

Aggie Invent #1

Summer 2014, Texas A&M Univ.

Engineering Innovation Center

Zachary McIlvoy

From the Aggies Invent website:

“In our efforts to promote innovation and an entrepreneurial mindset among students at Texas A&M University, the office of Engineering Academic and Student Affairs (EASA) will host Aggies Invent - a series of 48 hour hardware events offered at the Engineering Innovation Center (EIC) throughout the year. The format of the event is to engage about 70 students in hands on projects that will push their innovation. The concept is to gather interested students, seed the event with potential needs (medical, energy, or others), allow the students to self-select teams, give them access and support at EIC, and have them attack the ideas to create prototypes in 48 hours. The event will be similar to various Maker events being held around the country. EASA will design each event in collaboration with industry and faculty.

The end goal is to enable students to push their innovation/creativity, compete for the best design, gain practice with rapid prototyping tools, and encourage the best teams to enter national/international competitions with their designs. If the solutions are sufficiently able to be commercialized, then we would help plug them into entrepreneurial activities at Texas A&M University.”

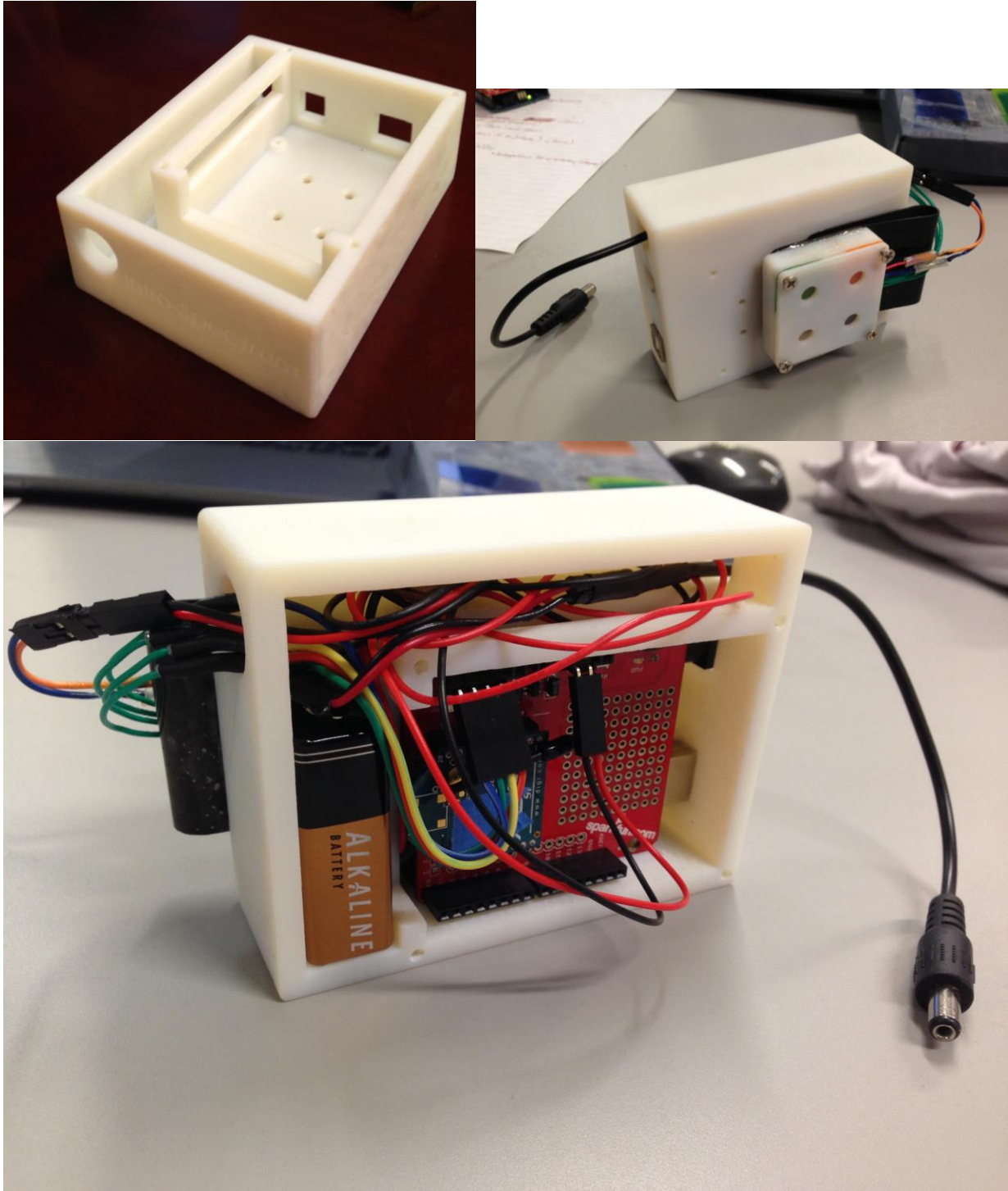
See a video of this specific event here: <https://www.youtube.com/watch?v=vs6jF07jLsc#t=79>

