SCANHOLO

Know your Body, Know your Food.

Present Technology / Wearables & Spectroscopy

Wearables

Wearable Technology is changing the way we live our lives. People all over the world own wearable devices and use them everyday in many different ways. Wearables operate by using core components such as smart sensors, capacitors, semiconductors and wireless connectivity.

Smartwatches and Fitness Trackers are two very popular types of devices that are worn on the wrist but there are many other types of wearable devices. Today we can buy Smart Clothing, Sport Watches and even Head-Mounted displays.

Ways were using wearable technology:

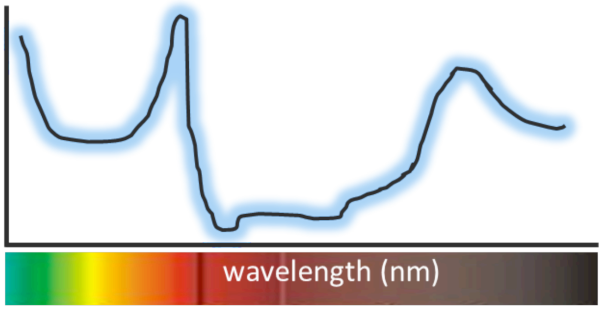
- Track Fitness
- Track Sleep
- Monitor Health
- Assist in Hearing & Vision Loss
- Fashion / Listen to music

While researching wearable technology we discovered a few limitations. The first limitation is that most every wearable needs to pair with a Smartphone to view results.

Second, not everybody that owns a tracker/monitor owns a Smartphone. For example, children can own a tracker/monitor but not a phone. Third, you physically need to carry your Smartphone with you to view instant results. Even those people that do own Smartphone's are sometimes restricted to when and how they can use them. The last limitation we see is that currently there is not a NIR spectroscopy enabled wearable device on the market capable of scanning food and presenting the results with Nano-Hologram technology.

Spectroscopy

Imagine having the ability to see what is in our food without X-Ray vision or super powers. The ability to scan material objects is a fairly new process but not a new technology. Today's scanning devices are based on a centuries old method of material analysis called "Spectroscopy". Every material reflects (and absorbs) light in a different way. The arrangement of that reflected light is what helps to identify those materials/compounds.



spectral fingerprint
each material interacts with light with a unique pattern
(emission, fluorescence, absorption, reflection, Raman ...)

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To identify materials with a spectrometer you first need to illuminate the surface of the object with a broad spectrum of near infrared light. Once illuminated, some light is absorbed raising the energy states of some molecules. The lower energy bonds are reflected back through a spectrometer in the device where the wavelengths are sorted and the spectrum is created. The spectrum is then sent to a free, open and collaborative database of food products from the entire world. The final step is when the scanned material is identified by intelligent software the results are downloaded to view with an application.

A few limitations of Near IR-Spectroscopy are the expensive cost as well as the very large size of the spectrometer. Another limitation we learned is that you can't scan most foods. For example, you can't scan a sandwich or salad because the ingredients are not mixed together but you can scan ice cream and drinks. Another current limitation is that you cannot scan inside packages.

