Business Idea Selection

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Group 13

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Allura: Sound-to-Color Converter for Synesthetes

Bonga Njamela - NJMLUN002

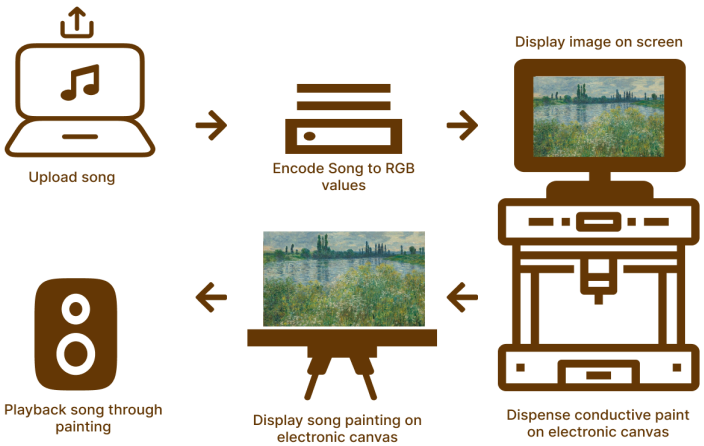
Problem Statement

Among 358 fine arts students at three large universities, about 23% (84) experience synesthesia which can impair their ability to describe their perceptions and sensory experiences to other people. This leaves most synesthetes feeling that their condition isolates them from others.

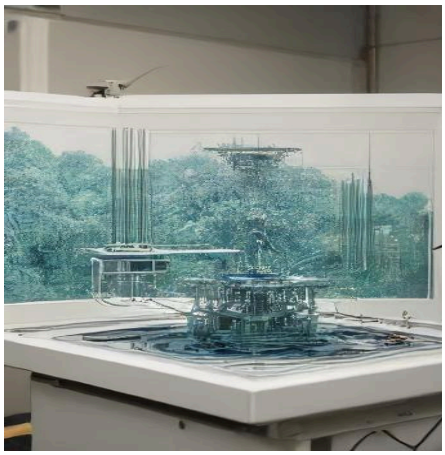
Solution

Our solution involves assisting fine arts students and professionals who are synesthetes (i.e. people who are diagnosed with synesthesia) to better portray their perceptions by converting music into an electrically conductive painting. We propose the development of an automated painting machine which dispenses conductive paint on a canvas. The canvas can be connected to a power source and small device with digital pins for reading the painting's conductive colours. This allows the small device to be able to playback the painting as a song through a speaker. With our innovative automated painting machine and electronic canvas, pictures can truly say more than a thousand words.

To use the automated painter, a song is uploaded through our graphical interface on a PC. Software in the machine uses an algorithm to map the bit arrangements representing the song to different colours. Each colour can be represented as RGB pixel values. The program uses the average of the RGB values as weights on voltage scale between 0-5V. The automated painting machine contains cartridges of electrically conductive paint that can be dispensed on the electronic 30"x36" canvas. The electronic canvas contains digital pins that when connected to a decoder, can playback the color encoded song through a speaker. This can help people with sound-to-color synesthesia to express their perceptions to those that are not synesthetes. Consequently, this can also help the visually impaired to interact with images through their auditory nervous system.



Allura: Sound-to-Color Converter



Mesh Wi-Fi Network

Murray Inglis - INGMUR002

Problem Statement

A single Wi-Fi router does not provide enough coverage for more advanced IoT use cases. Extending this Wi-Fi coverage into a seamless mesh network is not commercially accessible while also being complex and requiring extensive knowledge and practical experience.

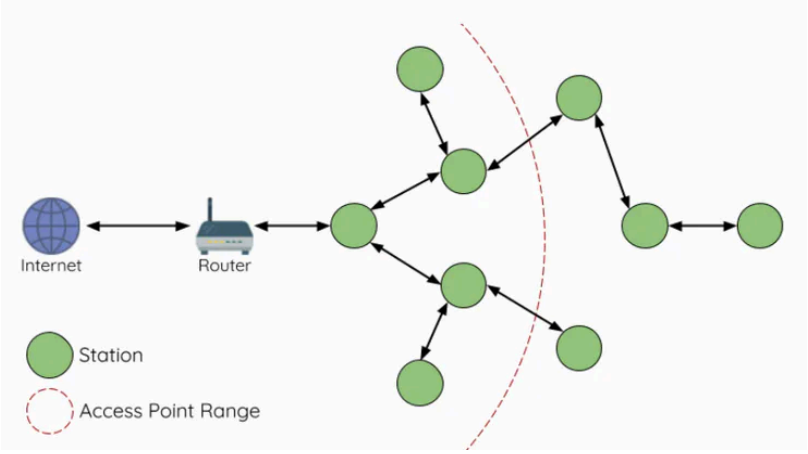
Product description

The proposed solution to the problem statement is a set of nodes that can be either battery powered or by a DC power supply. Once activated, the user will log into one of the nodes and connect it to the desired Wi-Fi network. The remainder of the nodes are already programmed to connect to each other to form a seamless mesh network. This allows for a simple and easily accessible setup for user's without advanced knowledge. The network can also easily be expanded by purchasing an additional set of nodes.