My Team's Needs Statement from NASA:

“As NASA looks towards deep space missions, lighting will play a significant role in the mission-not only for providing light to perform tasks inside and outside the spacecraft but also to provide a means to maintain circadian rhythms of the crew. Lighting may start to degrade possibly due to radiation or the lighting hardware. This can begin to affect the crew's health. A means of monitoring the amount of light and spectrum a crewmember is exposed is desired for detecting lighting issues. The design challenge is to develop a wearable lighting sensor system (WLSS) that monitors the intensity of light (white), red, and blue. The desired system should have programmable logging of light samples (white light intensity, Red and blue) from 5 minutes to 30 minutes in increments of 5 minutes. The WLSS should also have the ability, upon command, to download the information (24 hours' worth) wirelessly to a central base station. The goal is for each sample to contain a time stamp of when the sample was taken and the readings at the time for light intensity, the red, and the blue spectrum. A stretch goal is develop a way of measuring the cumulative lighting intensity a crewmember is exposed to as well as red and blue spectrum over a 24-hour period at the sampled periods. As NASA looks towards deep space missions, lighting will play a significant role in the mission-not only for providing light to perform tasks inside and outside the spacecraft but also to provide a means to maintain circadian rhythms of the crew. Lighting may start to degrade possibly due to radiation or the lighting hardware. This can begin to affect the crew's health. A means of monitoring the amount of light and spectrum a crewmember is exposed is desired for detecting lighting issues. The design challenge is to develop a wearable lighting sensor system (WLSS) that monitors the intensity of light (white), red, and blue. The desired system should have programmable logging of light samples (white light intensity, Red and blue) from 5 minutes to 30 minutes in increments of 5 minutes. The WLSS should also have the ability, upon command, to download the information (24 hours' worth) wirelessly to a central base station. The goal is for each sample to contain a time stamp of when the sample was taken and the readings at the time for light intensity, the red, and the blue spectrum. A stretch goal is develop a way of measuring the cumulative lighting intensity a crewmember is exposed to as well as red and blue spectrum over a 24-hour period at the sampled periods.”

Our Solution:

