Abstract Section

Dementia is a serious illness affecting a person's ability to think and remember, making daily life difficult. According to the Alzheimer's Association, six out of ten individuals with dementia wander at least once, often repeatedly, raising safety concerns. Lost Then Found is a small micro-patch that's placed between a user's shoulder blades. It provides real-time location tracking using quantum positioning technology, that can pass through most materials. There's a quantum accelerometer measuring how fast, how far, and what direction a person is moving. The patch shares the user's exact location with caregivers or medical personnel via an app. The patch charges its electronics by using body heat. Its underside has tiny micro-suckers for a strong hold without using adhesives. When seconds count, Lost Then Found quickly and easily finds people with dementia, making life less stressful for families and caregivers.

Find the lost faster with our tracker!

Present Technology

Personal location devices assist with keeping track of people, animals, and their belongings. These are some of the current technologies being used.

Emergency beacons are used a lot by hikers. It can send an emergency signal if the person gets lost. Rescue workers can use the signal to locate the person.

1

Global Positioning System (GPS) is found in smartphones, cars, and watches. GPS helps navigate to a location by giving you a set of directions. Smartphones have apps that use GPS to see where you are located. You can share your location with family and friends to let them know you are safe. Smartwatches also use GPS. They can provide walking routes or send your location to someone if you need help. Kids have these watches too. It helps the parents keep track of their children so they won't worry so much about them.

Bluetooth trackers are wireless connections. These trackers can be placed on important items that you don't want to accidently lose. If you do lose the item, your phone or someone else's phone can find it.

2

Some Smart clothing can have GPS trackers attached. People would not need to carry anything extra.

Today's technology helps locate people and items that are lost but it doesn't always pinpoint an exact location. Power is often lost before rescues can happen or the device gets broken. Our team's project will locate a missing person without the worry of power loss, equipment failure or if they simply forget the device.

History

Decades of Personal Location Devices

Early Tech.

Maps and compasses were used to help people find their way.

Early 1900s

Radio signals tracked planes, ships, and cars. These were not very accurate.

1970s to 1990s

GPS satellites helped people find locations. They were large and not very fast with finding a location.

2000s

Personal GPS Devices were placed in cars to tell you how to get to a location. Emergency Beacons were placed in small devices to send help signals.

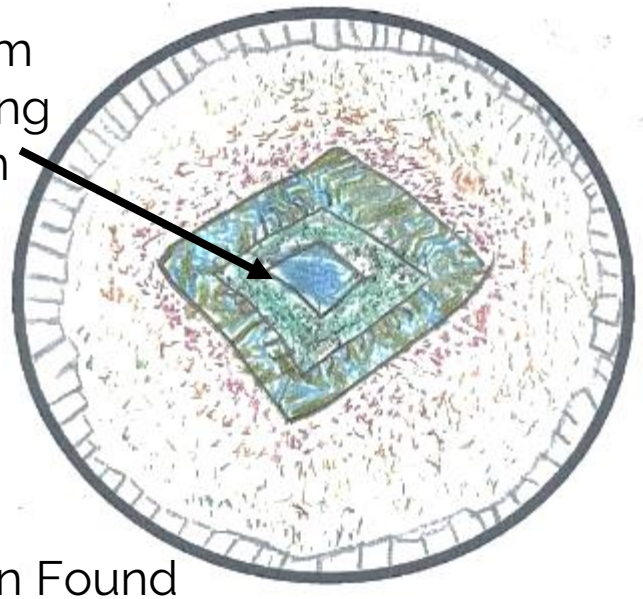
Late 2000s

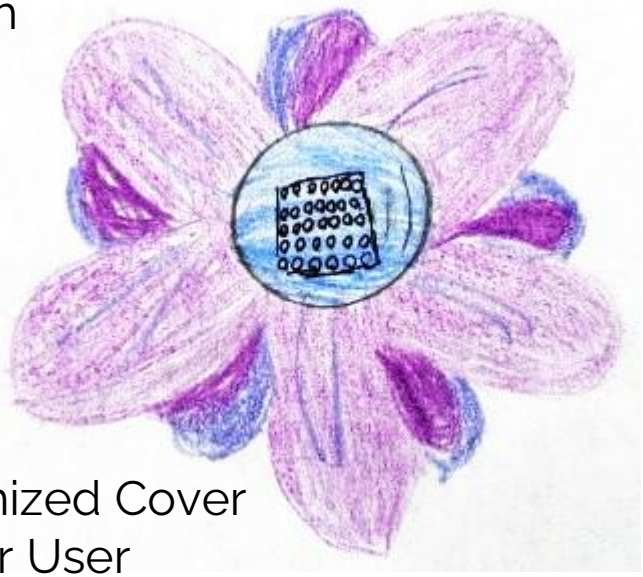
GPS was built into smartphones. Apps helped find directions. People could share locations with others.

