The Bionic Eye

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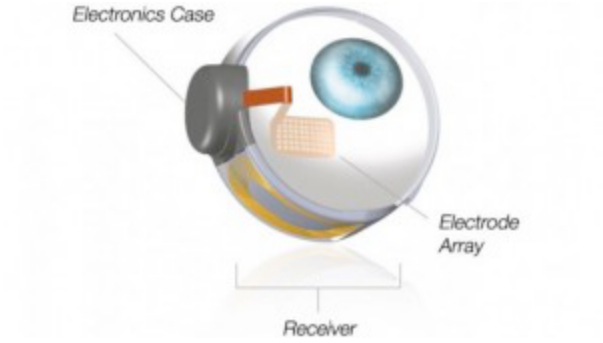
INTRODUCTION

Degenerative eye diseases such as Macular Degeneration and Retinitis Pigmentosa claim the healthy vision of millions of people all over the world. Fortunately for those people, while the degenerative eye diseases of the world progress, so does biotechnology. First inspired by The Argus® I, created by Dr. Mark S. Humayun of the University of Southern California, the advancement in artificial eye technology is rapidly improving, and with improvement comes new challenges that Biomedical Engineers all over the world are more than happy to take on. Once the first model of the bionic eye was produced by Second Sight, the world took notice, and now imitation companies are popping up everywhere. Due to approval for public use by the FDA in 2013, Second Sights newest model, The Argus® II provides even better vision than the previous model. This exciting new field in biotechnology has a plethora of benefits for the entire population, not just those suffering from degenerative eye diseases. Thanks to Second Sight, Biomedical Engineers have now kicked the door wide open to a possible world where blindness was merely a primitive illness.

PROCESS

The bionic eye is similar to a cochlear implant in how it is composed. There are both internal and external parts that work together, to both bypass damaged parts of the eye, and use the remaining healthy parts to relay the correct information to the brain for interpretation. There are five main components: including a digital camera, microcomputer, receiver, retinal implant, and the eye's optic nerve. The camera, which is attached to the bridge of a pair of sunglasses, picks up the images and sends them to the directly connected microcomputer. The computer then translates the images into light and dark pixelated images that are wirelessly transmitted to the internal parts, which is located in the back of the eye. The receiver accepts the images and directly transmits them to the retinal implant. The retinal implant contains a panel of electrodes which stimulate accordingly as if they were the eye's natural photoreceptors. The newly created electrical impulses are sent down the healthy optic nerve to the brain for image translation. Biomedical Engineers at Lawrence Livermore National Laboratory are already working on the Argus® III, which would only have one external piece (the digital camera) and two internal parts. The video processor will receive the images wirelessly from the camera. The message will then directly transmit the message to the retinal implant. This new model would save money, improve object recognition time, and possibly even allow for facial recognition.



The Argus®II: Computer simulation of the retinal implant

DISCUSSION

This new technology is only in the beginning stages, with public use only being around for a few months. Although the cost-benefit at this moment in time is poor, the future holds a lot of potential. Like any technology, as time goes on, the product improves. Every time the product improves the benefit to the patient is far greater than before. With an estimated cost of $115,000 in Europe and $150,000 in the United States before surgery, this technology is not considered cheap. However, insurance companies are beginning to realize the money that they can save in the long run, due to assisted living and technology costs a person living with a degenerative eye disease would acquire.

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