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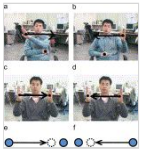
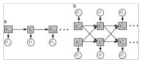
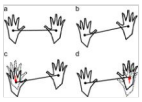
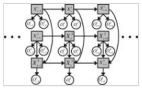

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Pattern Recognition

Volume 43, Issue 9, September 2010, Pages 3059–3072

Hand gesture recognition based on dynamic Bayesian network framework ☆

Heung-Il Suk[a], Bong-Kee Sin[b], Seong-Whan Lee[a]

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Abstract

In this paper, we propose a new method for recognizing hand gestures in a continuous video stream using a *dynamic Bayesian network* or DBN model. The proposed method of DBN-based inference is preceded by steps of skin extraction and modelling, and motion tracking. Then we develop a gesture model for one- or two-hand gestures. They are used to define a cyclic gesture network for modeling continuous gesture stream. We have also developed a DP-based real-time decoding algorithm for continuous gesture recognition. In our experiments with 10 isolated gestures, we obtained a recognition rate upwards of 99.59% with cross validation. In the case of recognizing continuous stream of gestures, it recorded 84% with the precision of 80.77% for the spotted gestures. The proposed DBN-based hand gesture model and the design of a gesture network model are believed to have a strong potential for successful applications to other related problems such as sign language recognition although it is a bit more complicated requiring analysis of hand shapes.

Keywords

Hand gestures recognition; Dynamic Bayesian network; Coupled hidden Markov model; Continuous gesture spotting

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☆ A preliminary partial version of the paper has been presented in the 19th IAPR International Conference on Pattern Recognition, Tampa, USA, December 2008, and the 8th IEEE International Conference on Automatic Face and Gesture Recognition, Amsterdam, The Netherlands, September 2008.

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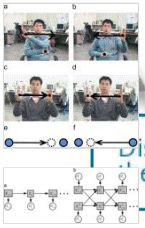

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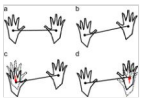

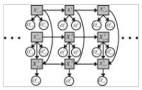

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respectively. Between 2004 and 2005, he was a visiting researcher at the Computer and Vision Research Center in the University of Texas at Austin. He is currently a Ph.D. student in the Department of Computer Science in Korea University. His research interests include machine learning, computer vision, and brain-computer interfaces.

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A Fellow of the IEEE, IAPR, and Korean Academy of Science and Technology, he has served several professional societies as chairman or governing board member. He was the founding Co-Editor-in-Chief of the International Journal of Document Analysis and Recognition and has been an Associate Editor of several international journals; Pattern Recognition, ACM Transactions on Applied Perception, IEEE Transactions on Affective Computing, Image and Vision Computing, International Journal of Pattern Recognition and Artificial Intelligence, and International Journal of Image and Graphics, etc. He was a general or program chair of many international conferences and workshops and has also served on the program committees of numerous conferences and workshops. His research interests include pattern recognition, computer vision, and brain informatics. He has more than 250 publications in international journals and conference proceedings, and authored 10 books.

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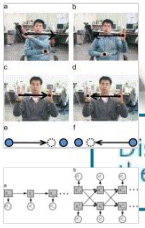
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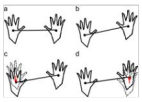
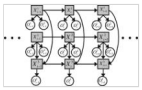

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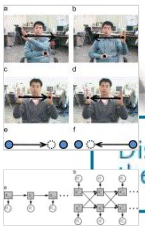
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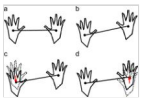
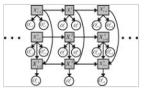

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