MobileHCI'22

CUSMO: Customizable and Modularized Smart Glasses for Future Mobile Realities in Everyday Life

01 INTRODUCTION

Mobile devices have greatly supported information and communication needs in daily tasks, but they also contribute to a notorious phenomenon, phubbing. The advent and popularity of wearable devices present an opportunity to solve this problem. We propose **CUSMO**, a customizable and modularized smart glasses for future mobile realities. We used a storyboard to describe the core functions and use scenarios of our envisioned utopian mobile realities with smart glasses in future everyday life.

Specifically, we consider use scenarios in work, transport, health management, social contact, travel, location sharing, and video sharing, and describe our envisioned use of smart glasses in these contexts (see Fig. 1). The proposed customizable and modularized product design and user experience design are firmly aligned with actual user requirements, providing insights into the future design of smart glasses.

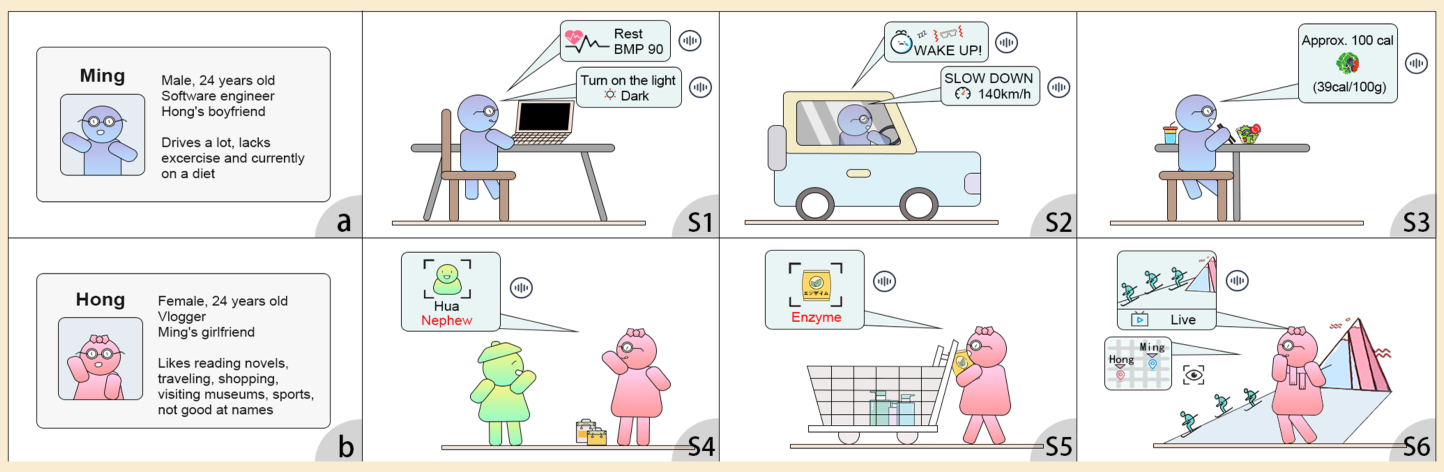

Fig. 1: Persona and storyboard showing the envisioned utopian mobile realities with smart glasses in future everyday life: (a) persona of Ming and his use of smart glasses in (S1) work, (S2) transport, and (S3) health management; (b) persona of Hong and her use of smart glasses in (S4) social contact, (S5) travel, (S6) position sharing and video sharing.

02 METHODOLOGY

We collected product review data about Huawei Eyewear III from Huawei's official store on JD.com, and refined user requirements for this product and smart glasses in general. We pre-processed the data (N=506) to exclude data that is not closely related to user requirements of the product itself, including content about online shopping services, logistics, and product price fluctuations. After the pre-processing, some questions were repeatedly coded in several subcategories (see Fig. 2). We summarized user requirements of product design (PR) as well as usability and user experience (UR), and incorporated them into our product and user experience design.