Use cases and scenarios

- Agriculture
- Home automation
- Home security
- IoT applications
- Research
- Emergency and disaster response

This product will be pre-programmed for nodes purchased together to automatically connect to each other and form a mesh network. This product will use a custom ESP32 PCB design in order to have as small of a form factor as possible with integration for a battery and power supply. The image to the right shows how the mesh network will operate. Each station represents an ESP32 node. The node connections are automatically configured using a path-cost minimisation algorithm.



Automatic Non-Invasive Fall Detector

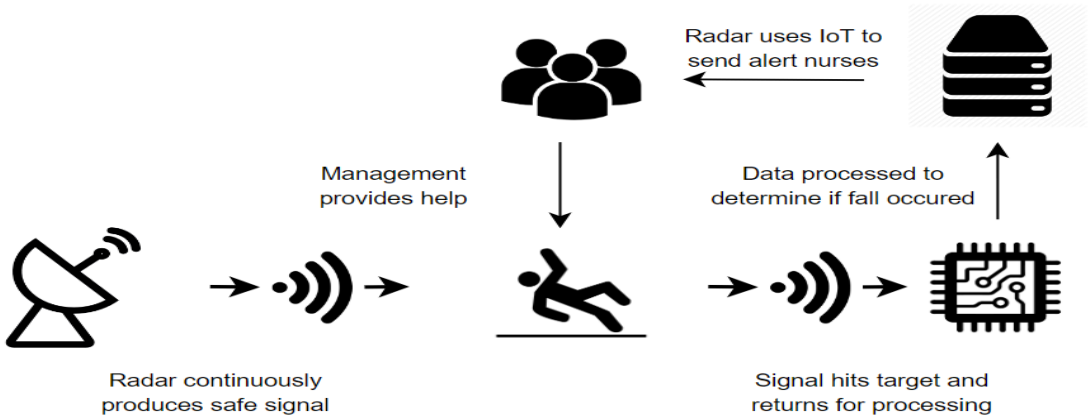
Talon Sewnath - SWNTAL001

Problem Statement

Due to the shortage of nurses and poor response time, patients and dependent retirees are often at risk of physical and psychological damage as a result of falling.

Product description

The proposed solution is to develop a radar based sensor which is connected to an IoT module for the purpose of detecting and reporting incidents. In recent years, radar technology was a power and cost intensive piece of technology but the discovery of millimeter radar chips have resulted in feasible solutions. The radar allows for detection independent of visual conditions and thereby complying with the ethics of surveillance. IoT enables instant communication of incidents with management. The continuous monitoring allows nurses to be notified without human intervention. The product should be equipped with limited battery power options and a sound device to adapt to scenarios without power. This device allows human resources to be used efficiently whilst protecting the user in a manner that respects their privacy.



Characteristics

- Privacy
- Non-Invasive
- Instant Detection
- Zero Disturbance
- Back-up Power
- Safe

Electronic cooling rods and cooler bag

Lloyd Ross – RSSLLO001

Problem Statement

Many South African students and citizens struggle to find affordable cooler boxes, especially those with self-cooling features. Crates of quarts, popular for their value, can also pose storage and cooling challenges, particularly for those with limited funds or fridge space, such as during trips or events.

Solution Product and description

The proposed solution to this problem is the development of electronic cooling rods designed to fit seamlessly into standard drink crates. These rods will be accompanied by an insulating cooler bag, also tailored to fit the typical drinks crate. This setup will allow users to transform a standard crate into a highly effective makeshift cooler box, capable of chilling and maintaining the temperature of all the drinks throughout South Africa's long and hot summer days. Unlike non-electronic cooling methods or ice, which may not last long and can be inconvenient, this solution offers sustained cooling.

This product is versatile as well; it doesn't need to be used exclusively with a crate. The cooler bag can be utilized on its own with the cooling rods, or the rods can be inserted into any cooler you already have, providing convenient and long-lasting cooling in various situations.

Theorized Cooling Rod Design

These cooling rods will utilize efficient electronic Peltier modules, paired with a specialized coolant liquid that offers superior freezing and heat transfer efficiency compared to regular water. This combination ensures that the rods can maintain cold temperatures effectively, even in challenging conditions, providing reliable and sustained cooling through the electronic system.

