures 1 to 7. These figures are screen captures of the web interface of the FROG. Behaviours can be executed by clicking one of the buttons in the web interface, sending the command via the web interface, or by executing them directly from the Front End or State Machine. The web interface was developed to try out different behaviours without the need of running a complete tour. Different behaviours could be quickly tested in the lab before trying them out in an autonomous tour. The following subsections will discuss the different behaviours in more detail.

2.1. Scenes

The web interface is able to control the different scenes that can be displayed by the Front End of the FROG. These scenes are the basic building blocks of the tour in the Royal Alcázar. The most basic scene is the 'Idle' scene, which means that no content will be played and only FROG's mouth will be displayed. The Points of Interest (POIs) of the tour can be played by selecting one of the POIs (POI 1 - END). Other behaviours, such as the behaviour during the approach to people or the use of augmented reality (AR) can be selected. The status window (the lower right corner of the screen) can display different content (e.g. ICL output and meter or the map and position of the robot)

Control over the audio and video (audio and screen) output of the FROG can be found in the control section of Figure 1. Examples are the turning on and off of the projector, and control the volume of the audio, and making screen captures of the current screen output.

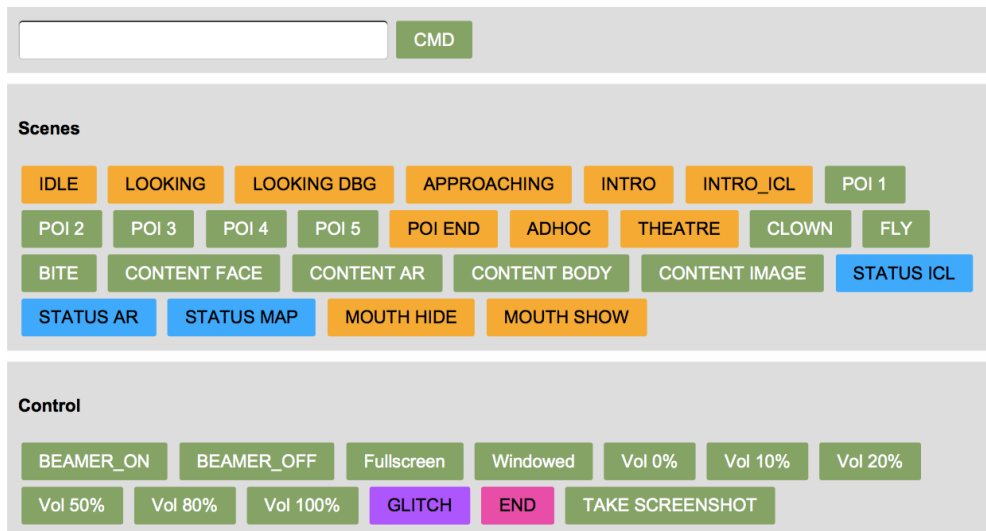


Figure 1 Web interface for sending behaviour commands, controlling different scenes, audio and video output.

2.2. Images and eyes animations

Figure 2 presents an overview of the different images that can be shown on the screen of the FROG. Most of these images will be presented during the autonomous tour when the guide is telling his story about the POIs.

The eyes of the FROG are able to display animation. Different animations have been developed using the Eyes Animation Maker. The section ‘Eyes’ in Figure 2 gives an overview of the different behaviours of the eyes. The Eyes Controller is responsible for controlling the eyes. The different animations are used during the tour to express certain emotions (e.g. ‘happy’ when users want to join on a guided tour or ‘sad’ when users have given the wrong answer during the quiz at POI5) or to communicate the current state of the FROG (e.g. ‘dimmed default eyes’ while navigating or an animation of an old audio tape while telling a story at a POI).

