André Novak (016017979) – UE Motion Capture - Quantifying human motion and posture (2023W)

Abstract

Music Makes You Move: Analysing Music-Induced Walking Rhythms

Music has the feature to make humans move. The beat of the music forces people to move to it, whether it is free and spontaneous or more coordinated (Burger, et al. 2014, p. 1). While many studies focus on the freely music-induced movements (Burger, et al., 2012 or Eerola, et al., 2006) only few are focussing on walking rhythm induced by music beats. Styns, et al. (2007) analysed walking rhythm alignment to music and found out that synchronization nearly always happens. Even if people had a hard time synchronizing to the music it always had an impact on their walking tempo. They used GPS devices to track the walking speed.

I wanted to take another approach measuring this phenomenon. Using a motion capture setting, I examined how well the participants can align their walking rhythm to different styles of music and how well they could keep it and how long they needed to align. The different music examples (detailed below) were chosen due to their different styles. This makes a comparison between different music genres possible.

For the recording, the six students and the leader of the course "UE Motion Capture - Quantifying human motion and posture (2023W)" at the University of Vienna were asked to find their own walking rhythm for 20 seconds and were then confronted with 3 clips of music (each around 20 seconds long) with 5 seconds silence in between. They were asked to adapt their walking rhythm to each piece of music.

The recording of the experiment took place at the MediaLab of the Faculty of Philological and Cultural Studies at the University of Vienna. Software and cameras from the company "Qualisys" were used for the marker-based recording. (MediaLab, 2023) The framerate was 100 frames per second. Markers which were placed on each heel were chosen for the analysis. Therefore, I defined a step as the position where the value for the Z-axis of each heel reaches its lowest point during regularly movements. For the processing of the captured data, I used the software "Qualisys Track Manager". For the beat tracking of the music clips, I used "Sonic Visualizer and its plugin "INESC Beat Tracker". The analysis I carried out using a Python-script.

The first results of the analysis show that the alignment capability varies between the participants. While some had less problems aligning to all music clips, others had hard times especially with the classical piece. Therefore, it can be said that the alignment to the pop music clips was easier than to the classical one. Especially finding the rhythm for the first music clip was harder than to the last one. When the rhythm was found, it was easiest to keep it with the last music clip.

For such an examination it must be said that the participants were watching each other doing the recording. In this setting they all could get to know the music while watching. I was also part of the participants (already knowing the music) so the results of the 4th participant were analysed considering this. In more extensive research, each participant should do the task on

their own without watching the others. The music clips could be chosen more systematic to include more styles and different BPM-rates to get a broader view on rhythm alignment capabilities to different types of music.

Keywords: Motion Capture, Music, Walking, Beat tracking, Rhythm Alignment

Listing of music clips:

- Rare Earth – Thema. (2018, July 26). *Big John Is My Name* [Video]. YouTube. https://youtu.be/C2RtDp9RTsU?feature=shared&t=36 (0:36-0:56)
- hr-Sinfonieorchester – Frankfurt Radio Symphony. (2021, October 05). *Berlioz: Symphonie fantastique · hr-Sinfonieorchester · Alain Altinoglu* [Video]. YouTube. https://www.youtube.com/watch?v=sdYRYbjCcJg&t=2300s (38:20-38:38)
- The Wombats. (2015, January 15). *The Wombats - Greek Tragedy (Official Video)* [Video]. YouTube. https://www.youtube.com/watch?v=9MHmx9nvHqU&t=27s, (0:27-0:48)

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