Smart Monitoring System

Piwani Nkomo - NKMPIW001

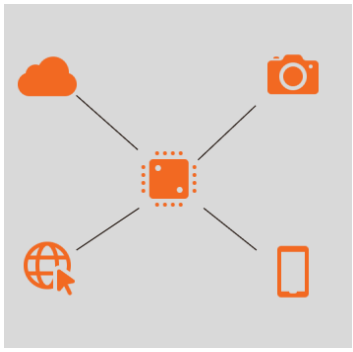
Problem Statement

Traditional surveillance systems are often prohibitively expensive for small businesses and homeowners in South Africa, leaving many properties vulnerable to crime. Additionally, existing affordable options typically lack advanced features like intelligent monitoring and remote access, which are crucial for effective security management.

Product description

The proposed solution is a low-cost, modular surveillance system that combines custom-designed hardware with intelligent software. The system consists of:

- Smart Cameras: Compact, weather-resistant cameras with night vision capabilities. making use of a custom-designed PCB.
- Central Processing Unit: A small, powerful unit that manages video storage, processing, and network communication.
- Intelligent Monitoring Software: Utilizes machine learning algorithms for motion detection, object recognition, and behavior analysis.
- User Interface: An intuitive mobile and web application for system control, live video streaming, and alert management.



The system is designed for simple installation and scalability. Users can begin with a basic package and expand their coverage by adding more cameras as needed. The product emphasizes ease of use, allowing customers with limited technical knowledge to set up and manage a sophisticated security system.

Use Cases and Scenarios

- Home Security
- Personal Vehicle Protection
- Elderly Care
- Pet Monitoring
- Child Safety

Chosen Idea: Automatic Non-Invasive Fall Detector

Motivation for Choice

This idea was chosen because it could make an indelible impact on the geriatric community by improving the quality of life of the elderly and sick. According to the World Health Organization, each year, an estimated 684 000 individuals die from falls globally, of which over 80% are in low- and middle-income countries [1]. This makes falling the second most common form of unintentionally death in the world. In most cases, these individuals can be saved if their wounds are treated immediately. This idea offers a cost-effective radar and ultrasonic system that can save lives without leaving users feeling like their privacy is being invaded. By collecting fall data, we can also predict the time of day that falls typically occur and reduce the number of deaths due to falling per annum. We also chose this idea because it offers easy market penetration and significant advantages of current technologies for managing and detecting falls in hospitals, retirement homes and hospices.

Pros and Cons

Pros	Cons
There is a niche target market consisting of patients and the elderly.	The product is targeted at a specific group.
The technology abides by privacy regulations and prevents the elderly from being conscious of surveillance.	High development costs
Long product life-cycle with low maintenance and recurring costs	Higher initial costs competing with familiar cheaper alternatives
Immune to power outages.	Sirens cause a disturbance to other patients.
The technology has not been deployed in the market yet.	An established market with many existing competitors
Non-Invasive and the technology is safe to use.	The sensor would be small but visible.
The system installation is a simple process.	Requires technician configuration and maintenance. The elderly may be resistant to new technology.
Strong product versatility and high scalability with the potential to integrate into the smart-home market.	Product scope limited to fall-detection only, unlike wearable devices which also offer other vital information such as heart-rate monitoring
Subscription and maintenance models for a recurring revenue stream beyond the initial sale of the product.	Susceptible to errors when objects with humanoid structure (such as mannequins) fall

Focusing on privacy and ethics can build a good brand reputation and customer loyalty	Radar signal interference from household items which can affect the accuracy of the device

Competitive Advantages

The business offers a unique approach to fall-detection devices. Available technology include wearable fall-detection devices such as smart-watches and ankle-monitors. Studies show that most users feel like wearable devices do not focus on privacy and ease of use. By installing our innovative fall detection system around the house and instead of on the body, we allow users to maintain a sense of privacy. Additionally, the system uses a central user interface for fall monitoring compared to wearable watches that need each individual to configure it for usage. Therefore, our system is much easier to use for the elderly compared to wearable watches.

By reducing the need for each individual to wear a watch, our business fulfills the key sustainability mandate of reducing e-waste. At the end of their life-cycle, wearable watches cause more waste than our radar and ultrasonic fall-detection system, since each old-age home, hospice or hospital only requires one device for up to 50 individuals.

Our business also offers cutting-edge AI technology to help medical professionals and researchers to better understand trends and anomalies in geriatric behavior over time.

In conclusion, developing a non-invasive radar and ultrasonic fall detection system offers a strong competitive advantage through market differentiation, scalability, and the potential for recurring revenue streams. Its focus on privacy, ease of use, and ethical considerations aligns with current consumer trends, while its adaptability and low regulatory burden position it for long-term success in both domestic and global markets. This makes it not only a viable business venture but one with significant growth potential.