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Senior Design Day 2018

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Department of

BIOMEDICAL ENGINEERING

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Handheld Endoscope For Delivering Nebulized Lidocaine

Team Members:

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Eagle Bio Tech

External Sponsors/Mentors:

- DUALAMS Inc.
- John S Houston

Internal Sponsors/Mentors:

Abstract:

A tracheoscopy is one procedure in which the trachea is examined using an endoscope. Typically, a tracheoscopy requires the endoscope to go through the nasal cavity and then the larynx to reach the trachea, where it can be used to administer a local anesthetic. For a typical tracheoscopy, a physician will use a liquid solution of lidocaine as the anesthetic. When this liquid solution is applied to the patient's larynx, it causes gaging and discomfort resulting in a lengthy procedure time. A method has been developed to circumvent this time and discomfort by using vaporized anesthetic. The vapor lidocaine causes little to no gagging for the patient during the procedure and results in a shorter procedure time. This method of delivery currently relies on doctors to not only own an endoscope already, but to have an endoscope which includes the necessary adaptor to allow the passage of the nebulized lidocaine. Furthermore, vaporizing lidocaine and delivering it through an endoscope are both very expensive procedures that are performed separately.

By developing an internally powered, portable endoscope that can vaporize and deliver lidocaine, Eagle BioTech hopes to simplify and eliminate the discomfort for trans-nasal and/or per oral vocal anatomy examination procedures. The device will shorten time of procedures while relieving patients from gagging and discomfort. Ideally the device will be sold for under $1000, making it more affordable for local and international markets. Doctors will be able to see and control where the lidocaine is being deliver via video and endoscope controllers.

The main goal of the project is to build a working prototype of a standalone flexible endoscope with replaceable ultrasonic canister to deliver nebulized lidocaine trans-nasally, for use in oral vocal anatomy examination procedures. The images given by the endoscope will be recorded by a camera module and sent to an LCD screen to be displayed. The doctor will be able to control the flexion of the endoscope's tip and the discharge of nebulized lidocaine.

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NGB-AL 1.0

Team Members:

- Mark Vines
- Valerie Little
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External Sponsors/Mentors:

- Assistive Technology Resources (ATR)
- Rex Moses

Internal Sponsors/Mentors:

Abstract:

The NGB-AL 1.0 is a wearable artificial larynx (AL) device designed to produce highly legible vocal output for individuals that have lost substantial speech capacity due to total laryngectomy surgery. A total laryngectomy affects an individual's capacity to speak, swallow, and breathe. In an electrolarynx, the vibration of the plastic diaphragm head against the neck creates vibrations in the throat to allow for speech. The NGB-AL 1.0 is designed as a collar to allow hands-free functionality to the user. In the current market, electrolarynxes do not offer this feature. Additionally, the NGB-AL 1.0 features the ability to control tone and volume. This device will improve the user's daily productivity and overall quality of life due to improved speech and the ability to use both hands. The amplified and filtered electrolarynx signals provide enhanced speech clarity and tone

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Auratech Sleeve 1.0

Team Members:

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External Sponsors/Mentors:

Internal Sponsors/Mentors:

- Dr. Vijay Vaidyanathan, College of Engineering
- Dr. Logan Porter, Collge of Engineering

Abstract:

The Auratech Sleeve is a high-tech, wearable fitness tracking device that captures heart rate and electromyographic signals produced by the user. These signals are captured and transmitted via Bluetooth to the user's Smartphone using the Auratech App, available on iOS. The user's heart rate will be displayed on the Auratech App during exercise. The EMG signal, captured from extension and flexion of the user's forearm, will be used to manipulate the user's Smartphone in a customized fashion. These two signals, differentiated by a 2V difference in their peaks, will be assignable to device volume (up or down), music track skip, or phone call answer or decline. The electrodes, sensor, and electronics housing that capture EMG and heart rate will be removable from the sleeve so that It can be washed.

This technology will be contained within an attractive, moisture-wicking compression sleeve. In the fitness community, aesthetically pleasing wearable items are rising in popularity. Fitbit and Under Armour are good examples of this. The Auratech Sleeve is a thin, lightweight, compression sleeve that comes in a variety of colors. The sleek and flattering design will attract users of all ages and athletic disciplines.