2010s

Smartwatches show your location on a map. Small trackers could be placed on clothing, items, or backpacks to locate the user.

Future Technology – Slide 1





Lost Then Found uses special technology to track people who may have wandered away, helping find them quickly and keeping them safe. It also sends alerts to let family members know if something happens.

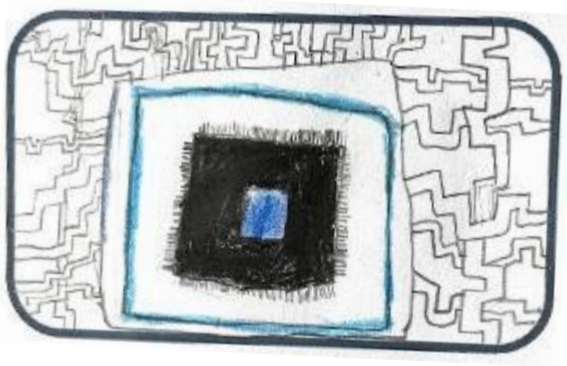
Our project uses quantum sensors to know the location of a person that has wandered away. Right now, we are using satellites and sometimes they don't work or can break. When the satellites don't work, you can't use current electronics. There are also places like space and any body of water where GPS won't work because satellites can't reach them.

Lost Then Found has a quantum positioning system. It uses photons and four pairs of light particles. A photon is a bunch of electrical energy that makes up all light. The photons go through four special paths. Three paths tell you where you are. Path number 4 keeps the timing accurate. This technology can give us a much better idea of where we are than today's GPS.

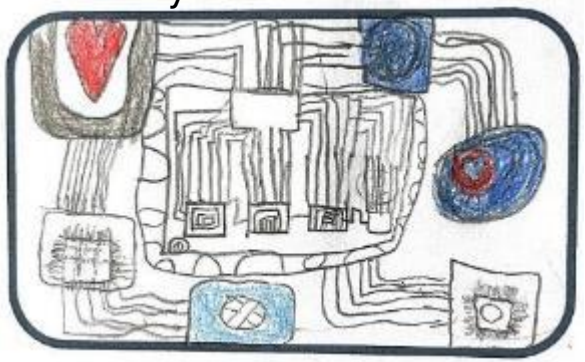
There is a quantum accelerometer that measures how fast, how far, and what direction a person is moving. Using tiny particles, it provides exact movement like a sensitive motion detector.

Future Technology – Slide 2 (optional)

