
ABSTRACT

Hand pose recognition is a hard problem due to the inherent structural complexity of the hand that can show a great variety of dynamic configurations and self occlusions. This work presents a hand pose recognition pipeline that takes advantage of RGB-Depth data stream, including hand detection and segmentation, novel hand point cloud description using the novel Spherical Blurred Shape Model (SBSM) descriptor, and hand classification using OVO Support Vector Machines. The system also includes a probabilistic gesture recognition process considering hand pose labels and trajectory features. We have recorded a hand pose dataset of multiple hand poses, and show the high performance and fast computation of the proposed methodology. The system is implemented using Microsoft SDK and is applied in a real and robust medical image navigation application.

1. Motivation

• Recognize hand poses and gestures with high visual variability.
• Introduce the recognition process in an automatic medical image navigation application.

2. System

• Novel Spherical Shape Descriptor

  Weight propagation of shape points within neighbor bins

• Quaternion-based rotation invariance

• Multiclass SVM

• Descriptor results improve state-of-the-art approaches (51 categories) [2]

\[
\sum_{i=1}^{k} w_i w_j + \varepsilon \sum_{i=1}^{k} z_i \geq \delta_i, \quad i \neq j, i, j = 1,..., k
\]

3. Application: medical image navigation

• Interface

• Medical imaging volume data sets [3]

• Application simulation

4. Future work

• Use virtual models to learn objects as a composition of parts.
• Use the same descriptor to learn spatial relations of object parts

References


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