Celebration of Design
Class of 2015

Senior Capstone Program in Bioengineering

Bioengineering in the Service of the Living World

Saturday, May 9, 2015
11:30 AM – 2:30 PM
Mandela Room
Old University Union
<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
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<tbody>
<tr>
<td>11:30-11:50 AM</td>
<td>3D BIO-PRINTER</td>
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<tr>
<td>11:50-12:10 PM</td>
<td>ADAPTIVE MATERIAL MEASURING AND CUTTING DEVICE</td>
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<tr>
<td>12:10-12:30 PM</td>
<td>BIO-METRIC TOOTHBRUSH AND ANALYSIS ALGORITHM</td>
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<td>12:30-12:50 PM</td>
<td>CORN CLEANING APPARATUS FOR ONONDAGA CLAN MOTHER</td>
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<tr>
<td>12:50-1:10 PM</td>
<td>POWER WHEELCHAIR FOR CHILDREN WITH PHYSICAL AND CORTICAL VISUAL IMPAIRMENTS</td>
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<tr>
<td>1:10-1:30 PM</td>
<td>ACTIVE PRESSURE ULCER PREVENTION CUSHION FOR WHEELCHAIR USERS</td>
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<tr>
<td>1:30-1:50 PM</td>
<td>CAR SEAT ACCESSORY ALLOWING ATTACHMENT AND ROTATION</td>
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<td>1:50-2:10 PM</td>
<td>POST OPERATIVE ORTHOPEDIC DEVICE—MEASURING WEIGHT BEARING</td>
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<tr>
<td>Title of Project: The Modular 3D-Bioprinter Gantry</td>
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<tr>
<td>Student Team Members: Rick Armbruster, Yanis Boukerrou, Xavier Brissett and Dan Sherman</td>
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<td>Team Leader: Xavier Brissett</td>
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<td>Faculty Advisor(s): Dr. Kaiming Ye</td>
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<td>Client(s): Dr. Kaiming Ye, Kyle Reeser and Sebastian Freeman</td>
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**Brief Description:**

3D bioprinting is a rapidly evolving, precise method of distributing biological materials for broad applications in tissue engineering. Opifex’s Modular Gantry Head is a product focused on adding versatility and control to this growing field. Centered upon a smart hub and universal accessory plate, our current design supports microvalve deposition, nebulization and UV light crosslinking as well as the means to incorporate additional functionalities. Arduino Pro Minis in the central hub and modules allow for intelligent communication. Our design enables the user to develop modules specific to their unique 3D bioprinting needs.

**Visual:**

![Image of the Modular 3D-Bioprinter Gantry](image-url)
Title: Prototype Power Wheelchair for Children with Physical and Cortical Visual Impairments.

Team Members: Alida Cooke (Leader)
            Kyle Bird
            Levi Leab
            Nicholas Parody

Advisor: Dr. Amber Doiron

Client: Ms. Reva Reid

Description:
This project is dedicated to building a power wheelchair for children with physical and cortical visual impairments to help them learn how to move independently with a power wheelchair. The ultimate goal of this project is to help them obtain a power wheelchair of their own in the future.
Title of Project: Onondaga Corn Cleaning Apparatus

Student Team Members: Brandon Cropley, Kevin Cheng, and Zachary Zeller

Team Leader: Zachary Zeller

Faculty Advisor(s): Nick Plavac and Dr. George Catalano

Client(s): Miss Freida Jacques

Brief Description:

This device assists our client Freida Jacques, a clan mother in the Onondaga nation, share the Onondaga heritage through the traditional corn harvest soup. Initially, our client spent about an hour outside cleaning the corn and then up to two hours back in her kitchen more thoroughly cleaning the corn in smaller batches to prepare it to be cooked. In turn, we seek to reduce this time by 50% so that Ms. Jacques can clean the corn in at most ninety minutes as well as to reduce the intensity of the corn cleaning activity by 40% based on perceived exertion.

