Applying new sensitive movement technologies to inclusive gaming

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The EnTimeMent project

EnTimeMent, which stands for ENtrainment & synchronization at multiple TIME scales in the MENTal foundations of expressive gesture, is an EU Horizon 2020 funded project that seeks to develop new technologies that can revolutionize the way in which we analyses and represent movements through computers. Current technologies for motion analysis gather data through cameras, retroreflective markers or body-worn accelerometers and gyroscopes, focusing on the calculation of kinematic parameters such as position and acceleration of different body segments [1]. On the other hand, when we look at another person moving we take into account the whole movement as much as the individual gestures that compose it, the expression on their face, and their posture, This is because human interpretation of movement goes beyond the mere quantification of kinematic aspects and it often focuses on qualitative aspects which are more meaningful to us [2]. Interestingly, many of the clues and events that we use to interpret and make sense of movement happen on different time scales as small gestures integrate in larger movement which gives them meaning. Furthermore, these time scales can also move into the future as we decode the meaning of a movement, predict following actions and adapt our behavior accordingly [3].
The EnTimeMent project is working on the development of new technologies that challenge the paradigm of current computer-based human movement analysis though the integration of sensory information from multiple timescales and sources from motion capture devices to physiological sensors monitoring, heart rate, respiration, muscular and brain activity. The aim is to enable more meaningful interaction around, movement and embodiment that can support people in a variety of contexts from reducing the cognitive load of members of an orchestra playing together, to supporting a person with chronic pain in identifying movement strategies which are potentially harmful.

Potential applications in Inclusive digital gaming

We strongly believe that the technologies developed as part of the EnTimeMent project could have significant applications in promoting disability interactions in digital games. Especially, we would be keen to discuss with other workshop participants the following areas of application.

Promoting inclusivity of current and future interfaces for digital gaming. Current motion-controlled videogames don't allow people with reduced motor coordination to play with others as the system is not able to correctly interpret their movements, resulting in poor and isolating gaming experiences. How could new technologies become better able to analyse and predict the movement of people with disabilities bridging the gap created by different motor capabilities and enabling people to play together?

Developing new serious games with the potential of supporting emotional interpretation of movement. Children on the autistic spectrum can have difficulty interpreting emotional state from gestures and body language. Could novel technology-mediated gaming interactions support children in learning about affective state in a more playful and enjoyable manner?

We would also be interested in discussing opportunities for collaboration with other workshop participants and explore potential new applications for disability interactions in digital games.

References

[1] Lim CH, Vats E, Chan CS. Fuzzy human motion analysis: A review. Pattern Recognition. 2015 May 1;48(5):1773-96.
[2] M. Solanas, M. Vaessen, and B. de Gelder. 2019. Multivariate analysis of affective body perception using postural and kinematic features of movement. In Human Brain Mapping Conference. Rome.
[3] Badino Leonardo, Volpe Gualtiero, Tokay Serâ, Fadiga Luciano, and Camurri Antonio. 2019. Multi-layer adaptation of group coordination in musical ensembles. Scientific reports 9, 1 (2019), 5854.