Layer One



Layer Two



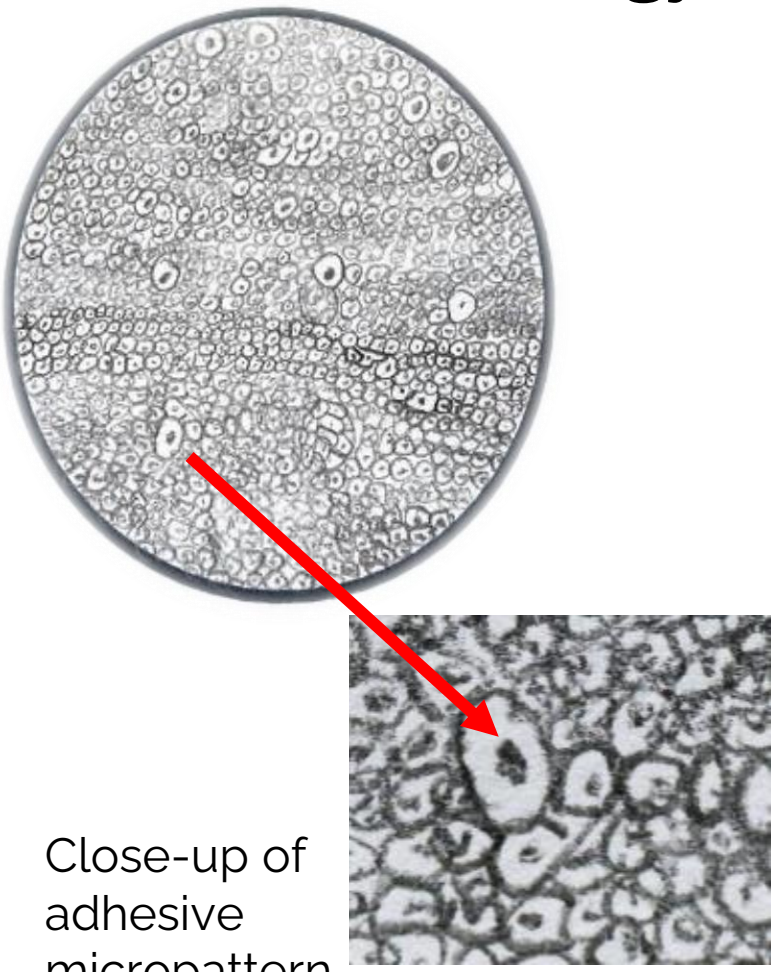
Layer Three

The quantum parts need a cooling system to keep everything working. The quantum sensors and small computers use tiny particles to remove heat, helping our invention stay cool while using only a small amount of energy. The system is small and bendable. The quantum cooling system will be placed on a flexible circuit. The circuit connects everything with copper wires. It is made out of conductive polyester that is thin, bends, and stretches. A microprocessor would collect the information from the quantum sensors. It is the brain of our device. It does the thinking and processing of the information it collects. There are sensors that measure temperature and heartbeat. People with dementia might not realize if they are too hot or cold. Checking their temperature helps to make sure that they are not in danger of a serious health condition or changes due to outside elements.

Our design has a wireless chip that sends data about the person to a phone. There is an option to send it to family members, the doctor, or an emergency worker. This is the messenger that sends real-time updates on the location and vitals of the person.

Lost Then Found uses energy from your body heat and movement as the power source. We produce heat all the time. Using thermoelectric energy makes the patch lightweight and comfortable. You can wear it for a long time without replacing parts.

Future Technology – Slide 3 (optional)



Close-up of adhesive micropattern structure mimicking octopus suction cups.

There is a protective layer that will keep the electronics safe from the elements while being flexible and not causing skin problems. Lost Then Found is protected by a hybrid 3D-printed patch. Mimicking octopus suction, the bottom side of the patch attaches to a person's skin using an adhesive micropattern structure. The surface would be covered with tiny flexible brush-like structures. The tips would have tiny suckers that would stretch and bend without losing grip. The rest of the patch would be a smart polymer that can adapt to the person's skin.

Lost Then Found is a patch that is attached to a person that is likely to wander. It will be placed between the shoulder blades in the middle of the upper back. This spot is hard to reach, so will stay in place longer.

A phone app will give current updates on location, heart rate and temperature, along with the amount of energy generated by the person's body heat.

Having this new technology will give people with conditions like dementia the ability to move around more freely without getting lost, and their families can feel sure they're safe.

Find the lost faster, with our tracker!

Breakthroughs– Slide 1

Being able to keep people safe and independent is our future technology goal. Lost Then Found will help people with dementia lead more meaning lives for as long as possible. However, there are breakthroughs in technology that need to happen in order for our tracking patch to work. People with dementia often hide or get trapped in locations. The signals must be able to travel through all states of matter without limits.

Quantum positioning is a way to get an exact location without relying on satellites. To use quantum technology, scientists need to make the components tiny enough to be placed on a patch. We saw pictures of some of the first computers. They were huge! Today, we have small computers on our phones, and watches but a quantum patch will have to be micro-sized.

A quantum patch needs a cooling system. If Lost Then Found gets too hot, it will not work correctly. High temperatures can also cause burns on the skin according to Angel Qian Han, Ph.D. in thermal engineering. The cooling system needs to use a small amount of energy in a small space without overheating.

