Title: A multi-modal behavior generator for social robots

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Abstract The static and dynamic realistic effects of the appearance are essential but challenging targets in the development of human face robots. Human facial anatomy is the primary theoretical foundation for designing the facial expressional mechanism in most existent human face robots. Based on the popular study of facial action units, actuators are arranged to connect to certain control points underneath the facial skin in prearranged directions to mimic the facial muscles involved in generating facial expressions.

Keywords Social HRI · Multi-modal Expressions · Behavior Generation · Social Robots

1 Introduction

Social robots have many expression elements for interact with humans. The robot generates multi-modal representations using expression elements appropriate for each robot. Softbank Robotics uses the own software framework named NaoQi to programming and control to their robot platforms: NAO, Pepper, etc [1]. Jibo also has own software framework that can control only Jibo [2].
For developing the application with these robots, the developer uses only robot's software framework or tools. If the robot platform changes, the development method will be changed also. So, many software framework and tools has been developed for the generalized behavior generation for control many robots for reduce these efforts [3]. In this paper, we suggest the multi-modal behavior generator can be used in various social robots. The developer can make many expressions suitable for scenario reflecting the characteristics of robots.

2 Multi-modal Behavior Generator

The behavior generator - shows as fig 1 - consists of 2 layers and 8 nodes. It developed and running on ROS. The behavior has 2 layers that is similar with humans, the one is the expression that executes commands received from the task manager, and other is the expression that always running in backgrounds. The former like as text-to-speech, gesture, move to somewhere, facial expressions, the latter likes as gaze, idle behavior, manage turn-taking.
The task manager that controls domain scenario send the commands (scripts) to behavior generator about the action to be expressed. The scripts include the text-to-speech, objectives and additional expression elements. Table1 shows the example scripts.

Table 1 The example scripts

- data: How are you! <sm=tag:greeting> I am receptionist robot. <expression=happiness> How can I help you? - data: I will guide you to the meeting room. Follow me. <move=waypoint:meetingRoom1> Follow me.

In background of robot, gaze, idle behavior and turn-taking are running continuously. These elements receive the perception results from perception module and the scripts from task manager. And, each element changes the mode by received data.

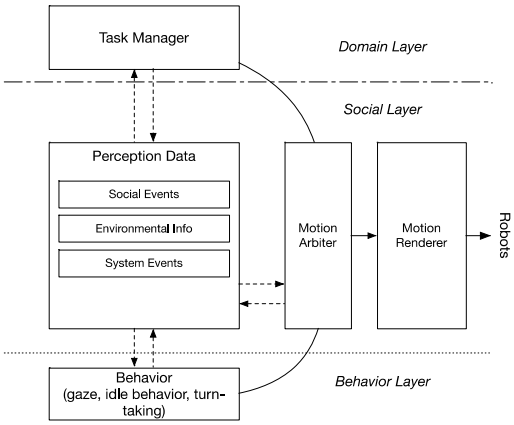

Figure 2 Block diagram for behavior generator

3 Conclusions

In this paper, we develop the behavior generator that can used to indoor service robot Silbot3 and android robot EveR using generalized methods. We apply the same scenario to two different robots and shows the effectiveness of proposed behavior generator. In the future, we will review the effectiveness through the evaluation as the questionnaire. And, we will advance the expression elements.

References

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