Villanova University

Contact Lenses for the Future

CorneAR

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Project Definition

Introduction

Contact lenses are universally used by those who need glasses. They are a convenience when compared with regular seeing glasses, because they are not apparent to other people. Many people who are in need of either of these products would prefer to wear contacts because of ease of access and its invisibility. The purpose of CorneAR is to add to this convenience by adding augmented reality into the lenses of these contacts. This will allow for even more functionality of this everyday product. The motivation for this project comes from the desire for further research of microtechnology and integration. Being able to create such a small device that would be able to fully function inside a human eye, which is a very sensitive part of the body, would allow for technology to bridge the gap between external and internal technology.

There has been prior research in this area, but it is cost-ineffective for large-scale reproduction. CorneAR has been designed with budget in mind, so that mass production is completely feasible.

This project aims to create a fully functional set of contact lenses which contain a projector onto the viewing surface which will tell its user critical information about their body and surroundings.

Objective

With CorneAR, we plan on creating a contact lens which contains enough technology to create a projection on the frame of the lenses. We plan on doing this by having a projector on the side of the lens which will be able to project onto the surface. This module will connect to the power supply as well as the computing chip with conductive but human-safe wiring.The computing chip will make calculations to figure out the geometry of the surroundings and where to project information to make it look realistic. We also plan on including a biometric reader so that the contacts will be able to supply its user with information about their bodies, such as body temperature and heart rate among others. All of this must be contained within the contact lenses themselves.

Specifications / Restraints

Since regular contact lenses have a 15mm diameter, CorneAR will have a similar structure. Contact lenses also typically have a thickness of ~80 μm, meaning that the components that we utilize will have to be much less than that to be safely inserted into the product. We believe that at this point, we will be able to create components that fit these requirements.

Methodology

Feasibility Analysis

We have two main approaches to this project. The first one is a more disposable set of contacts. They are meant to be tossed away after each day, which is typical for many types of contact lenses. The technology in them will not be very advanced, and will not create excess waste. Second, there is a more durable pair which is meant to be worn for a much longer time. Currently unsure of how long they will be able to keep active for, but a month's worth of use is a feasible target.

	Pros	Cons
Disposable	- Disposable after one day of use - Cheaper to produce	- Will contain less technology, meaning less functionality - May be wasteful
Durable	- Meant for a month's worth of use - Will contain more technology inside, meaning more functionality	- Could get ruined over the course of a month - Costly

Due to the increased functionality of the durable pair, the main research and data is based on this design.

Proposed Approach

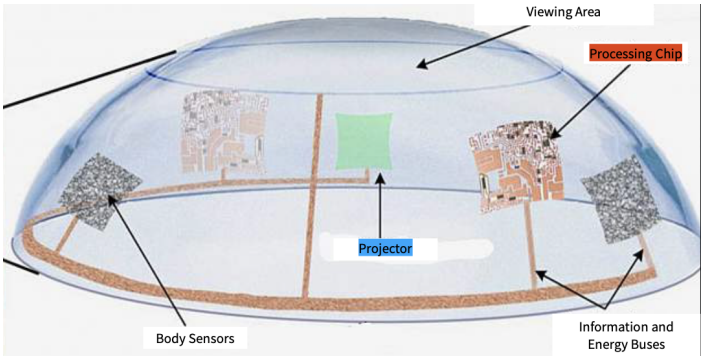
We propose to create a pair of contact lenses which will last the user about a month. The chips will be integrated underneath the surface of the lens. By creating an intermediate layer in the lens, we are also able to adjust contact power since we can move individual sections of the lens for adjustment.

The lens features two processing chips and two body sensors. This is to make sure that the data is processed as quickly as possible while also maintaining a low weight. Producing AR effects takes a lot of CPU load, so having at least two chips simply for computing is essential.

The body sensors are for detecting bodily functions. They are not meant for complete biological accuracy, rather a somewhat-accurate test, like most smartwatches on the market. This will be clear when the product ships.

The projector is only on one side of the lens and will be able to create a complete picture on the viewing area. The light being emitted will not be harmful in any way.

All of these components will be safe to be implemented inside the human body and eyeballs. The majority of our testing will be performed in order to ensure this fact.



Non-technical Aspects

The mission of CorneAR as opposed to competing groups is affordability. CorneAR will be as accessible as can be. By creating the more durable pair as well as the disposable pair, we hope to give the most variety and everyone access to at least some form of CorneAR.