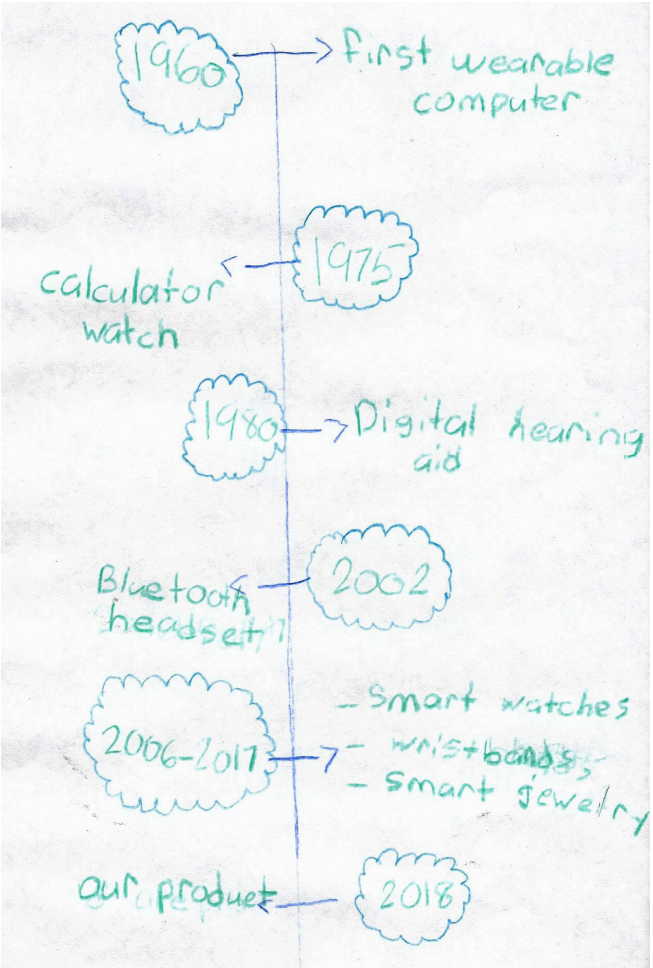
History

Wearable Technology

The history of wearable technology began in the 1960s by Edward Thorpe. To beat casinos at roulette, he and the father of information theory, Claude Shannon, invented the first wearable computer. This computer was small enough to fit into a shoe and another into a pack of cigarettes. Their device was basically a mini box worn on the waist with wires coming from the top and bottom. One wire ran down to his shoe and the other to an earpiece.

Over the next 20 years wearable computing became smaller and easier to use. In 1975, the first calculator watch was co-built by Hewlett-Packard and Hamilton. Soon after in the 1980's, the Digital Hearing Aid was created. Wearable technology took off in the year 2002 with the first Bluetooth headset.

From 2006 - Present we saw hundreds of different types of Smartwatches, Wristbands and even Smart Jewelry come to the market. Some of the largest examples are Google Glass, Apple iPod, iPhone and Apple Watch. As wearable technology becomes user-friendlier and socially accepted new types of devices like Specialized Visual Aids, Medical Monitors, Smart Safety Glasses and Augmented Reality are being developed for use in Healthcare, Fitness and Educational fields.



History of Spectrometer

Spectroscopy began with Isaac Newton's optics experiments in 1666-1672. Newton applied the word "spectrum" to describe the rainbow of colors. During the 1800s Joseph von Fraunhofer made advances with dispersive spectrometers. His work

enabled spectrometers to become more precise and quantitative scientific technique. Since then, spectroscopy has played and continues to play a significant role in chemistry, physics and astronomy.

In 2013 research began on a product named TellSpec. The product was tested in 2015 and later had prototypes available in 2016. TellSpec is a handheld device that can identify specific ingredients in food by using a technology called near-infrared spectroscopy and a Texas Instruments' digital light processing (DLP) chipset. Another handheld scanner named "SCiO" uses a technology similar to *TellSpec*'s but is designed to identify the molecular content of foods, medicines, and even plants. It illuminates an object; optical sensors detect the reflected light; and the device analyzes it using an algorithm and a cloud–based database that is constantly updated.

Future Technology

We've set our time machine to the year 2038 and hit the button marked "HOLD ON BUDDY". Time travel is very exciting but while were still here in the year 2018 let us take the time to explain our vision for our SCANHOLO technology.

Collecting information and finding new creative ways to visualize that information seamlessly into our daily lives is a constant technological struggle. Why do we always need multiple large connected devices to perform tasks like scanning food and monitoring health? Today, in order to eat safe and stay informed about the foods we

put into our bodies we must carry a scanning device and a Smartphone to view results or simply eliminate those foods from our diet.

To enable society to become less dependent upon on multiple devices our team envisions a wearable hands-free device intelligent enough to scan, process and transmit large loads of data and display results in high-resolution. Our future technology is named “SCANHOLO”. SCANHOLO empowers people of all ages living in fear from allergens hidden in foods and misleading packaging labels to eat freely again. SCANHOLO is a wearable technology designed to scan food and instantly displaying the results in a 3D hologram above the device.

