

Human Hand Motion Recognition Using an Extended Particle Filter

Chutisant Kerdvibulvech

Rangsit University, 52/347 Muang-Ake, Paholyothin Rd, Lak-Hok,
Patum Thani 12000, Thailand
chutisant.k@rsu.ac.th

Abstract. This paper presents a method to recognize hand motion using an extended particle filter in real-time. We integrate a deterministic clustering algorithm and particle filter together. The skin color of a human hand is firstly segmented by using a Bayesian classifier. Next, during online process, the adaptive algorithm is used to calculate skin color probabilities. By using the online adaptation, this method is able to cope extremely well with luminance changes. After that, we determine the probabilities of the fingertips by using semicircle models for fitting curves to fingertips. Following this, the deterministic clustering algorithm is utilized to search for regions of interest (ROIs), and then the standard particle filter is also performed for motion recognition robustly. Representative experimental results, even when occlusion exists, have been included.

Keywords: Human Hand, Motion Recognition, Extended Particle Filter, Finger Recognition, Online Adaptive, Real-time, Luminance.

1 Introduction

Researches about hand motion recognition are recently and interestingly a popular topic. Consequently, computer vision has been applied to many kinds of application to assist human motion tracking. In this paper, we aim to track the human hand motion and the fingertip positions. It is not easy to achieve for tracking the fingers because some fingers are not stretched out separately. Thus the existing fingertip tracking methods are indirectly applicable to the self-occlusion fingertip tracking as the fingers are usually bent. Moreover, the background is sometimes non-uniform which makes it more difficult for background segmentation. As a result it is more complicated to locate the fingertip positions correctly. Our method for tracking the fingertips solves these problems.

After obtaining the input images, we first segment the hand from the background using a color detection algorithm. To determine the color probabilities of being skin color, during the pre-processing we apply a Bayesian classifier during an offline interactive training phase [1]. Online adaptation of skin probability is then used to refine the classifier automatically using added training images [2]. Following this, we determine probabilities for fingertips by cropping the models of semicircle shape for a