Visual:
Title of Project: Biometric Toothbrush

Student Team Members: Kevin Blatt, Lee Detota, Allyson Kritzer, Matthew Mahan

Team Leader: Allyson Kritzer

Faculty Advisor(s): Dr. Craig Laramee

Client(s): Odin Visionary Technologies, LLC

Brief Description: Biometric products are increasingly popular devices, and are used to measure physiological signals to promote healthy living. Odin Visionary Technology, LLC is seeking to develop this technology for toothbrushes. The toothbrush device we developed provides a brushing report that enables the user to gauge their brushing effectiveness. With the use of a 3-axis accelerometer, 3-axis gyrometer, 3-axis magnetometer, and pressure sensor a continuous stream of data is collected and sent to a computer via Bluetooth. Our algorithm, which utilizes a support vector machine, determines the duration and position of the brushing. The user can then view their brushing activity on a user friendly web page, as well as viewing their final brushing assessment.

Visual:
Title of Project: Active Pressure Ulcer Prevention Cushion for Wheelchair Users
Student Team Members: Joshua M. Cohen, Evan Terrell, Troy Vargason, Jin Xiang Yu
Team Leader: Joshua M. Cohen
Faculty Advisor(s): Dr. Guy K. German, Department of Biomedical Engineering
Client(s): Gail A Mathieson-Devereaux and Ann Myers, Decker School of Nursing

Brief Description: Pressure ulcers form when a sustained stress on the skin reduces blood flow and causes damage to underlying tissues. Injuries resulting from pressure ulcer occurrences can leave hospitals and care centers liable for treatment, which can cost up to $50,000 per incident and is very labor-intensive. Use of a wheelchair increases an individual’s pressure ulcer susceptibility at bony prominences in the pelvic region. Our device has been created to reduce pressure on a seated subject’s buttocks at an affordable price. Preliminary testing of our device suggests adequate pressure reduction to allow for blood flow at bony prominences.
Title of Project: Adaptive Measuring and Cutting Device
Student Team Members: Yuwei Jiang, David Olsen, David Rios, Christopher Siriban, Stephanie Smith, Hannah Wong
Team Leader: Hannah Wong
Faculty Advisor(s): George Catalano
Client(s): ACHIEVE Country Valley Industry
Brief description: We built and designed a device that can roll out, automatically measure and cut fabric. The rubber feed rollers are powered by a gear motor to pull the fabric off the bolt for a desired length and the secured electric rotary cutter allows for a clean, straight cut. It is designed to be user-friendly especially for individuals with developmental disabilities. This machine will help optimize the fabric measuring and cutting process and allow CVI to accept and fill more fabric orders.
| Team Members: Hemant Heer, Joshua Miller, Joshua Cohn, Myles Quock |
| Team Leader: Hemant Heer |
| Faculty Advisor(s): Nick Plavac, Department of Biomedical Engineering |
| Client(s): Thea Arnold |
| Brief Description: Caregivers experience difficulties transferring children to and from vehicles. This process becomes increasingly difficult with children who have mobile impairments. Caregivers have to maneuver children in uncomfortable ways that place unnecessary strain on the caregivers’ bodies. The ‘Easy Seat’ is an accessory for child seats that eliminates the difficulties associated with transferring children into and out of child seats. Our device provides rotational capabilities to child seats, enhancing the lives of caregivers and children. |
Title of Project: Postoperative Orthopedic Device – A Weight Bearing Measurement System
Student Team Members: Jordan Abramowicz, Michelle Cerniglia, Rebecca Irwin
Team Leader: Rebecca Irwin
Faculty Advisor: Margaret Decker RN MS CNE
Client: Lourdes Hospital Orthopedic Surgical Unit

Brief Description
Our senior design team set out to create a novel device that could quantitatively measure partial weight bearing status, and alert the patient if the recommended threshold is exceeded. Our proposed technique will remedy the shortcomings of previous technologies, while fulfilling the needs of patients and our client. Our design is produced at a low cost, while taking safety, sanitation, ease of use for the caregivers, and the natural walking motion of the patients into consideration. Our device will be strapped to a patient’s shoe of any adult size, and will be able to be programmed by the caregivers to sound an alarm when the patient exceeds their partial weight limit; this will allow the physical therapists and nurses to be able to better coach the patients through the rehabilitation process. This device will afford caregivers the quantitative accuracy needed to improve patient care, while removing the dangerous and subjective aspects of the methods currently used.