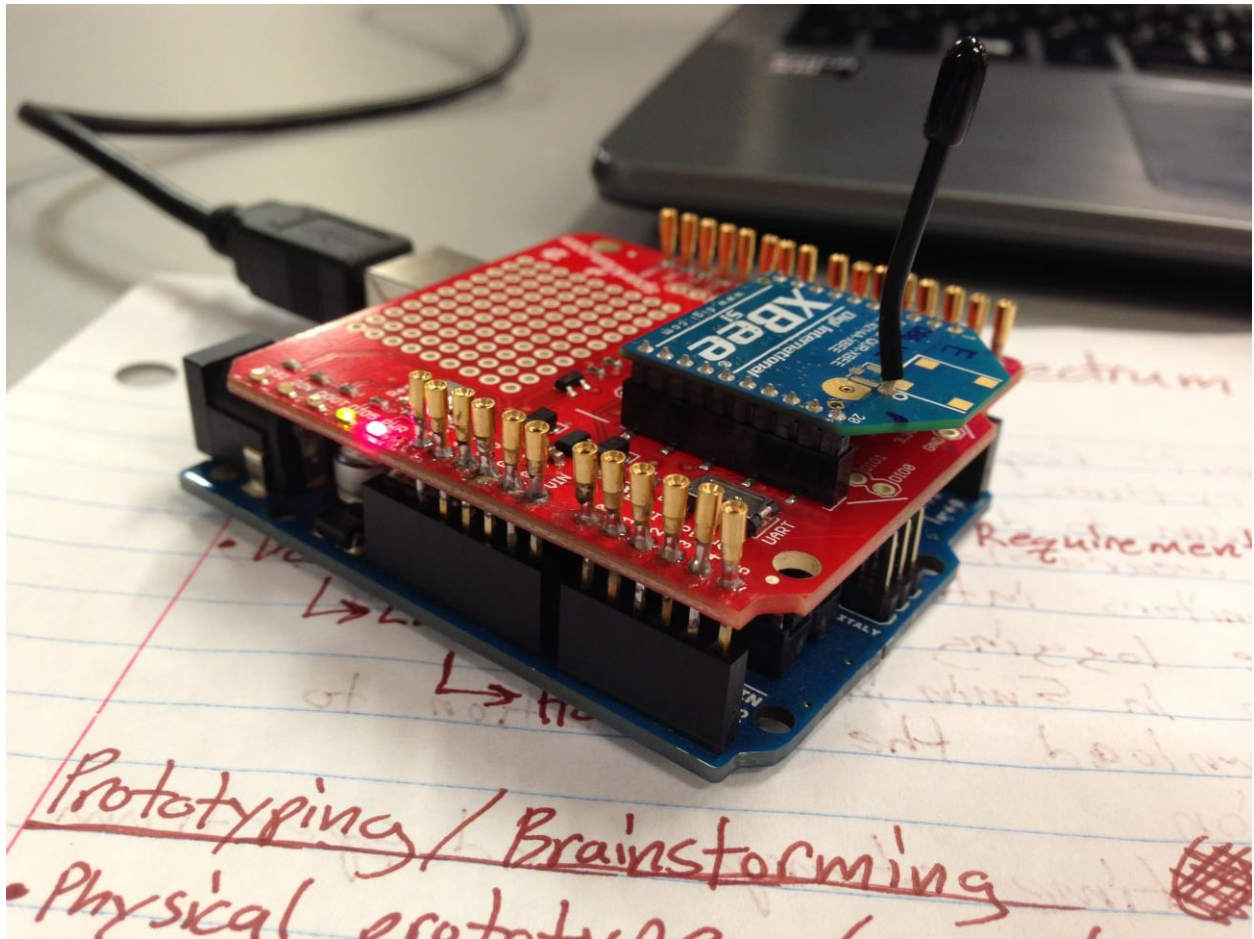
Our solution was a prototype device that functioned as a clip, allowing it to be attached anywhere on a given outfit, uniform, or space suit, to give it the maximum light exposure. Some research and further communication with our sponsor brought us the specific areas of light exposure related to circadian rhythm and the blue light spectrum. Thus, our device focused on being able to detect the light color spectrum, and light intensity as starting points. With these capabilities we could adjust color and intensity of cabin lights to put individual astronauts on different day/night schedules from each other, as well as to adjust for natural color fading and shifting on the LED bulbs to prevent its contribution to depression and mood swings. Our wearable communicates wirelessly with a base station, which then collects and interprets the data. Based on this information, it then automatically adjusts the lights' brightness and color. Everything from the case to the wireless protocol was custom-designed, and then integrated with Phillips Hue bulbs to provide color changing capabilities.