Advanced Cooling System

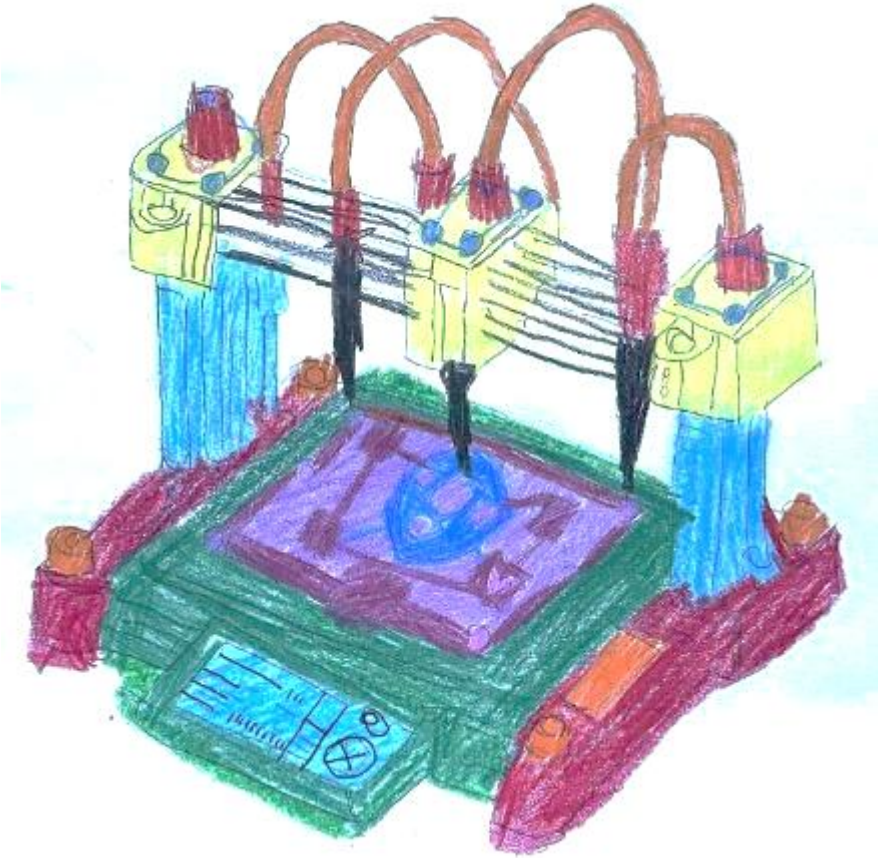
Top view of Lost Then Found patch. The cooling system is located around the edge of all the electronics.

Breakthroughs– Slide 2 (optional)

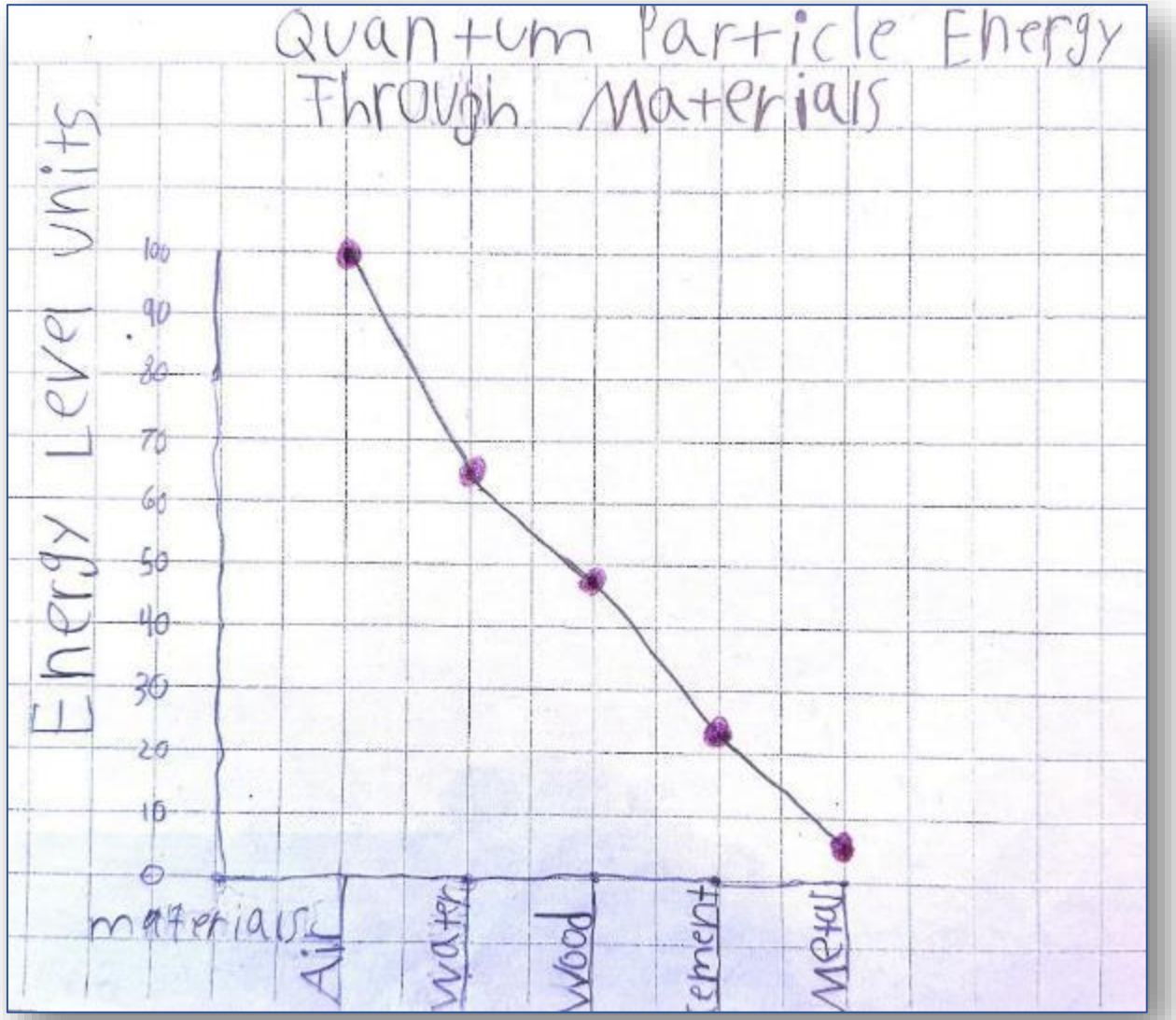
Quantum technology is very sensitive. Magnets, heat, or even a phone could interfere with it. The patch needs to be protected from these things so it can work in everyday life without being affected. That is why we thought of using 3-D hybrid printing that seals the patch with a protective layer.

