A Real-Time Vision-Based Framework for Human-Robot Interaction

Meng Chun Lam\(^1\), Anton Satria Prabuwono\(^1\), Haslina Arshad\(^1\), and Chee Seng Chan\(^2\)

\(^1\) Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor D.E., Malaysia
\(^2\) Center of Signal and Image Processing Faculty of Computer Science and Information Technology, University of Malaya, 53004 Kuala Lumpur, Malaysia
mengchun2020@gmail.com, \{antonsatria, has\}@ftsm.ukm.my, cs.chan@um.edu.my

Abstract. Building human-friendly robots which are able to interact and cooperate with humans has been an active research field in recent years. A major challenge in this field is to develop robots that can interact and cooperate with humans by understanding human communication modalities. Nonetheless, human face is a dynamic object and has a high degree of variability in its appearance, which makes face detection a difficult problem. In this paper, we present a real-time vision-based framework to detect human face and analysis of the human face direction in window area to interact with robot. A cascade of feature detectors trained with boosting technique has been employed. Experimental results using servo motors connect to SD21 and PIC16F887A microcontroller; and the MIBOT Pro have validated our approach. Our future work is to build an intelligent wheelchair whose motion can be controlled by the user’s face direction.

Keywords: Vision-based framework, human-robot interaction, face detection, AdaBoost algorithm, Visual Informatics.

1 Introduction

Advances in technology and robotics are making more concrete the possibility of having domestic robots performing tasks inside one’s home. To date, a wide array of assistive robots is already available for treatment and rehabilitation of temporarily impaired people and for long term care of people suffering from chronic illness. A new challenge can be identified in the possibility of implementing robotic devices which can go beyond the sphere of mere health assistance and help people in everyday activities at home \[4\]. Far from being a matter of functionality alone, the issue of acceptability depends on the psychological implications of Human-Robot Interaction (HRI).

One of most important components to develop a human-friendly robot is visual interfaces, as it facilitates natural and easy interface for human-robot interaction \[7\]. Facial gesture can be a natural way to control a robot. Bakx et al. \[3\] have analysed facial orientation during multi-party interaction with a multi-modal information