Bournemouth University

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# Briefing paper

## Exploiting temporal stability and low-rank structure for motion capture data refinement

Feng, Y., Xiao, J., Zhuang, Y., Yang, X., Zhang, J.J. and Song, R., 2014. Information Sciences, 277, 777-793.

**Currently, motion capture data have been widely used in computer games, film production and sport sciences. However, even with the most expensive commercial mocap systems, there are still instances where noise and missing data are inevitable. This paper presents an effective framework for motion data refinement. The experiment (experimental dataset is published) shows that the proposed method outperforms all competitors not only in predicting missing values but also in de-noising most of the time.**

## Key Findings and Impact

This paper presents a motion capture (mocap) data refinement method. This method is developed based on the low rank property of motion data and proposes to exploit the temporal stability of mocap data. With the low –rank structure and temporal stability property, it finally converts the mocap data refinement problem into a robust matrix completion problem. Thus, a temporal stable and noise robust matrix completion (TSMC) is developed. A fast iterative optimization method is designed to solve the objective function of TSMC model. Moreover, in order to increase the degree of automation for data processing and boost the performance of the TSMC model, an efficient trust data detection method is developed.

Generally, the approach contains two main parts: (1) detect and find out the trust data entries using an efficient trust data detection method and then (2) refine the imperfect data using the proposed TSMC algorithm. Extensive experiments on both synthetic and real data have demonstrated the effectiveness of our proposed technique. Thus, it could be widely used in pre-processing of mocap data to improve the product effectiveness..

## Conclusion

To sum up, in this paper, it aims to solve the motion refinement problem. Firstly, it converted the refinement task into a matrix completion problem and presented a new method that using both the low-rank structure and temporal stability properties of motion data. It also developed a fast optimization method derived from the ALM algorithms to solve the proposed model. Moreover, an efficient trust data detection method is developed to automate data processing and boost the computation performance. Extensive experiments on both synthetic and real data have demonstrated the effectiveness of the proposed method

**Future research**

In the future, we would like to incorporate the human skeleton information, where human motion data contains strong structural information, into our proposed model. In addition, techniques such as key-frame reduction and motion data segmentation can be used with our framework to further improve the speed of our algorithm.

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www.sciencedirect.com/science/article/pii/S0020025514002977