LUMINOSITY

PORTFOLIO 1.0 and 2.0 (Revisited)

2016 -2018

Igniting innovation through foresight, design and delivery

Special Thanks to:

Pres. Michael Crow
and
Panchanathan Sethuraman

and all the other mentors who helped us grow.

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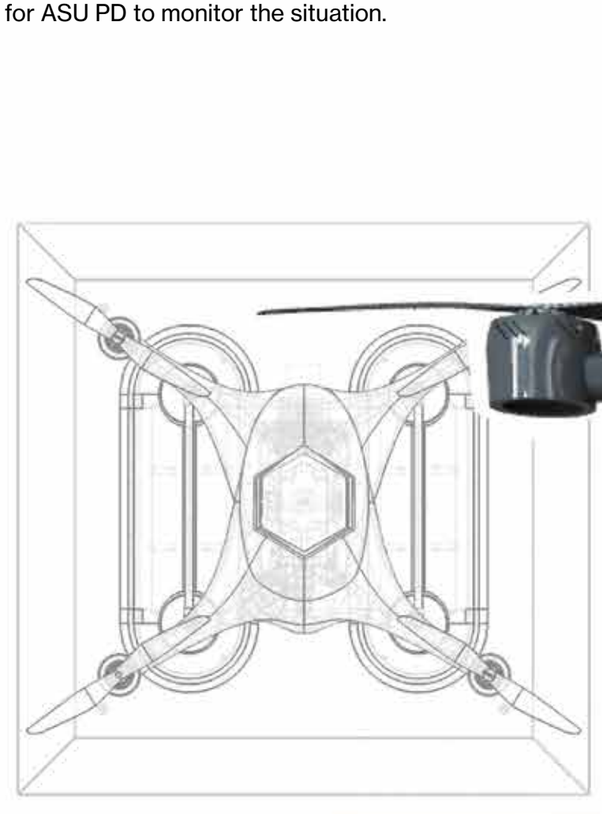
The Luminosity Lab

theluminositylab.com

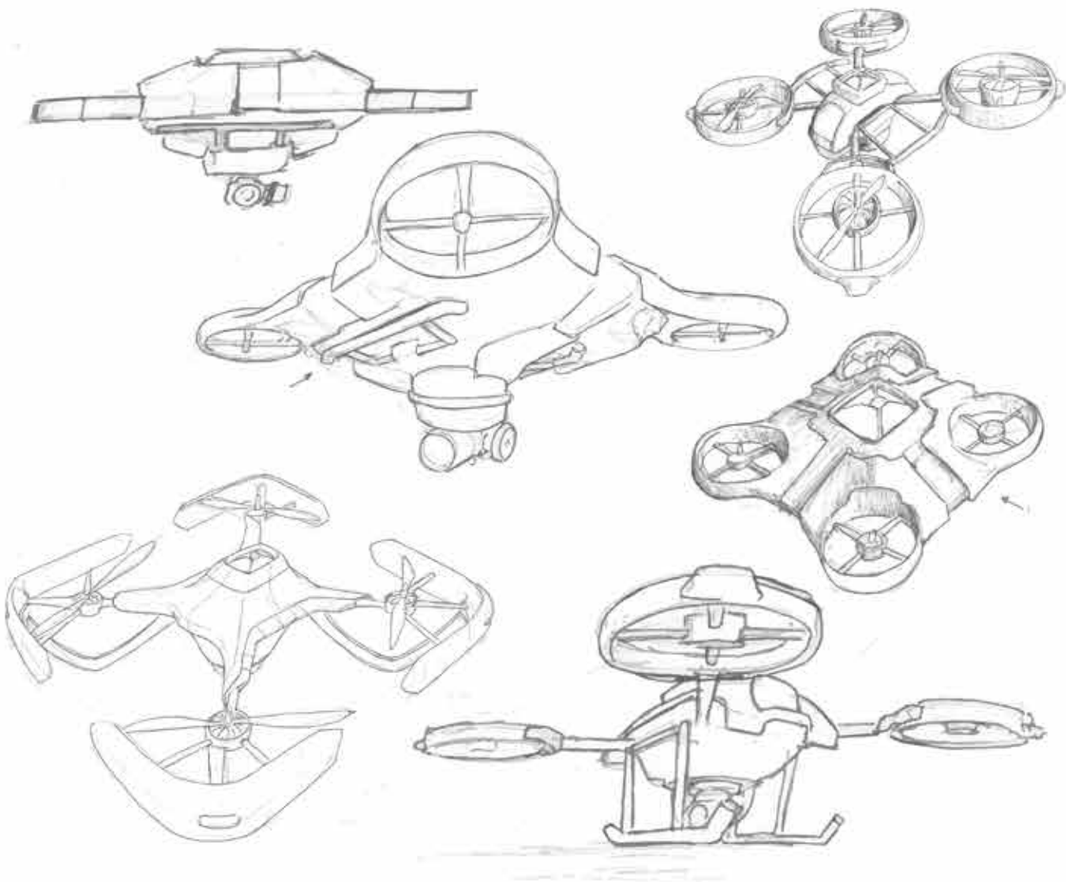
AIRBUD: EMERGENCY RESPONSE UAV

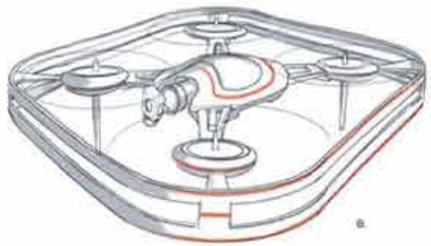
Robots are pervasive in today's society. From the digital assistants on your phone and PC, to automated factories, robots make our lives safer and more productive. More recently, robots' aerial siblings are replacing satellite and traditional aerial observation platforms, and companies are pushing to allow drones for wider commercial applications. Guardian Drones is a system designed to increase university campus safety by augmenting a campus's existing emergency response team with fast autonomous agents. Our system employs a cloud-driven architecture to bring security directly to the students - literally. Using their personal smart device, students can request to be escorted through campus by a drone, with an optional spotlight that provides comfort for the student, and that establishes a live video link for ASU PD to monitor the situation.



EMERGENCY RESPONSE UAV: CONCEPTS

CAD model of UAV internals



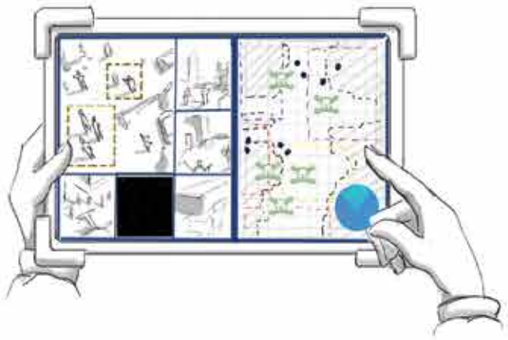


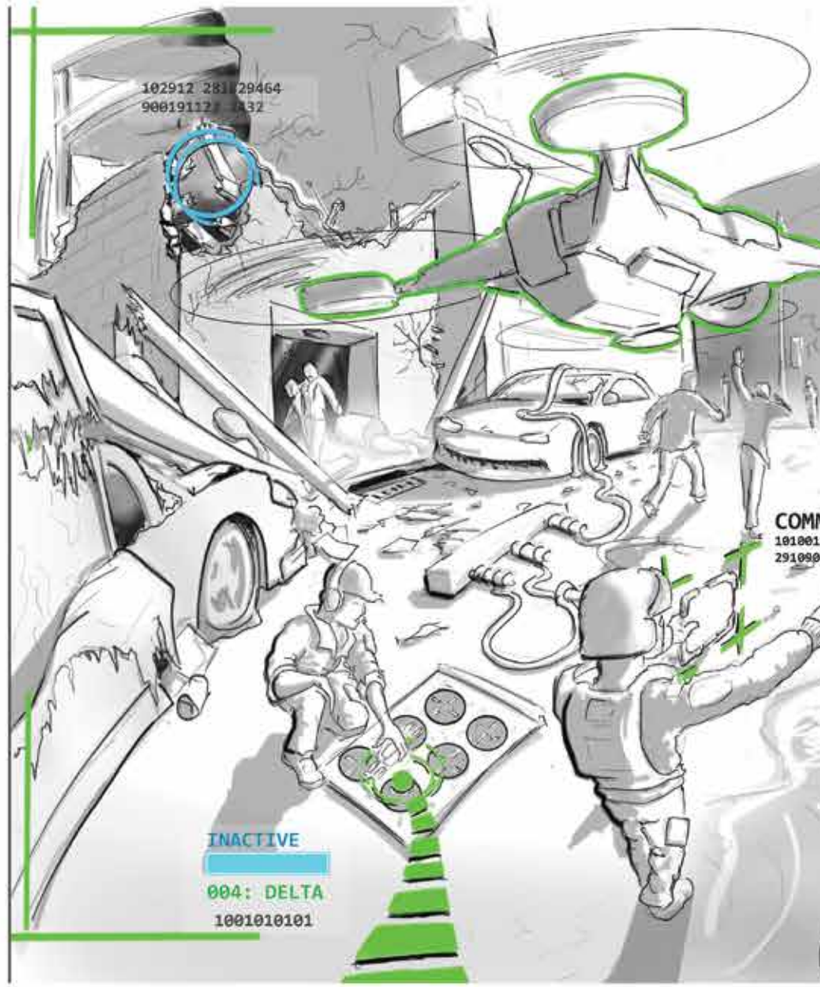
ASURE: SEARCH AND RESCUE UAV SWARM

2017 alone has been a year filled with many local and global national disasters that have affected the lives of hundreds of thousands of people. During these events, large scale community and government driven fundraisers take place in attempt to remedy the damage that has occurred to families, homes and businesses. The fatality of these events takes the lives of many - and at times leaves several unaccounted for - leaving families in a state of panic and hopelessness. Disaster relief crews are tasked with surveying entire rural or city areas to save as many lives as possible, while also ensuring their own safety. With damaged infrastructure and no clear path, the search and rescue operation can be very slow, and the distribution of essential resources can be inefficient.

Our solution is a fleet of autonomous drones carried by search and rescue teams that can be deployed in seconds to canvas a selected area to seek out disaster victims. Using cutting edge machine learning technology, our network of drones can navigate their environment without any assistance from the operator. This minimizes any learning curve traditionally associated with utilizing drones for search and rescue, and makes it commercially viable for emergency use.

The entire fleet of drones can be carried in backpacks by emergency response teams. The operator on the search and rescue team can use a hand-held touch interface to draw out a region of interest on the displayed satellite map. The scheduler algorithm on the handheld interface would deploy each drone in an optimal way to scan the entire target region. Once the drones are deployed, the status and video feed of each drone can be viewed on the interface screen. The interface would be able to classify humans by running a ML model on each frame of the video. The video feed of all the drones are streamed using a mesh network which increases the search distance available to the team... (Continued on next page)



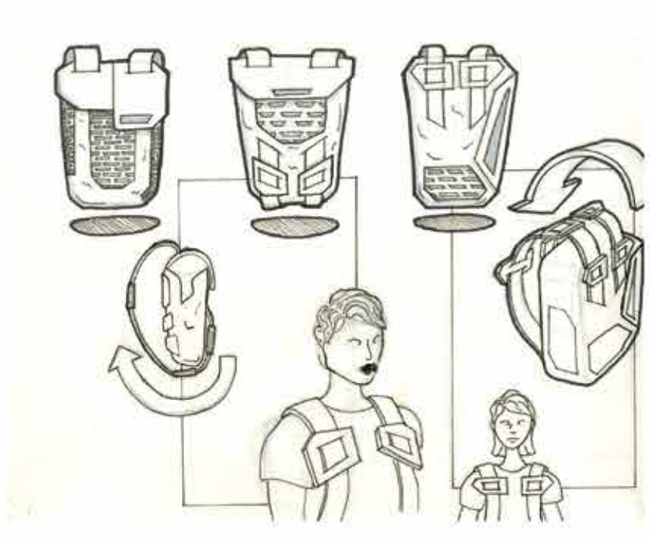


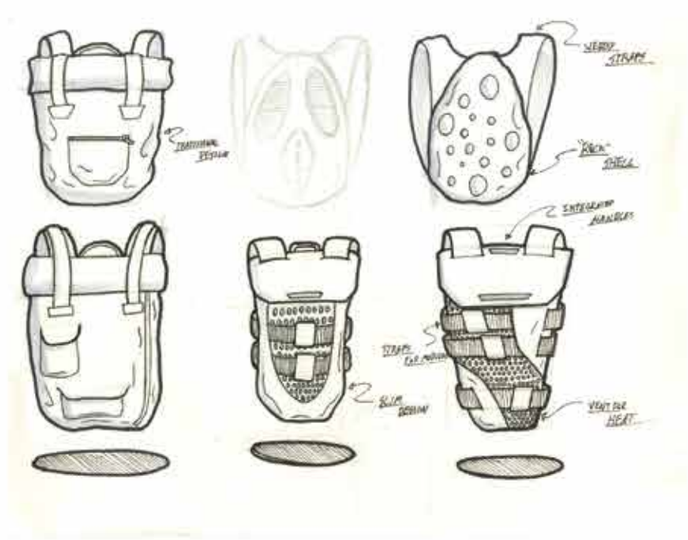
ASURE: SEARCH AND RESCUE UAV DEPLOYMENT PACK

(Cont...) This process provides the most efficient solution to providing aide to a disaster affected community, allowing the search and rescue team to devote their time to the most demanding areas while also increasing their search precision. For the proposed solution to be viable, it takes a lot of talent in both hardware and software development to allow the system to operate flawlessly; our team has six years of experience in drones, autonomous systems and machine learning. We have allocated resources towards the completion of several key requirements that are pivotal to our success in creating this system. The drones themselves need to be a small enough form factor to maneuver in close quarters and effectively create a map to aid in human navigation of the target area. Building the proper infrastructure for the connected fleet includes creating an accurate ML algorithm, trained to detect disaster victims amid harsh conditions. Due to the lack of training data for the ML system, we will take a machine vision approach, allowing video to be preprocessed before it's fed into the ML network (there would be perspective transformation algorithms implemented). The key milestones include generating a longer flight time for the micro drones by creating a custom battery mount that allows for a simple exchange of batteries. We also intend to maximize the scan area of the drones by implementing a mesh network that optimizes efficiency and range. The distribution of each drone in the network is controlled by a scheduling algorithm operating at the base station. Accomplishing these requirements is feasible through our lightweight and simple design.

There are a few steps to implementing this design. First, the team will be composed of two parts: a software team, and a hardware team. To start, the software team will oversee the design of our search algorithms and ad-hoc network setup, both of which will be tested in a simulated environment. The simulation will allow the team to fine tune all parameters quickly without waiting for the physical drone platforms. A Software Defined Network (SDN) will be created to quickly simulate and configure the expanded wireless mesh network. The hardware team will start their work by designing a small, efficient drone platform that will be used for search and rescue. This will include both the standard control system electronics and actuators, as well as a unique sensor payload optimized for search procedures. The team will build a single unit, which will then be handed off to the software team to use as a hardware-in-the-loop testbed. Once integration of this drone with the software architecture is successful, the hardware team will create four more identical drones. Once these are done, the software team will implement the mesh network, first on grounded drones, and eventually airborne drones. Finally, the two teams will administer rigorous testing to ensure the system is fully functional.

The biggest risk for this project is making the shift from one drone, to having a full autonomous fleet, able to synchronize and complete an optimal search and rescue mission. In order to mitigate this risk, the software team will be testing these search algorithms in multiagent simulations, which will allow the team to optimize for the final platform setup. The team is filled with individuals who have experience working on multiagent systems, so scaling from one to many drone platforms will not be a major obstacle.





NASA HP: HOVER PRO COMPETITION

Luminosity represented ASU in competing against eight other institutions around the United States, with the mission to find a way of improving the life of the astronauts aboard the International Space Station (ISS).

The team spent hours going over ISS logs, video tours and news articles to try to gain more insight as to what life is like on the space station. It was identified that the astronauts on ISS are often surrounded by a variety of designated computers which are mounted to various terminals around the station. Despite there being many laptops around the station, astronauts tend to carry their own p ersonal computer along with them. In what equates to space juggling, consistent attention is needed from both hands for astronauts to work with their laptops in order to insure these devices do not float away. There seems to be a preference toward having a computer near the astronauts at all times, and hence a potential solution was developed by the lab.

The proposed solution from Luminosity is the HP Hover Pro, which is an adjustable auto stabilizing laptop mount that uses mini control moment gyroscopes for stabilization. A central fan can be used for dual axial rotation and propulsion, and 3D mapping will be used to keep track of the laptop to ensure that it never leaves the astronaut's side. The HP Hover Pro can also follow the user through the station, allowing them to watch the screen or use video chat while staying hands and anchor free. This can help enhance the world's view on how astronauts interact with the ISS while they are on camera...
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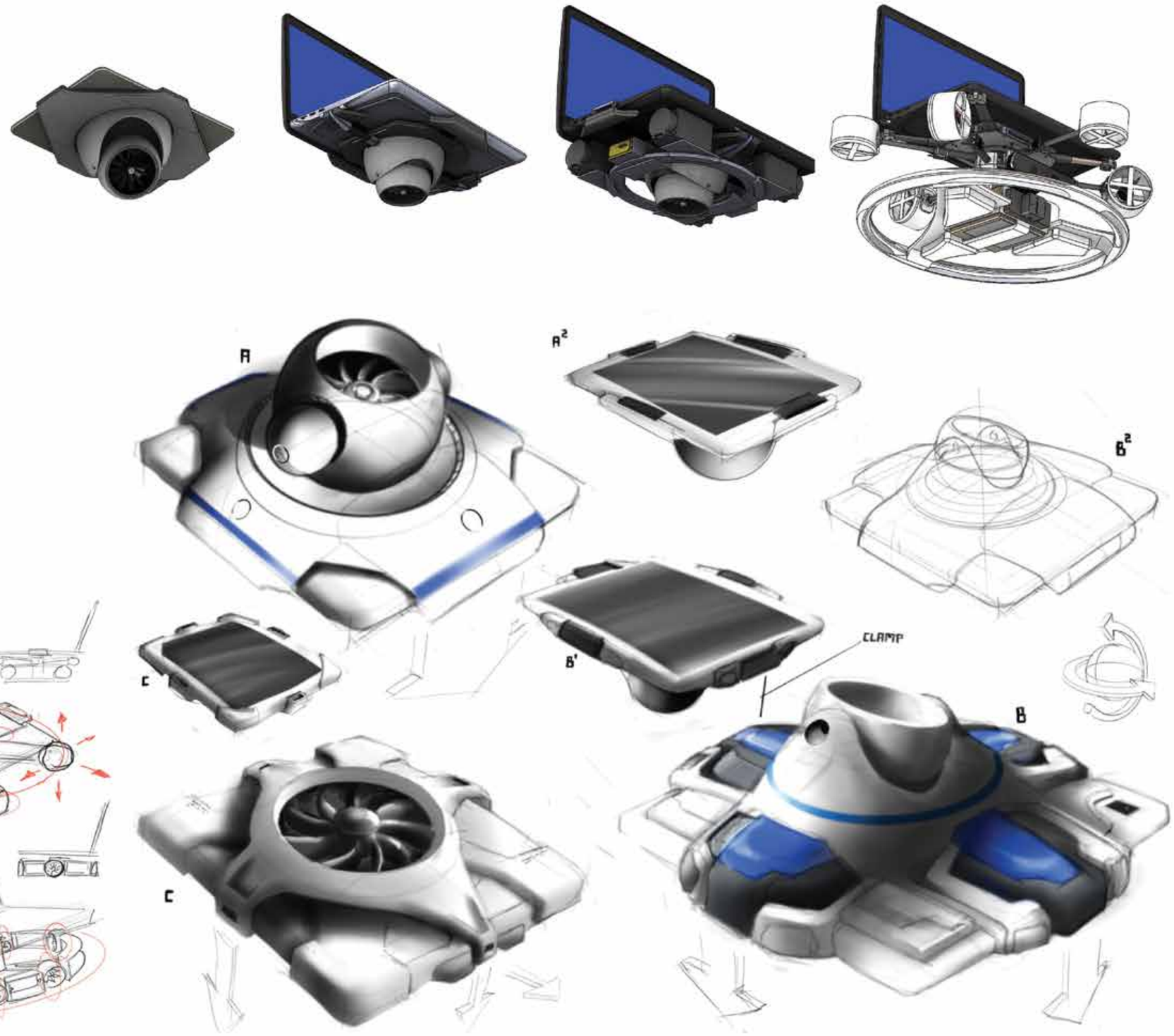
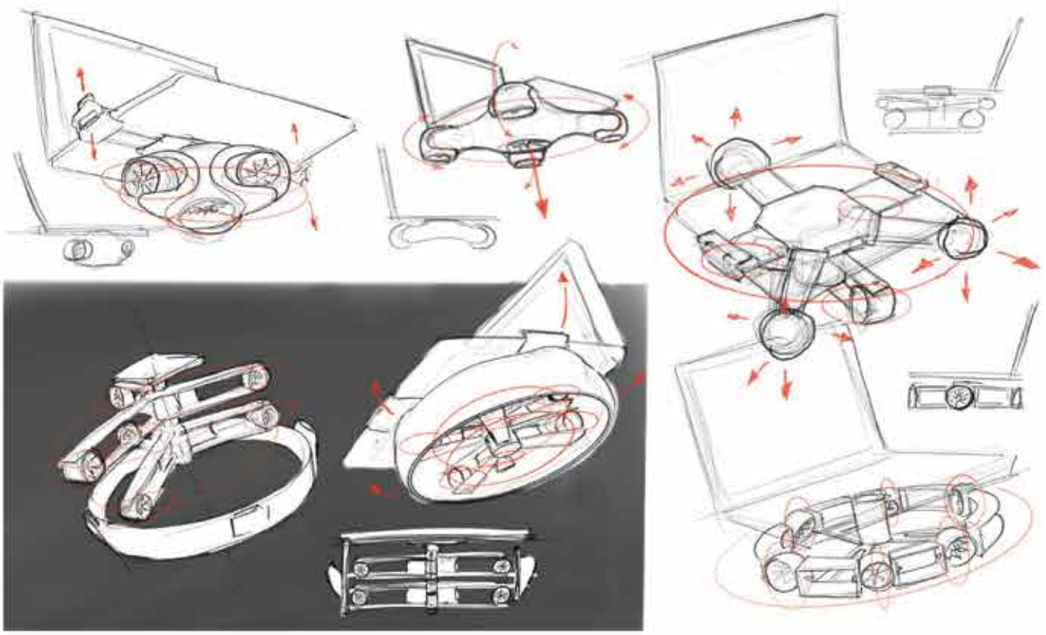
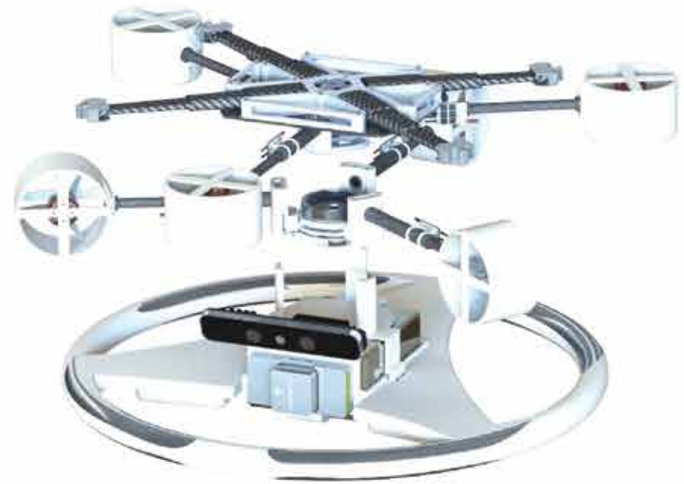




NASA HP HOVER PRO

(Cont...) Imagine you are an astronaut aboard the International Space Station. The first thing you'll do is check your laptop to see what you have to do that day. Any disruption will throw off your pace and so you don't want your laptop floating away while you work.

The HP Hover Pro and adjustable auto stabilizing laptop mount that utilizes gyroscopic stabilization, while maintaining dual axial rotation capabilities. The mount features 3D-mapping for object tracking, to ensure that your laptop never leaves your side, with a capacitive touch gripping ring as an interface for fixed and floating location.



COMPREHENSIVE WORKOUT MACHINE

The Luminosity Lab reversed engineered the mechanisms optimal for strength and conditioning from the subset of pre-specified exercise equipment available at the Adaptive Training Foundation. Following, selected and adapted mechanisms to apply to a unified assembly that will make up a new exercise equipment machine designed to provide a complete workout for its target users. Luminosity was responsible for the research and development of a functional CAD design capable of
meeting ATF's desired outcomes for this new exercise machine. The following were the conditions considered during the design process.

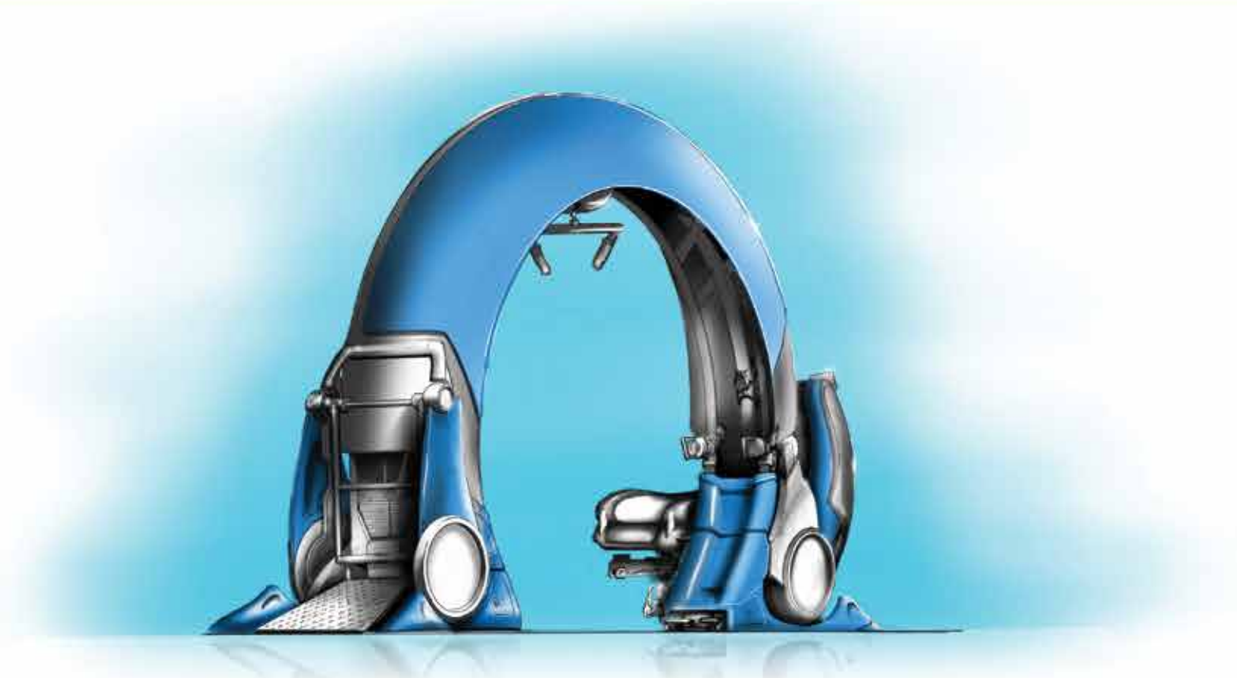
1. The resulting assembly of resistance mechanisms will depend on adjust-ability while providing continuous resistance. Several possible mechanisms exist, employing the use of: air, gravity, magnets and centripetal forces.