Hybrid 3-D printing will put working electrical parts and sensors into a patch. Breakthroughs need to happen to make part of our patch flexible and other parts stiff. It's like flexible building bricks that can change shape. It has flexible parts that can bend and twist along with stiff parts to make the design strong. The printer needs to be able to do different jobs at the same time during a single print.

We need to have octopus suckers printed the size of microneedles so that the patch will stick to all skin textures. The material needs to be biocompatible. That means it won't hurt our body or cause a bad reaction, or make a person sick.



Breakthroughs– Slide 3 (optional)



These new technologies can not work today because of the printer speed. There are a lot of people with dementia that need this patch. It takes a long time to print just one, when we need thousands.

An investigation our team would need to perform is how our quantum design could locate people through different materials. Our graph predicts how a quantum location system signals would work through different materials. We do know there would be many environmental variables to consider when Lost Then Found is in use.

Design Process – Slide 1

Dementia makes everyday life difficult for the people who have been diagnosed. Someone needs to keep them safe 24/7.

Our team's first idea was to create a waterproof robot that would keep a close eye on a patient. The robot has waterproof cameras and wings used for balance in the air and water. The tail camera has face identification of the person it has been assigned to watch. It would report the location of the patient at all times. It uses a wireless charging station.

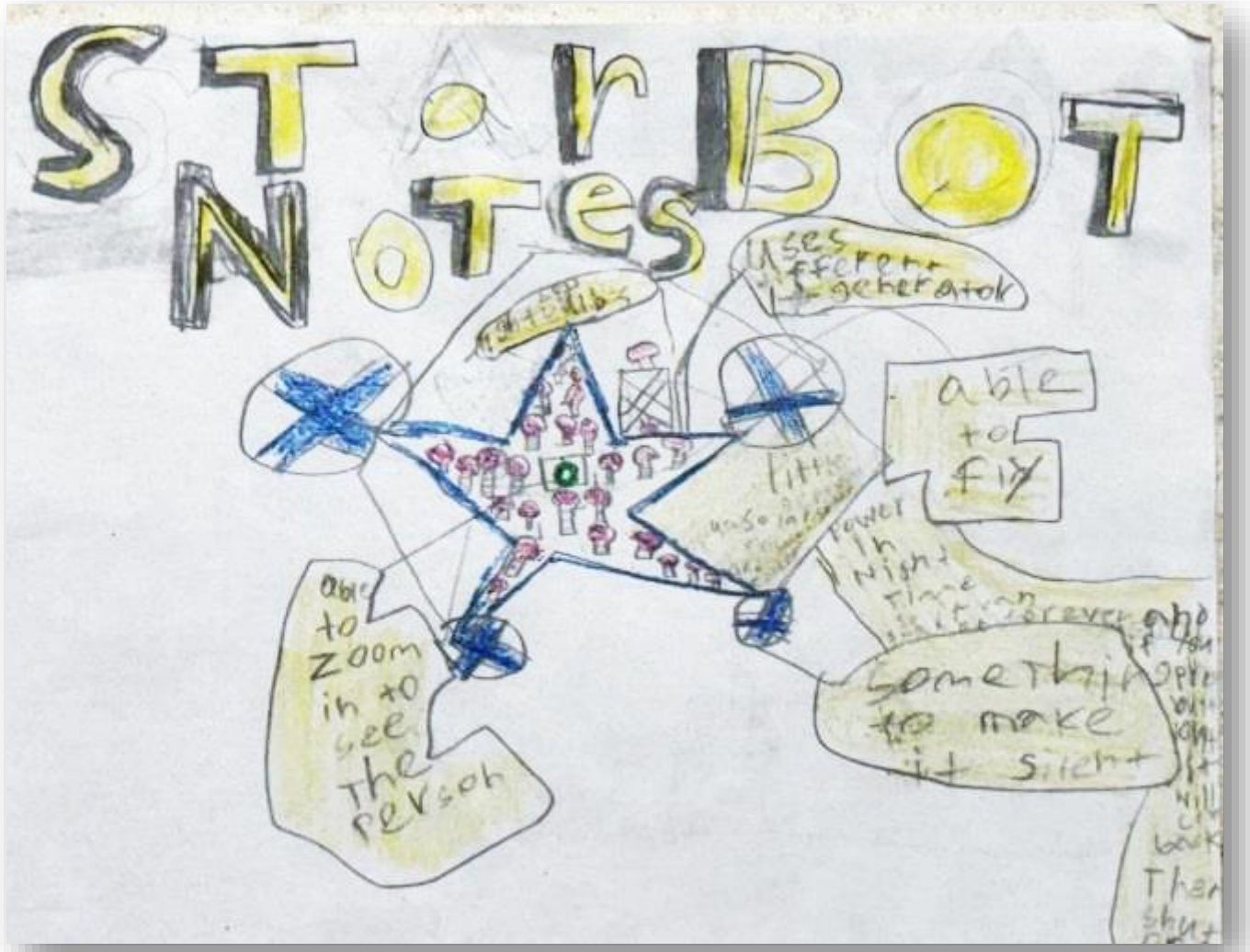
We rejected the drone idea due to noise and lights that might agitate a person. The team thought having too many drones flying in a location would cause congestion in air spaces. It wasn't practical to take on public transportation or places like a library.

Design Process – Slide 2

The team was still considering a design that blended into a surrounding air space. This Starbot is three inches long and uses floating technology to eliminate noise. It uses AI for navigation.

The user would take a strand of hair and place it in the center of the bot. DNA samples will be taken along with facial recognition to make sure Starbot is tracking the correct person. It gathers energy from any light source. It quietly follows the patient while the caregiver gets notices on an app.

