

D2.2 Robot Behaviour Specification

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PU	Public	PU
PP	Restricted to other programme participants	
RE	Restricted to a group specified by the consortium	
CO	Confidential, only for members of the consortium	

Executive Summary

Deliverable D2.2 is concerned with the identification of the robot's behaviour in the use-case scenario described in Deliverable D2.1 Use Case Scenario Definition, which defines the robot actions, component movements, and sensory cues, and the associated sensory-motor processes specified in the use-case interactions.

The purpose of this deliverable is simply to identify the ROS2 nodes that will implement these actions. It also identifies the ROS2 packages in which the ROS2 nodes will be implemented. The detailed specification of these nodes (the exact functional description, the topics to which the nodes subscribe, the topics on which the nodes publish messages, the services and actions that are advertised and served, and the services and actions that are invoked) is provided in Deliverable D3.1 System Architecture.

Together with Deliverable D3.1, Deliverable D2.2 provides the requirements for work package WP5 on robot behaviours, complementing and augmenting the detailed specification already provided in the work plan.

The dynamics of the interaction between the visitor and the robot are sequenced by the `behavior_controller` node, which executes the XML behavior tree defined in Deliverable D1.2 DEC Tour Scenario Script and Behavior Tree.

This is the first version of the deliverable for the DEC (`pepper4dec`) project. It adapts the corresponding CSSR4Africa Deliverable D2.2 to the Digital Experience Center (DEC) spin-off project: the single DEC tour-guide scenario replaces the original CSSR4Africa receptionist and laboratory-tour scenarios, and the ROS1 `cssr_system` nodes are replaced by the ROS2 nodes of the `pepper4dec` repository verified against the current source tree.

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1 Implementation of Robot Actions

Deliverable D2.1 Use Case Scenario Definition identifies the set of baseline robot actions that are invoked when the robot interacts with the visitor in its role as a tour guide for the Digital Experience Center (DEC). These are summarized in Table 1 below, along with the corresponding ROS2 nodes that implement the robot actions, and the ROS2 packages in which the nodes are implemented. Each node has a set of configuration parameters that, suitably chosen, allow it to produce one or more of the required robot actions.

Deliverable D3.1 System Architecture provides a detailed specification of each ROS2 node. It specifies the node configuration parameters that are read from the associated configuration file, the data that are read from the associated input file, the data that are written to an associated output file, the ROS2 topics to which the node subscribes for input, the ROS2 topics on which the node publishes output, the services and actions that are advertised and served, and the services and actions that are invoked.

The dynamics of the interaction between the visitor and the robot, implemented with these ROS2 nodes and those identified in Deliverable D2.3 Visitor Behaviour Specification, are sequenced by the `behavior_controller` node, which executes the XML behavior tree defined in Deliverable D1.2 DEC Tour Scenario Script and Behavior Tree.

Robot Action	ROS2 Package	ROS2 Node
Animate behaviour	<code>animate_behavior</code>	<code>animate_behavior</code>
Deictic gesture	<code>gesture_execution</code>	<code>gesture_action_server</code>
Display dialogue	<code>behavior_controller</code>	<code>behavior_controller</code>
Iconic gesture	<code>gesture_execution</code>	<code>gesture_action_server</code>
Interactive question answering	<code>conversation_manager</code>	<code>conversation_manager</code>
Locomotion	<code>pepper_navigation</code>	<i>(launch/config)</i>
Look up knowledge-base	<code>conversation_manager</code>	<code>conversation_manager</code>
Navigation	<code>pepper_navigation</code>	<i>(launch/config)</i>
Rotate head to centre gaze on the visitor	<code>overt_attention</code>	<code>overt_attention</code>
Rotate head toward an exhibit	<code>overt_attention</code>	<code>overt_attention</code>
Rotate torso to face visitor and adjust gaze	<code>overt_attention</code>	<code>overt_attention</code>
Speech synthesis	<code>text_to_speech</code>	<code>text_to_speech</code>

Table 1: The robot actions in the DEC tour-guide scenario, and the ROS2 packages and nodes that implement them.

Navigation and locomotion are provided by the `pepper_navigation` package (the Nav2 stack) over a map built and localized by the `pepper_slam` package; both provide their functionality through launch files and configuration rather than a single dedicated node.

Principal Contributors

The main authors of this deliverable are as follows (in alphabetical order).

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Document History

Version 1.0

First version for the DEC (`pepper4dec`) project, adapted from the CSSR4Africa Deliverable D2.2 Robot Behaviour Specification. Replaced the two CSSR4Africa use-case scenarios (receptionist and laboratory tour guide) with the single DEC tour-guide scenario, and kept the CSSR4Africa action-based table layout (one row per robot action, sorted alphabetically), remapping each action to its ROS2 node and package (verified against the source tree) and adding the interactive question-answering action provided by `conversation_manager`. Other DEC changes from the ROS1 version include tour sequencing by the `behavior_controller` node (replacing the `scriptInterpreter` node) and SLAM-based localization in the `pepper_slam` package (replacing the ArUco-marker approach).

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