

## **BioHack Project Details**

### Project #1: ICU Hand Washing Recognition System

Clinical Background: Hospital-acquired infections affect nearly 2 million patients every year in the U.S. and are responsible for nearly 100,000 deaths per year. Across the nation and even in our institution multiple initiatives have been developed to try and improve hand hygiene compliance as a means to reduce hospital-acquired infections. To date these initiatives have only provided marginal results and we have not achieved our goal of 95% compliance. Every interaction between a healthcare provider and a patient starts with a hand hygiene opportunity, which in turn is a chance to improve our commitment to safety and quality. Other hospitals rely on multiple methods to ensure hand hygiene compliance, but existing systems are expensive, involve intrusive individual tracking and cannot be retrofitted to existing infrastructure.

Engineering Challenge: The goal of this project is to design and build a prototype for an automated visual alert system for health-care workers to adhere to hand hygiene protocols as they enter and leave a patient's room. The system should not use any auditory alerts, since these will lead to alarm fatigue and likely noncompliance. It should also be able to record and store compliance data, but no individual personal information. More importantly the device will be retrofitted to existing hand hygiene stations, and sinks, which will avoid the need to make major alterations to existing infrastructure.

Prizes: \$100 Amazon Gift Cards for each member of 1<sup>st</sup> Place Team, \$50 Gift Card for 2<sup>nd</sup> Place team members, \$20 for 3<sup>rd</sup> Place team members

### Recommended Hardware:

Arduino

Breadboard

Sensors (IR, Ultrasound, Motion Sensor, Force Sensors are some examples)

Battery Pack for Power

Basic Circuit Starter Kit

Output Displays

## Project #2: Wheelchair Obstacle Sensor

Clinical Background: Wheelchair users operate their devices in a wide range of environments and settings. Often these settings and environments include tight spaces, obstacles, relatively steep slopes and other less than optimal environments. In these settings, users can often be at risk of impacting walls or other obstacles, and can be moving at a higher than desired velocity which puts them at increased risk of injury if they do contact an obstacle. Current wheelchair designs do not have any type of warning device or guard to help prevent these potential accidental collisions between the wheelchair and the environment.

Engineering Challenge: The goal of this project is to develop a system that will help to prevent accidental collisions between wheelchairs and walls or other similar obstacles in the environment. The goal of the system is mainly to prevent injury to the wheelchair user, so the system may consist of a warning device or a protective device, or some combination of both systems. The device or system is analogous in many ways to the combination of automotive safety systems that include bumpers and obstacle detection and warning systems.

Prizes: \$100 Amazon Gift Cards for Each member of 1<sup>st</sup> Place Team, \$50 Gift Card for 2<sup>nd</sup> Place team members, \$20 for 3<sup>rd</sup> Place team members

### Recommended Hardware:

Raspberry PI

Infrared Sensor

Raspberry Pi Camera

Basic Circuit Kit

Battery for Power

DC Motors

Small Speakers

Chair

**\*\*\*WHEELCHAIR NOT REQUIRED FOR PROJECT\*\*\***