All of our facilities are 100% solar-panel powered. Our facilities contain garbage, recycling, and composting bins to most efficiently sort our waste. Our packaging for these products is fully recyclable and sustainable.

We are collaborating with Seva (the national eye-care charity) to donate some of our profits to their cause. We are also FDA approved.

Administration

Major Tasks

Our first major task is funding. We hope to secure as much funding as possible to have as much flexibility as possible when it comes to the creation of this project. We plan on securing funding by proposing our idea to as many investors as possible. Joseph will be searching for investors and giving presentations.

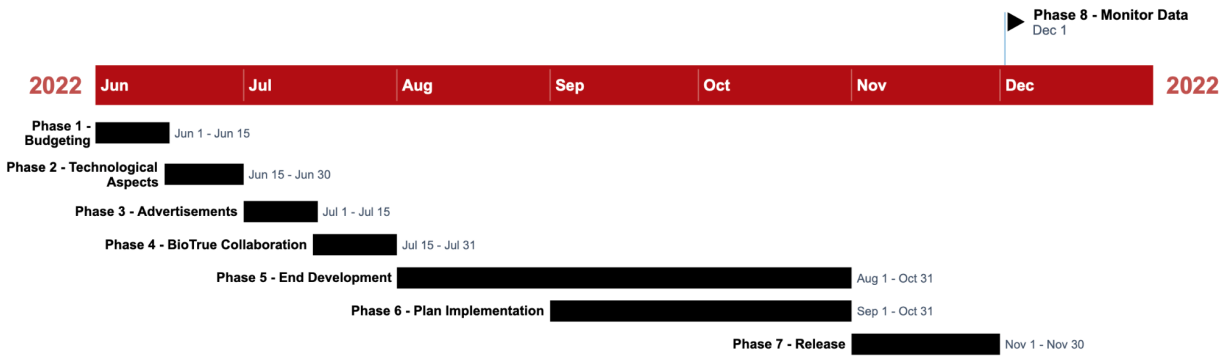
The next step is creating a software development team. By estimates, approximately ten people are required to code this project. Peter will search for members and lead this team. This process will begin after sufficient funds have been secured.

After the project has been completed, advertisements will be put into use in order to market the product. Virtual and physical advertisements are going to be used. Peter will lead this effort. The website, created by one of our lead software developers, contains a short and user-friendly video on how the product was designed and hands on representation of the features it contains. It also includes an option to purchase the contact lenses online. A social media campaign is also going to be launched on platforms such as Snapchat, Twitter, and Instagram which simply expands product awareness. Lastly, there will be a small group of representatives from the development team that will travel to an AMA conference (American Medical Association) where we will launch the idea to medical professionals and expand our target market by thoroughly explaining how the product works.

Finally, the product will be implemented into the market. Joe will reach out to pharmacies, supermarkets, and any other distribution centers to sell the lenses.

This will all be completed by the beginning of 2023.

Schedule



This timeline portrays the complete timeline of events in the creation of CorneAR. Additional aspects of the project have been planned in this timeline. Development will begin in August and testing will begin in November.

Budget

The budget is based on the needs of the creators. The planned amount that the workers will be paid is $50 an hour. This will be about $50,000 in total for all of the months in which they are recruited.

For advertising, it is estimated that, for all of the campaigns desired, it will cost about $5,000 a month. For all of the months included in the time allotted, this will be about $25,000 in total with 5 months of uptime.

Additionally, creating the initial prototype was estimated to be around $10,000 with all accessories to that included.

Overall, it is $85,000 to implement these lenses.

Facilities and Resources

BioTrue has offered one of their warehouses for our staff to implement the physical design. Our other materials and resources are also derived from the BioTrue facilities, as we have partnered with them to create a more technologically advanced lens. These materials include the physical contact lenses, the contact solution, and the electronic chips implanted inside of the product.

To establish credibility in the marketplace, our software development team includes only the top individuals in said field. Patrick Gatner, the second in command on the team, graduated from MIT with a bachelor's in computer science. He largely contributed to the technical design

of the Oculus Rift, a virtual reality device, and the artificial intelligence design of Sophia, the first social humanoid robot that was declared a citizen in Saudi Arabia. The rest of our team undergoes a layered interview process to ensure that the final group contains those with the utmost experience in the technical goals we are attempting to attain.

References

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