Seminar 2: Requirement Identification

Task 1: Functional and Non-functional Requirements

Use the Volere template to identify functional and non-functional requirements from https://spectrum.ieee.org/looking-through-mojo-visions-newest-ar-contact-lens

Summary

Mojo Vision AR contact lenses (Perry, 2022; Boyko, 2022)), in prototype stage and awaiting U.S Food and Drug Administration approval. It is a smart lens with built-in display that provides information in a timely manner to provide relevant notifications and answers. Mojo Vision uses the concept of Invisible Computing (Microsoft, 2022) that deals with the militarisation of computing devices as to become “invisible” to the user.

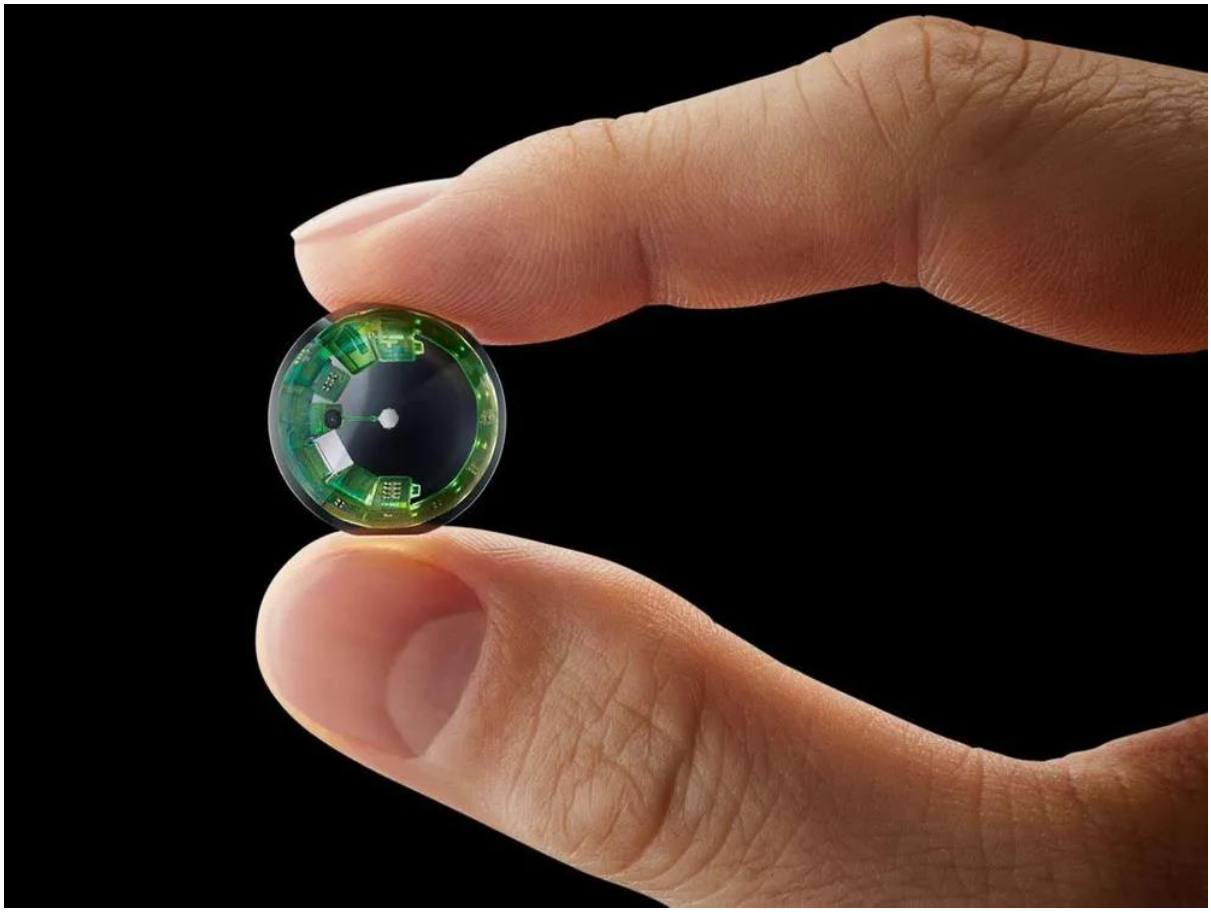

Figure 1 Perry, (2022)

Functional Requirements

Table 1 functional Requirement #1 (FR-01)

Volere Template	**Description**
Description	The product has the highest possible LED display for images and navigation.
Rationale	To provide the wearer with crisp, clear, and sharp images
Author	Michael Justus – Chief Engineer
Criterion	The lens has upwards of 8000 pixels per square inch.
Dependencies	Manufacturing process for micro-LEDs
Created on	27 March 2022

Table 2 Function requirement #2 (FR-02)

Volere Template	**Description**
Description	The lens provides relevant information when required by the wearer.
Rationale	To enable the wearer to access real-world information on-demand.
Author	Michael Justus – Chief Engineer
Criteria	Accessing basic information such as maps or compass and text messages from the wearer's connected mobile phone.
Dependencies	Invisible Computing Platform Mobile App Integration

Volere Template	Description
Created on	27 March 2022

Non-functional Requirements

Based on the Volere template, the following non-functional requirements are available to choose from: Look and Feel, Performance, Maintenance, Security, Cultural, Compliance, and Operation and Environmental.