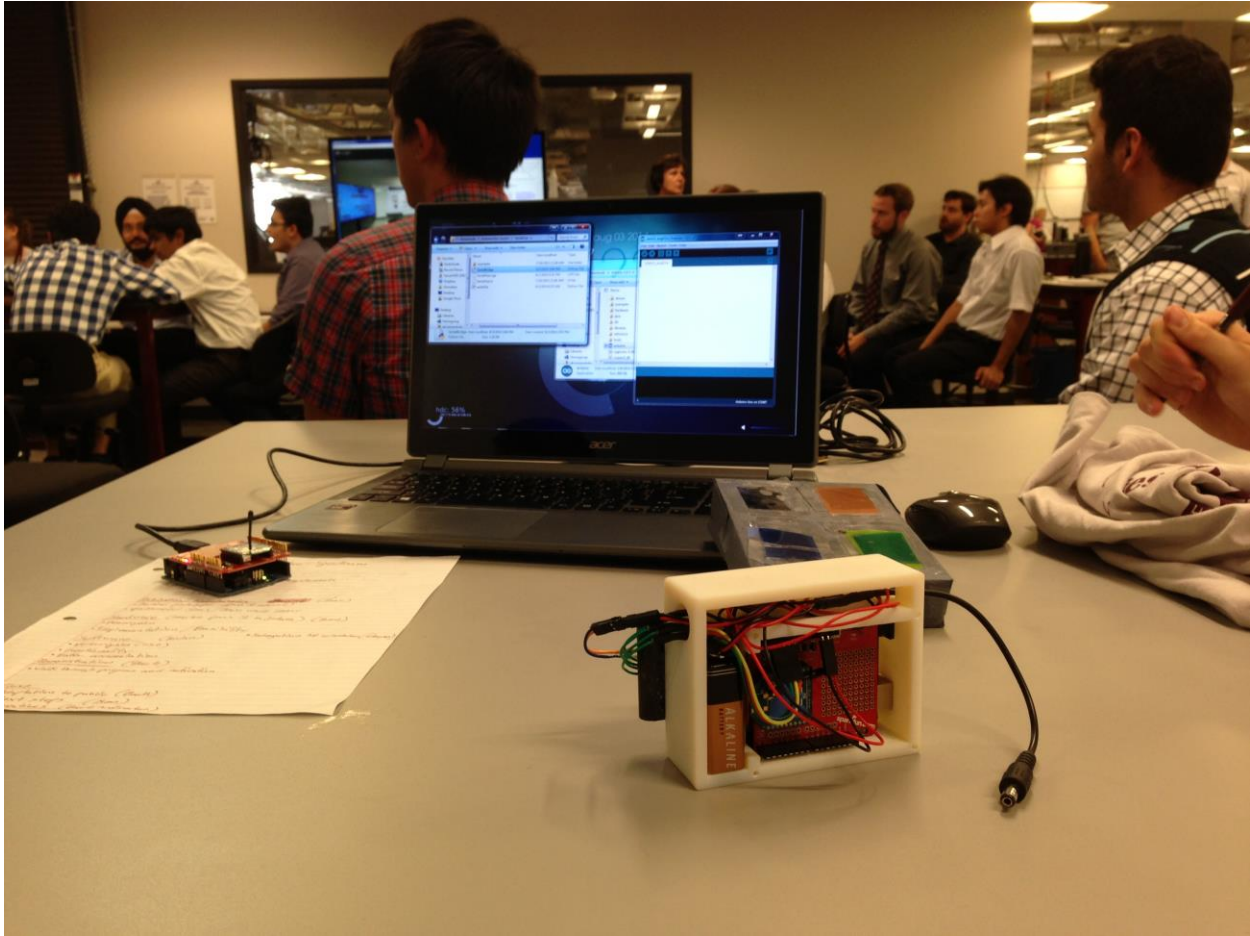
Top Left: our custom-designed, 3D printed case

Top Right: final project, "front" view

Bottom Middle: final project, "back" view with cover removed



The wireless receiver



Final project setup

Pictured: wireless home module, computer for processing incoming data and communicating with the lights, wearable device (cover removed), color filter demonstration