2. Each contact must be accessible by an Adaptive (amputee or physically disabled user) from a central location. Contact does not need to be limited to, but must be capable of interaction with Adaptives. The area of reach and user positioning was visually compared to the Vitruvian man as the resulting product has been nicknamed "The Da Vinci Machine". The concept structure will resemble that of a ring with many of its contact points being along its interior. Additional contact points along the exterior will be reserved for workout sets with mechanisms and movements requiring the highest spatial demand.

3. The final design will be that of a minimalist exterior form while maintaining minimum necessary size, meaning each selected conditioning mechanism needs to be redesigned to be as compact as possible.

4. Additional requested parameters have been for VR integration, IOT connection, and digital workout interface capabilities all at the lowest possible cost. (Need target price estimate for final product) with intent to enhance the data tracking and/ or entertainment of a workout routine.

5. A project goal is to recognize that many workout mechanisms can be further tailored to an Adaptive's use and so innovative iterations of such mechanisms can also be sought after.



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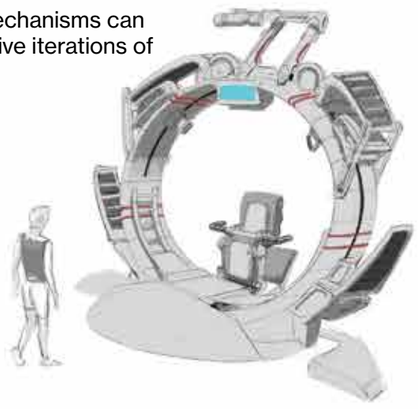
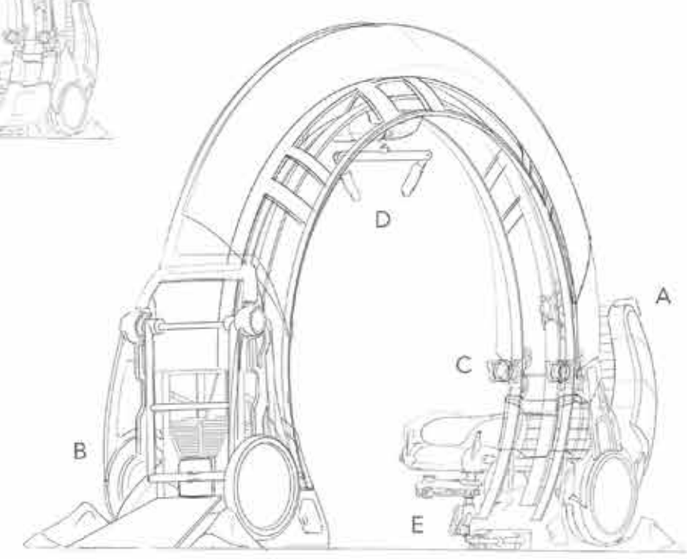
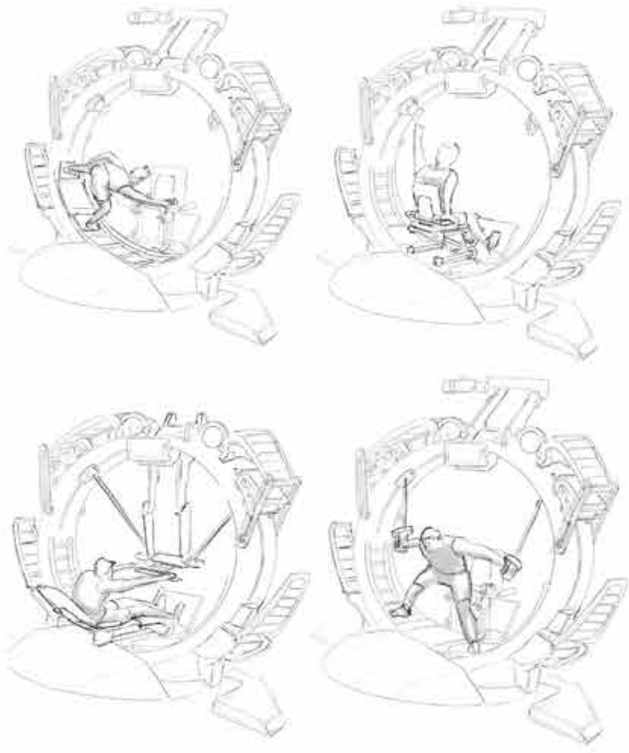


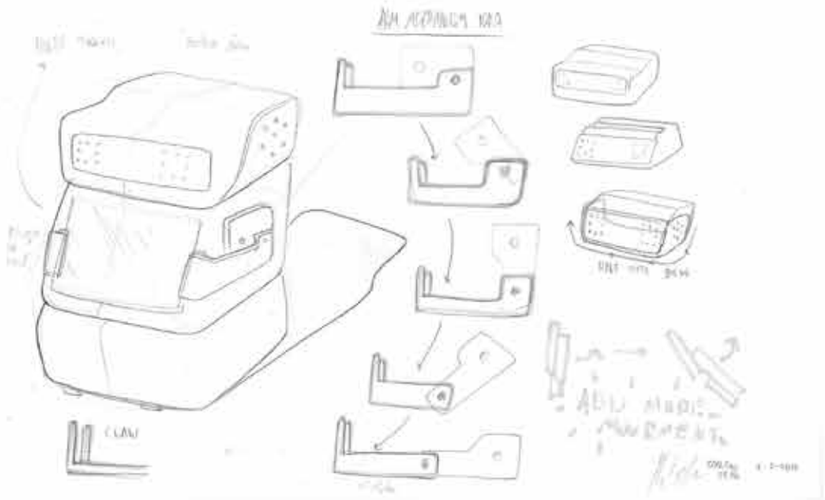


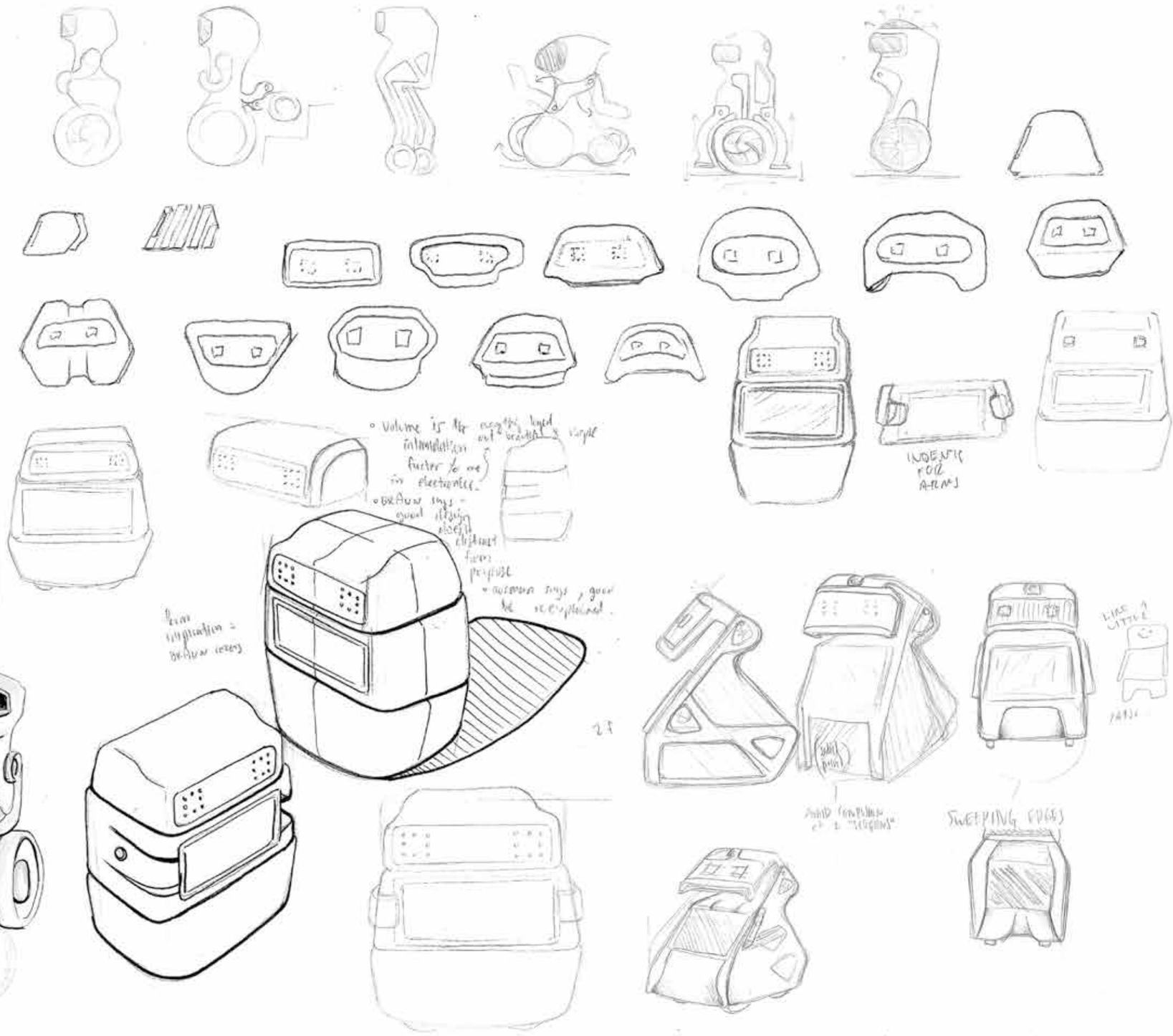
A. Treadmill
B. Isokinetic Machine
C. 270 Pronating grips
D. Pull up bar
E. Delpoyable chair lift
F. With body covers

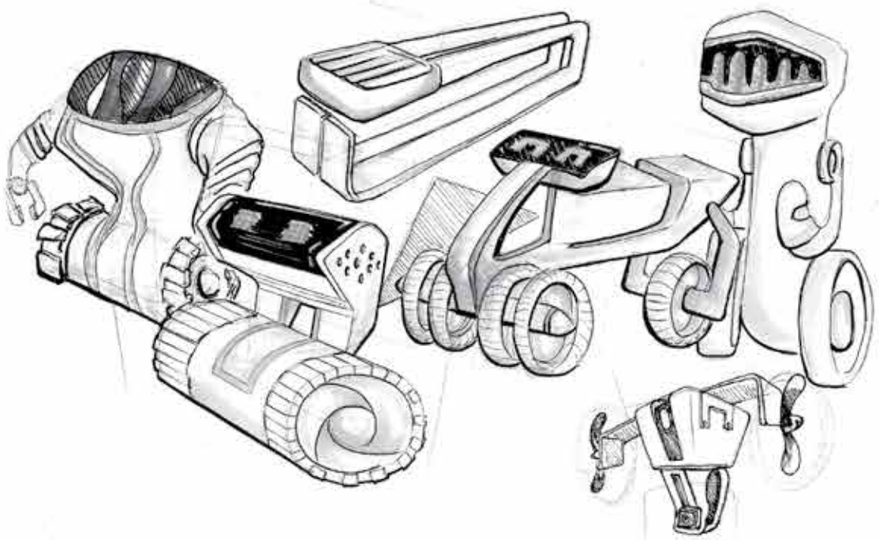


MODULAR ROBOTIC CONCEPTS

The market lacks a platform that teaches kids first principle robotics that includes but is not limited to mechanical design, electrical engineering, and software engineering. We set out to change the de-facto robotics learning platform for schools towards an extendable and open source solution. The end project should be low cost in order to lower economic barrier of entry. This product should include a curriculum that teaches the user first principles around robotics. The product needs to be approachable with a low barrier of entry and also have a high skill ceiling. We intend to use preexisting economies of scale and desktop FDM 3D printing and laser cutting in order to make the project both open hardware and open source.







K.I.P.: MODULAR EDUCATION ROBOT 2.0

The “Knowledge is Power” Project (KiP) is an educational robotics platform:

KiP teaches principles of mechanical, electrical, and software engineering through a hands on project that inspires creativity by combining Learn-Build-Play. KiP is engineered from common “maker” components to reduce the cost and make the skills learned highly transferable to common technologies. KiP is has an open source “maker” community to share designs and ideas making it easy for any individual to download custom software or 3D print and laser cut the parts themselves. KiP teaches principles of mechanical, electrical, and software design through an integrated build and learn method.
KiP makes complicated and difficult engineering more approachable for everyone, while still being fun and interactive with learning options such as comic books (Page 17-19) The objective of the curriculum is to help people who are unfamiliar with robotics get up to speed with all of the technologies that KiP utilizes.

The following are some of the mechanical topics that KiP can teach:

3D Printing: KiP teaches the basics of FDM printing, why 3D printing and additive manufacturing is important, and basic printer maintenance practices
Laser Cutting: KiP teaches the basics of laser cutting and how they can be used to build and customize KiP

Gears and Mechanisms: KiP uses gears to actuate it’s shoulder joint. This serves as the basis for teaching about the basics of torque and mechanical advantage.
Approximate Build Times: Expert 1.5 hours, Beginner 5 hours.

Servos: KiP teaches about servos, what they are, what they’re used for, and how we control them. It covers the basics of PWM (Pulse Width Modulation) with an emphasis on how it relates to servo control.

Steppers: KiP teaches stepper control at a high level and incrementally digs deep into these motors until a deep level of understanding is achieved.

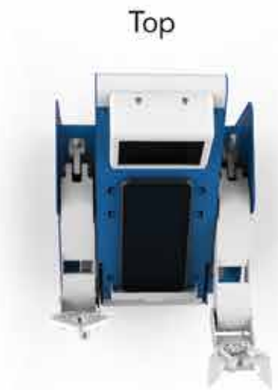
Control Board: KiP teaches basics of electrical systems using it’s custom control board, battery pack, and charging circuit.

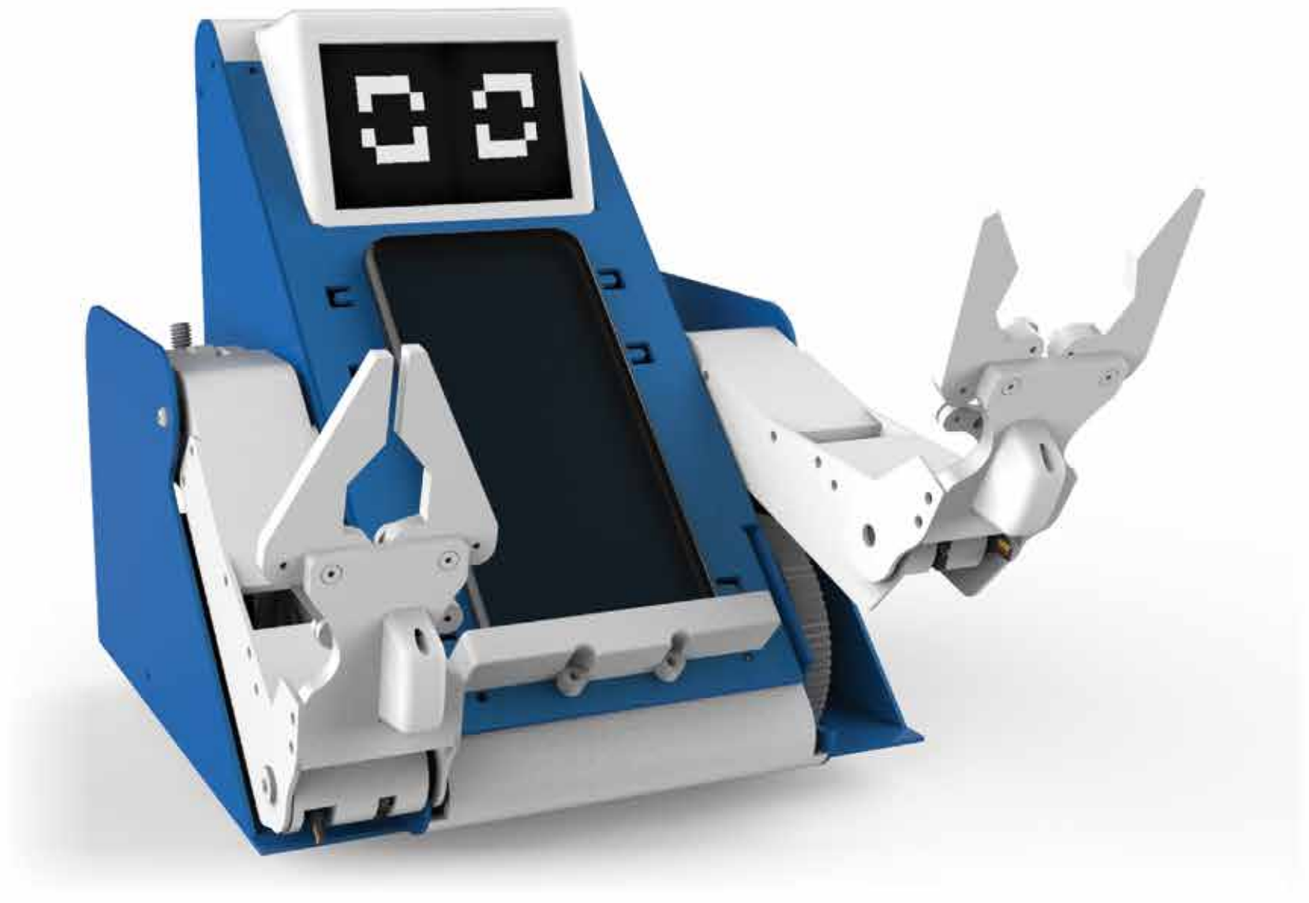
Software: KiP utilizes a Raspberry Pi as it’s compute module. KiP teaches the basics of Python for programming autonomous tasks and other custom functionality using it’s Python API. KiP’s software is completely extendable and easy to use. The drive base provides precise and flexible autonomous driving code so that KiP can navigate around in either predetermined paths or even paths generated at run-time.

Play: (Examples)
Autonomous Sidewalk Chalk Drawing; Users can download designs for the custom chalk gripper (or design their own) and 3D print the parts and then program KiP to operate in autonomous mode to create custom drawings and designs.

Ping-Pong Ball Launcher: Users can download designs for a Ping-Pong Ball launcher attachment and 3D print the parts required and then replace the gripper with the launcher.

KiP’s function and potential is limited by the imagination and innovation of it’s builder.





M.Y.R.A.: MODULAR EDUCATION ROBOT 1.0

MYRA (Make Your Robot Awesome): An affordable, open-source, hands-on platform for teaching a breadth of relevant hardware and software skills to students of all ages.

Project KiP, originally called “Myra” (Previous Page), and was started in 2017 by a group of engineering and design students. The educational goals of Myra were the same, but the robot was more complex, with fully articulating arms and wrists. Over time, as the KiP robot (shown far right) was made to be more inexpensive and therefore marketable as a kit for children and teenagers, the robot was simplified and went through several cosmetic remodels.

Myra eventually became smaller, then turned into the KiP robot, a cube-like fully 3D-printed shell (compared to Myra’s laser cut body) and transformed into the pocket sized KiP.

The creation and transformation of MYRA and KiP, were led on 4 fronts:

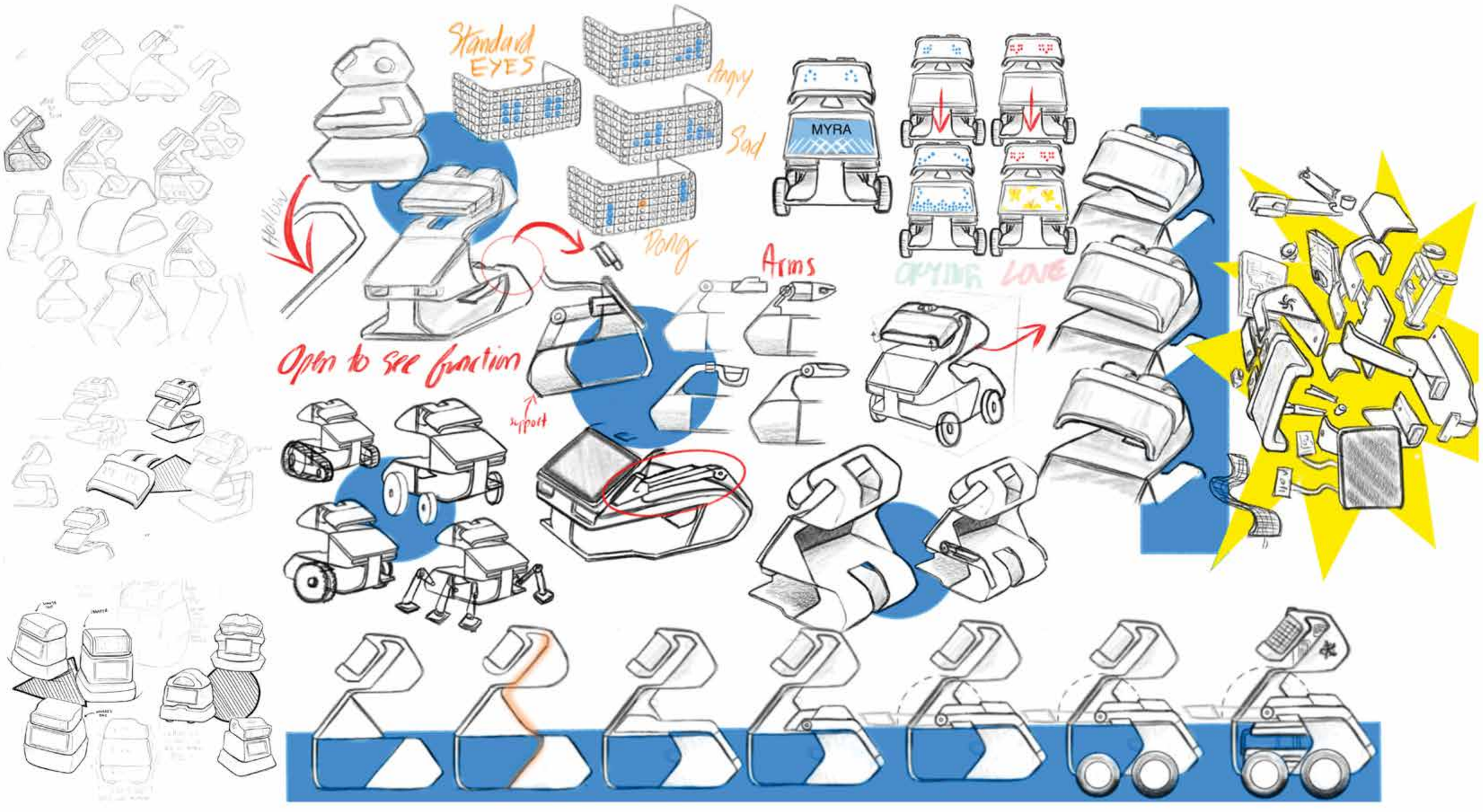
Industrial Design (page 14): Form studies and numerous prototypes were considered for an easy to build platform to house the numerous mechanical components. Easy of assembly and maintenance access were key in its development.

Mechanical and Electrical Engineering (Page 15): Selection components and testing on a custom made PCB, which would be the heart of the project.

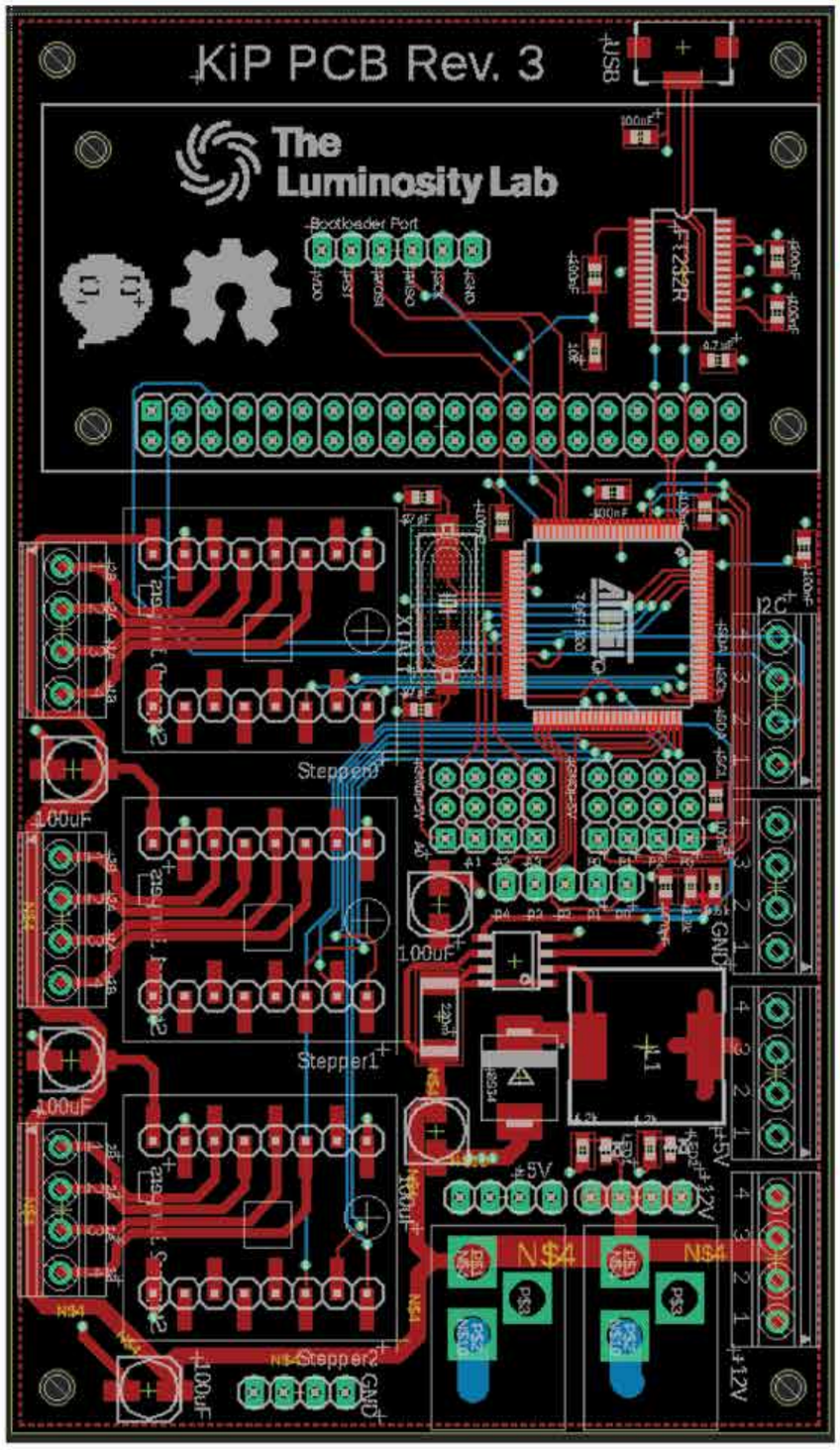
Graphic Design (Page 16): In addition to a brand designed around both MYRA and KiP an interface was designed around communication and feedback using eye animations.

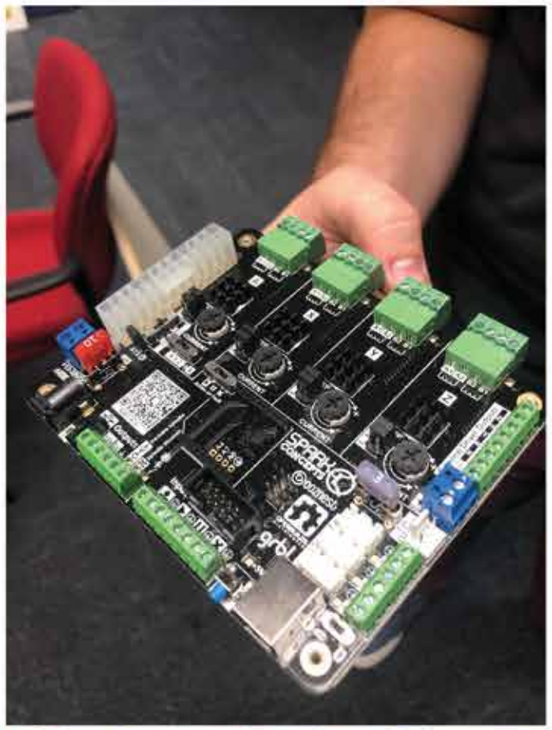
Marketing: (Page 17-19) The KiP Comic was written in 3 episodes to inspire young students to try out KiP, with a story of fellow students discovering their passion for STEM through the creation of a KiP, from an all in one development kit.