Table 3 Non-function requirement #1 (NFR-01)

Volere Template	Description
Description	Augmented reality information display is unobtrusive to the wearer's normal operating vision.
Rationale	The AR lens is designed to *enhance* a wearer's real-world context. Allowing an unobstructed world view while presenting useful notifications and information to a wearer allows for stress-free acceptance of the product into a wearer's day-to-day activities.
Author	Michael Justus – Chief Engineer
Criterion	The lens presents information when a wearer's eye lines up with calibrated crosshairs.
Dependencies	Invisible Computing Platform
Created on	27 March 2022

Table 4 Non-functional requirement #2 (NFR-02)

Volere Template	**Description**
Description	The battery lasts for at least two hours.
Rationale	To allow wearers to obtain benefit while leveraging the product for activities such as a short walk, hike or movie.
Author	Michael Justus – Chief Engineer
Criteria	The battery maintains a charge for at least two hours with all contact lens electronics running at full usage.
Dependencies	None.
Created on	27 March 2022

Task 2

Identify data structures to address functional and non-functional requirements from Task 1.

Selected data structures to contain data of the requirements above:

Requirement	**Data Structure (and justification)**
FR-01	Floating points and Matrices – used by the gyro meter to track the users eye position in 3D space (Ghose et al, 2020) Bitmap data – to display images via the micro-LEDs onto the wearer's retina. Preferably use NumPy's array structure (Van der Walt et al., 2011)
FR-02	Byte Array – contains secure ID used to establish a connection to the contact lens' peripheral bridge connector worn around the wearer's neck (Van der Walt et al., 2011)

Requirement	Data Structure (and justification)
	Floating point – used to establish a data transmission band on the 5GHz wireless transmitter. Stack – to support navigation activity through several apps
NFR-01	Strings – wearer information obtained at time of order, to be stored securely Floating points – contain several dimensions of the wearer's eyeball surface structure. Also used to measure for an expected minimum of light passthrough.
NFR-02	Floating points – to support accurate battery level measurements beyond mere whole numbers. List – used to store history of battery performance for the duration it was worn.

References

Abeykoon, V., Perera, N., Widanage, C., Kamburugamuve, S., Kanewala, T.A., Maithree, H., Wickramasinghe, P., Uyar, A. & Fox, G., (2020). Data engineering for hpc with python. EEE/ACM 9th Workshop on Python for High-Performance and Scientific Computing (PyHPC):13-21.

Boyko, C. (2022). Mojo Vision Reaches Significant Development Milestone for Smart Contact Lens. Available from https://www.businesswire.com/news/home/20220330005140/en/ [Accessed 27 March 2022]

Ghose, U., Srinivasan, A.A., Boyce, W.P., Xu, H. & Chng, E.S. (2020). PyTrack: An end-to-end analysis toolkit for eye tracking. Behavior research methods, 52(6):2588-2603.

Microsoft, (2022). Microsoft Invisible Computing. Available from https://www.microsoft.com/en-us/research/project/microsoft-invisible-computing/ [Accessed 27 March 2022]

Nagpal, A. & Gabrani, G. (2019). Python for data analytics, scientific and technical applications. 2019 Amity international conference on artificial intelligence (AICAI):140-145).

Neurauter, R., Hergel, P. & Gerstmayr, J. (2021). Evaluation of Inertial Measurement Units for Short Time Motion Tracking. In International Design Engineering Technical Conferences and Computers and Information in Engineering Conference 85468:V009T09A045..

Perry, T., (2022) Looking Through Mojo Vision's Newest AR Contact Lens: With batteries, motion sensors, and a microLED on board, Mojo lets me try out its first apps. Available from https://spectrum.ieee.org/looking-through-mojo-visions-newest-ar-contact-lens [Accessed 27 March 2022]

Rice, B., Jones, R. & Engel, J. (2017) Behaviour Driven Development. Available from https://behave.readthedocs.io/en/stable/philosophy.html#the-gherkin-language [Accessed 24 Mar. 2022]

Van Der Walt, S., Colbert, S.C. & Varoquaux, G. (2011). The NumPy array: a structure for efficient numerical computation. Computing in science & engineering, 13(2):22-30.