This Starbot was inventive, but we still rejected the idea of having a bot following someone even though this design was small and quiet. We thought the bot idea was invading personal privacy. This problem became a lot more complicated.



Design Process – Slide 3

This was one of the final designs the group brainstormed. We noticed tattoos on people. We began to think of something that could be attached on the skin. Our discussion led to people who were tattooed in a harmful way against their will. We didn't want to repeat history. Then the team thought about creating something temporary. The design would be a temporary tattoo with a GPS locator and conductive ink.

The team agreed that this technology would be easy to apply but could be scrubbed off just like the stick-on tattoos you would wear for fun. We decided that our design should be closer to a medical patch.

We know we wanted some communication technology in our engineering project. GPS can be a problem. One team member told us that a family member did not reach their destination due to GPS satellite errors. That is why we began to research quantum positioning in our design.

We agreed that our final design will have options to create personal, cultural, and stylish shapes based on the user's choice.

Consequences

Drawbacks

- Privacy and Security: Quantum location patches can track things very accurately. So, it's important that only the right people have access to this data and keep it safe. It's really important to protect the user's privacy.
- Electronic Waste: The patch is small but still has electronics. If the parts are not recyclable, they can become e-waste.
- Cost: Because of the variety of materials, it could be expensive to produce. This might make it hard for everyone who needs one to get one.

Benefits

- Time: No time is wasted when someone wanders away from their safe area.
- Convenience: The user doesn't have to remember to put the patch on their body. You don't have to carry around a phone, put on a watch, or wear a certain piece of clothing.
- Multi-Use: The patch combines location tracking and health monitoring.
- Lightweight and Comfortable: It is made with thin, flexible 3-D hybrid printed pieces. This makes the patch comfortable to wear.
- Reduces Carbon Footprint: Printing is done directly on the device. This will reduce manufacturing steps.
- Designs: The Lost Then Found patch comes in designs that the user will choose. The design can also be custom-made to represent the user's personal, self-expression, or cultural meaning.