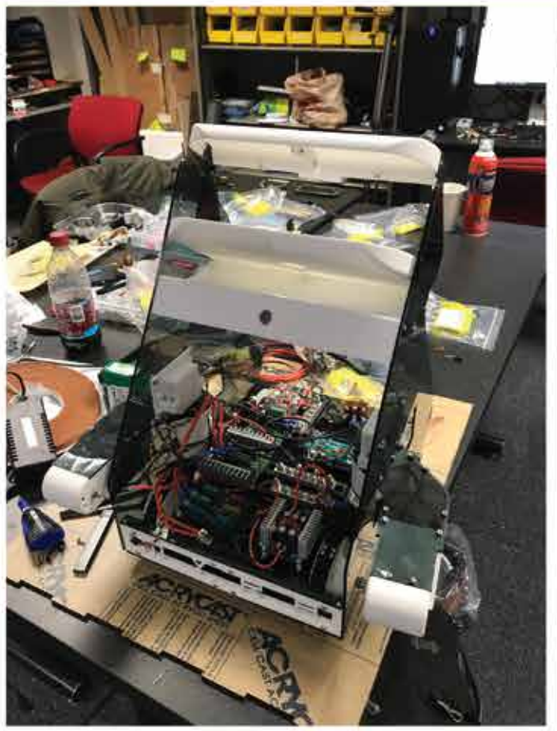
K.I.P.: FORM AND DESIGN STUDY

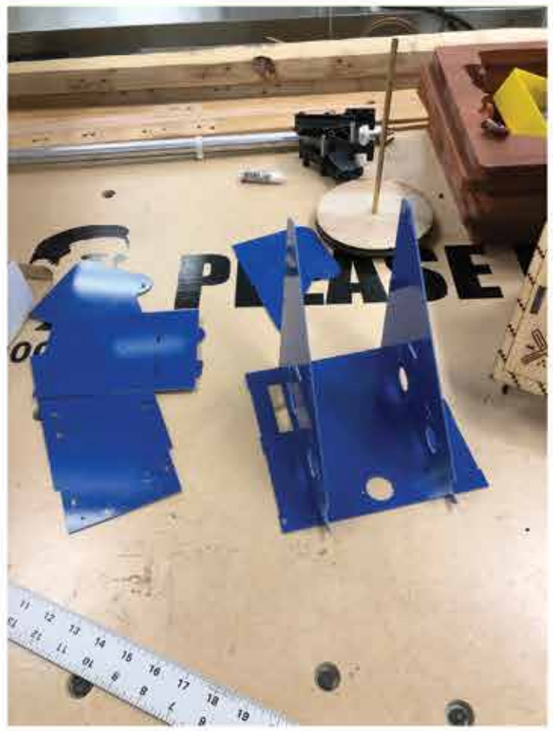


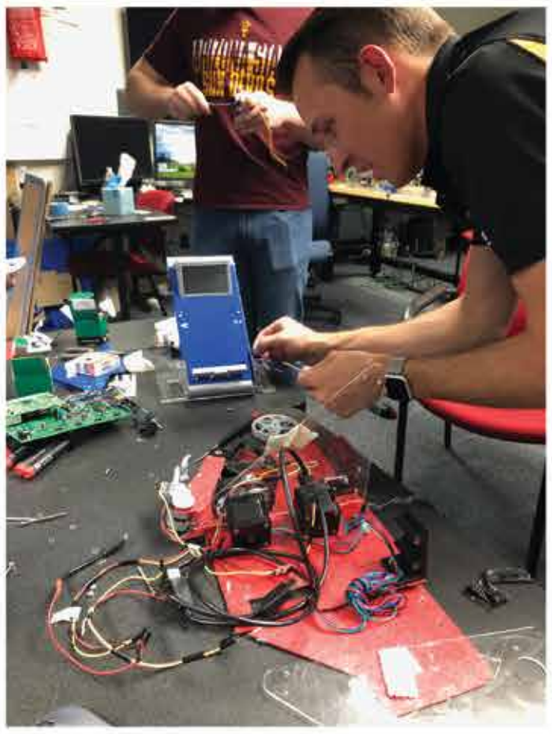
K.I.P.: HARDWARE AND ENGINEERING

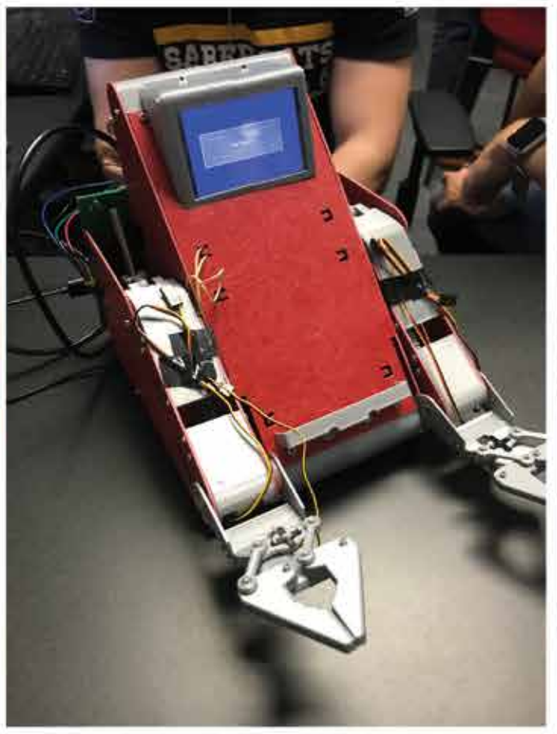


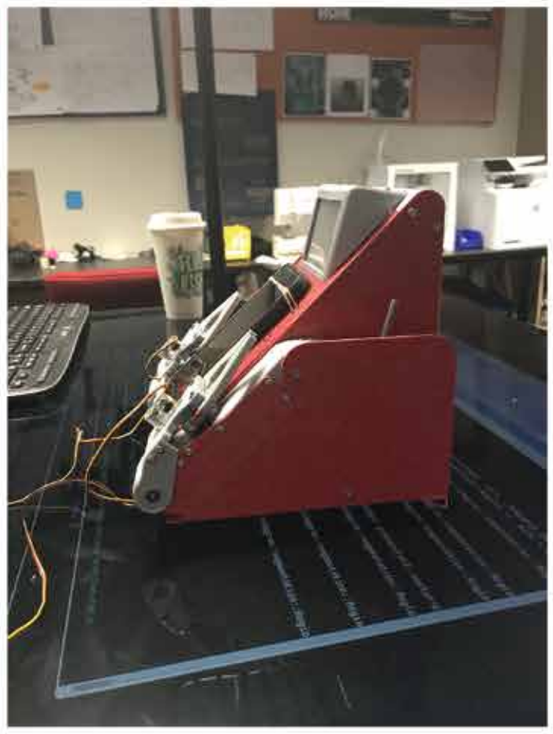






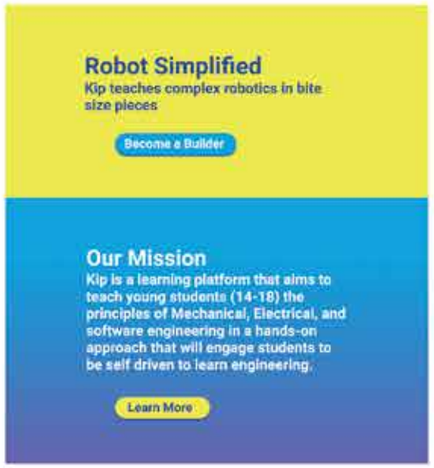






K.I.P.: USER EXPERIENCE STUDY

Kip Messages



Kip in writing

Kip is meant to be spelled out with a capitalized K and lowercase ip.
The following is not permitted: KIP, kip, KiP, kiP.

Kip color hex codes

#2C9DD7

#F2FF4D

#1749A8

#6765AE

#2C9DD7

#6765AE

Varius backgrounds

Final Logo

Kip wordmark logos

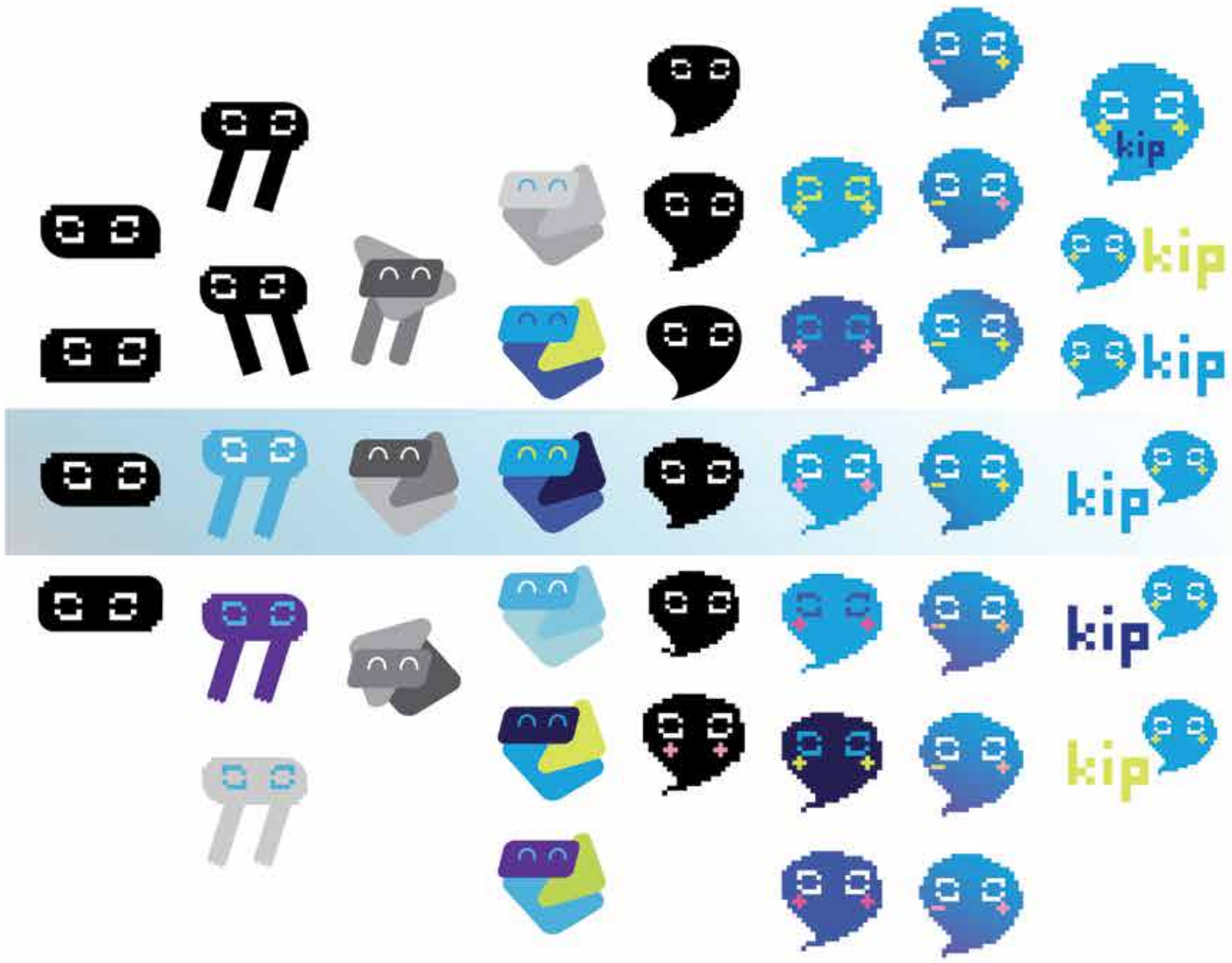
Typography and colors

web font is Roboto Bold

#1749A8 on white

#1749A8 on yellow #F2FF4D

Font is white on gradient



Buttons

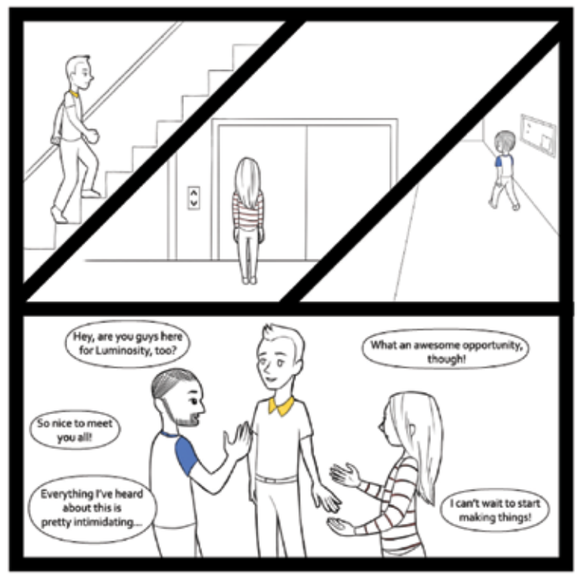
button is flat color design with blue drop shadow


THE MAKE YOUR ROBOT ADVENTURE
EPISODE 1

1


"I hate that method of teaching. There's no solution in the method, there's no engagement of... the next generation of thinkers or dreamers."
"You must engage them in being engaged in what we know and how to solve the issue, and actually deriving the solutions themselves, not later, now."
"Now that requires a complete reconceptualization of everything."
-Michael Crow

2


Hey, are you guys here for Luminosity, too?
What an awesome opportunity, though!
So nice to meet you all!
Everything I've heard about this is pretty intimidating...
I can't wait to start making things!

3

4


So you're telling me we can create anything?
Pretty much! And I guarantee we have someone with the skills to get it designed and made.
The possibilities are endless!
Actually, I have an idea for something that could really change the future of education...

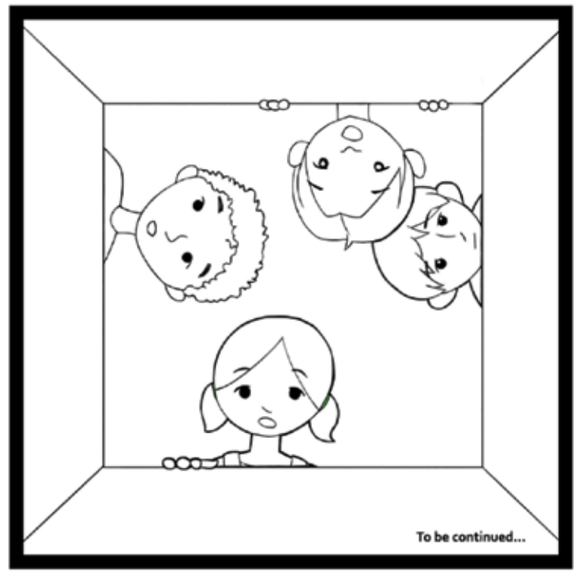
5


We can use machine vision for emotion recognition.
And this may change, too, once it's on the open-source platform.
It can teach kids to work in teams!
And then they can learn to finish a model, too...
It'll be really easy to program the LEDs to flash.
The drive train is ready!
What if the side panels were transparent?

6

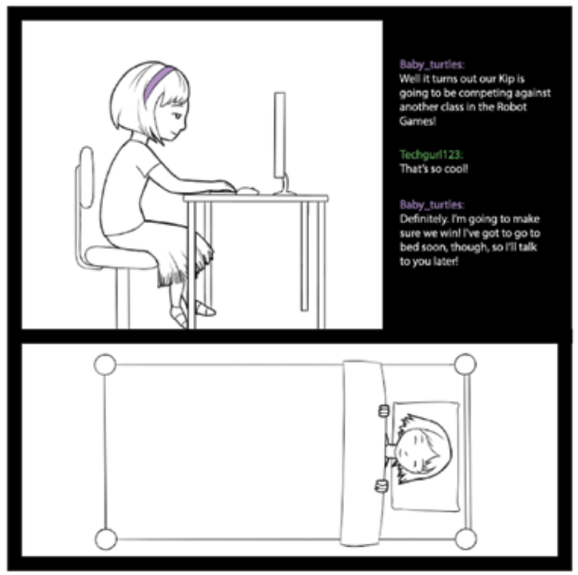

6 months later...
What's that?
Ooooh...
Woah!

7


To be continued...

K.I.P. COMIC: EPISODE 2

8



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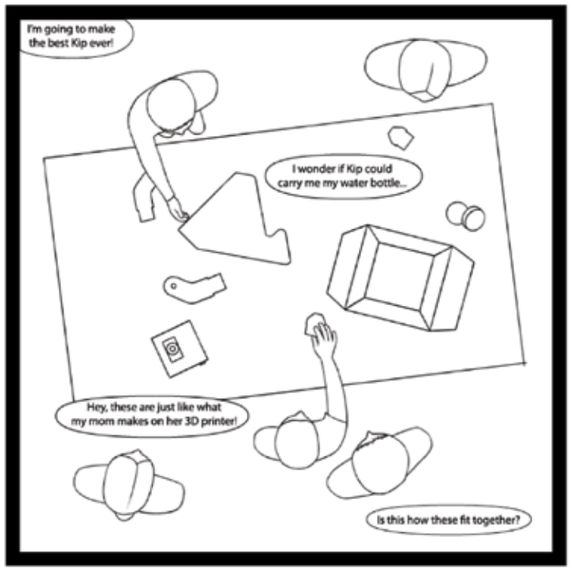

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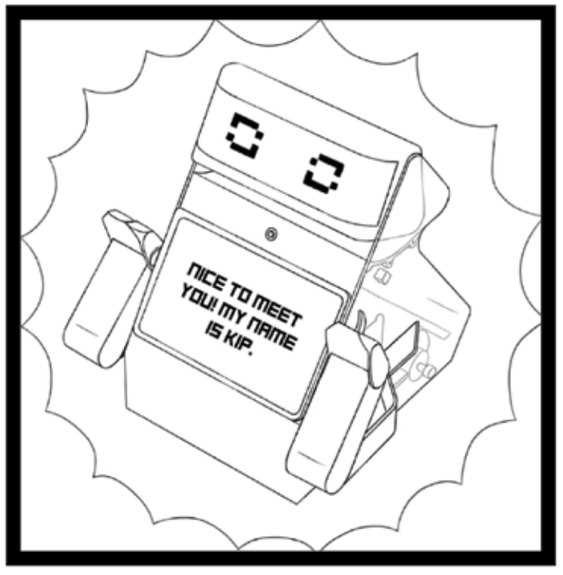

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K.I.P. COMIC: EPISODE 3

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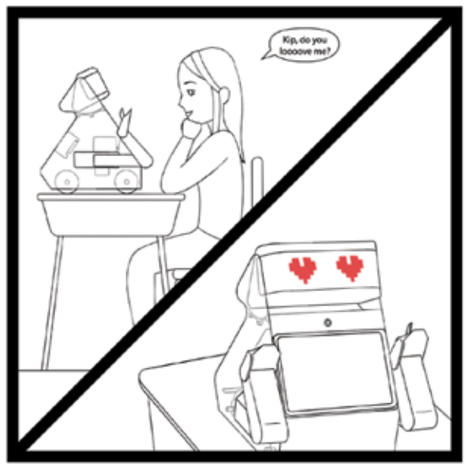

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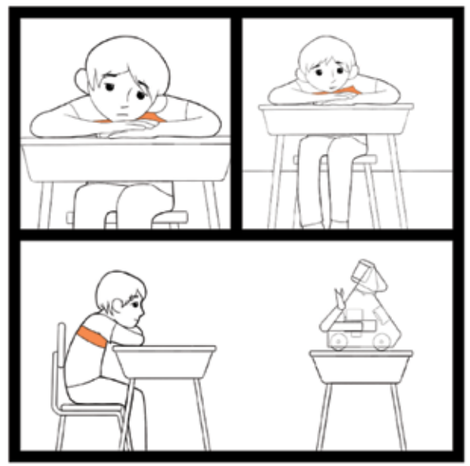

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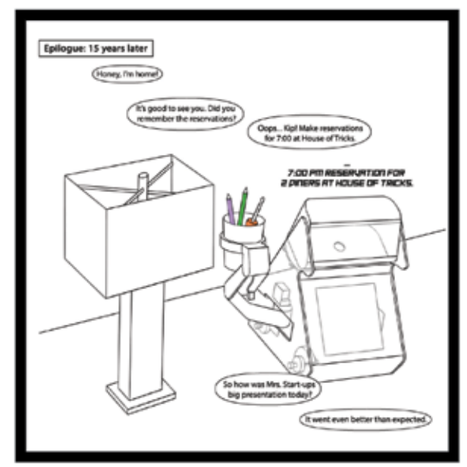

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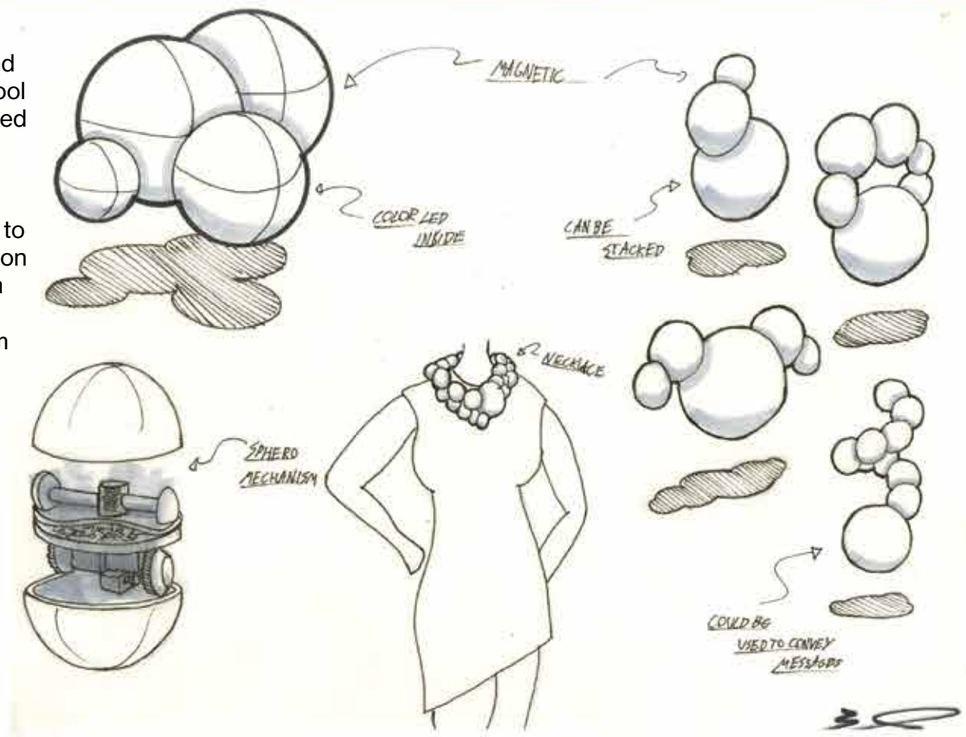
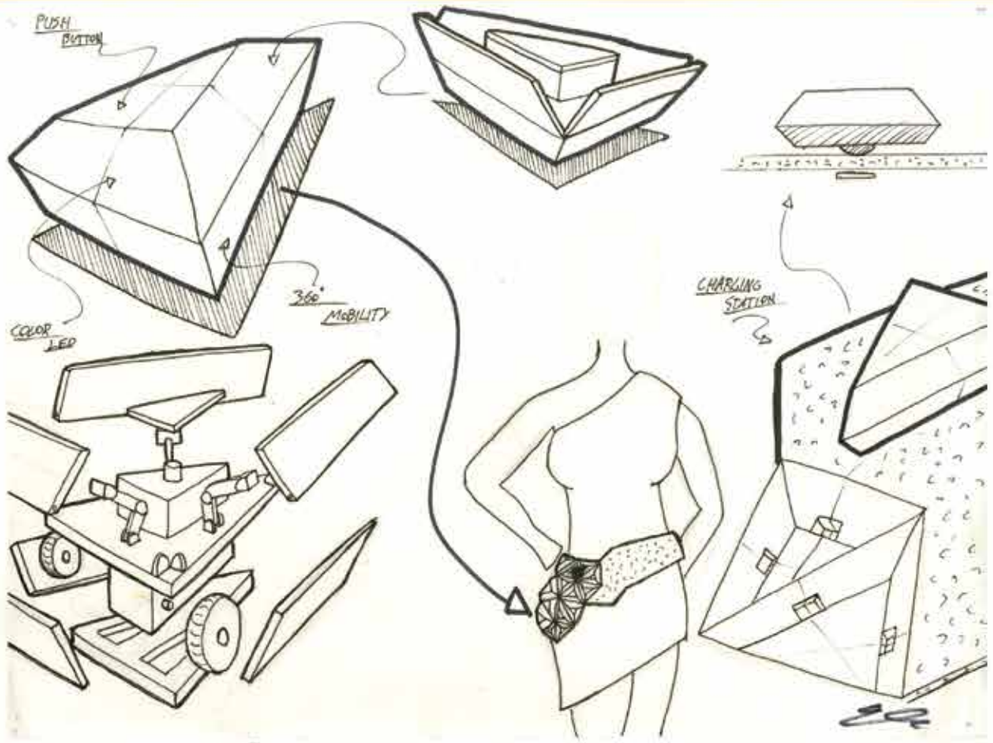
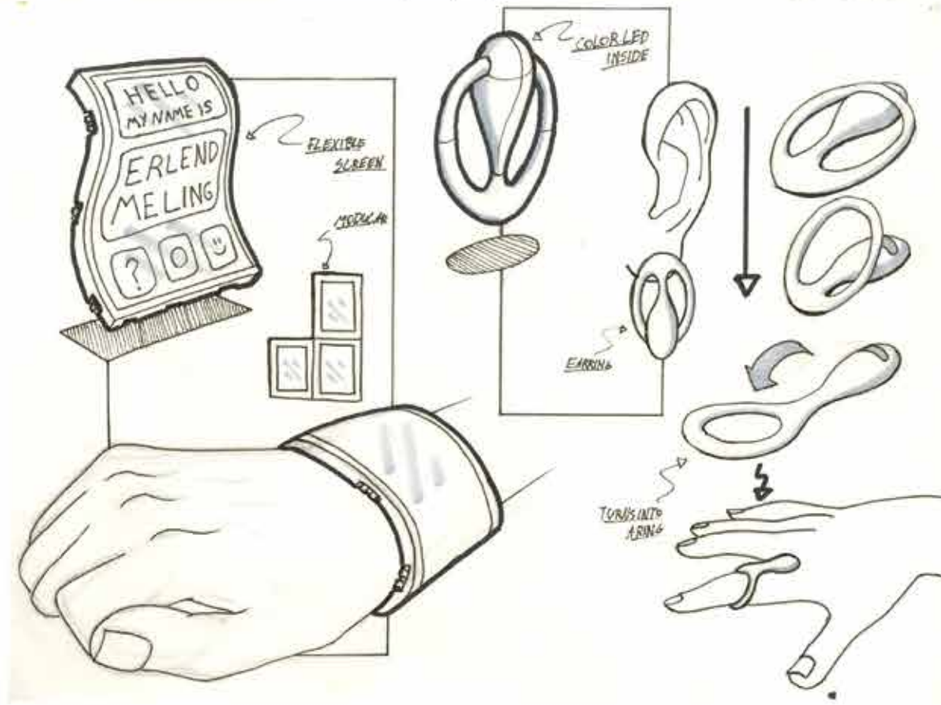
OVERLAY: WEARABLE TECHNOLOGY CONCEPTS

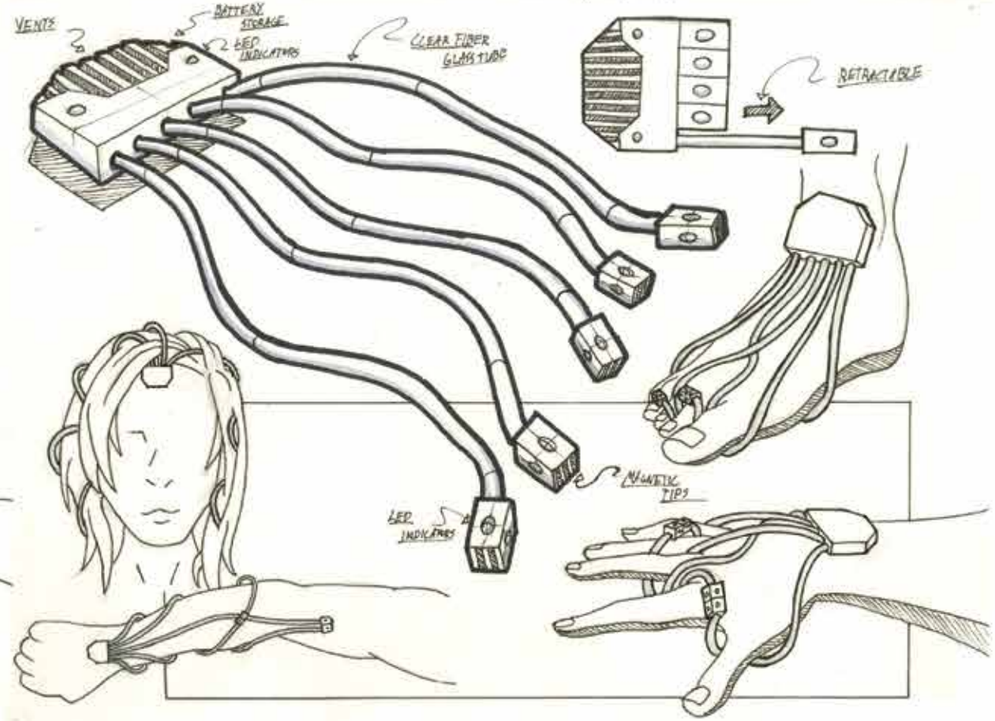
Following the introduction of the Fashion and Design Program at the ASU Herberger School of Design, the Luminosity design team worked with students to imagine way of integrating robotics and technology into fashion.

