Pervasive Media - Week Four

SensorViz Exercise

Key stages:

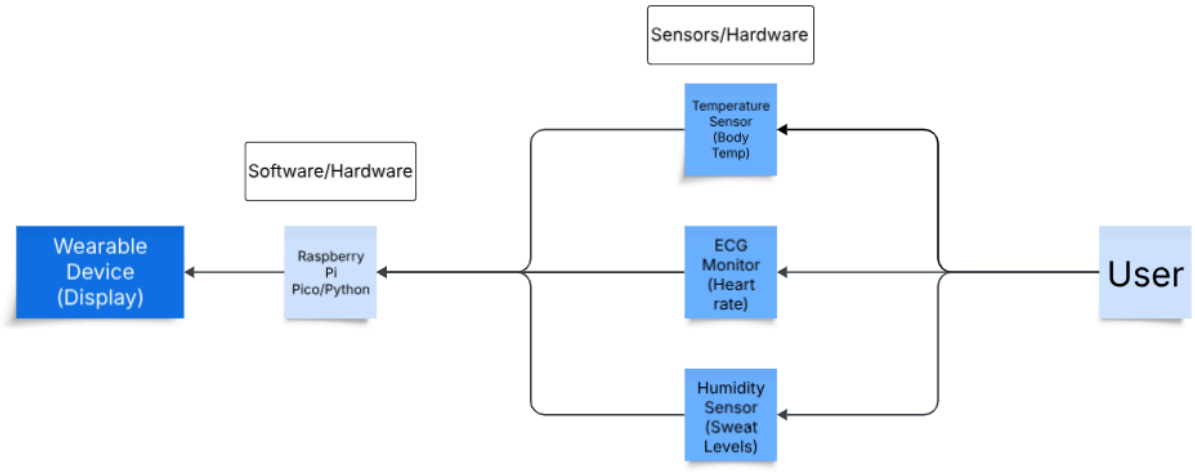
1. Identification of problem: Consult each sensor's datasheet in order to understand their behaviour. Due to the complexity in data collection, makers may decide to collect data by wiring it. Coding for each sensor to determine which sensor is the best suited. Data presented in a graph or data format, not 3D.
2. Project proposal: SensorVis: a visualisation tool for novices that can be used within the prototype stages to visualise data in a 3d editor and an AR overlay; real-time updates -> fast design iteration, allows users to choose which sensor is the best
3. Similar project research: they looked at the components, similarities, differences, etc., and compared them to their current proposal and implemented them. After noticing the gap in the market for projects that included spatial information, they decided to implement this into their project. Situated visualisation: They noticed that situated visualisation was implemented through providing augmented tools; they decided to alternatively implement situated visualisation through supporting electronic components. Another project implemented predefined graphics into their project, something they did not align with due to their contextualisation as a learning environment rather than prototyping their project basis.
4. Formative study: Common themes between each of the pre-existing projects and what to improve upon depending on this; additionally, what users found issues with.
5. Project concept (final definition): Datasheet visualisation aimed at makers who found issues on pre-existing projects, aimed at the early stages of prototyping, directly from the datasheet. Explores which ones are most suitable for their prototype.
6. User study (quantitative results): 12 people were given a task as participants to create a study lamp using the components given, and they had to add four extra features. Half the participants were tasked to create this using SensorViz, and the other half, without. Sensorviz results were shorter in time and completed the task to a higher standard.
7. User Study (Qualitative Results): Positive feedback received.
8. Summary: Addressed the problem they wanted to solve and explained how their project did this and illustrated how their project improved the users' lives.

Application to our project:

a) Our project is a wearable device that aims to visualise stress levels, taking in factors using sensors such as body temperature and ECG to conceptualise the users' stress. SensorViz also uses sensors, but to scan the users' prototype and then help them conceptualise it as a 3D model and correctly add on sensors where necessary.

b) For our project, all the data being used will be sourced from user testing and online sources like NIH, also known as the National Library of Medicine (Shaffer & Ginsberg, 2017), to refine our primary data.
c) i. Potential Tools – For 3D visualisation, we discussed using Blender, as we have previous experience with it, and it is an easy 3D modelling software to work with in general. ii. To collect data, we were deciding between Arduino and Raspberry Pi, as they are both suitable for using multiple sensors, and we have prior experience with them, so we wouldn't need to learn how to use them. We settled on Raspberry Pi because it was smaller, more portable, and more capable of running complex tasks like real-time processing. iii. Our device will need to do real-time processing to read the data the sensor is getting from the user and then use that data to measure their stress level.
d) With more time, we would have tried to incorporate machine learning into our device to make the stress level monitor more accurate, but unfortunately, with the given time frame, that isn't possible.

System Workflow



Reflection and Next Steps

a) We still need to decide on what output the user will get from the device so they know their stress level is too high.
b) Converting the real-time data we will receive from the user into stress levels will be a complex task and we'd need to make sure this process won't be too much for the Raspberry Pi to take on.
c) We will probably use tutorials that use both an ECG monitor and a Raspberry Pi in collaboration to gain more insight into how to do this process.

References

- Shaffer, F., & Ginsberg, J. P. (2017). *An Overview of Heart Rate Variability Metrics and Norms.* Frontiers in public health, National Library of Medicine, 5, 258. (Online) Available At: https://doi.org/10.3389/fpubh.2017.00258 [Accessed: 27/01/2025]
- Yoonji Kim, Junyi Zhu, Mihir Trivedi, Dishita Turakhia, Ngai Hang Wu, Donghyeon Ko, Michael Wessely, and Stefanie Mueller. (2022). *SensorViz: Visualizing Sensor Data Across Different Stages of Prototyping Interactive Objects.* In Proceedings of the 2022 ACM Designing Interactive Systems Conference (DIS '22). Association for Computing Machinery, New York, NY, USA, 987–1001. (Online) Available At: https://doi.org/10.1145/3532106.3533481 & https://hcie.csail.mit.edu/research/sensorviz/sensorviz.html [Accessed: 27/01/2025]