Social Relationship Development between Human and Robot through Real-time Face Identification and Emotional Interaction

Video Abstract

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ABSTRACT

We developed an interactive humanoid robotic platform with a real-time face learning algorithm for user identification and an emotional episodic memory to combine emotional experiences with users so that the robot can differentiate its reactions to users according to the emotional history. In this video, it is demonstrated how a robot can develop a social relationship with humans through the face identification and emotional interaction.

CCS CONCEPTS

• **Human-centered computing → Human computer interaction (HCI)**; • **Computer systems organization → Robotics**;

KEYWORDS

Social Robot, Social Relationship, Emotional Interaction

1 INTRODUCTION

As well as the technical growth, societal change of aging period and increase of single-person households demand sociable robots. The core of social relationships is emotional interaction because emotion is the fundamental mean to build the social relationship [1]. Therefore, we developed and demonstrated an interactive robot that is able to build a social relationship with users by learning emotional experiences and showing expressions to them. We expect that this sociable feature will promote user's intimacy with robots.

2 TECHNICAL OVERVIEW

In this study, we developed an interactive humanoid robotic platform named as 'Mybot' as shown in Fig. 1. It has expressive robotic head with facial simulator and arms for emotional gestures. Mybot is able to learn and identify human faces in real-time by incorporating OpenCV libraries with the Haar cascades method for face detection, and ARTMAP [2] for quick face categorization in which

feasible performance can be achieved even with small number of samples. Through a touchable screen, users can pat or bully the robot to make it happy or bad. Through a microphone and speech recognition, users can complement or make fun of the robot with words. For experience learning, the hierarchical emotional episodic memory [3] is applied to combine emotional interactions with users so that it can anticipate prospective emotions in response to the users. Emotions occurred by touch / speech and anticipated by the episodic memory are expressed via robot's facial expressions, arm gestures, and TTS voice.

3 VIDEO DESCRIPTION

The video scenario is as follows. (1) When an unknown user appears in front of the robot, it asks the name of the user and starts face learning. (2) When a normal user appears, the robot nods its head (Korean style greetings). (3) The user pats the robot and gives compliments to the robot, then the robot feels positive emotions and the emotional experiences for the user get stored in the episodic memory. (4) When the friendly user appears again, the robot shows friendly greetings, in which the robot uses arm gestures with a smiling face. (5) Conversely, in this time, a user bothers the robot and makes fun of the robot so the robot feels negative emotions. Then, the negative emotional experience for the user get stored in the episodic memory. (6) When the unfriendly user appears, the robot refuses to interact with the user. (7) However, the unfriendly user develops the relationship through continuous friendly interaction so that positive emotional episodes become dominant experiences.

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Figure 1: The interactive humanoid robot 'Mybot'