Some concepts were explored as designed to prototyped and shown in an upcoming fashion show also associated with the new program launch. In addition to wearable robotics, edible fashion was also explored, in the form of a novel kombucha based material being developed at ASU at the time.





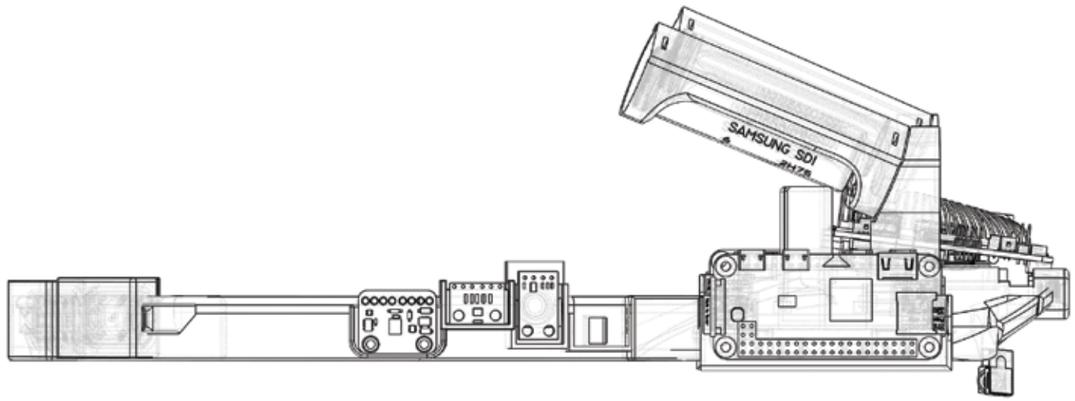


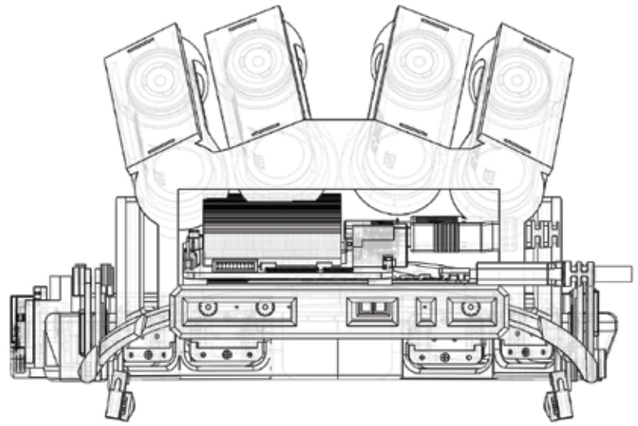


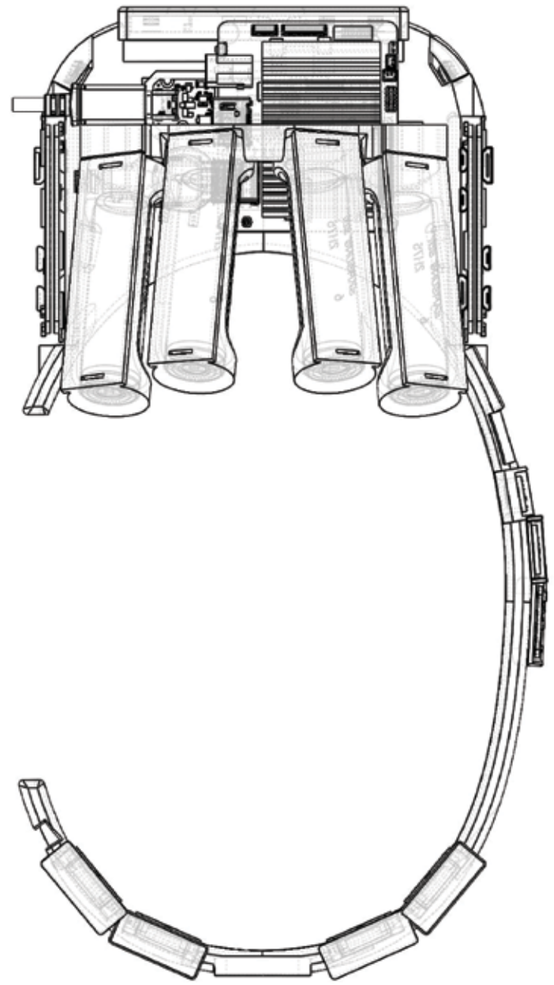
OVERLAY: AUXILIARY SENSORY SYSTEM PROTOTYPE

Wearable technology has become more accessible than ever before, with a wide variety of sensors available which are programmable for personal use. There is a need for such technology in the medical industry and may be necessary in successful adaption to preventable medicine. Wearable technology allows one health to be consistently monitored so healthy decisions could be readily made. These devices could also be used to extend ones sensory perception, allowing them to be more aware of their surroundings for safety.

The Overlay Auxiliary Sensory System Prototype was Luminosity's first attempt at develop a prototype for Medical technology addressing both needs for a preventable medicine support device. Originally designed as a headband with a suite of body data sensors and proximity data gathering devices which included detection for: body temperature, heart rate, eye tracking, air quality, ambient air temperature, lidar and more. This data could be read on an off board device or audibly read back using bone conduction headphones, also integrated into the band. The prototype shown here is the first CAD model and prototype, primarily as a chassis for the large number of off-the-shelf components. This design would ideally fit in a beret, or a loose cap.

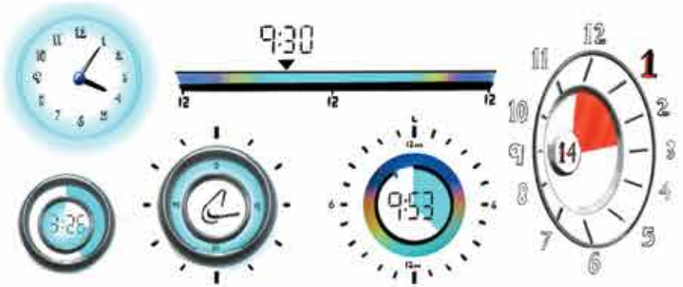


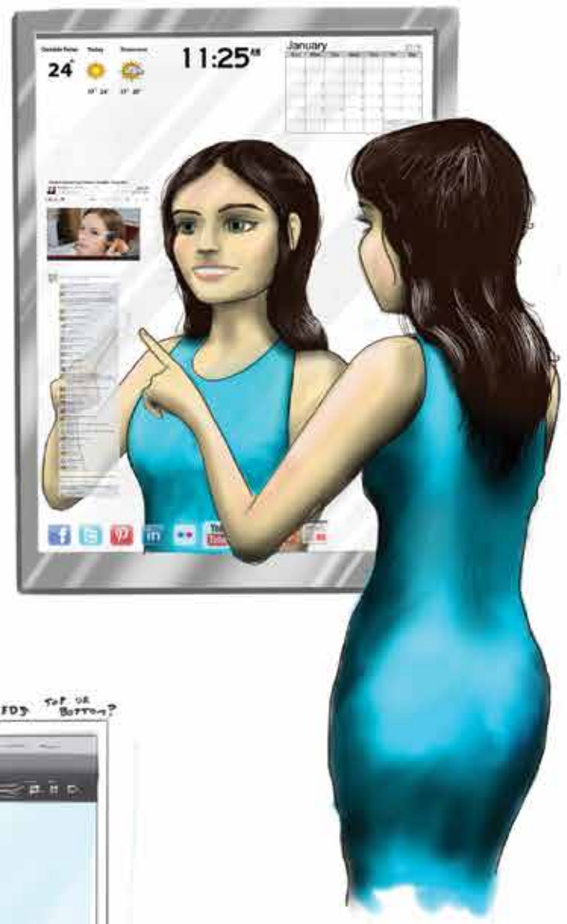


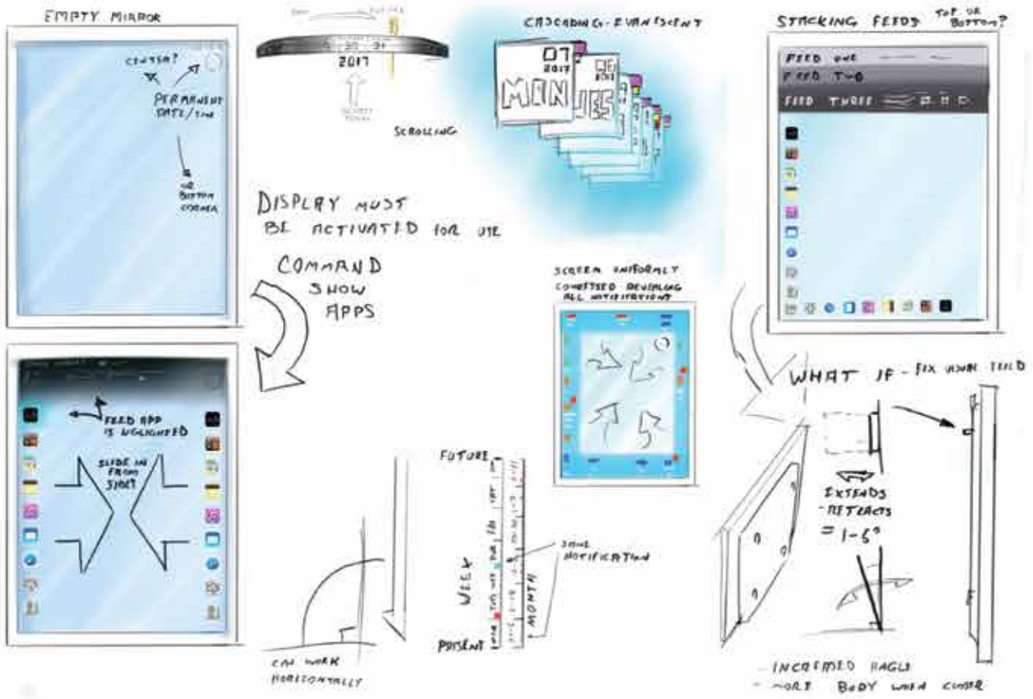


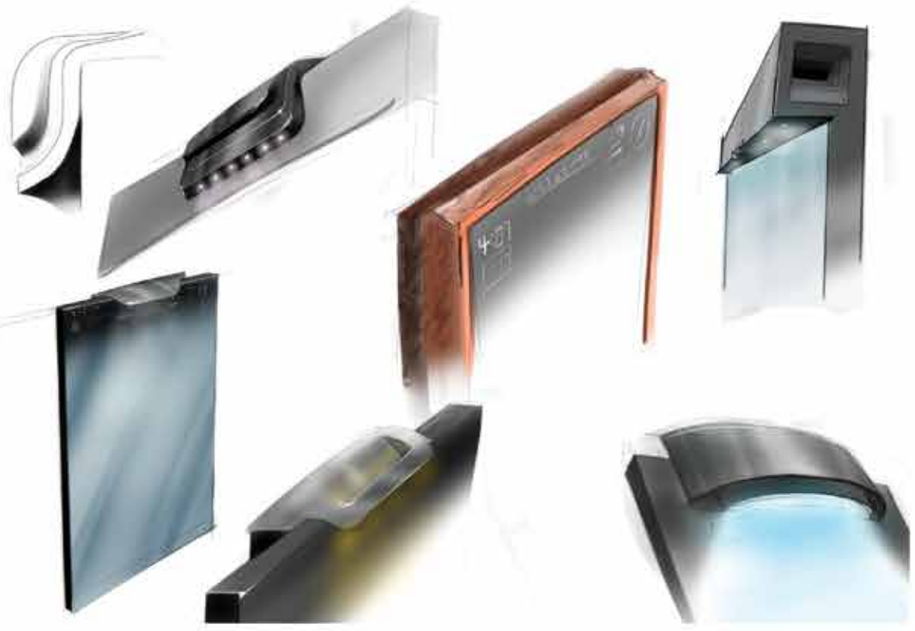
SMART MIRROR CONCEPT SKETCHES

One of the first projects attempted by the Pilot Luminosity team, to explore team roles and product development phases. The completion of a smart mirror, will require, a physical prototype, and a user interface, ideally with at least a partial touch interface. The product deadline was for the first Global Silicon Valley Presentation in the spring of 2018. The team discussed at length how to develop the prototype and ultimately made the smart mirror out of wood and an TV with a tough pad at the base of the screen. Apps such as a personal calendar, weather, time and date were added to the interface as well as a few personalized apps such as YouTube and a web page for google search. The prototype was eventually dismantled and it parts were used to eventually create the Starbucks Cup Display Table.





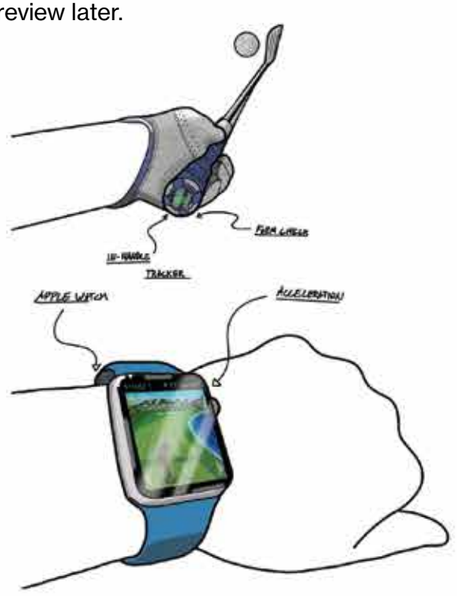


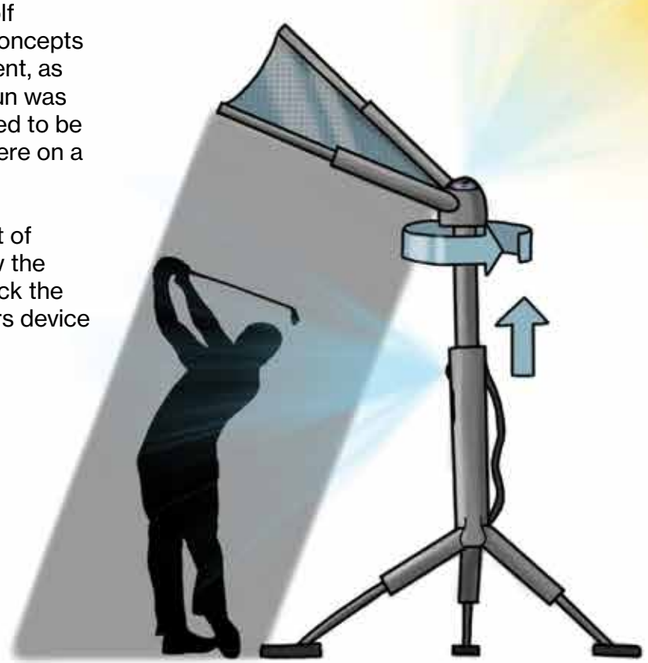


GOLF TECHNOLOGY CONCEPTS

The ASU athletics department came to Luminosity to discuss concepts around how to add new technology to the ASU golf department to support their teams' practice. Amongst the concepts discussed, a desire for a mobile shade structure was apparent, as for as much as half of the year, extensive exposure to the sun was detrimental the players' practice. The shade structure needed to be light enough to carry, or drag and could be deployed anywhere on a golf course at will, in seconds.

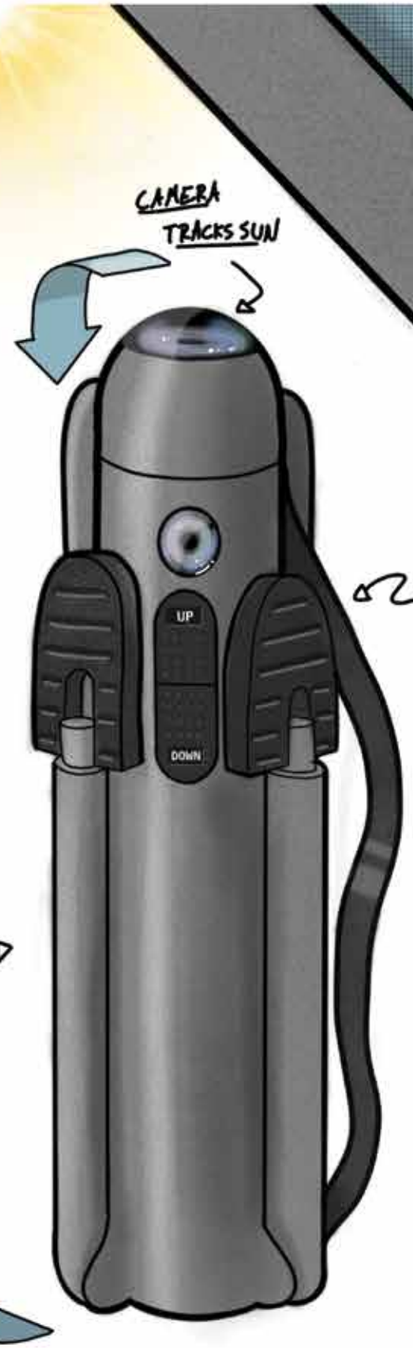
A second concept that was discussed was the development of an app, that could track the form of the golfer based on how the golf club was gripped. Movement tracking glasses could track the trajectory of the ball, all the data could be saved on the users device for review later.

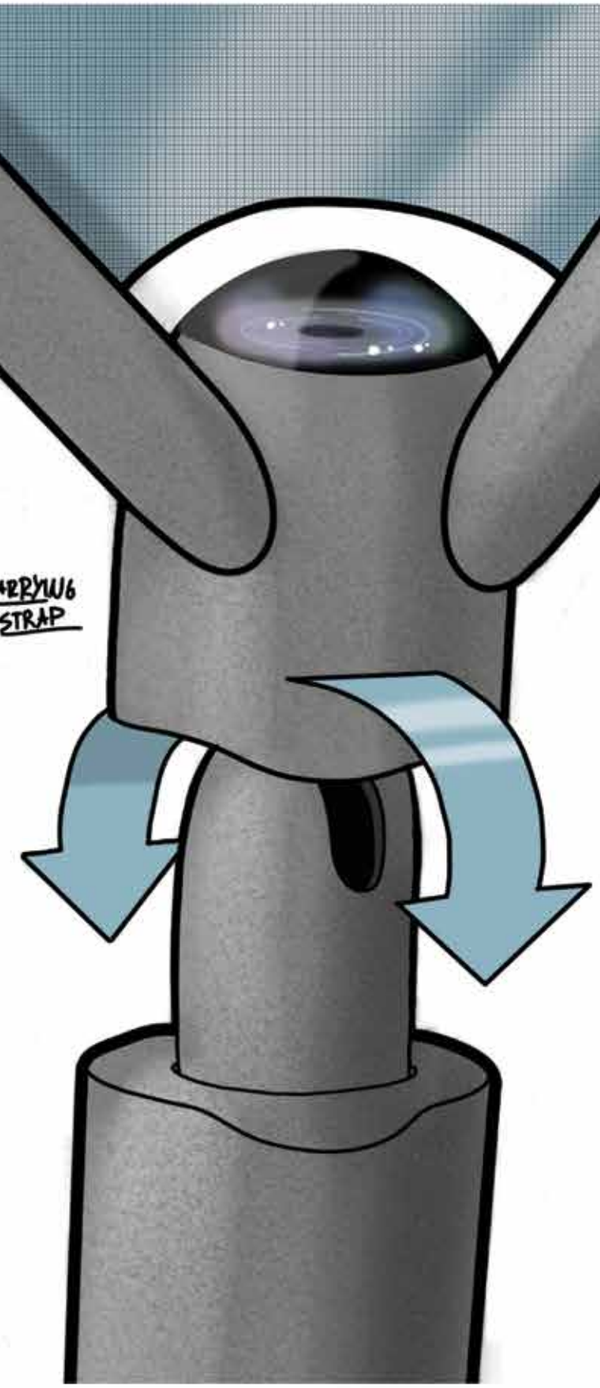


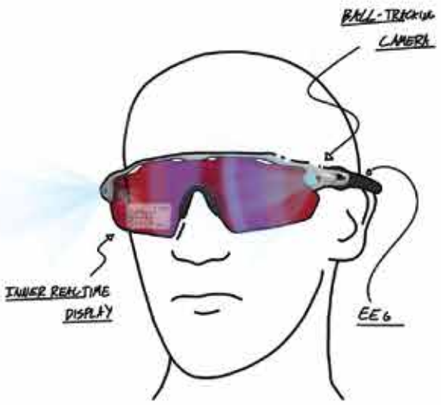


AUTOMATICALLY CASTS SHADE ACCORDING TO PLAYER POSITION

FOLDS INTO PORTABLE SIZE







INTERCONNECTED PUBLIC DIGITAL BOARD

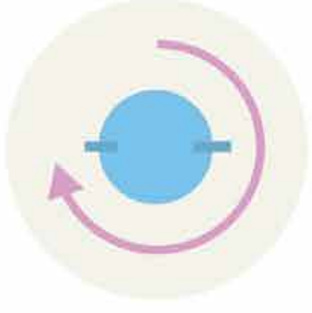
Rubik's Cylinder is a 21st century redesign of the cylindrical posting kiosks around the ASU campus. These kiosks are underutilized and have ceased to be a place of reliable posting information because of the shift toward virtual event posting and notifications. By rebuilding these kiosks with virtual screens to post not only notifications but a consistent feed of news and local events, students can have live information, saving the labor to print and maintain physical advertisements. This also eases the necessity of ensuring advertisements can be displayed on all campuses and kiosk locations rather than just the one. These new virtual kiosks can have a touch interface, or be manipulated through personal phones. ASU can use these to push their own ads, show events across campuses and act as a communication portal between campuses and perhaps in the future, other schools.

PEERKAT: NOTE TAKING BUDDY

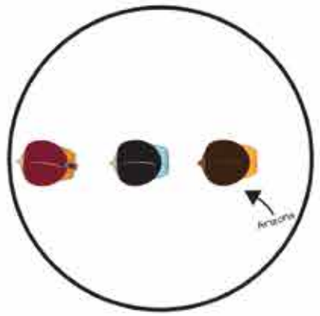
A personalized note-taking buddy.

By clicking their Peerkat, teachers start a new recording of each part of their lecture.

Students have a Peerkat as well!



Students turn on their Peerkat by twisting to the right.



There is a lack of quality education in Arizona.

Students do not feel emotionally supported in class.

Teachers can use Peerkat to guide classroom thorugh difficult topics.

Students click once to indicate challenging course material.

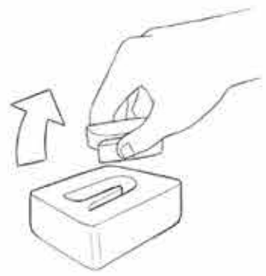
Student can access transcribed and audio lecture and review at their own pace.

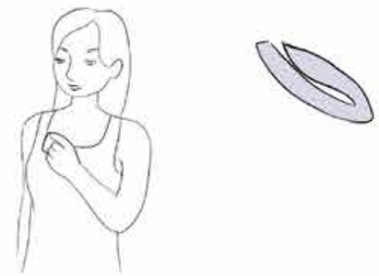
Teachers can see where students are getting stuck in class, and tailor their lecture to better suit students.

DROWZLE: CONCEPTS

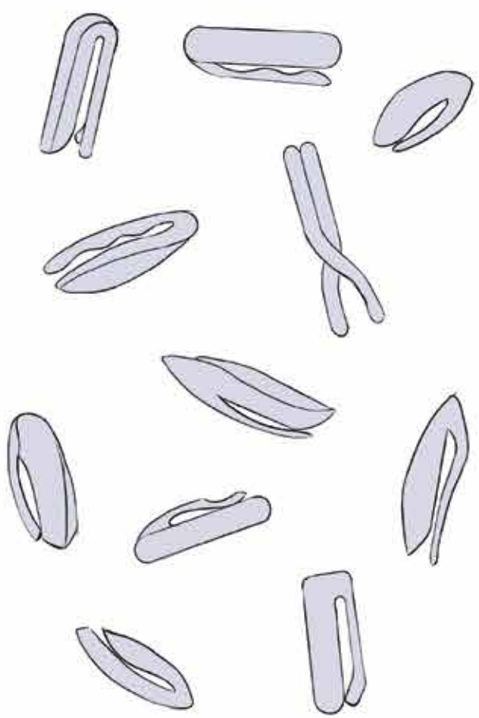
Resonea approached Luminosity to develop new methods of using technology to track and record symptoms of Sleep Apnea to catch it sooner and track its progress. If people have very quiet breathing sounds when they sleep and/or are facing away from a mobile device (typically placed on a bedside table), it is difficult to capture sound that can be analyzed. Sound drops off significantly beyond 18 inches from source (ie. Mouth and nose.) Luminosity proposed a solution to develop a hardware solution, likely wearable or near-contact device, with a microphone that can resolve the problem with quiet breathing sounds and potentially allow another person to sleep in the same room without capturing their sleep breathing sounds in addition to those of the subject.

The opportunity is to enhance DROWZLE, using a game/ gamification, the validated effectiveness measures such as Epworth and FOSQ10 on the effects of sleep quality on daytime sleepiness and functional outcomes. The opportunity is to create a new clinically proven way to measure daytime effectiveness that can complement or replace traditional validated surveys - only doing it through a game that tests reaction speed, awareness based off some of the research that has been done on Cognitive and motor reaction times in obstructive sleep apnea syndrome. This impacts all human's by giving them an objective way to measure sleep quality in a fun and informative manner. This will drive up the adoption and usage of Drowzle which ultimately leads to more people to become aware of sleep apnea and seek treatment for the disease. This can substantially lower the number of undiagnosed cases of sleep apnea from the current estimated 21 million in the US alone. Additionally, the focus on sleep health and its effects on daytime function can help people enhance their performance even if they do not have the disease of sleep apnea.