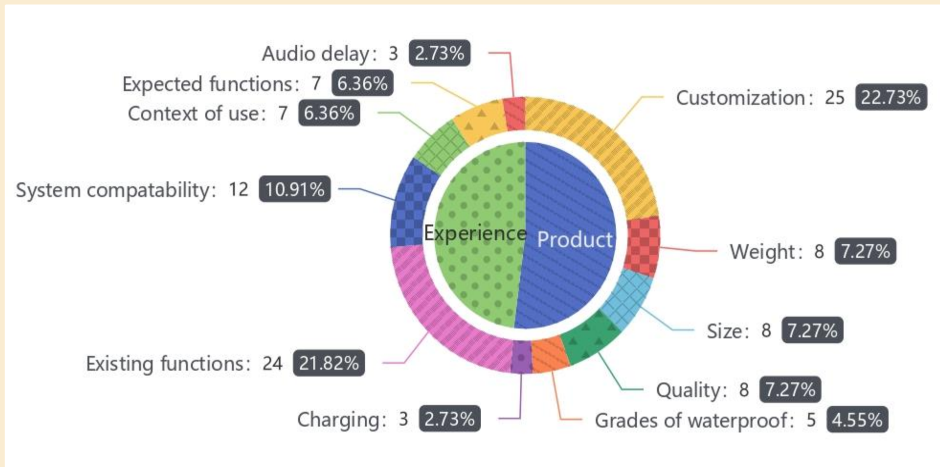

Fig. 2: Analysis results of Huawei Eyewear III review and inquiry data on JD.com

USER REQUIREMRNTS

PR1: Support customizable and universally compatible accessories. This is to meet different groups' needs of lenses, appearances (frames) and sizes.

PR2: Improve the waterproof grade, at least ensure that sporty users do not have to worry about the impact of sweat on glasses.

PR3: Reduce the weight. Although the results do not confirm whether the glasses are overweight, the lighter the glasses are, the more user-friendly.

UR1: Improve the battery time.

UR2: Support for use in different contexts.

UR3: Visual capture and augmentation.

UR4: Health assistant.

03 DESIGN

Product Design. We aimed to design highly customizable smart glasses with high performance, low latency, and low power consumption. In the meantime, we will try to make the product as light and ergonomic as possible.

Our proposed design adds a camera, two sensors, and an optional screen display to achieve users' desired functions. To increase the battery time of the glasses without adding weight, we designed a detachable power supply module (see Fig. 3).

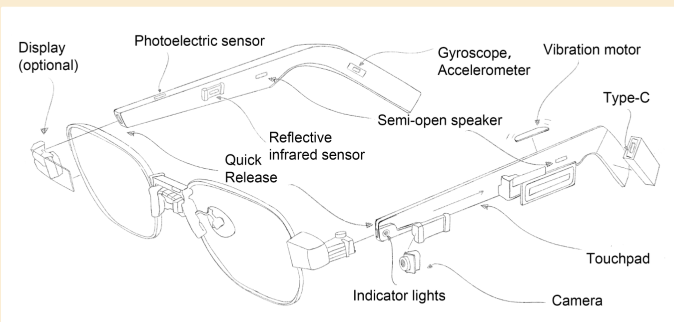

Fig. 3: Product design of the smart glasses.

User Experience Design. We explained the user experience of the smart glasses design based on Norman's three-level model of emotional design [2], namely Visceral, Behavioral, and Reflective.

Visceral	Behavioral	Reflective
* It refers to the perceptible qualities of the product and what sense it brings to users. It aims to construct emotions to improve the general appeal. * The visceral level of the user experience of smart glasses starts from senses, including touch, sight and hearing.	* It relates mainly to the functionality, comfort and convenience of the product. * For functionality, we considered several use scenarios of smart glasses and users' expected contexts of use.	* It refers to the enjoyment of spiritual enjoyment for personal satisfaction. * The user experience design of smart glasses needs to consider customization and entertainment.

04 IMPLEMENTATION

Light Detection (S1). A digital light intensity sensor is included in the product design to identify ambient light intensity.

Heart Rate Detection (S1). We transferred the analog signal to Arduino and converted it into digital signal through the reflective infrared sensor on the user's earlobe, and calculate the value of heart rate.

Driving Fatigue Detection (S2). Similar to the spinal health monitor in Huawei glasses, we applied this in the driving scenario to monitor drivers' physical status and to avoid accidents caused by driving fatigue.

Vehicle Speed Detection (S2). Combined with the accelerometer speed detection, we alert users if they are speeding.

Food Calorie Detection (S3). We implemented image-based object detection for food and obtained the associated calorie information from existing database.

Relative Recognition (S4). We trained a model based on collected face image data, and provided relationship information based on face recognition.

OCR Image Text Translation (S5). We implemented the image text recognition based on text matching and provided the translation audio output.

Live Streaming(S6). We developed a video chat function that supports different resolutions, which is the fundamental technology for live streaming.

Location Sharing (S6). We proposed the display of location sharing using the extended screen display, and implemented the physical design in our prototype.