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Notes:

- Websites articles rewritten to adjust reading levels https://www.briskteaching.com/
- Bibliography generated using "Bibliography.Com - Free Citation and Bibliography Generator." *Bibliography.Com*, https://www.bibliography.com/generator/.
- All hand drawings done by the Exploravision team members.

Sample Web page – 1

TOSHIBA | nsta ExploraVision

LOST

THEN FOUND

Dementia is a serious illness affecting a person's ability to think and remember, making daily life difficult. According to the Alzheimer's Association, six out of ten individuals with dementia wander at least once, often repeatedly, raising safety concerns. Lost Then Found is a small micro-patch that's placed between a user's shoulder blades. It provides real-time location tracking using quantum positioning technology, that can pass through most materials. There's a quantum accelerometer measuring how fast, how far, and what direction a person is moving. The patch shares the user's exact location with caregivers or medical personnel via an app., The patch charges its electronics by using body heat. Its underside has tiny micro-suckers for a strong hold without using adhesives. When seconds count, Lost Then Found quickly and easily finds people with dementia, making life less stressful for families and caregivers.

Find the lost faster, with our tracker!

Sample Web page – 2

Enlarged Prototype of Lost Then Found Layers

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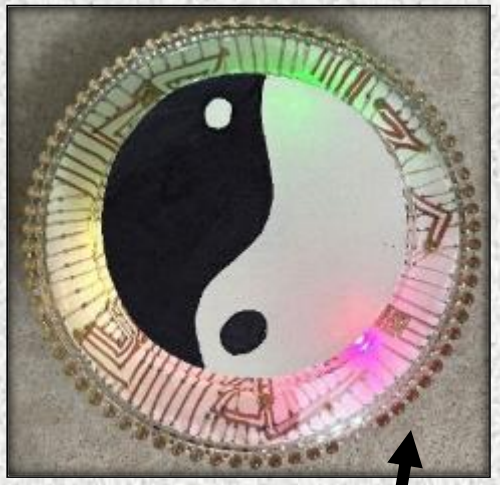
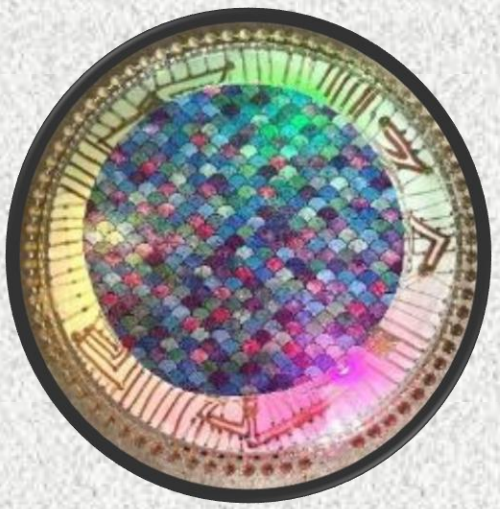


Top layer with choice of custom designs.

Next layer showing quantum positioning system with sensors and microprocessor.

Third layer electrical circuits with outside cooling system.

