Redesigning the Attachment Mechanism for Wearable Running Sensor

This bachelor's thesis assignment was done for Wearm AI. To understand the assignment, first, one needs to understand the company's mission and product.

Countless runners suffer from pain or injuries during their running training. To tackle the root cause of these issues, physiotherapists conduct running form analysis. However, to conduct a proper running analysis, the patient must run indoors on a treadmill with the therapist present. The runner then must implement the information gained during the running form analysis into their training.

The current practice of running form analysis is limited as the analysis is done indoors on a treadmill and not outdoors during the runner's training. Therefore, the company Wearm AI is developing a sensor that can be worn on the shoe while running. This sensor can be used to analyse the runner's motion during their training. So, the runner receives continuous feedback on their running form without a therapist needing to be present. This way, Wearm AI enhances running training and gives runners a powerful tool to improve their running form and prevent injuries.

The current prototype by Wearm AI is rather rudimentary. It has not been fully developed yet. Therefore, for this bachelor thesis assignment was to redesign the enclosure of their current prototype.

The focus of this thesis is to redesign the attachment method of the sensor so that it meets the technical requirements, user requirements, and manufacturing requirements.

The technical requirements for the sensor are that it is robust enough to sustain the physical impacts during running and that it can sustain an outdoor environment. Furthermore, the sensor must be attached securely enough to create accurate recordings.

As for manufacturing, the method of choice is 3D printing as it is affordable for Wearm AI and meets the demands of their first product version.

The user requirements for the sensor are that is ensured that the user does not make errors and can understand how to attach the sensor as intended by the designer. It must be avoided that the user makes mistakes when attaching the device as proper attachment is essential for the sensor to function correctly.

Based on the requirements, three concepts were ideated. The three concepts differed in their function. All designs are connected to the shoelaces, but in different ways. The first concept utilised an elastic band, the second a hinge mechanism, and the third a rigid clip.

All concepts were user-tested to investigate their performance with first-time users.

The testing revealed the strengths and weaknesses of the different designs. Based on the observations during the user testing, the attachment mechanism for the sensor was redesigned. The goal of the redesign is to combine the strengths of the different concepts observed during user testing.

The final redesign now needs to be retested by the company to see whether it performs better than the previously tested concepts.

Wearm AI can build on the thesis work to create the final version of its sensor that meets the technical, manufacturing, and user demands.

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