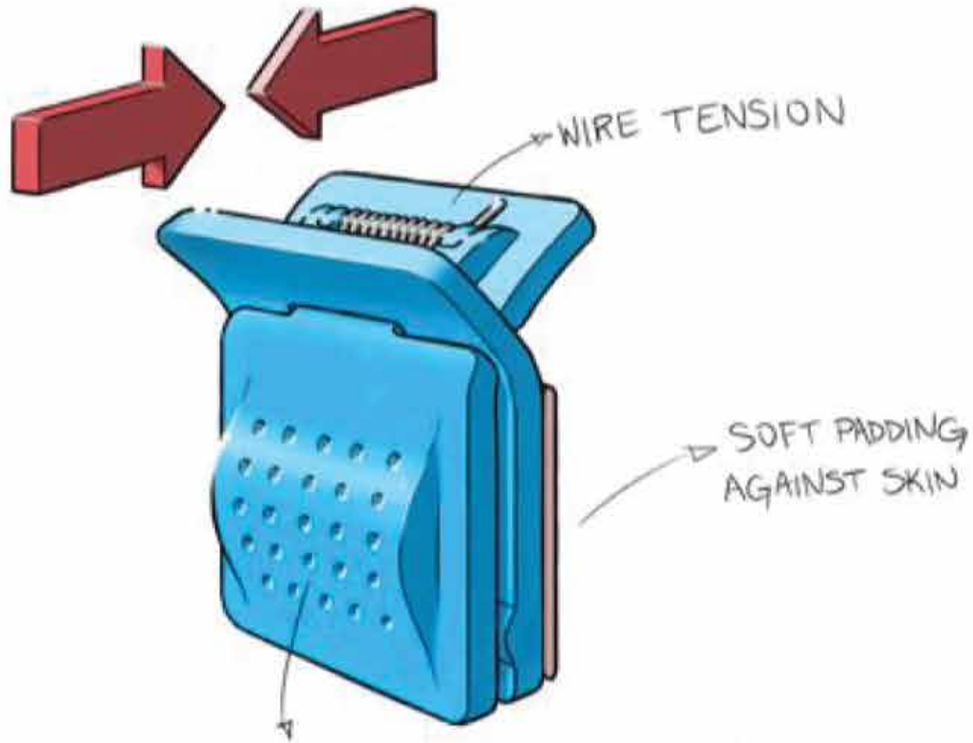


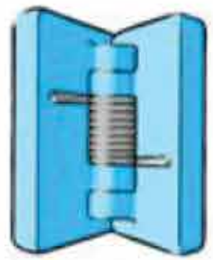
Attach Clip to Pajamas

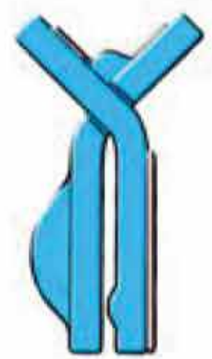


Record Sleep

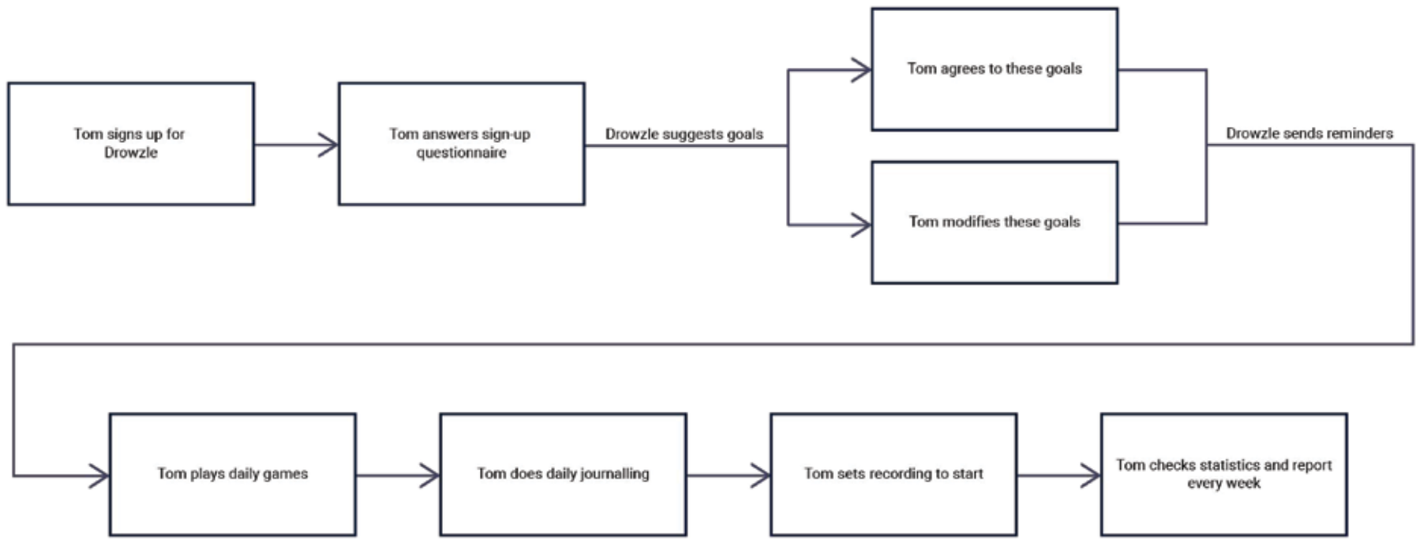
Replace Clip in Docking Station

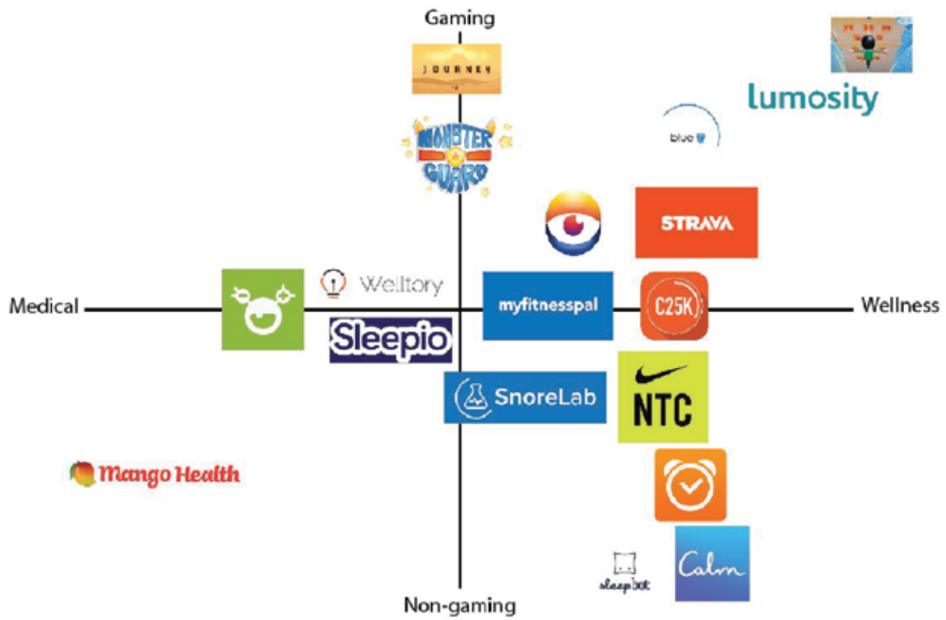


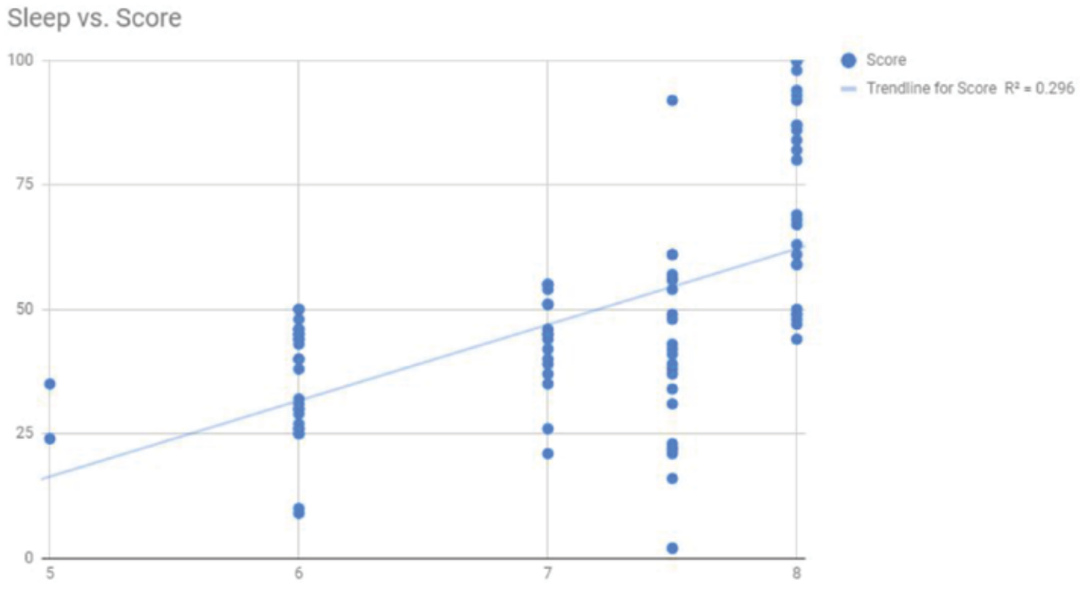




DROWZLE: DEVELOPMENT PROCESS







Developed mini games to **measure sleep deprivation symptoms** over time.

Added app functionality to encompass **general wellness** and promote intrinsic motivation in users.

Incorporated points system to **reward user engagement.**

DROWLZE APP: ICONOGRAPHIC JOURNALING

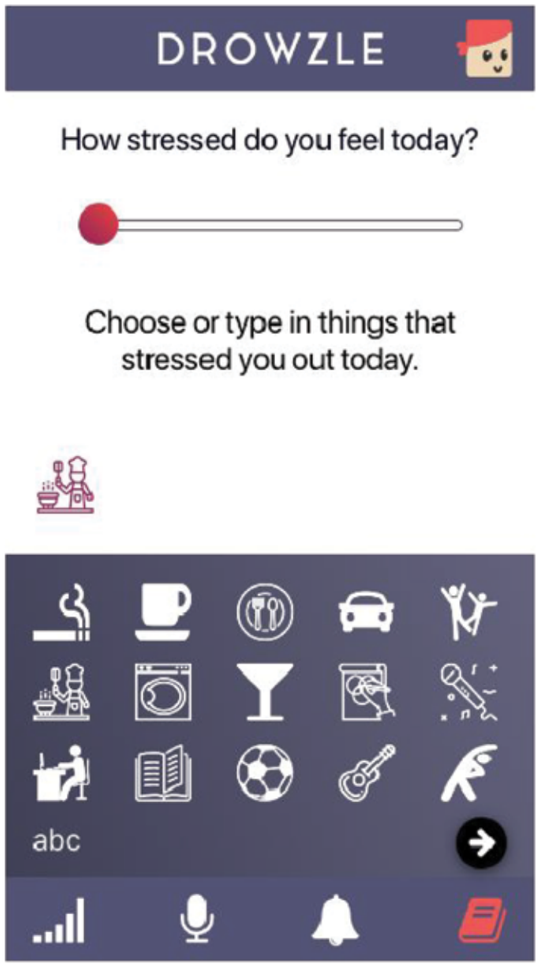
The project goal for the development app was to increase the adoption and usage of Drowzle a screener for sleep apnea and tracker of sleep health. Looking to incorporate gamification to make it easier for users to understand the impact of their sleep quality on their daytime effectiveness.

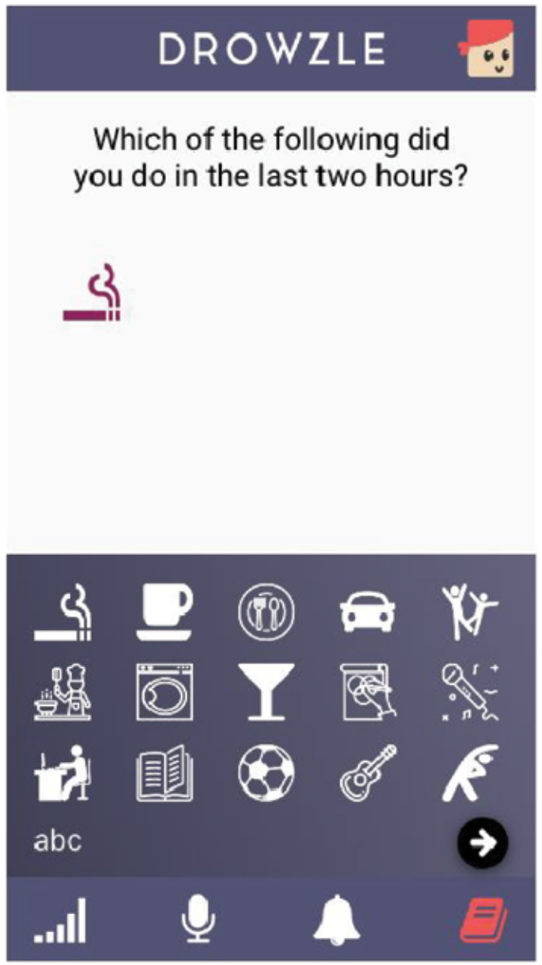
Students worked with the Incyphae's team to implement the concept, using Unity or another gaming engine to realize the concept into a mobile format and complete a working prototype that demonstrates the five features proposed for the gamification of DROWZLE. These should demonstrate the capability but do not have to show all possible features and functions. In other words, a demonstrable subset to give a flavor of the capability.

An example of a subset of capability is to have an avatar that you pick and add one or two features like a mustache or the color of their costume. Then show how the ability to make that addition to the avatar was the result of completing a game.

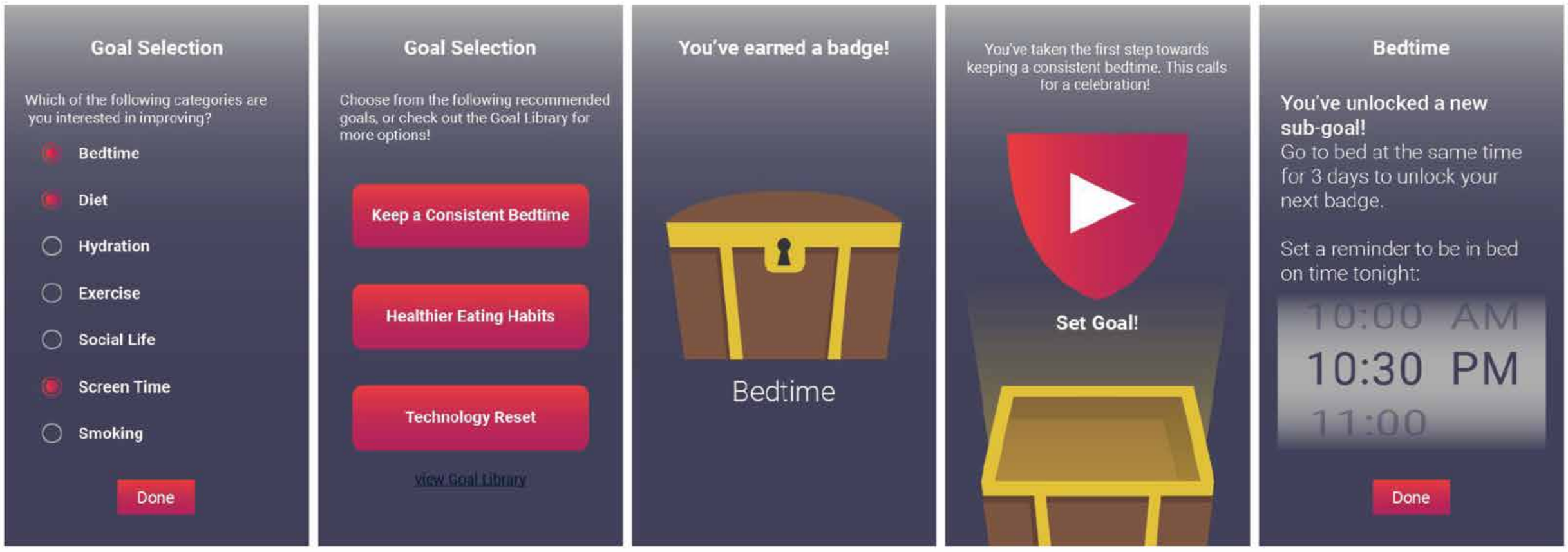
The five features of gamification are:

1. On boarding game encouraging the completion of survey
2. Building out of a person's personal avatar
3. Goal setting
4. The iconography journal
5. A reaction time game (e.g. walk the plank, cannonball game)

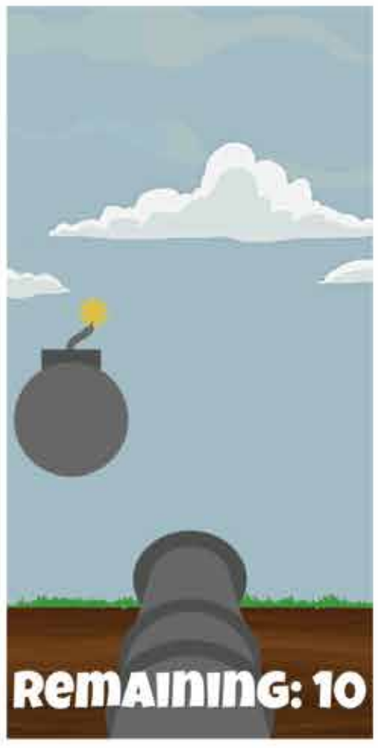




DROWZLE APP: GOAL SETTING



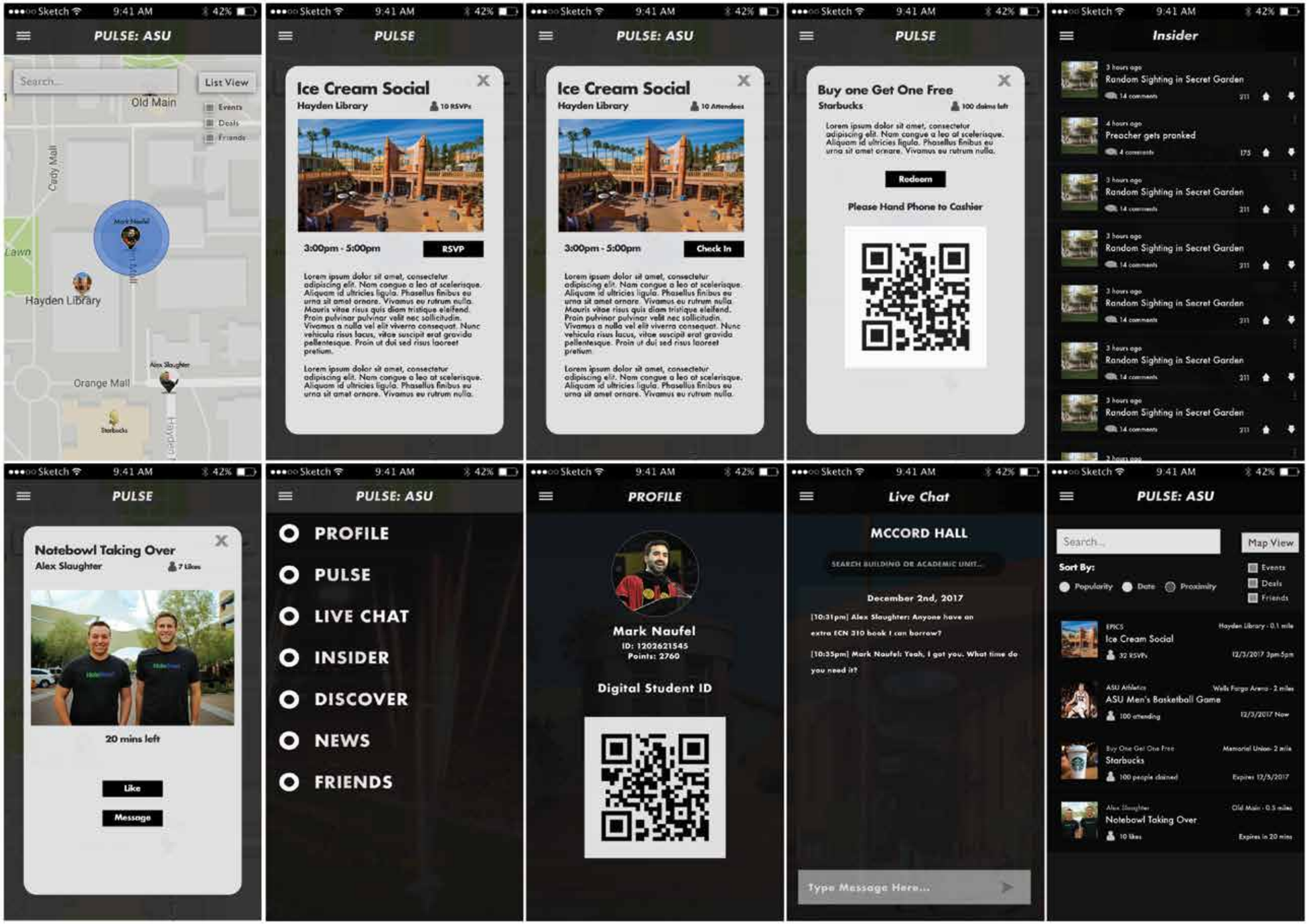
DROWZLE APP: CANNON BALL GAME



EMBER: PULSE ASU APP

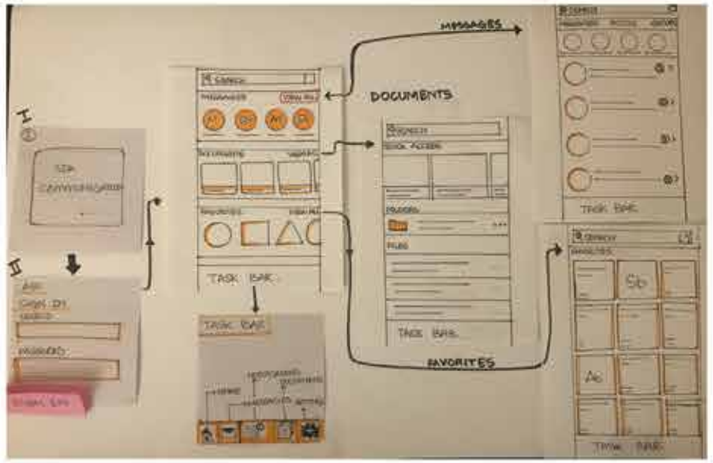
The Ember application was created to help students discover more the their college campus and get everyone more involved in activities around campus. It was our hope that this application helps to spur interactions that would normally never happen. This product enables communication between, students, groups and communities at the university while promoting products and services students might find to be useful on a day to day basis. The application can show what areas on campus have a lot of traction and who's hosting events around campus at a glance. Students will be the primary users interacting with this application using features like chat, message boards, social scheduling, checking-in along with deal-hunting and finding services on campus to help them go about their studies. Club and organization leaders can use this platform to promote their respective interests on campus in real time with a large user base on a closed campus network. Our users will primarily be those within the campus community. Students and Administrators. The majority of the design will focus around getting users around campus and to where things are happening.

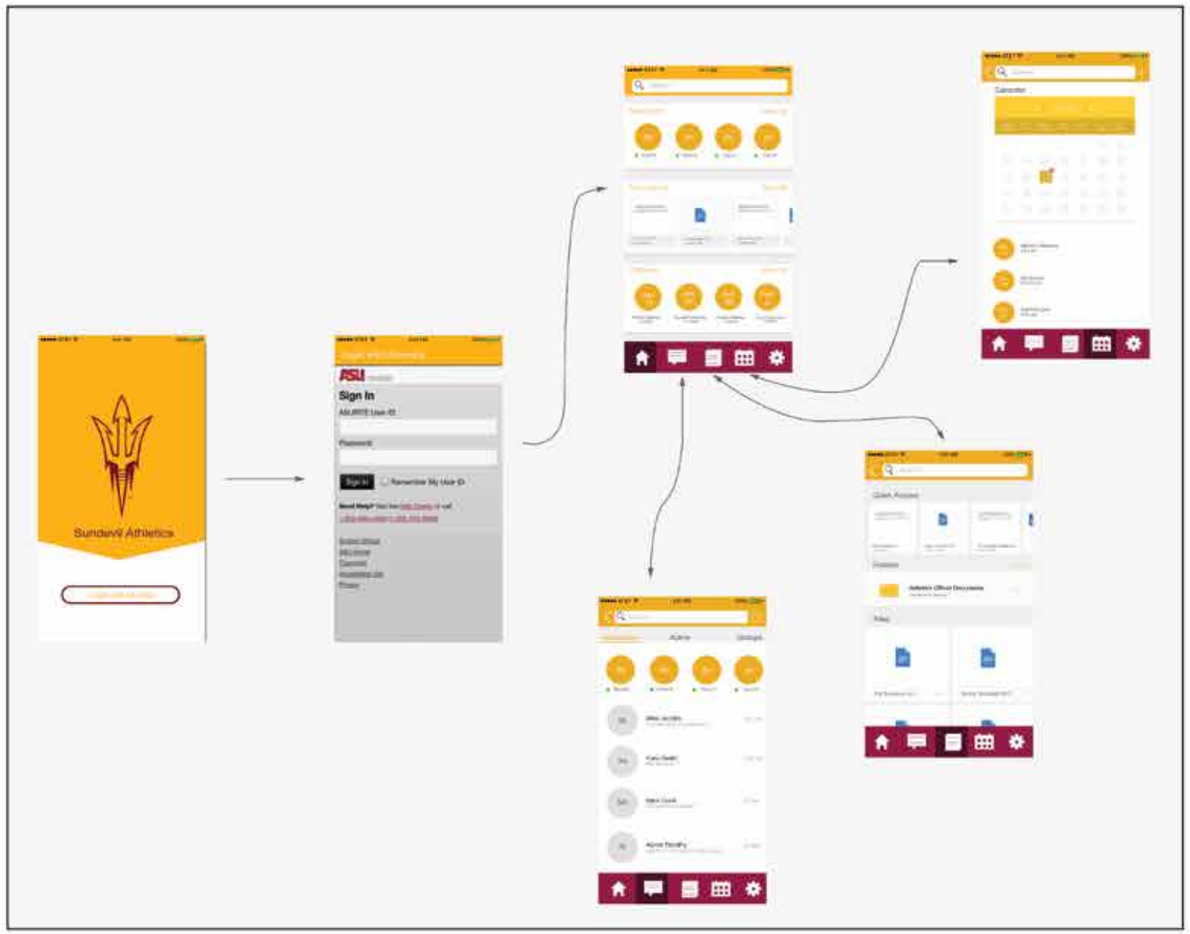
The design of this product utilizes an object-oriented approach. The user of this software product will be interfacing with university to make meeting new friends and discovering new places much easier. We expect the vast majority of our users to be University students or University faculty/admin. This application is only designed to help students explore the campus, it is not meant to do anything beyond that. The application is only designed while on campus. The user or simulator operator interfaces via a touch screen. They are continually prompted for input as the program ages with them. The user is expected to set their settings, like reminders and notification preferences and to allow the phone to collect their GPS position. After those items are done, the user may interact with the app by chatting, searching or simply moving the map around to see what's going on.

