Dance synchronicity analysis using image-based human pose estimation

Proposal for a Master thesis topic (EN)

Problem

Working as a dance Teacher one of the main problems is to get all the students to dance synchronously. It is not an easy task to focus on multiple people at once and to point out the exact moments when they have been out of sync. To dance synchronously, different aspects, need to be evaluated at the same time. For example, position, timing, speed, direction, impulse and a lot of more aspects, that would be hard to analyse mathematically.

Recent research results in Computer Vision and deep learning algorithms have developed a method to determine, estimate and reconstruct multiple human poses from videos. Using these methods, humans can be reduced to a human pose skeleton which represents the orientation of a person in a graphical format. This model is reduced to specific key points of the human body, which must be connected. Another promising and more detailed model would be the reconstruction of the human shape with a mesh recovery.

Research Question

In this Master thesis the subjects dancing and computer vision which seem to be completely different at first glance should be brought together. Computer vision algorithms can be used to detect dancing humans and find a way to quantify their movement into analysable results or scores. The goal of this thesis is to find a way on how to evaluate synchronous dancing of humans mathematically. The evaluation of dance videos should be used to help the teachers to illustrate, in which moments the students are not synchronous.

1. Research

In the first phase of the master thesis further research will be conducted to evaluate what already has been done and explored in this topic. Furthermore, interviews with different dance Teachers will be carried out. Firstly, regarding if there even would be an actual need for this specific analytic tool and secondly which aspects could be interesting to investigate. Also, which could be possible methods to illustrate the differences in their dancing or to show when and how exactly they are out of sync. After the interviews and understanding the underlying problem better, different Pose Estimation algorithms will be experimented and checked for their suitability to this specific task.

2. Development / Prototyping

In the beginning it needs to be decided, what aspects will be investigated, and which programs/algorithms will be used for the development of algorithms. The basic conditions for the analysis videos need to be specified. Test videos must be recorded to build and test the algorithm in a continuously iterative process. Those Videos need to vary in their complexity and synchronicity.

3. Testing

After the algorithm is ready to deliver results the usability will be tested with dance videos of different complexity to evaluate the effectiveness in displaying, how synchronously they dance.

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