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Music Therapy Vibration Chair

Team Members:

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- Dr. Vijay Vaidyanathan, College of Engineering
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Abstract:

Physical pain is universal and can be caused by various factors that affect the body in many ways. Although there are many conventional methods to manage pain, there are still millions of Americans that suffer daily from back pain caused by injuries, illnesses, or lasting effects of medical procedures. Resonant Technologies has worked to combat symptoms of chronic and acute pain throughout the back by using physical and cognitive therapeutic techniques to create a Music Vibration Chair.

Music vibration therapy can be a reliable, viable, and scientifically significant option for pain treatment in the medical field. This device will help to stimulate the nerves through vibration, causing physical relief, while also providing the user with the cognitive benefits of music therapy. A biological feedback system will continuously monitor the user's heart rate and use the information to tailor the intensity of the vibrations supplied by motors throughout the chair to best fit the needs of each individual. The user will also be able to choose the music that aids in powering the vibration motors, which provides an enjoyable and relaxing therapeutic experience

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Nanoparticle Distribution System

Team Members:

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External Sponsors/Mentors:

Internal Sponsors/Mentors:

- Dr. Guido Verbeck, UNT Chemistry Department

Abstract:

Chemotherapy results in the large-scale death of healthy tissue and radiation poisoning in the patient, and removal of tumors in surgery cannot ensure the complete removal of cancerous tissue. Currently scientists are researching the effectiveness of nanoparticles in cancer treatment. Due to their reactive nature, nanoparticles can be used in various applications, more importantly medical applications. SANE Tech aims to reinvent the approach to cancer treatment with the Nanoparticle Distribution System.

The Nanoparticle Distribution System device will create and deliver nanoparticles to a localized cancerous area on the human body. This distribution system will be comprised of a vacuum chamber, a mobility cell, a laser system, and a user interface. The nanoparticles will be created in a vacuum chamber using laser ablation on metal sheets. During laser ablation, the laser will focus onto the metal sheet, and the pulsing of the laser will irradiate layers from the material. The vaporized material will react with surrounding material and condensate into nanoparticles. These condensed nanoparticles will be collected and deposited. The nanoparticles will travel through a stainless-steel mobility cell to ensure that the all of particles can be transferred without interference. The device will also feature customizable delivery of the nanoparticles to the designated area using a diode targeting system. An interface will allow for the user of this device to accurately target and distribute nanoparticles.

SANE Tech strives to create and distribute nanoparticles (using metals effective in cancer treatment) to patients with cancerous tissue. By rethinking the current approach to cancer treatment, it is possible to prevent negative results in patients. A device that administers nanoparticles is essential to improving cancer removal techniques because it provides a basis for many future treatment applications. Creating and distributing nanoparticles is essential in improving cancer treatment since the ultimate purpose is to limit the damaged cells and prevent cancer from spreading.

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Vigilant Monitor

Team Members:

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External Sponsors/Mentors:

Internal Sponsors/Mentors:

- Dr. Vijay Vaidyanathan, College of Engineering

Abstract:

Sudden Infant Death Syndrome is an unpredictable tragedy where a seemingly healthy infant under a year old perishes, usually while sleeping. To increase an infant's probability of surviving the onset of SIDS and give parents peace of mind Mazu Medical developed a smart baby monitor. This monitor, a crib mounted video camera connected wirelessly to a bedside display unit, uses real-time Eulerian Video Magnification to detect heart rate. If the infants heart rate becomes critically low, the monitor activates a 3 stimulus response consisting of an alarm, bright flashing lights, and vibration attempting to induce crying, arousing the infant and alerts parents via their bedside unit.

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One BioMedical

Team Members:

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External Sponsors/Mentors:

- Smith & Nephew

Internal Sponsors/Mentors:

Abstract:

Currently, Smith & Nephew, a bio therapeutics company processes Bovine Collagen by taking small, 2-3 cm cubes and blending them with a kitchen blender. Furthermore, after the collagen has been properly blended, it is then taken to an individual worker to manually separate with tweezers into thin fiber strands; moreover, the appearance of the fiber depends on the judgment of each worker. This current process is labor heavy, costly, and time consuming. Therefore, the project goal that one biomedical has been tasked with, is to develop a semi-automatic processing device that will obtain the desired collagen fibers, decrease labor, time, cost, and ultimately replace the current methodall together.