Breakthroughs

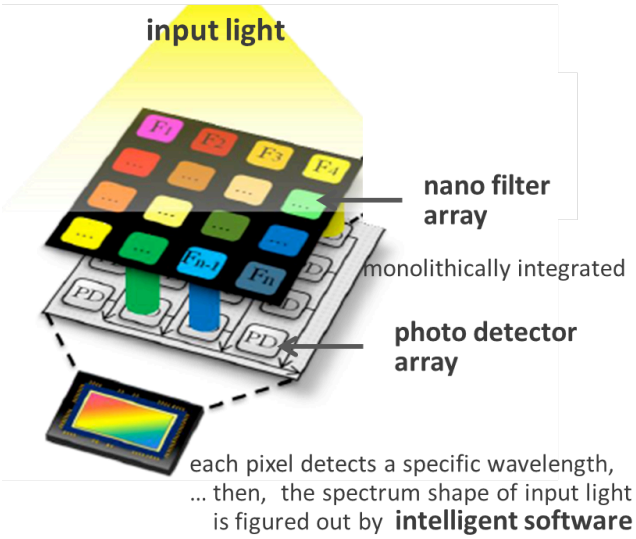
Our proposed SCANHOLO technology is a hybrid of a few technologies that are dependant upon evolving scientific breakthroughs and A-ha moments. The future success of portable holograms lies in scientific discoveries like Image processing power, display capabilities, light conditions and optical thickness of the Hologram. To make holographic technology suitable for OLED displays and Smartphone screens the technology needs to become super thin. By reducing individual projection elements to the Nano scale, the technology can produce three-dimensional images without the need for 3D glasses.

One reason we currently don’t commonly use portable holographic devices is because the illusion of a three-dimensional shape needs to be within the parameters of the

optimal thickness limit – computer-generated holograms are too large to fit atop Smartphone's and therefore have limited practical application.

For now, the only way to validate our breakthroughs is to create a hologram on a phone is by using a glass pyramid on top of the screen. When the attachment is made correctly it looks like the object is spinning in the air but its actually just being projected and reflected.

The advantage of a chip-based spectrometer is that is not only very compact, with packaged dimensions comparable to a typical USB thumb flash drive, but also achieves the subnanometer resolution typically found in larger laboratory-grade spectrometers the size of a laptop power supply.



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Nano Hologram Technology coupled with Chip based Spectrometers are two of the breakthroughs that will enable our vision to become a reality.

Design Process

During our discovery phase the team researched and discussed several food scanning technologies and device concepts. Though the three of these ideas did not make it to our final vision we learned from every step along the way and created our ultimate technology in the end.

1. Food Test Strips.

We thought if you covered test strips with the food in question then inserted that sample into the band, the results then would display on an LCD, or OLED display. Limitations are you need to have test strips and testing device and possibly a Smartphone.

2. Pico Projector.

If we placed a mini projector into the top of band it would create an on skin interface letting us view the scanned results. This would take place of a Smartphone when not available or not wanted. One limitation to this technology is the surface to be projected on needs to be exposed and most of the time this is not possible.

3. Chameleon skin Band.

One way to show instant results is to have a clear band that changes color with positive or negative results. For example, if peanuts are detected then the band will change red and green when the allergy specified is not found in the scan. Limitation is that it’s just not enough data displayed and not enough wow factors.

All of these ideas seemed like the one until we discussed them further and thought, “There needs to be an even easier and futuristic way of doing this”. Then it came to us, holograms. Lets use Nano Hologram technology within a device on the wrist instead of a projector placing visuals on the arm. Many times people will not have an exposed arm to serve as the projection area.

Consequences

The negative and positive consequences of technology on society are well documented but we feel that it is personal for every user. When we speak of SCANHOLO technology we feel that it has positive consequences on society as we classify it as an Adaptive Technology. With access to worldwide data, a scanner or app could tell us what types of hidden foods were allergic to but as of today we’re depending on old habits. We look at the benefits of finally knowing what we eat and what ingredients will lead to positive and negative consequences.

The more advanced technology becomes, the more it seems to have control over our lives. One negative consequence that may be seen is in the form of “Over Interaction”. Were classifying this as a user, which cannot stop scanning and viewing items. The negative consequences to this are the level of engagement into the device and screens and not onto what is happening around them. Take walking down the street and viewing your results of your candy bar you just scanned and you accidently walk into

something. Though these may seem like small consequences to some we wanted to note that all technology has positive and negative effects on society.

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