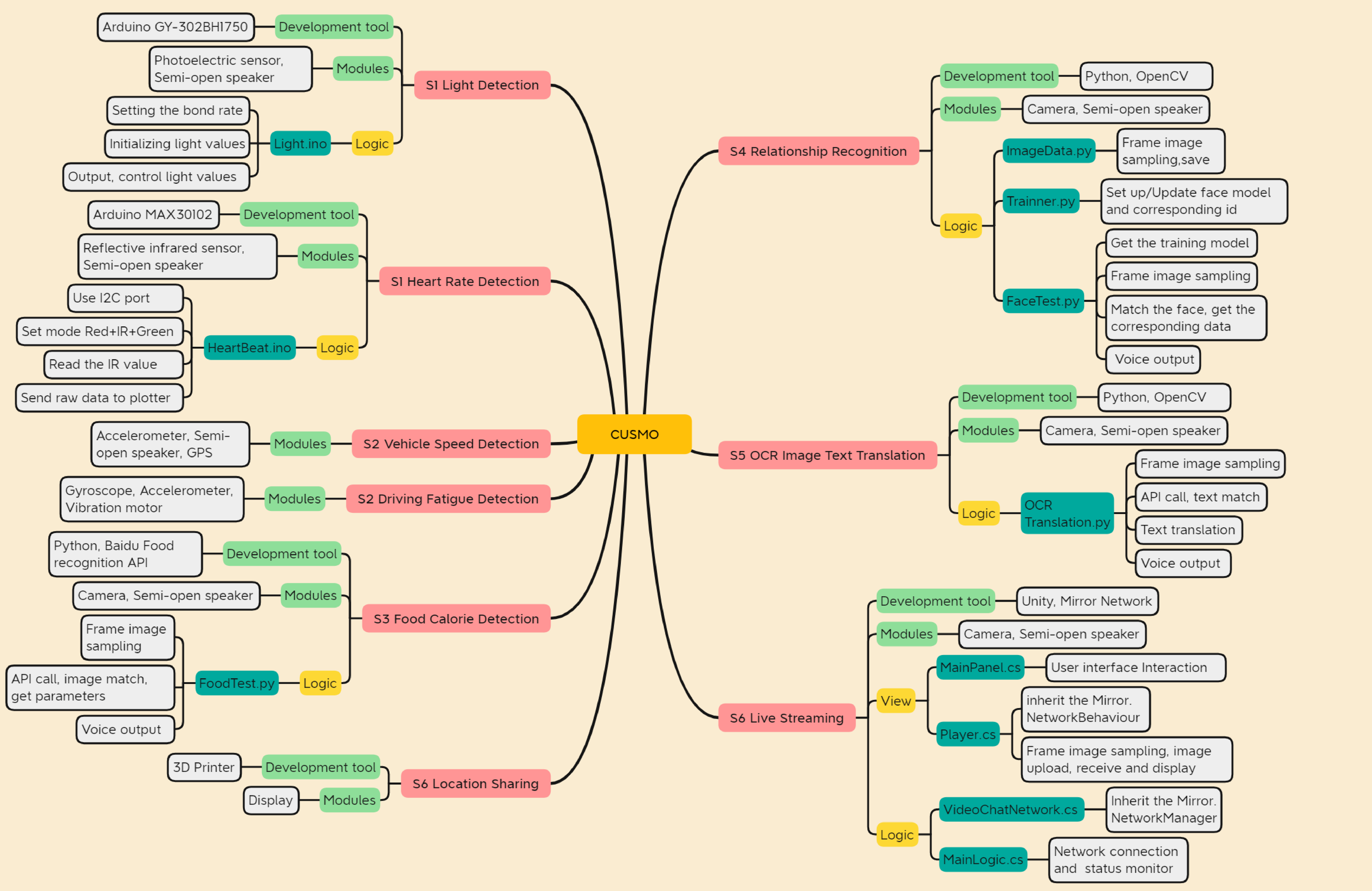

Fig. 4: Mindmap of implement functions (source code available GitHub[1]).

[1] https://github.com/Axiosly/CUSMO/

05 CONCLUSION & DISCUSSION

Our research makes two main contributions:

1. We implemented the daily functions used in **work, transport, health, social contact, travel, position sharing and video sharing** in smart glasses to bring convenience to future life.
2. Our requirement analysis and conceptualized scenarios will provide insights into the future design of smart glasses.

In addition, our product design and user experience design strongly support the identified design requirements and are closely related to daily life use. In the future, we would like to investigate these through further implementation and evaluation.

References

[1] Item.jd.com. 2022. Huawei Eyewear III. [online] Available at: <https://item.jd.com/100030842176.html> [Accessed 22 September 2022].

[2] Donald Norman. 2002. Emotion & Design: Attractive Things Work Better. Interactions Magazine 9 (07 2002), 36–42. https://doi.org/10.1145/543434.543435

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