StressLess

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Proposal

Written by Nana

Chosen Track

For our chosen project, we had to pick from one of four module tracks—robotics, socio-ecological interaction, wearables, and artificial intelligence (AI). We looked into each track for possible ideas before deciding to make an informed decision. Robotics is defined as a subfield of mechatronics, electrical engineering, and computer science that studies the conception, design, construction, and operation of robots (Perez et al., 2018). With robotics being such a wide topic, looking at a specific topic seemed like the most logical idea. We looked into the idea of automated robots but ultimately decided against robotics, as it was a topic everyone in our group had explored beforehand, having made a Braccio Arm robot and more, and we'd rather branch out. AI and socio-ecological interaction were the next tracks we explored; Perez et al. (2018) define AI as the science of enabling machines to do tasks like logic, reasoning, planning, learning, and perception. Socio-ecological interaction refers to the interdependencies between people and their environment (Aarts, 2020). With issues like climate change, extreme events, disruption of biogeochemical cycles, biodiversity loss, deforestation, and desertification, to mention a few, actions need to be taken by people through means of technological devices, ecological interventions, and value orientations to solve these ecological challenges. Though both tracks were extremely extensive and allowed for flexibility, we settled on wearables because we wanted to explore a new avenue of technology, and as a group, wearables was the only track that was a completely new concept to us all.

Concept

Wearables are technologies or electronic devices that can be worn on the body, either as part of clothing or as wearable accessories (Xue, 2019). As of recently, they have grown in popularity, especially in 2015, after Apple released the Apple Watch, though smartwatches had been around for over a decade at that point. They have also been implemented in more sectors, such as healthcare, education, athletics, and security, since they are practical and convenient. We were particularly intrigued by the usage of wearables within the field of healthcare. Wearables have become much more popular within healthcare, with examples of this being insulin patches, blood pressure wristband monitors, and sleep monitor wristbands. For this reason, we felt making our project health-related would be worthwhile and beneficial.

In addition, we felt the topic of wearables linked to one of the topics for the semester, ubiquitous computing, very well. Ubiquitous computing is defined as the ubiquity of information technology and computer power, which, in theory, pervades all everyday products (Friedewald & Raabe, 2011). This relates to wearables, as they are integrated into our everyday lives so seamlessly that they've faded into an afterthought. They are also available to use at any given time since they are almost always worn. With these two qualities, wearables fulfil the two main characteristics that make a device ubiquitous computing, according to Weiser (1991): transparency and ubiquity. Hence, our project would be supported by in-class knowledge and activities that could improve the overall quality of our project.

The project "Immaterials: Light Painting WiFi" by Timo Arnall, Jørn Knutsen, and Einar Sneve Martinussen inspired us with the way they reveal the hidden aspect of WiFi through long-exposure photography. In this way, their project links to ubiquitous computing, as Wi-Fi has been integrated seamlessly into our daily lives, with most of our devices needing Wi-Fi to function. With it being such an essential part of life, it has essentially faded into the background despite its importance. This project shows how people can use Wi-Fi to interact with physical space with a weaker signal (hence fewer lights) when more buildings are blocking the signal. Similarly, our project will inform people of their stress levels, which is hidden information, and bring it into the light.

Like with any piece of technology, wearables come with their challenges, ranging from ethical to health equity (Canali, Schiaffonati & Aliverti, 2022). Research shows that privacy risks are one of the biggest concerns for wearable devices because of the constant monitoring of data (Xue, 2019). We plan to avoid this issue by storing the data remotely with multiple security measures in place, like encryption of data. Additionally, another concern is environmental damage caused by the increased usage of wearable devices. Resource depletion, e-waste, and water consumption are all growing issues caused by digitalisation (Ghoshal, 2024), and creating wearables will only exacerbate the problem. We would combat this by implementing a recycling initiative for our device. With all these things in place, our wearable project and wearables in general could become a valuable part of everyday life.

Goals

We aim to create a working wearable wristband, similar to fitness watches, by the end of our project. This wristband will measure the wearer's skin temperature to then use these readings to detect the wearer's stress levels and send an alert to the user via the flashing light embedded within the wristband. This will then show users breathing exercises they can do to help reduce stress again through the light turning on and off. On the wristband, there will also be embroidery to act as a fidget toy. Our device will be geared towards young people, especially those in higher education.