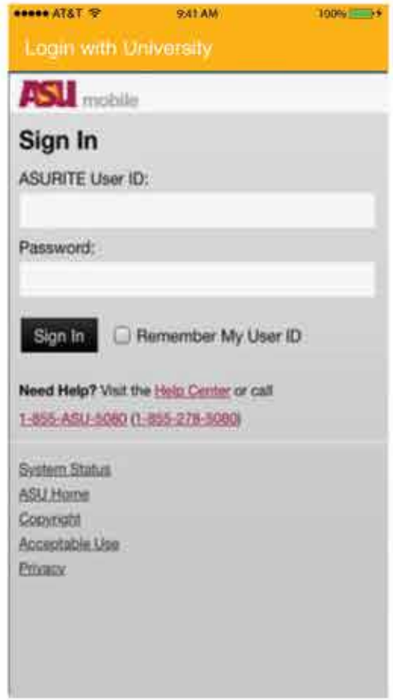


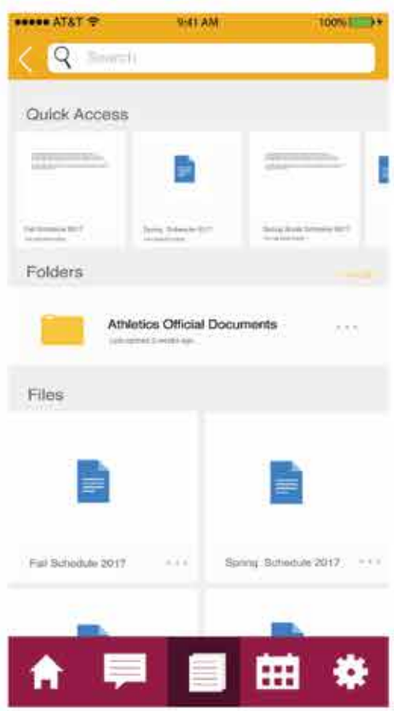
SUN DEVIL ATHLETICS APP

Sun Devil Athletics came to Luminosity in 2017 with a goal of developing an app for to help student athletes manage their schedule by having an linked profile with their ASU account. This allowed the student athlete to easier manage their schedule between sports and class. Luminosity designed and built the minimum viable product with the goal of getting running by 2018. Shown here are the concept still frames that would eventually be the front facing end of the app.









To develop an effective conversational AI, it is essential to incorporate the context of the conversation while processing the user's incoming speech data. In our model, we designed a solution that evaluates the context of the conversation based on previous dialogue with the user, as well as the most recent user input. This model consists of three main modules, Context Evaluation Module, Conversation Manager, and Response Generator, each of which is explained in detail in the sections below. Before we prepare a feature vector of our input, we use an Intent schema, which is built in functionality of Alexa skill set. The one we will be using ours will be in Response Generator. First, the user input is taken by Alexa enable device. Second step, the Alexa engine converts the speech into textual form. Third that text is passed through a intent schema. In this intent schema we are trying to handle session variables so that we can arrange the context sequencing according to the user. After this we will pass the it through various lambda functions. The feature vector of the input is formed based on the Intent and the slots from the lambda functions layer. The dimensionality of the context vector is critical, to reduce computation time and improve the accuracy. Further experimentation during technical implementation will inform the selection of this dimension. The extracted feature vector is used further in the next modules.

Context Evaluation Module:
The objective of the Context Evaluation Module is to select a "context vector" that best represents the current topic of discussion. The feature vector extracted from the input text is passed as part of the input. The previously generated context vector is appended to the feature vector. If this is the first context vector being generated, a zero vector is considered the previous context. This vector is the input for a set of Neural Networks where each Network is trained to detect a particular aspect of the conversation. Each Neural Network's output vector represents an aspect of conversation such as 'topic', 'mood', 'context similarity', 'is it a question', etc. The output vectors of these Neural Networks are put together to form the current context vector. The resulting context vector is passed on to the Conversation Manager Module for further process.

Conversation Manager Module:
The Conversation Manager Module is a rule-based system that ensures the conversation flows naturally. It has special controls over the responses or the next topic to talk about. These controls are to be taken in the exceptional situations. The basic structure follows to first create the context similarity of the context vectors. Once we have the context similarity of current vector and previous vector, we can perform cosine similarity/manhattan distance to get the degree of user's engagement in the conversation. If user's degree of interest is identified to be low (we need to fix a pre-defined threshold), Conversation Manager sets a special command that guides Response Generator to switch to a topic based on 'Topic' value in the context vector. If the confidence of prediction in the 'Topic' aspect is lower than a predefined threshold, Conversation Manager sets a special command to guide the Response Generator to start a random trivial dialogue. These are hard wired actions. If none of these two exceptions happen, the context vector is carried forward to the Response Generator. In any case, the CMM will return some instructions on how to continue through the current reading of either the news story being discussed or a direction of some web resource to read as specified by the current context.

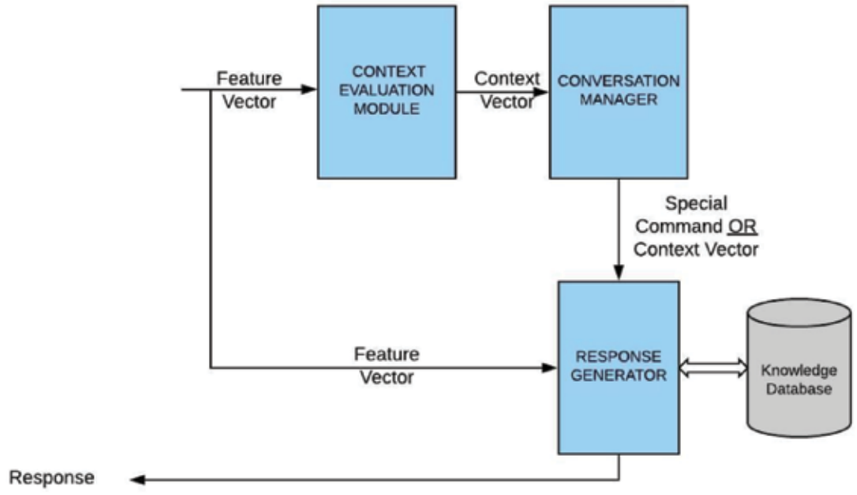
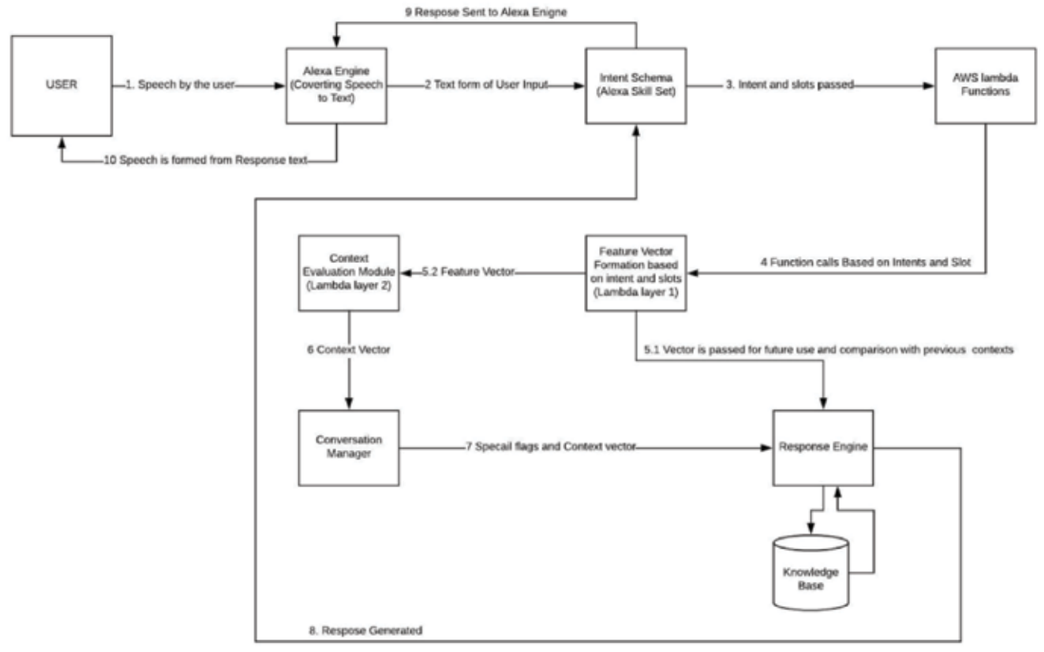


Figure 1: Block diagram demonstrating the idea behind the three-tiered system

Response Generator:
Inputs to the Response Generator are output from the Conversation Manager and the original feature vector of the user's input. The Response Generator Module generates appropriate text response interacting with the Knowledge Database. The response generator is the engine where all the contexts will now be reduced. Understanding co-reference resolution, lack of knowledge, missing slots, will all be handled here. After semantic parsing of the question the response generator will go through the following steps.

First it will try to remove the ambiguous pronoun if any with understanding the current and previous contexts to learn the object to which the statement is referring too. If there if no ambiguous pronoun or if the pronoun is resolved, then we parse the sentence to get semantic representation.

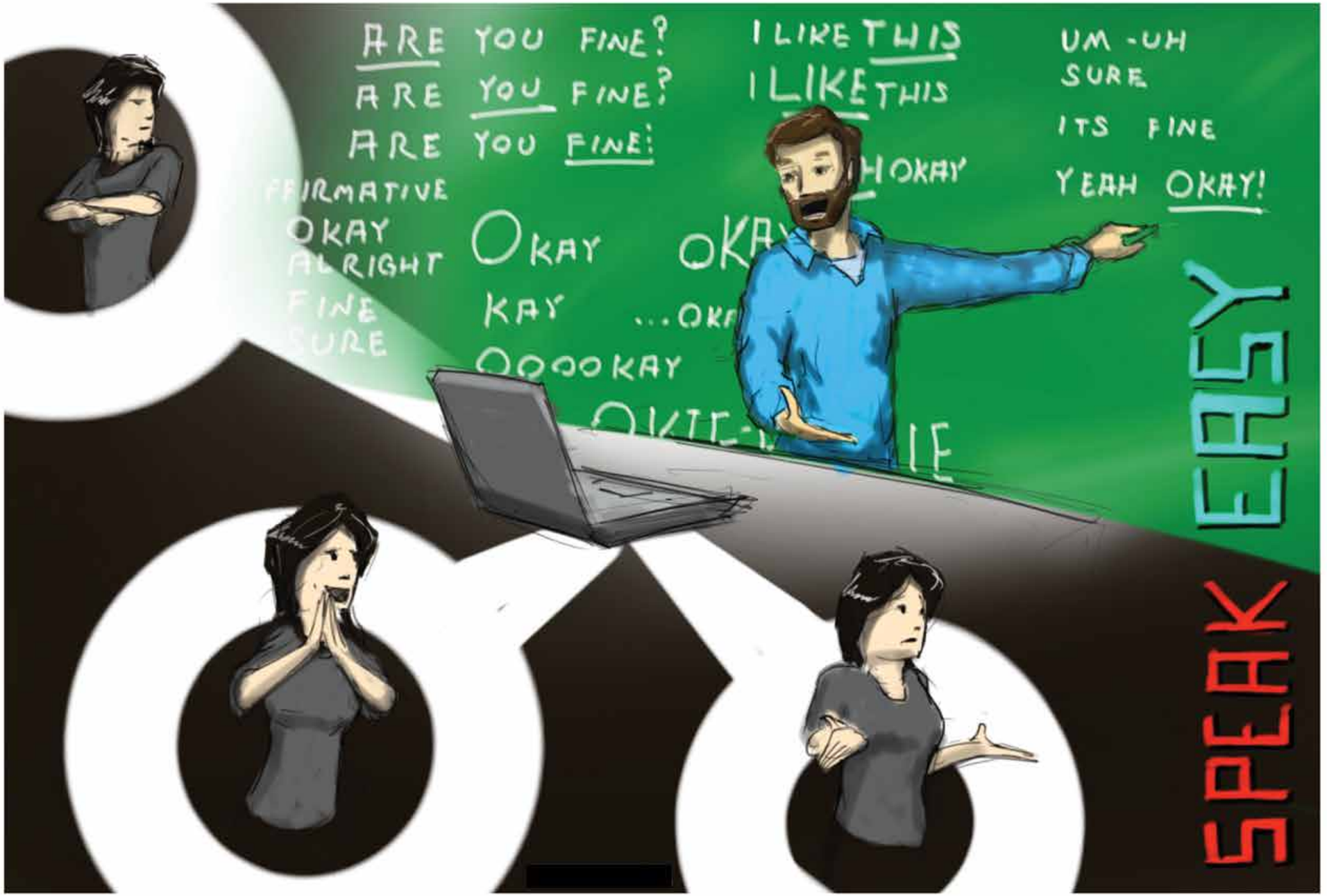
Second step will focus on slot filling based on some pre-determined prompts to create a coherent statement. Suppose someone asks "who is the president?", the slot of the country is missing, we need to fill this slot to query knowledge base. So second step will check if any additional information is required, which will fill in the slots. Third step after all this will be querying the knowledge base. Now assuming that all the slots are full filled and then we have a complete question. This complete question will now be classified into different categories based on the source from which we can extract this information. Then if we are able to extract the information, we will change the nouns and pronouns according to the current context. This step is "state aware," as in, if the Socialbot is currently in the process of discussing a news story, it will be able to continue reading aloud the news story to the user as directed by the Conversation Manager. The sentence will be checked for grammatical correctness in a final checking step and then the answer will be passed to Alexa engine, which has built in functionality to convert that text into speech and message is delivered to the end user



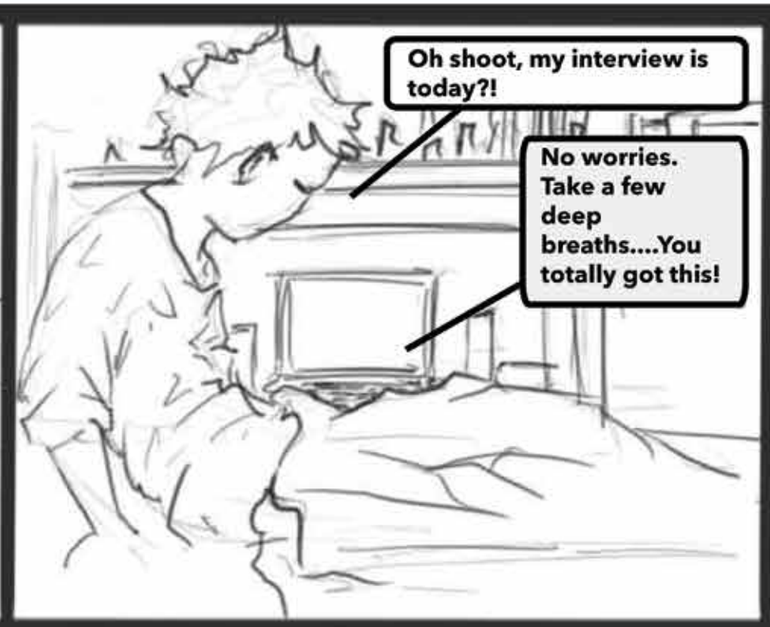
SPEAK EASY: VOICE INFLECTION MACHINE LEARNING

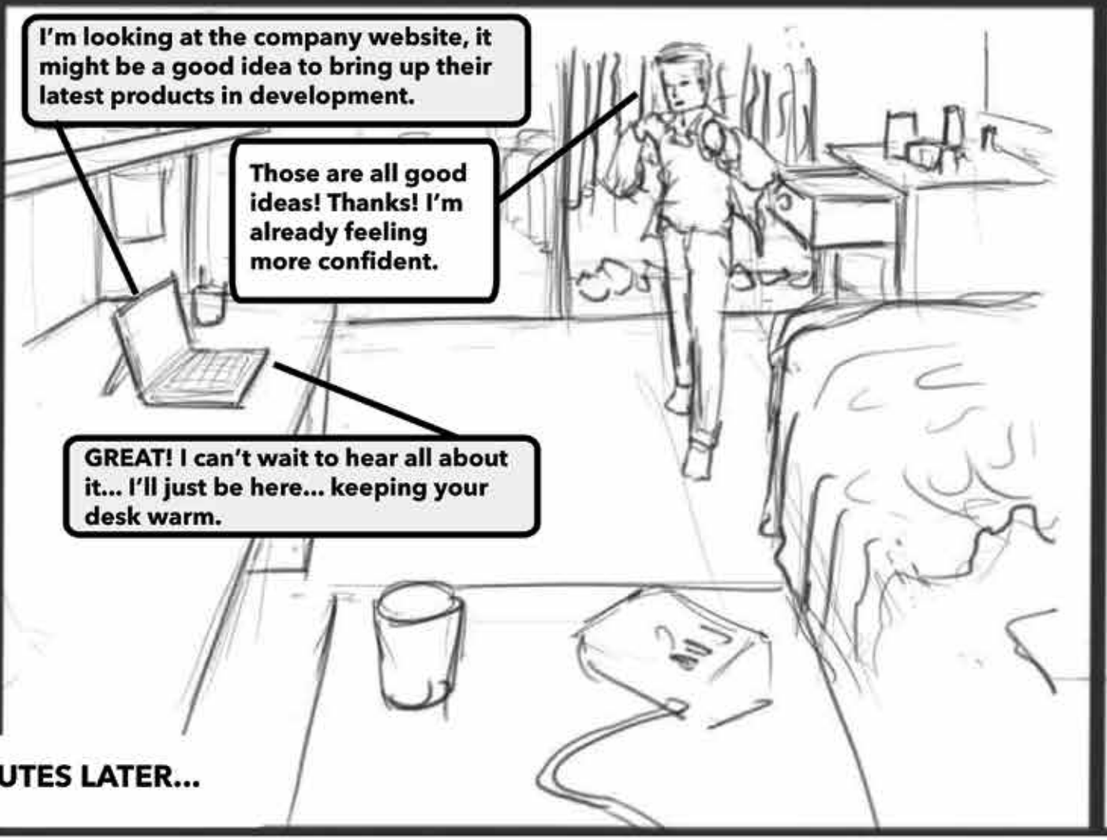
Speak Easy was a research initiative proposed by Luminosity's pilot engineering to develop a neural network with speech recognition producing generative responses with in-context voice inflection. To produce this program, a machine learning approach was required with an emphasis on emotional intonation of various words within a sentence to provide an accurate emotional layer. This process is characterized by the following storyboard and the image to the right, of a teacher matching emotional states with key words in a sentence, to imply intonation to a chatbot personified as the female. Ekman's 6 basic emotions were selected as the primary pool of emotions to build inflections upon; Joy, Suprise, Anger, Disgust, Sadness and Fear (with a consideration to add Contempt). After considering the workload to develop the neural network, Luminosity partnered with a sister lab, the Center for Cognitive and Ubiquitous Computing (CUBiC) for further development.

The goal for this project was to further the process of AI generative conversations to sound more natural and more consistently able to pass a Turing test in daily conversation, ideally on non-technical topics. To convey this to CUBiC, a storyboard (as shown on the next page) was written to illustrate new ways generative conversation can enhance user-device interaction.



SPEAK EASY: APPLICATION STORYBOARD





TEN MINUTES LATER...

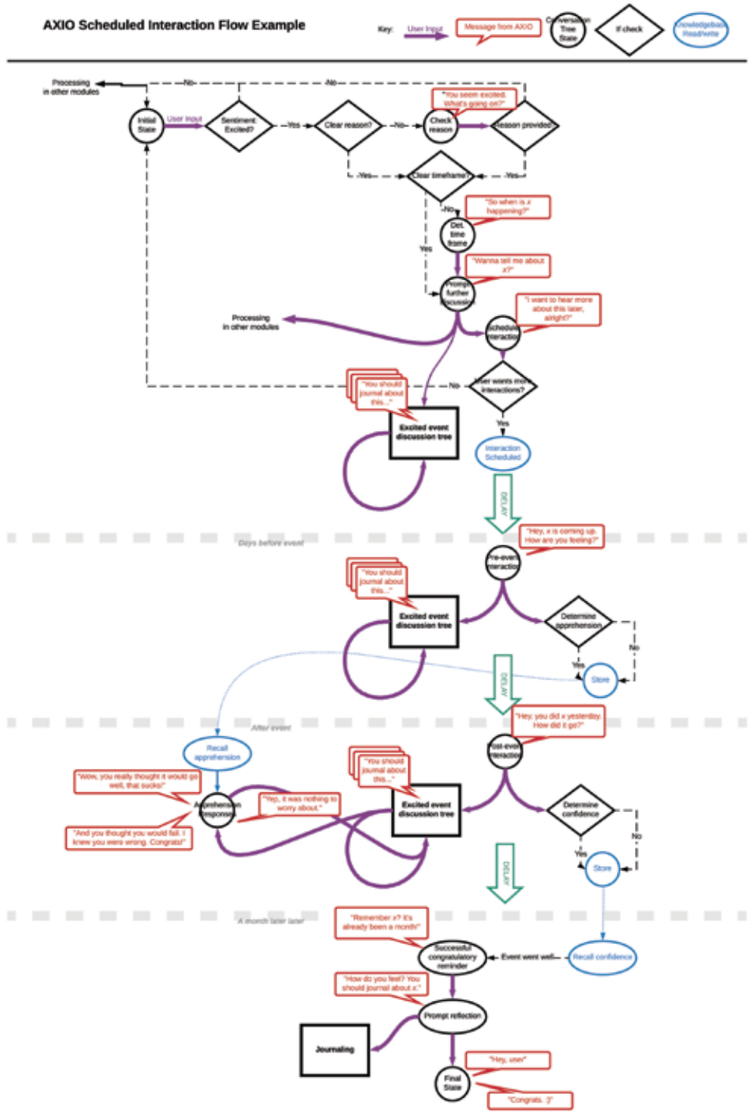
AXIO/ ATLAS: LEARNING AI CONCEPT MODELS

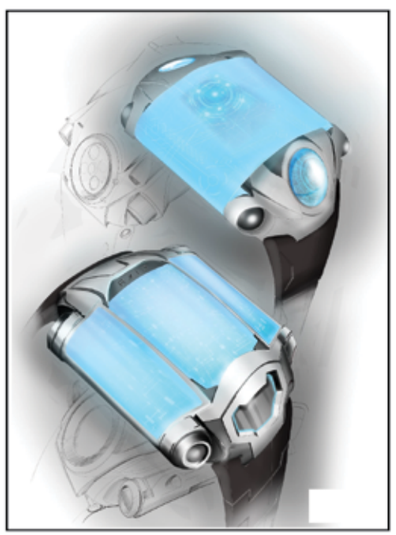
Launched as a request from Laboratory Founder, ASU President Crow, to develop an artificially intelligent, education platform designed to have an all in one teacher/ life coach inside a device for a user to learn from and grow with. The concept was originally derived from, the Young Lady's Illustrated Primer, a device in Neal Stephenson's novel, The Diamond Age. A unique feature of this Illustrated Primer device, was that it educated its student, using stories that derived personal details from the students' life, to enhance the context and relatablilty of the lesson. This concept is considered to be an example of personalized education and with the recent rise of artificial intelligence, this kind of generative personalized education may be possible.

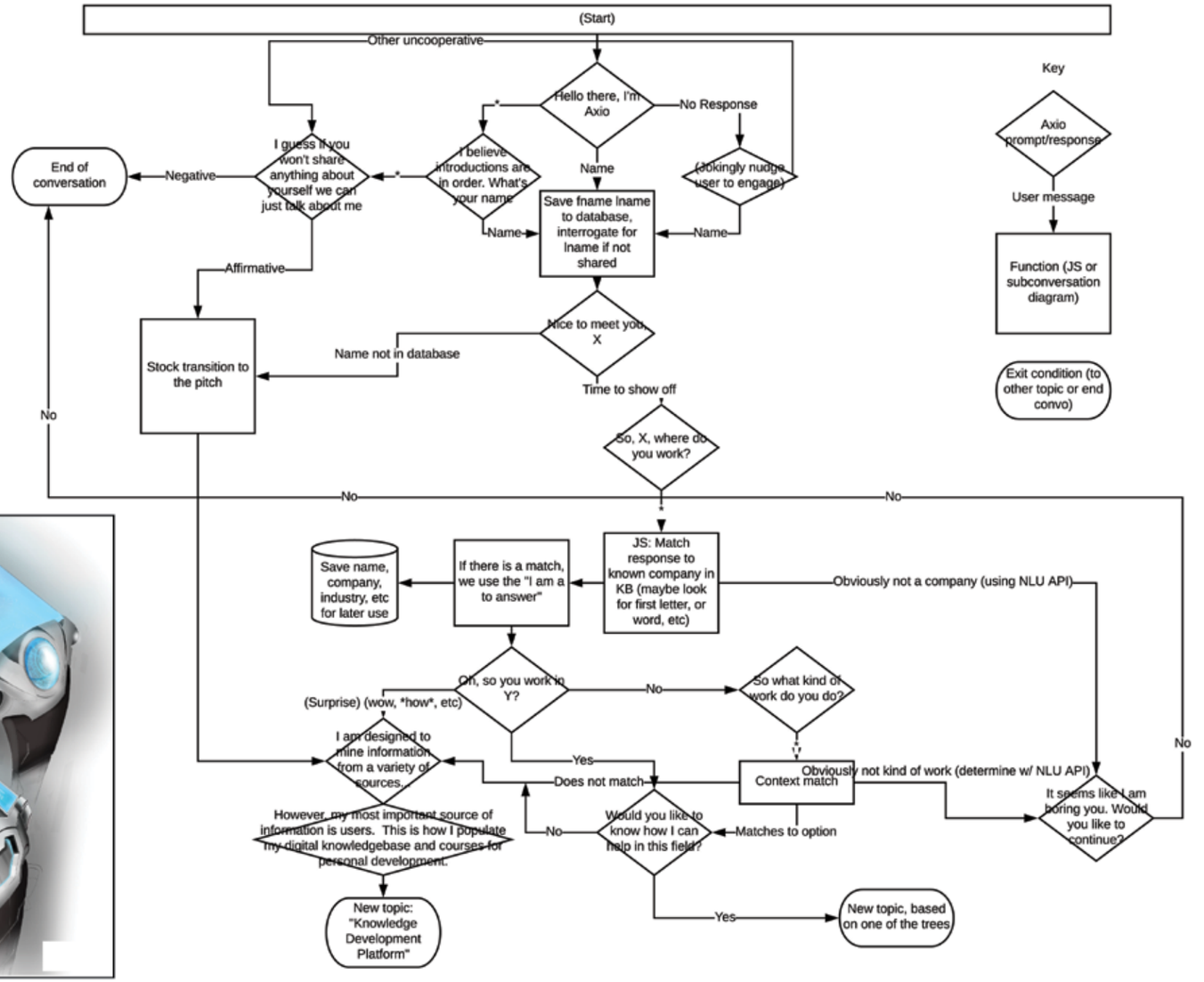
As one of the largest and longest running projects within Luminosity, Axio (which was originally named Atlas) was the alias that we gathered our prototypes and concepts around. Shown below and on the next few pages, several flow diagrams, user interfaces, and wearable devices were considered and its first beta was launched in 2018. Its demo video is available by following the QR code to on the top right. Axio, was eventually renamed to Primer.