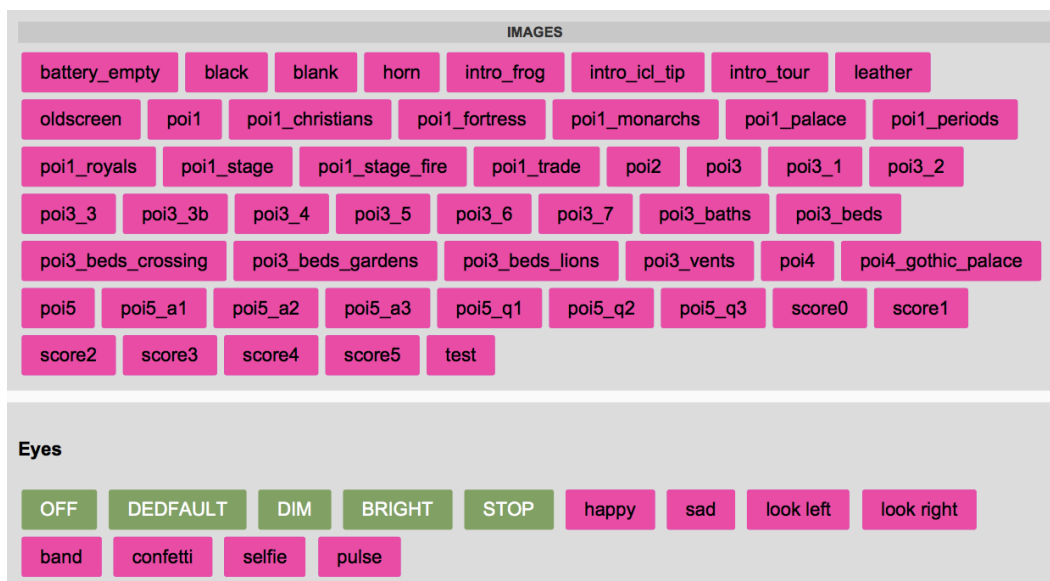


Figure 2 Web interface with different behaviours of FROG (displaying images and controlling the eyes and eyes animations)

2.3. Face tracking and videos

When the face-tracking scene is activated (see Figure 1) different face overlays can be selected. The various face overlays can be found in Figure 3. The FROG is also able to play videos.



Figure 3

2.4. Arm behaviour

The arm of the FROG is controlled by the arm controller and can be pointed in almost all compass directions, except the West direction because of the blind spot of the servomotor. North is pointing to the front of the FROG. Figure 4 gives an overview of the compass directions relative to the FROG. During the tour the arm will point to fixed positions on the map. The behaviour of the arm is calculated based on the current position of the robot and inverse kinematics. All three servomotors can be controlled during these animations. The LEDs in the arm can be turned on and off.

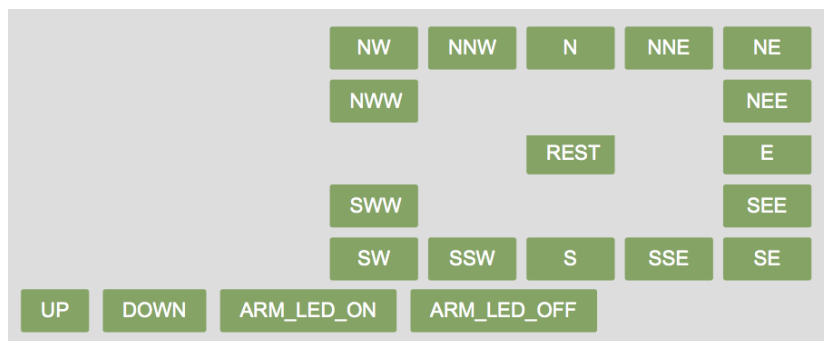


Figure 4 Behaviours of the FROG arm

2.5. Audio behaviour

The FROG robot is able to play audio clips. Audio clips can be music, earcons, or speech (the tour guide voice-over and the robot voice). Figure 5 gives an overview of different music and earcons that can be played. Figure 6 gives an overview of the different utterances of speech that can be played.

2.6. Navigation behaviour

Navigation commands to the different POIs can also be executed via the web interface (see Figure 7). The robot will navigate to the POI and when the navigation task is finished it will start playing the content of the POI. Other behaviours related to the navigation of the FROG are the docking/undocking and the approaching of persons.

Other behaviours that are not directly related to the navigation of the FROG are also displayed in Figure 7. These behaviours will be used before starting or after finishing a navigation command. Examples are starting and stopping the ICL human affective

signals analyser, the behaviour when the batteries are almost empty and the behaviour when the FROG has lost its guided visitors.