Final layer with hybrid 3D-printed adhesive micropattern suction cups,



Sample Web page – 3

Lost Then Found Patch Location on the Body

Locator Layers

Custom Patch Design Examples

Sample Web page – 4

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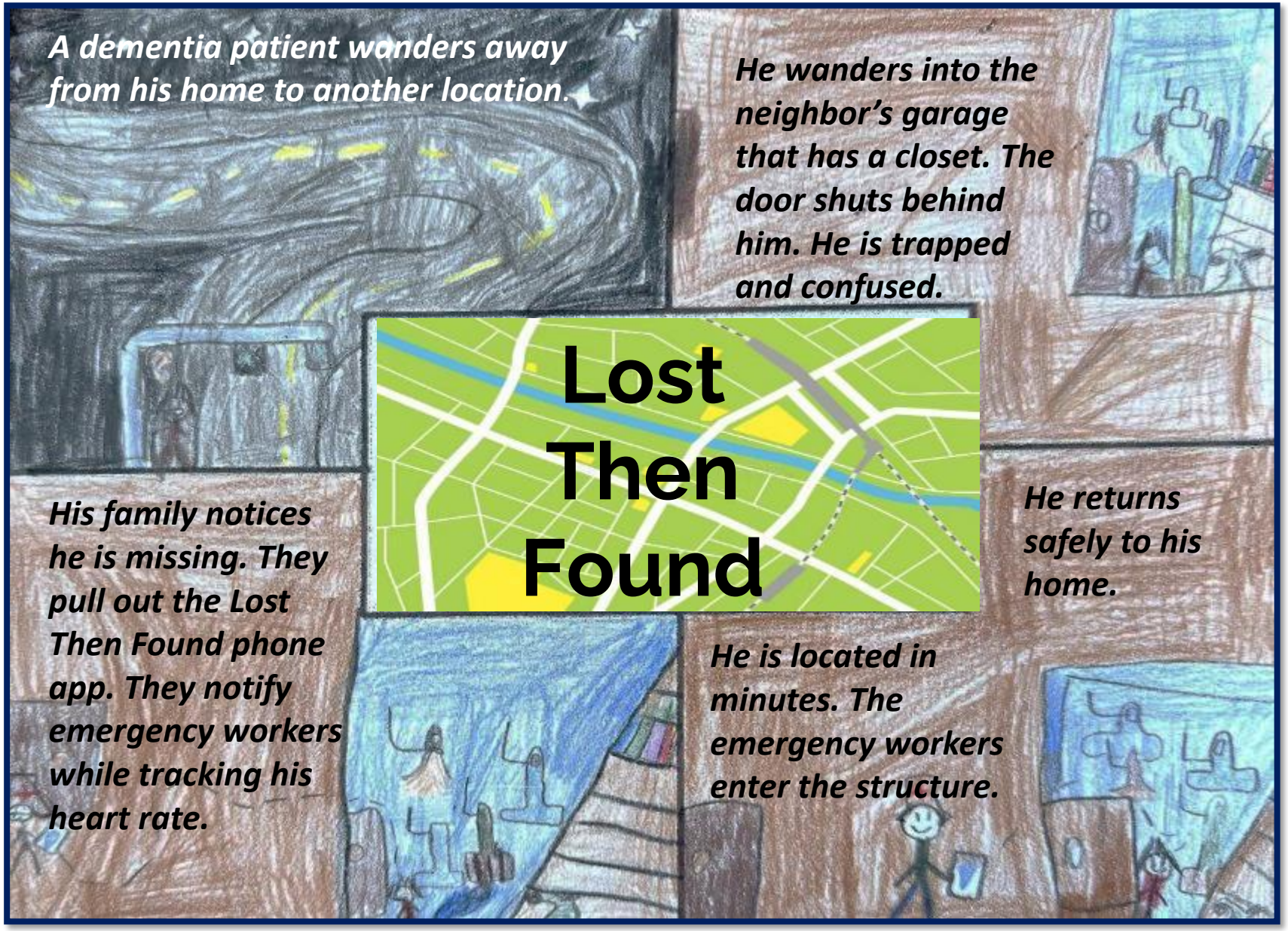
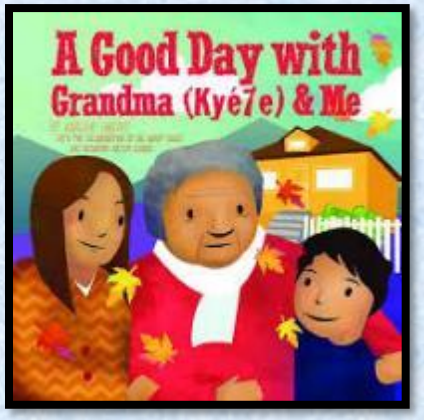


Live Map Tracking
View exactly where the person is located.

Detailed Directions
Step-by-step instructions on where to find the person.

Emergency Call Button
Quickly call for help.

Sample Web page – 5



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Join World Dementia Awareness

September 21 Each Year

https://www.alzint.org/get-involved/world-alzheimers-month/

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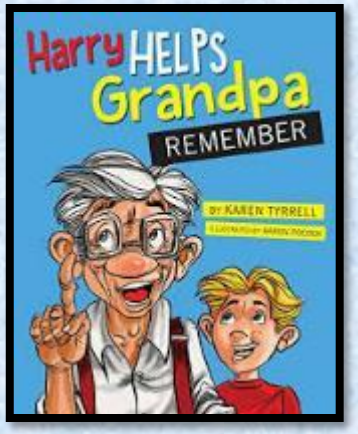

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