

Public summary

In this bachelor thesis, the possibility of implementing EMG inside Awear Atlas product was researched at Awear for the bachelor of Industrial Design Engineering at the University of Twente.

Awear is a start-up under Novel T located in the Incubase at the University of Twente. The start up is developing the Atlas system, a system which maps body movements using inertial sensors and alerts the user when needed. The target group from Awear is very broad ranging from people revalidating to people working from home. In this thesis, the focus is primarily on people sitting and then bending forward which causes pain in the lower back.

The Atlas system has no way of knowing anything about the health endurance of the back and thus must give more general feedback. Awear wants to see if using EMG for biofeedback to the atlas system is a method to give more specific feedback to the users.

EMG is the method of measuring muscle activity by detecting the electro potential in the nerves controlling the muscles. EMG is as the hypothesis is that muscle activity, and more specifically muscle fatigue, has a relationship with back pains and can thus be used to prevent back pains.

With the competitor analysis, all competitors were split into 4 groups, discipline, physical limiters, and healing being the traditional competitors such as physiotherapists, back braces or a heating band. Awear is part of the prevention 4.0 group, who combines industry 4.0 with back pain prevention by the means of for example digital twins and big data. With EMG implemented the strengths of prevention 4.0 will become even more apparent with more accurate feedback, although the cons as well with higher battery usage and ease of use suffering severely.

There are already competitors who use the combination of EMG and inertial sensors to map out the human body such as the upright go 2. However these are not yet ready for the global consumer market due to complexity in use or price.

To start with finding a relationship between posture and muscle fatigue a prototype was made. Using three different experiments, in which the muscle activity of the erector spinae and the biceps was measured during both rest, intensive usage and when bend forward, the prototype was tested if it could be used to analyse the relationship between back pain and muscle fatigue. The prototype is able to detect muscle fatigue and can differentiate the muscle activity in erector spinae if the subject is sitting upright or sits bent forward and can thus be used in this future research.

Then to visualise the possible implementation a concept design was made for the implementation of EMG in the Atlas system. The design based of the current design takes follows the current shield in arms theme but swaps the colours to resemble the colours of Awear more closely. This part was finalised with a scenario in which a user uses the product and encounters the problems such as precise placement and calibration.

In conclusion the EMG is a promising technology for Awear however placement and calibration do make emg still user unfriendly. The relationship between muscle activity and back pain still has to be found but can be done in future research.