axio

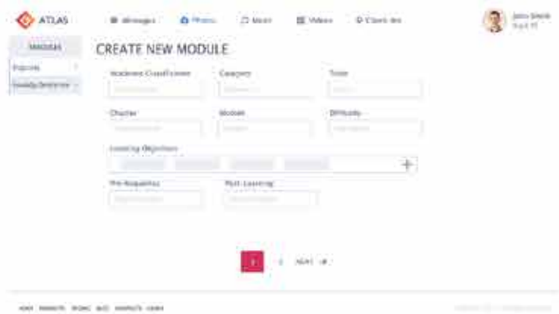
Your platform for personal growth

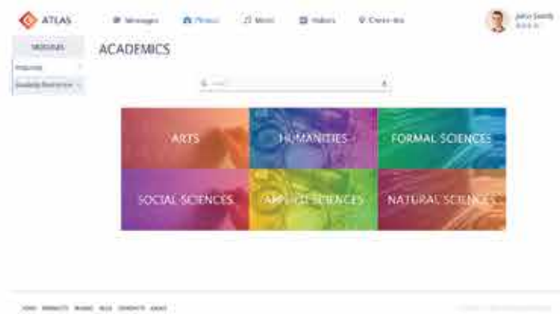


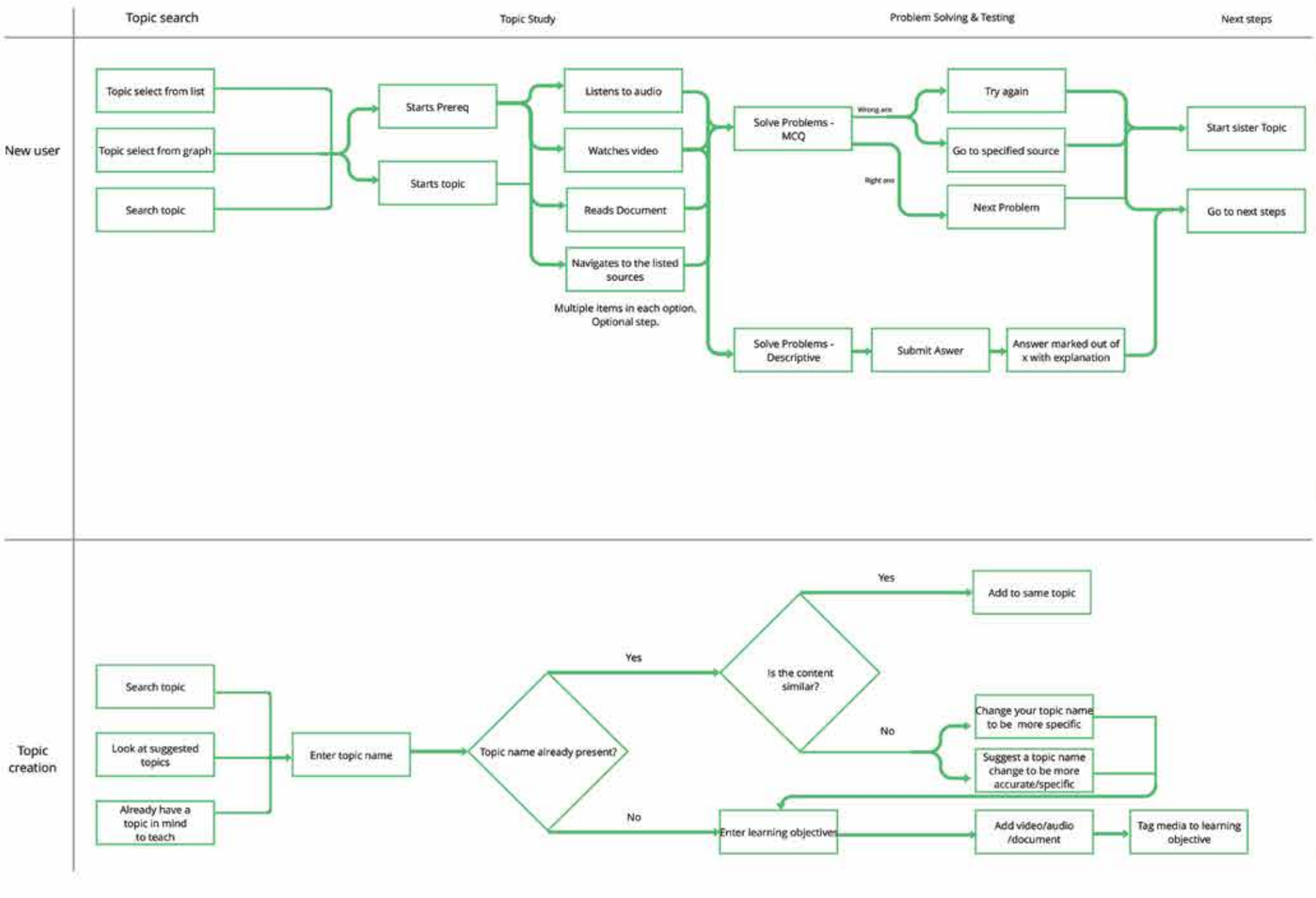


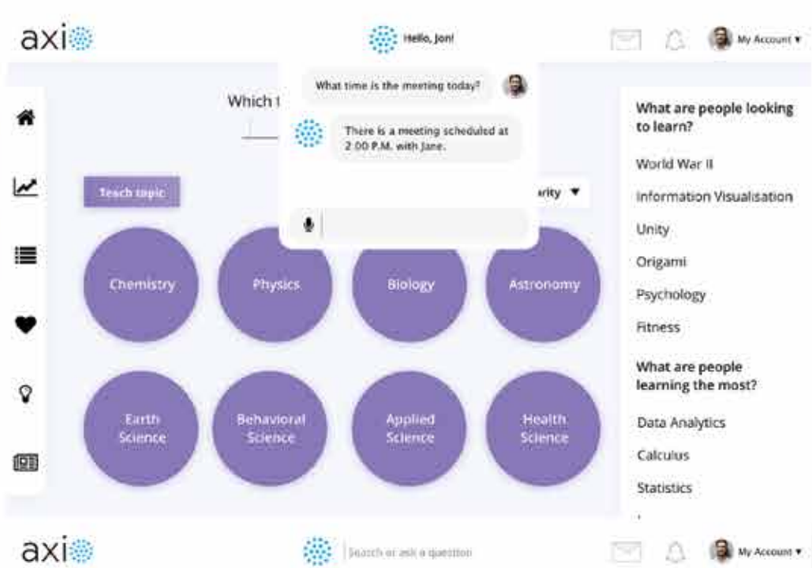


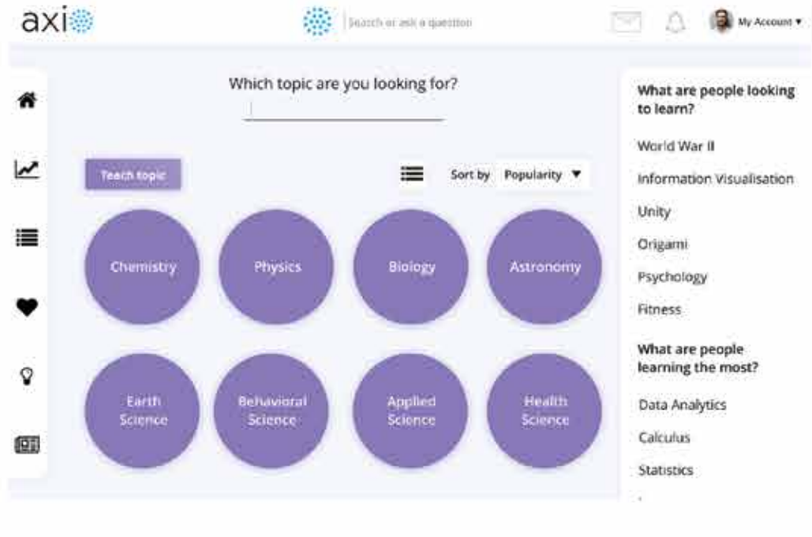
AXIO/ ATLAS: INTERFACE CONCEPTS



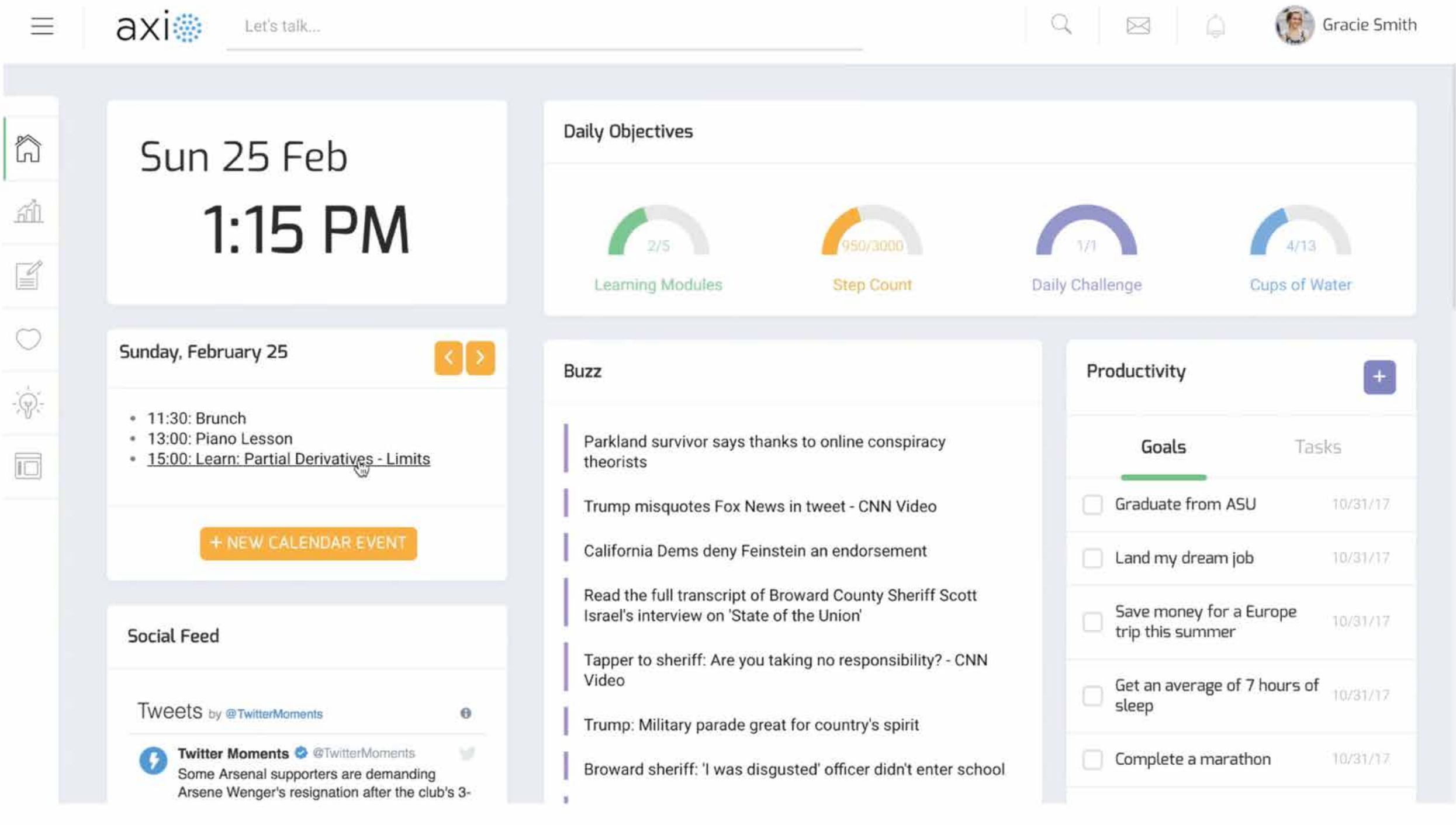








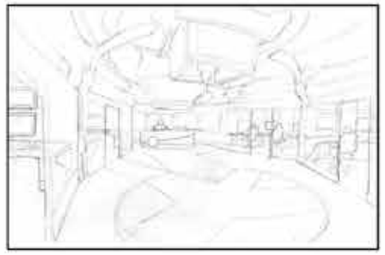
AXIO: INTERFACE 1.0

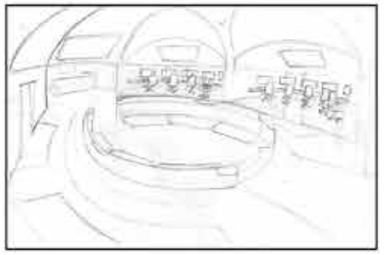


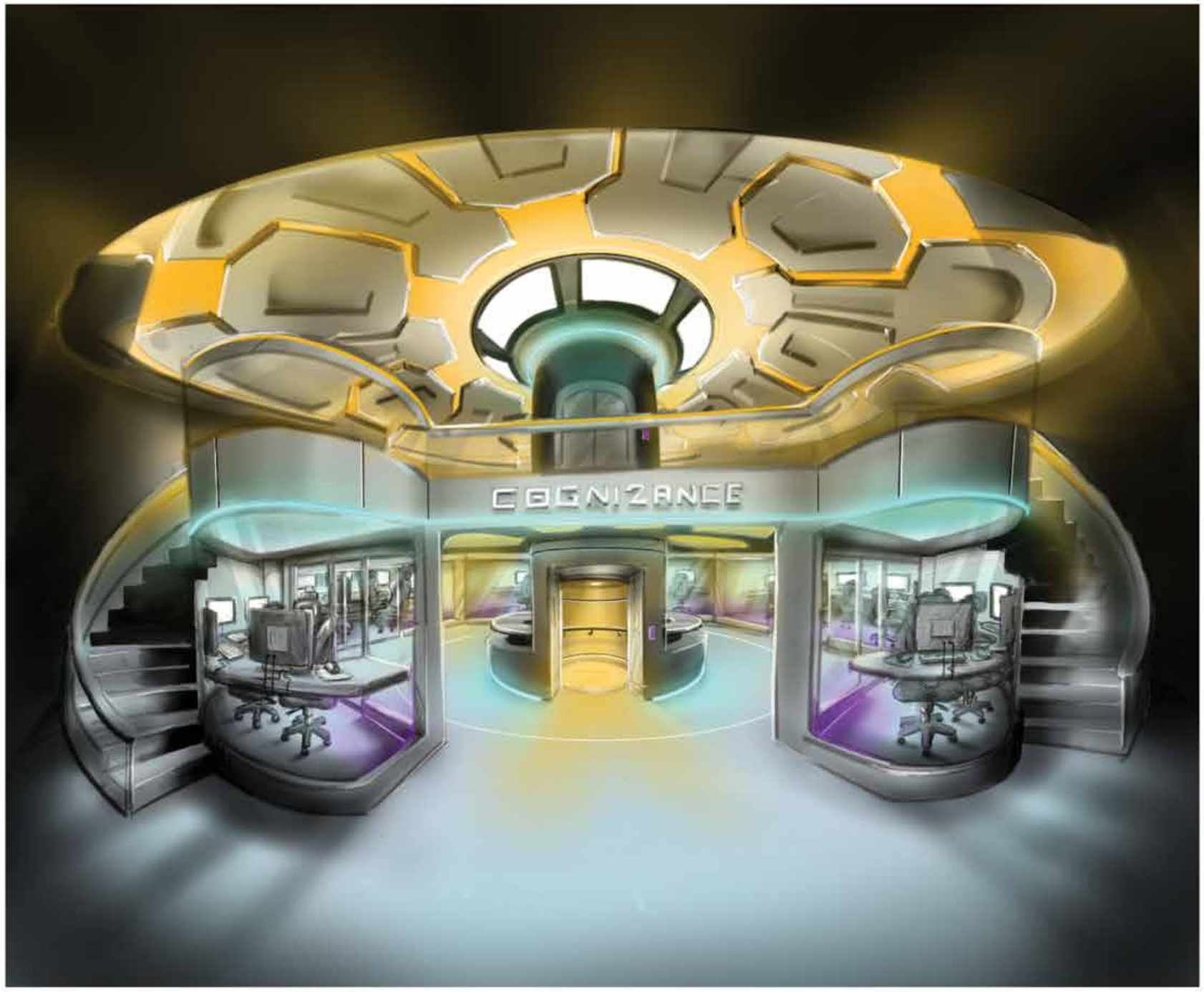
COGNIZANCE: E-SPORTS CENTER CONCEPT

Cognizance is a proposal in 2017 to ASU by Luminosity's first business team to develop a wing of a new tech focused facility in Mesa Arizona, into an e-sports center. Alternative space was also considered in the PV West center at ASUs Tempe campus. The reason why is that a rise in competitive video games sports such as: League of Legends, Counter Strike and Fortnite both domestic and abroad would encourage ASU, as a school that takes pride in its sporting facilities, to cater to this growing audience. By establishing a high budget e-sports practice and competition arena, ASU can position itself a host in the American southwest for continued rise of digital sports.

Luminosity since its foundation has had many e-sport enthusiasts and gamers as part of its community; having over the years established communities in Minecraft, DoTa, Fortnite and more. Luminosity occasionally holds gaming nights to this day.



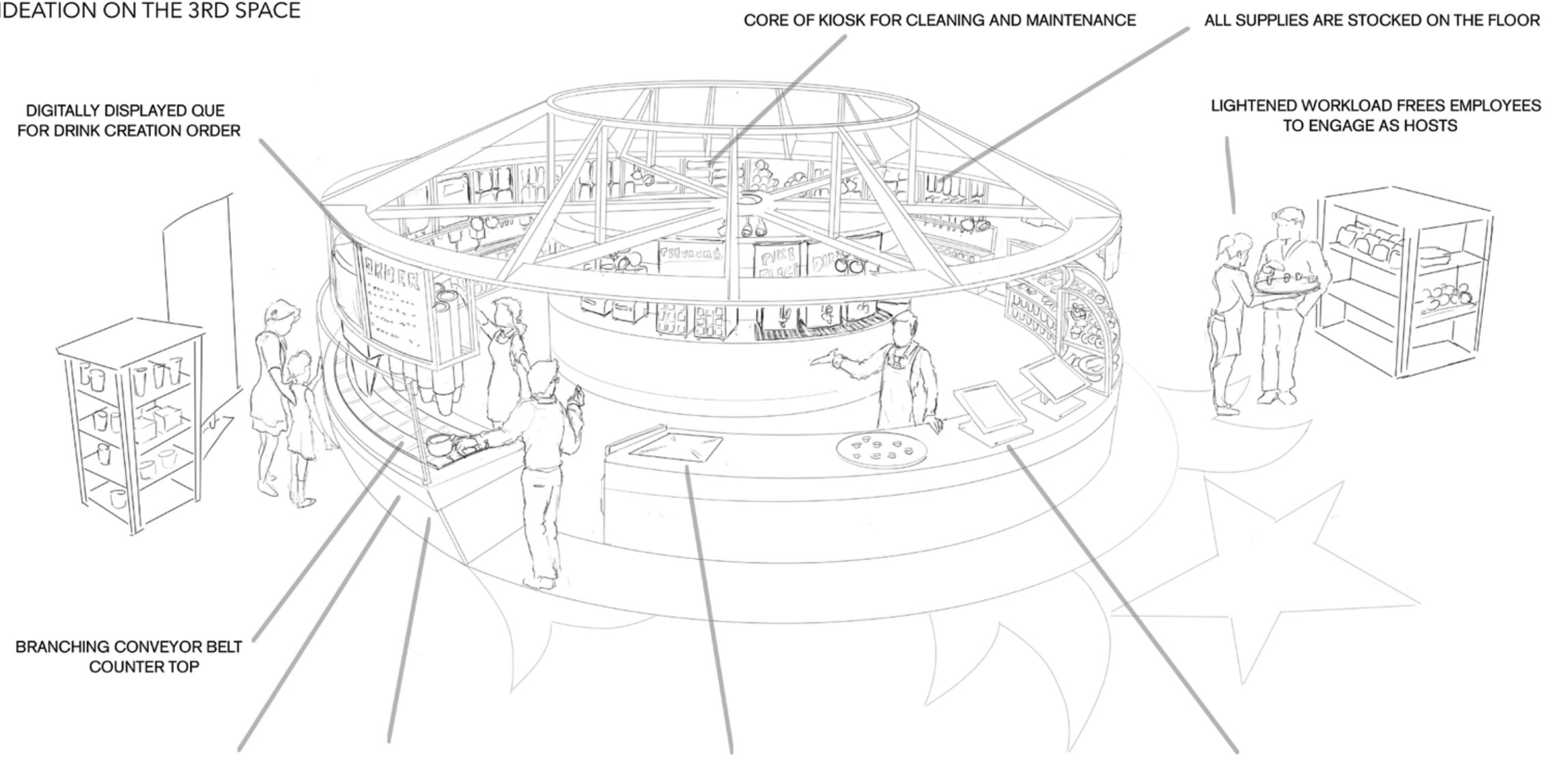




STARBUCKS: AUTOMATED KIOSK CONCEPT

LUMINOSITY LABORATORY
PROJECT: AUTOBUCKS
IDEATION ON THE 3RD SPACE

SUMMARY: A CONCEPT KIOSK FEATURING AN ASSEMBLY LINE, SUSPENDED ABOVE A COUNTER TOP WITH CONVEYOR BELTS FOR AUTOMATIC DRINK PRODUCTION CAPABILITIES, STREAMLINING THE TASKS OF THE EMPLOYEES FOR MAINTENANCE AND CUSTOMER ENGAGEMENT



VITALITY: BIOPHILIC SPACE COMPETITION

In 2016, the ASU Biophilic Design center held a competition for the design of a space on the ASU Tempe campus, reflecting the principles of biophilic design and architecture. Biophilia is greek for the love of Nature. A team comprised of Luminosity members entered and won first place in the competition with the following proposal.

“The biophilic design [pursued by team Vitality] was inspired by natural edges of water-carved rocks found in the Sonoran Desert, lines the lower floor of the re-desgined Memorial Union as unique pieces of furniture. Each piece, replete with soft light shows and surrounded by sounds of nature, builds upon each other in winding, geological patterns. The room should evoke a sense of stepping into a cave, inducing feelings of refuge, calm, and mystery for all visitors who want a reprieve from mundanity. Above all, the design should instill a greater appreciation and wonder for the beauty that surrounds us in nature and in life itself.”

Our original solution evoked the visual sense of nature by connecting the first and second floor of the Memorial Union, using a biodiverse stair set (shown in top two images). With a through-provoking form, the staircase would support traffic flow and enrich all passerby with knowledge of the Sonoran Desert. Unfortunately our original design could not be implemented due to conflicting plans with the partner Architecture firm. Thus, we re-interpreted the geological, exo-skeletal feeling of the staircase into modular furniture pieces.

We were inspired by the painted rocks of Sedona and the cave domes in Papago Park, that evoke a great sense of refuge and the overall vibrancy of life in the Sonoran desert landscape. Architecturally, we drew inspiration from Arcosanti, in Yavapai county, an experimental town with ecological architecture, whose forms emerge like exo-skeletal cacti. Visually we also echo Danish architect Bjarke Ingels, who develops structures that appear to blend Papago coves and Arcosanti together.

Biophilic design means creating spaces for people to experience a sense of holistic well being. Biophilic spaces should be inspirational, innovative, restorative, and integrate functionality with the ecosystem that the design belongs in. Biophilia nurtures a love of place- for us, that place is Arizona.

Biophilic Design Principles

01 Nature in Space
- 01 Visual Connection
- 02 Presence of Water (Hydroponic)

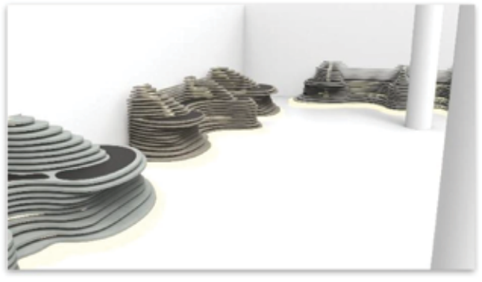
02 Natural Analogues
- 01 Biomorphic Forms and Patterns
- 02 Complexity and Order

03 Nature of Space
- 01 Refuge
- 02 Mystery

It is all too easy in modern life to be lost in constant worry - about paying debts, grade point averages, salary growth per year, so on and so forth. Almost always, the worries return to numbers. In the way that we reduce a lot of richness in our lives to numbers, modernity can be rather dehumanizing.

Our designed place would be the opposite - it would feel both tranquil and invigorating at the same time, as well as help reduce stress and improve creativity and well-being.

We want to emphasize well-being not as a way to return to productivity, efficiency, and more numbers, but as a wholesome way of being that is quiet yet lively.



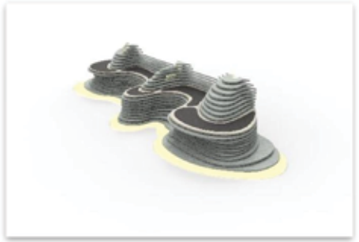
Students can come in, sit and lean against the furniture - perhaps chatting quietly among themselves while watching and listening to the dripping of the hydroponic system. It would be refuge away from the relative normalcy of academic life.

Anyone can walk in and run their fingers along the edges, along all the curves and marvel at how strange and beautiful it is, that wood material from Arizona could evoke stone and sedimentation.

Overall, all passersby would be actively engaged and remember how beautiful Arizonan nature is.

Final Design

All of our units can be disassembled and collapsed. Benches interlock with end pieces along the wall and can be deployed in many configurations, creating a continuous structure. Units will be made from lightweight recycled material or pine wood from Flagstaff. Together, these pieces create a non-uniform and aesthetically mysterious space, the kind of place that we dream about when desiring an escape to nature.



Winding Canyon Bench

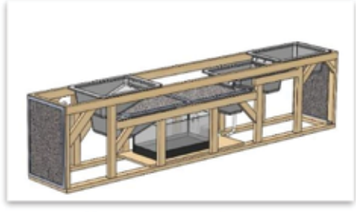
View at:
https://www.youtube.com/watch?v=EfegXBwB_EU

- LED wrapped bases for floor lighting
- Easy to integrate with other LED strip lights
- Each layer can be taken out individually

Monument to the Master Cave Builder

View at:
https://www.youtube.com/watch?v=HrK13DgjnXM

- The bench can be flipped around – mirrored
- Leaving a gap between the mirrored benches for hydroponic system
- Water is the original master – trickling streams create cave systems



Hydroponic System

- Closed loop (only need to plug in to power pump)
- Modular
- Secondary to design intent, but shows structural adaptability of design
- Useful for Kratky based hydroponics or metamorphic rock medium

View of Entire Room
https://www.youtube.com/watch?v=xu6HzuT2iRU

AMAZON HQ2 COMPETITION: TEMPE REPRESENTATIVE

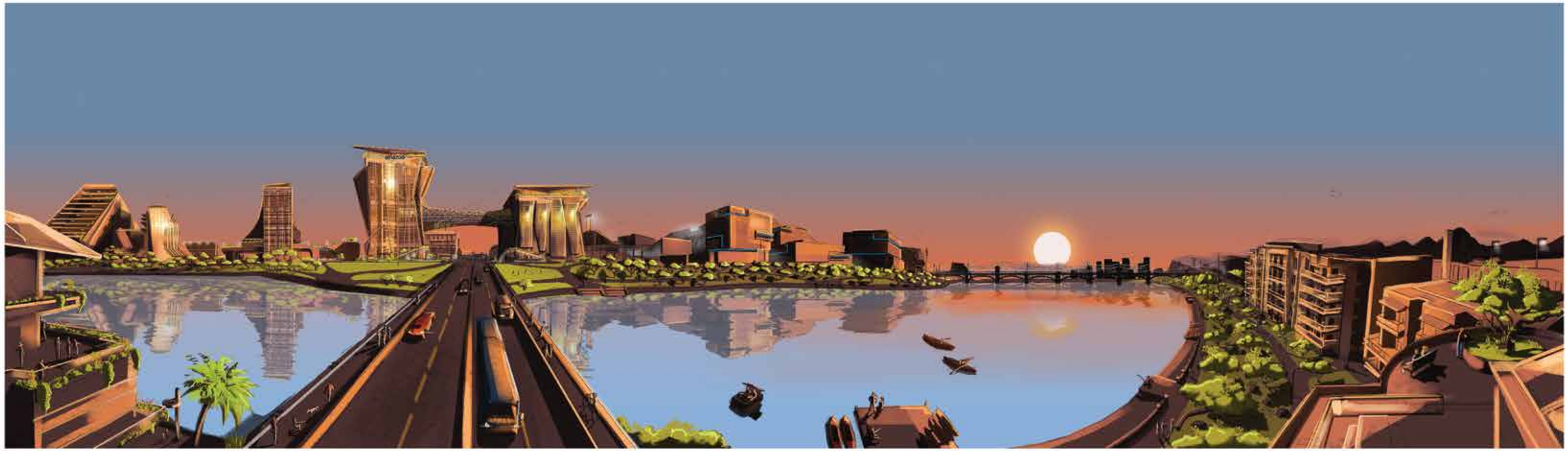
In the fall of 2018, Amazon announced its decision to build a second headquarters outside of Seattle, Washington. Cities across the United States rushed to develop proposals to send to Amazon, inviting the company to their city for a new headquarters as it would bring many jobs with it as well. The city of Tempe partnered with Luminosity Design to Illustrate concepts for their proposal, involving offering the newly developed Novus corridor and the Tempe Town Lake Waterfront as features for the new headquarters location. Luminosity assembled a team of architects, industrial designers and landscape architects, to discuss their concepts for what an Amazon headquarters might look like at both proposed Tempe locations, and developed a series of concepts to deliver to Amazon within a week. Ultimately, Amazon did not move to Arizona, though the proposal built relationships between Luminosity, the Office of Knowledge Enterprise and Development (OKED) and the city of Tempe. Many years later, a version of the sketch proposal can still be found on the cover of the OKED memo cards. The concepts illustrates follows:

Right: Overlooking a plaza in the Novus Corridor at dusk, Papago park in the distance, from the window of a cafe, in the Amazon headquarters lobby.