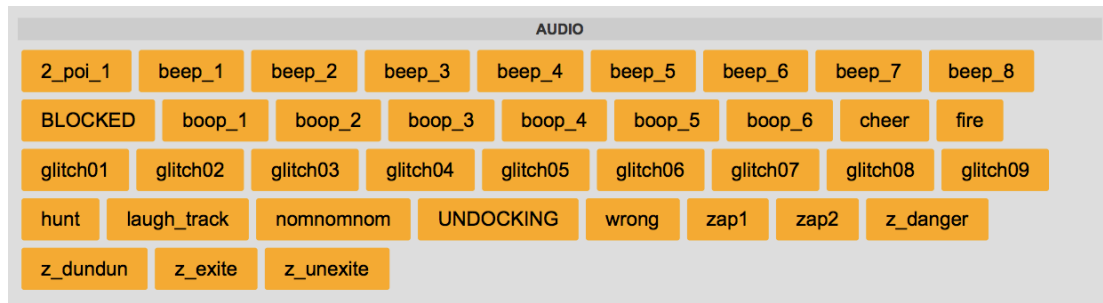


Figure 5 Possible audio clips that can be played by the FROG



Figure 6 Messages that can be presented in speech by the FROG

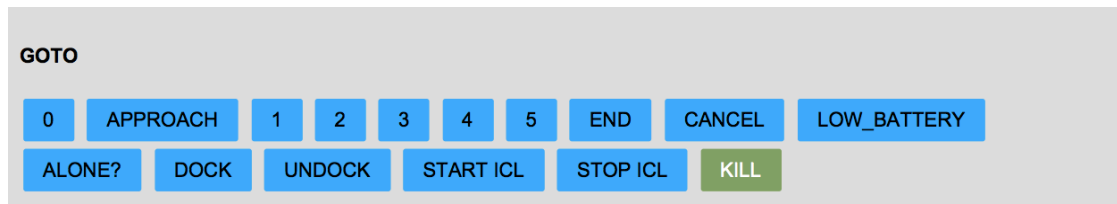
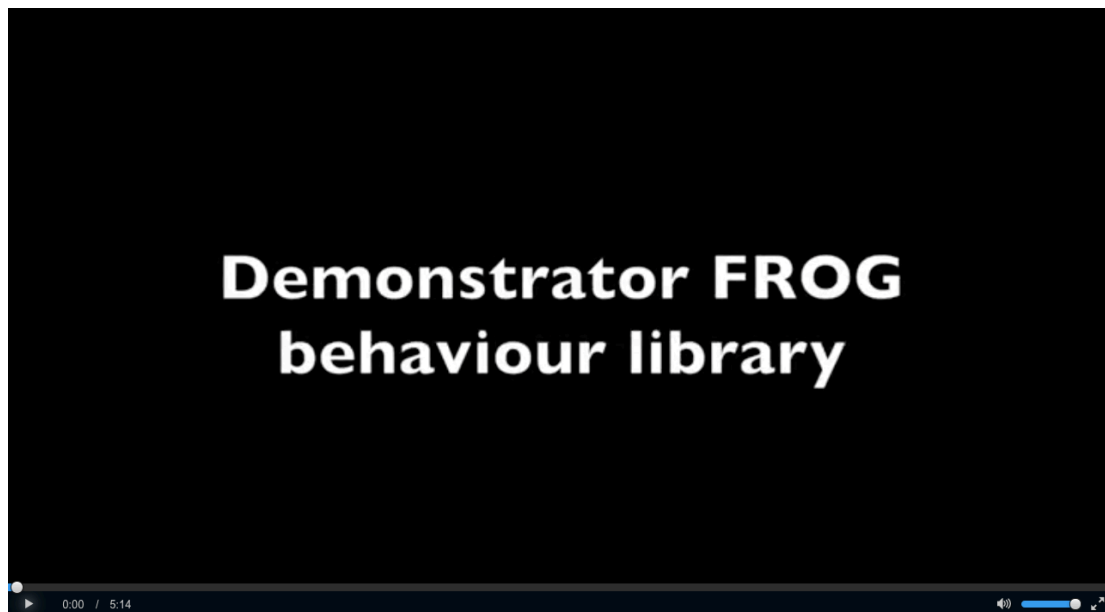


Figure 7 Behaviours of the FROG related to navigation

3. Demonstrator

A movie of the FROG behaviour library can be found below. Click on the image or the URL to open the video.



<https://www.dropbox.com/s/gd5m4eeko4314pk/Behaviour%20Library.mp4?dl=0>

4. Conclusion

In this deliverable we presented the FROG behaviour library. The different behaviours were discussed and we demonstrated how we used the basic behaviours to build a complete tour for the Royal Alcázar in June and September 2014. By making use of the behaviour library we were able to try out parts of the complete tours. The tours were successfully tested during the integration sessions in June and September 2014.