Heartbeat Drum – Discovery Space 1

Overview
Our sponsor has presented the need for a Heartbeat Drum to our team. Such a device involves a heart-rate sensor, amplifying circuit, and mechanical drum apparatus to play back a user’s heart beat in real time. The problem is multidisciplinary, with bio-signal analysis, electrical engineering, and mechanical engineering represented in its design.

Objectives
We planned to build a heartbeat drum that functioned reliably and safely for Discovery Space, and include with it lights and a BPM display to provide additional entertainment and educational value.

Approach
- We began by meeting with Discovery Space and isolating our sponsor’s most important concerns: safety, durability, and ease of use.
- Preliminary research revealed an existing heartbeat drum developer, The Exhibit Guys Inc, but due to the educational nature of the project and lack of existing patents, copyright was not an issue.
- Initial designs were based on The Exhibit Guys Inc’s drums, but diverged when we decided to purchase a heart rate sensor instead of building one ourselves.
- We created CAD models to see how the different components (circuit, hand sensors, drum) of the project might fit together.
- When the drum was working reliably, we took testing results from our team members and peers, looking for relevant parameters like accuracy of heart rate. These results were found to be satisfactory (<5% error).
- Qualitative feedback for our project at the design showcase was important. Children and adults alike found the device entertaining and engaging. There was a very positive reaction from the interactivity of the device.

Outcomes
- The sponsor has saved thousands of dollars (The Exhibit Guys Inc charge up to $8,000 for a heartbeat drum).
- This project has created a unique exhibit for Discovery Space that will facilitate a new exploration into human physiology.
- Possibilities remain for expansions to this project in subsequent semesters; there are many potential features to add or improve upon.