A study done in 2022 discovered that young persons aged 18 to 24 were more likely to experience moderate to severe stress, sadness, and anxiety symptoms (AXA, 2023). As university students ourselves, we also understood on a personal level how stress (academic or

otherwise) can build and develop into health issues such as hypertension. Most young adults would use our wearable devices to tell them they are getting too stressed and would then be shown a breathing exercise to help them calm down. We also hope to create an app that will link to the device. For both our app and wristband, we intended to have simple, aesthetically pleasing, and easy-to-interact user interfaces (UIs) in order to meet the wants of our target audience.

Timeline – Nana

Gantt Chart (Downwards: Weeks, Across: Tasks)

10/03 = Check-in, 07/04 to 28/04 = Easter Break, & 12/05 = Final Presentation

	Project Proposal	Research	Design Iteration	Design Testing	Practical Outcomes	Reflection
27/01						
03/02						
10/02						
17/02		Prototype 1				
24/02						
03/03						
10/03			Prototype 2			
17/03						
24/03						
31/03						
07/04						
17/04						
21/04						
28/04						
05/05						
12/05						Final Piece
19/05						

Methodology

The timeline of our project suited the spiral methodology, as we combined waterfall methodology and prototyping, so we created a Gantt chart to represent it visually, which is often used to represent waterfall methodology. This meant that we could develop the project iteratively by making multiple prototypes instead of jumping straight into the project with little understanding of what we were creating, while having a clear, continuous, and successive structure.

Waterfall Methodology is defined as a sequential management style for a project, getting its name from the chronological, cascading order similar to a waterfall (IPM, 2022). As a group, we appreciated the clear succession and division of tasks and decided we wanted this for our timeline, as it would help us stay on top of the work needed to be completed because of the definiteness of what task needed to be done when. In addition, we also felt that prototyping iteratively would be the most practical way to construct our device so that after each prototype, we could decide as a group what worked well and how to implement that within the next prototype; users can also be looped into the process, testing and informing us of their thoughts on the prototype for a user review. Spiral Methodology combines these two concepts to have a software development process that integrates iterative and incremental development. This is exactly how we wanted to complete this project, so we chose to use spiral methodology.

Deliverables (Done By)

Phase One:

- Hardware and Software Research: 23/02/2025
  Research appropriate sensors (e.g., heart rate monitors, galvanic skin response sensors) and real-time data processing software. Consider platforms like Arduino, Raspberry Pi, or custom-built scripts for data collection and visualisation. Determine hardware needs such as microcontrollers, Bluetooth modules, and haptic feedback components.

- Design/Aesthetic Research: 23/02/2025
  Explore ergonomic designs and materials for comfort and wearability. Investigate visual styles for stress level feedback, such as LED patterns or app-based interfaces. Review similar wearable health projects to enhance the aesthetic and functional aspects of the wristband.

- Prototype 1: 23/02/2025
  Create initial sketches of the design and make 3d models based on the sketches for the project.

- Use Case Development: 27/02/2025
  Define user interaction scenarios, such as monitoring stress during work, exercise, or relaxation. Identify target users and environments like offices, gyms, or meditation

spaces.

Phase Two:

- Prototype 2: 06/03/2025
  Develop an initial prototype that captures basic heart rate and stress data and visualises it through simple LED indicators or a mobile app interface. Implement real-time data tracking and improve signal accuracy.

- User Testing 1: 07/03/2025
  Conduct preliminary testing with a small sample of users to gather feedback on comfort, usability, and data accuracy.

- User Review 1: 07/03/2025
  Analyse feedback and identify areas for improvement in both hardware and software functionality.

Phase Three:

- Final Code: 10/04/2025
  Implement all optimisations, bug fixes, and final adjustments to the software and hardware components.

- Final Testing: 11/04/2025
  Perform comprehensive system tests to ensure accurate data collection, seamless connectivity, and effective feedback mechanisms.

- Final Adjustments: 19/04/2025
  Conduct an in-depth analysis of the project's success, challenges faced, and potential future improvements. Document user feedback and explore opportunities for expanding functionality or integrating new sensors.