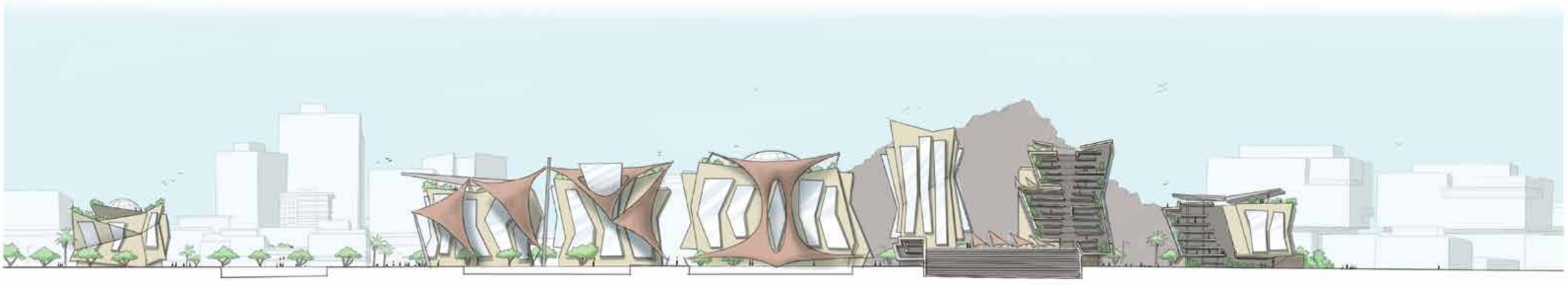
Below: Looking Southwest, at dusk, standing on north side of the Scottsdale Road bridge, at Tempe Town lake, in the year 2030 showcasing several new business along the completely developed Novus corridor.

Next page top: An architectural section drawing of the Novus corridor buildings.

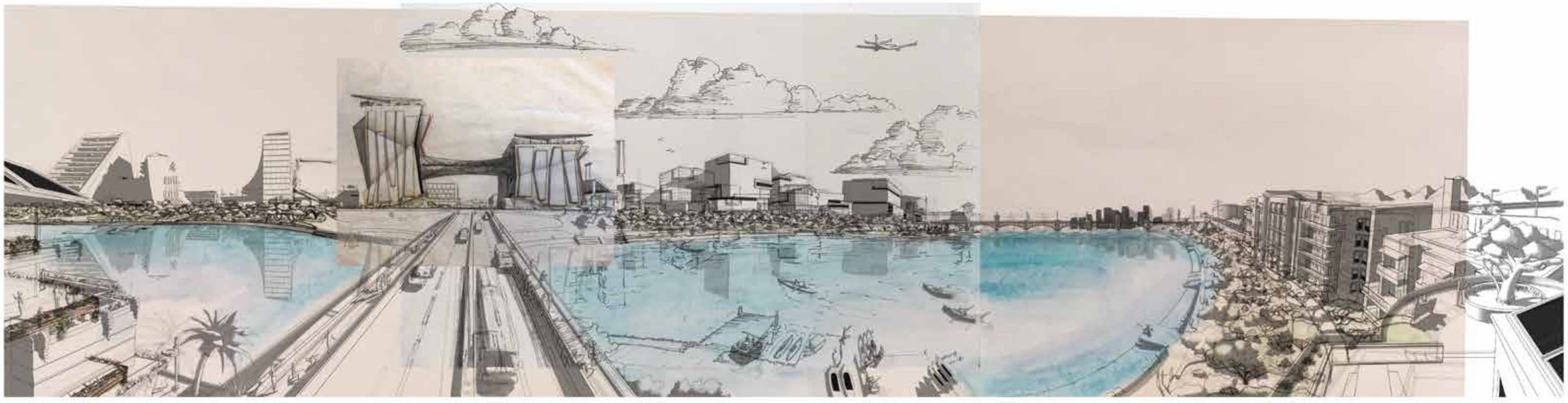
Next page bottom: An overlay compilation of the main render of Tempe town lake, showing each individual sketch page that contributed to the collaborative vision of Tempe's proposal.



Novus Corridor Section View



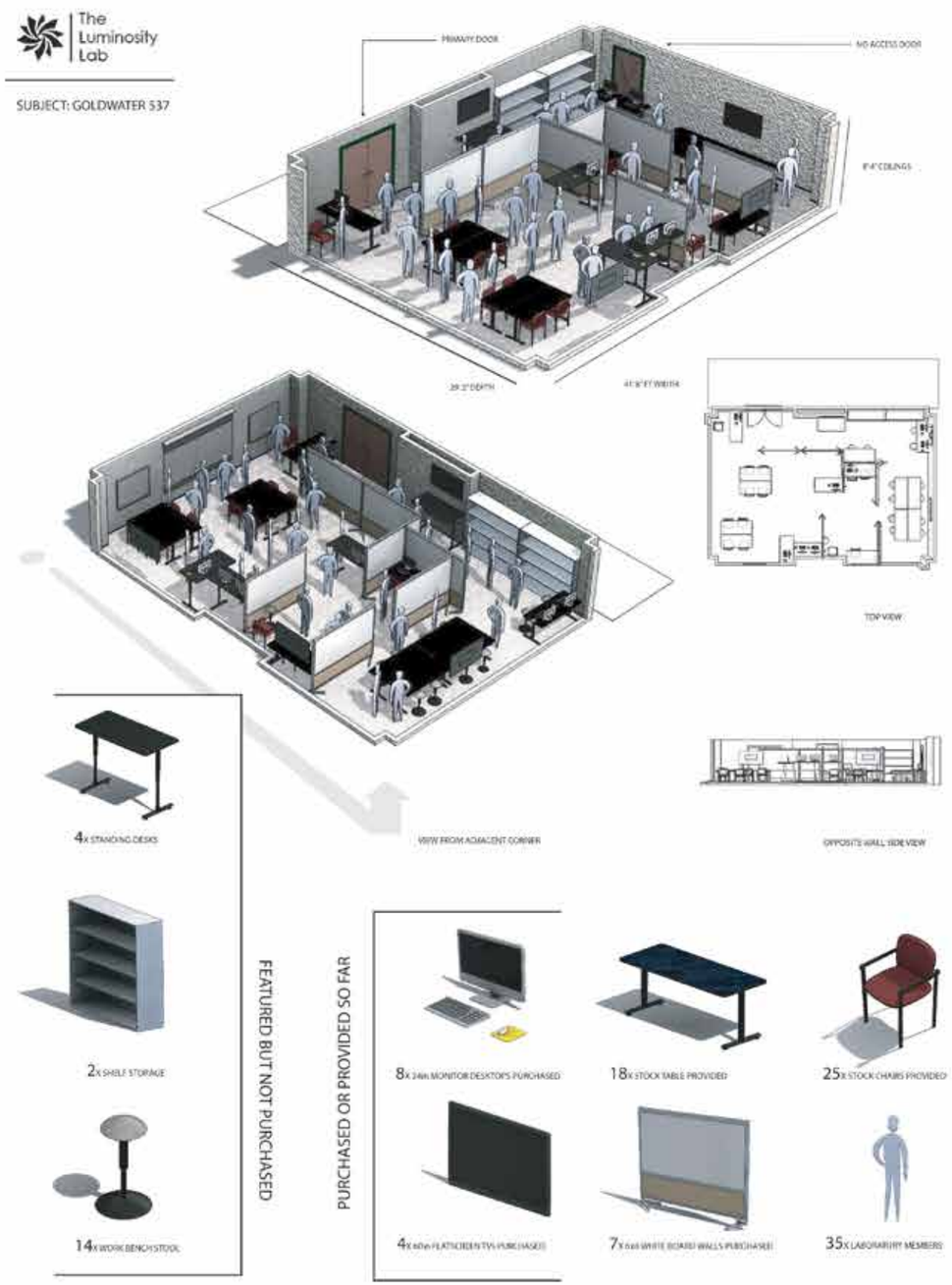
Waterfront collaborative sketch overlay

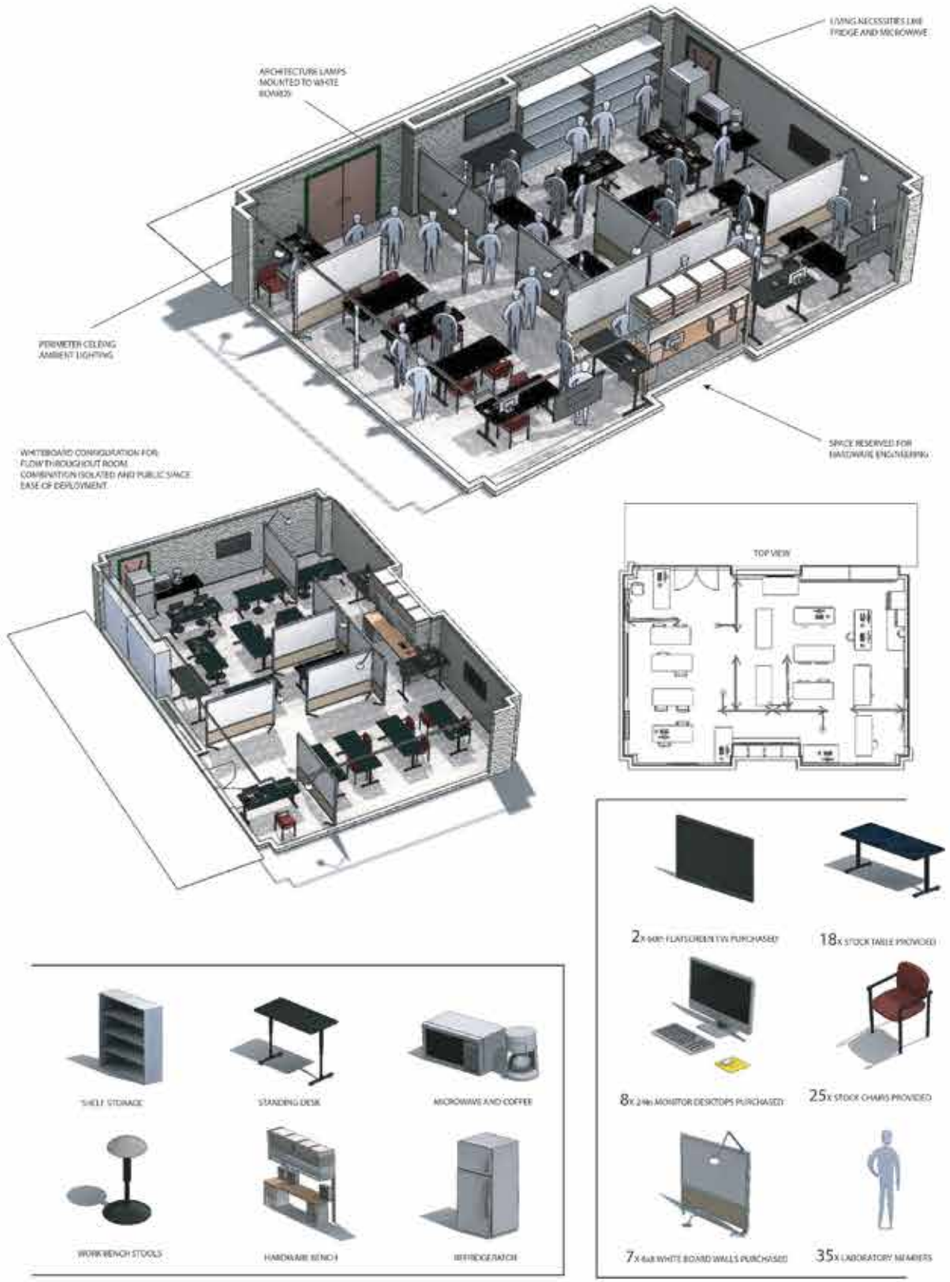


GOLDWATER MAKERSPACE: EST. 2017

In the fall of 2016 and Spring of 2017, Luminosity did not have its own space, meeting in the Engineering wing G to develop projects. It was difficult to prototype given we also had no permanent storage. After a successful first year, Luminosity was granted its first permanent facility in the Fall of 2017 in 537 Goldwater. The Luminosity design team, was tasked with making the best use of the space as the lab was growing in number, and only one classroom sized space was available. Early concepts, were based around dividing the room up into sub spaces and adding sound dampening elements to the room. The entire plan was built, mapped, and budgeted in CAD before implementation. The laboratory consisted of many different types of students with different space and noise needs and so several configurations of the room were attempted.

Goldwater remained the only Luminosity space until Fall 2018 when the Office of Knowledge and Enterprise Development partnered with Luminosity and granted additional space in the Fulton center. The Fulton Space allowed Goldwater to be reconfigured into a maker space, while study and meeting space was moved to Fulton. The Goldwater space could open up and more prototyping tools and equipment could be moved in. Because the space was windowless it was still the ideal facility to prototype on Luminosity's more secretive projects. Goldwater remained as Luminosity's primary makerspace until Fall 2023, when the Fulton School of engineering provided a new makerspace in Engineering F, right next door, to where the laboratory first met in 2016.





FULTON LABSPACE: EST. 2018

In 2018 Luminosity was provided its new showcasing space by the Office of Knowledge and Enterprise Development, on the first floor of the Fulton Center. This was great honor and a milestone in the growth of Luminosity, was it was the only Laboratory that operated out of President Crows building. This positioned Luminosity to present itself to anyone who might be on their way to meet the executives at ASU.

The Fulton space became the primary meeting, showcasing and study space, for the lab, allowing Goldwater to transform into a dedicated makerspace. It was a stark contrast for a Laboratory that had just spent the last year in a space with no windows to having a space with no walls. Luminosity was able to showcase its agile and innovative ideation methods, live drawings, and open discussions on complex topics, aiming to be an exemplary space for the nations most innovative university. Concepts were discussed, to design the hallways outside of the laboratory as well. (Shown right)

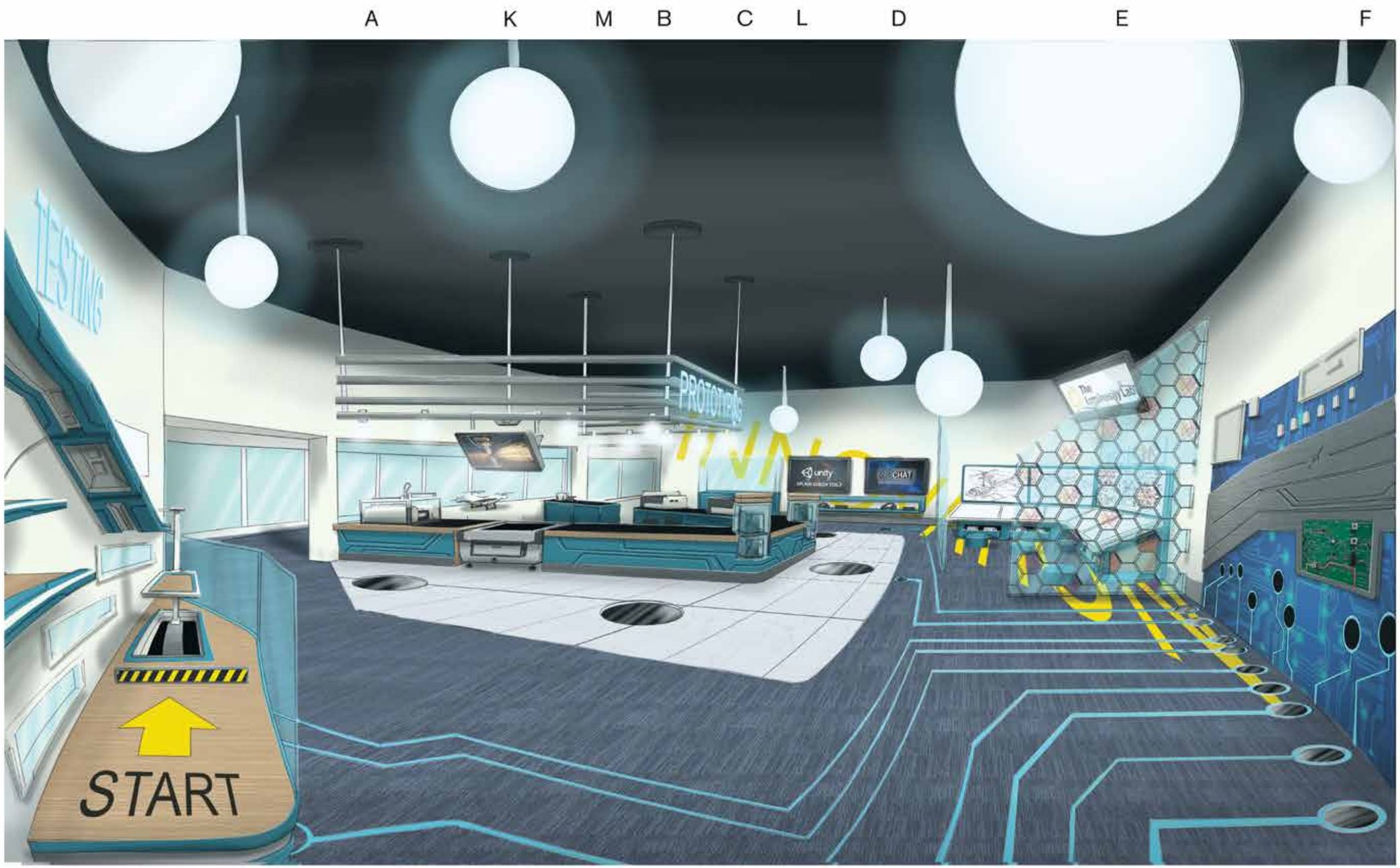
After the unfortunate theft of a prototype, prototyping inside of the Fulton Space became difficult. It was one of the key capabilities of the Luminosity design and Engineering teams, and remain relatively unknown by the greater university due to Goldwater having no exposure at all. This would eventually lead to the acquisition of the Polytech and later the Engineering F facilities, allowing for more accommodation for exposure, and reducing risk of theft from random observers.

ARIZONA SCIENCE CENTER EXHIBIT: CONCEPT

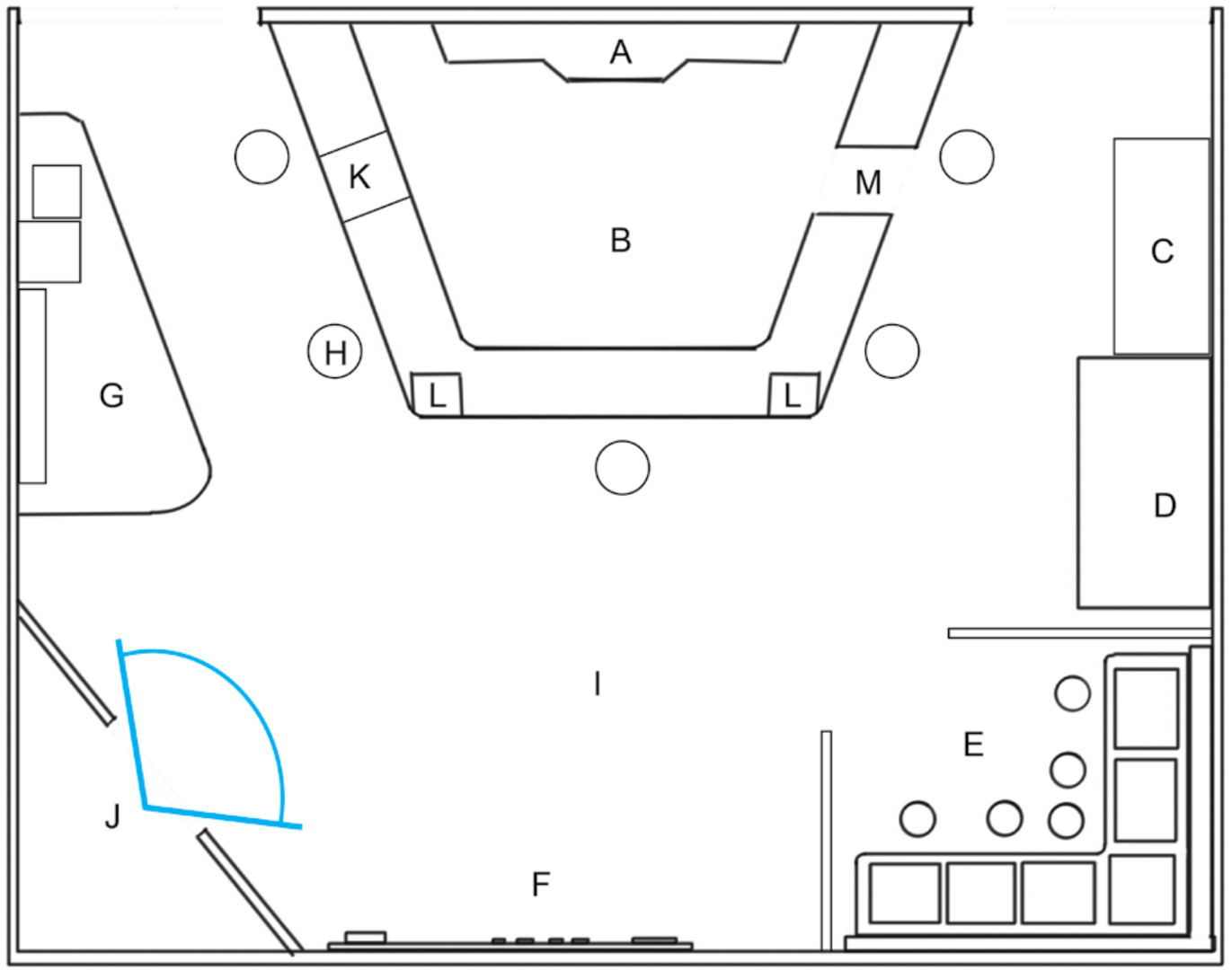
In Fall 2018, the Arizona Science Center approached Luminosity to design a new exhibit at the Arizona Science Center, around “Technology”. Luminosity was provided a concept space to design around and free reign to propose ideas to the center.

Luminosity explored several ideas shown on page 49, which aimed to bring visitor into the work of their devices, exploring PCB design, internal components and visualizing circuitry.

Luminosity’s design concept shifted over the next several months to an expression of additive manufacturing and robotics. With the recent development of the KIP program (Page 14), we decided to showcase how easy it is to get into robotics and showcase our own mini creation process for KIP along the way. Shown right (and labeled on next page) the room is divided into several sub-areas on an open floor plan. There is a design station, for both 2D drafting and 3D CAD, a sensor building wall, a 3D printing station at the center of the room and a testing obstacle course for when KP assemblies are complete. The concept is for a young visitor to briefly visit each station and contribute in some way to the construction of a KIP unit. The actual assembly itself, is largely symbolic as visitors will not be able to take one home without purchase, but the goal is to expose the audience to each step of design to creation.



Top down floor plan configuration floorplan concept 2.0



A- Entrance side window and display shelf

B- Primary working area, robotics assembly site

C- Seondary display case (Content Pending)

D-Virtual Reality headset demo station (2 stations)

E- Cintiq design zone (walled off w/ hexagon windows)

F- Sensor interface for robotics obstacle course

G- Robotics obstacle course start (runs along left wall)

H- Piezo electric pads for assembly site info display

I- Circuitry visual linking interface of F and G

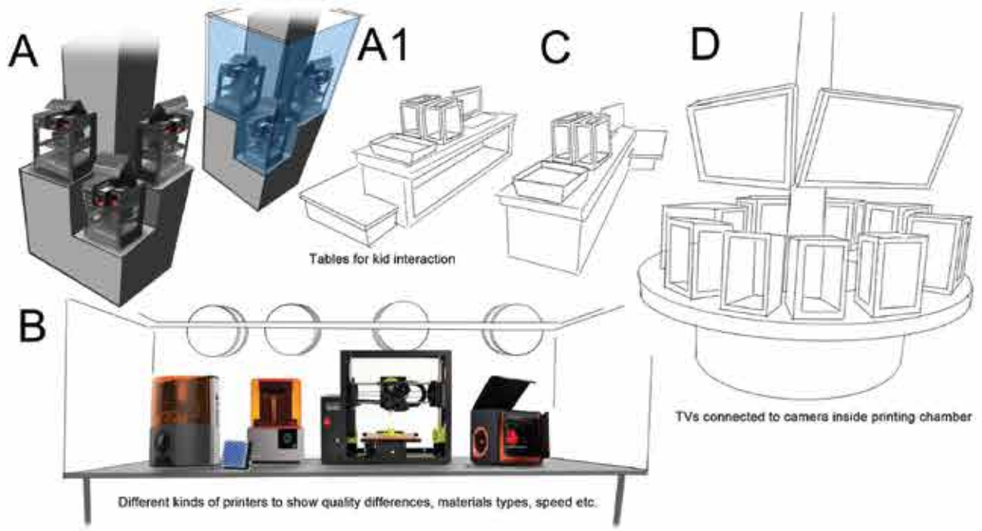
J- Ham Shack and vantage point

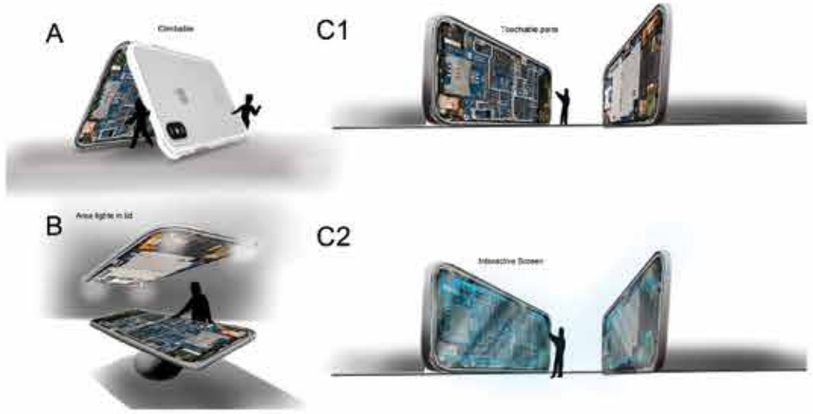
K- Laser cutter

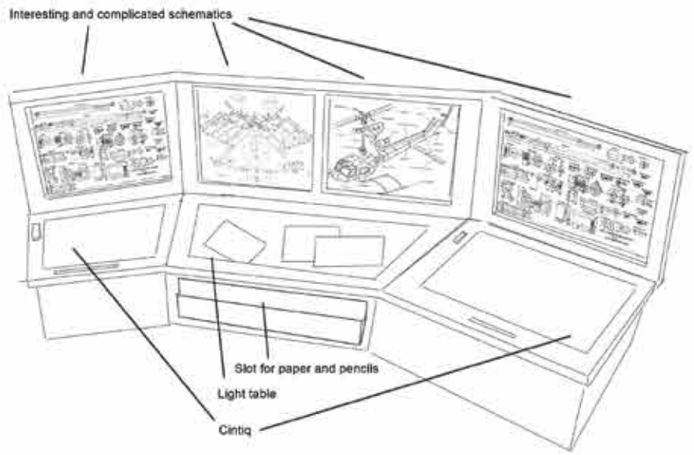
L- 3D printing display case

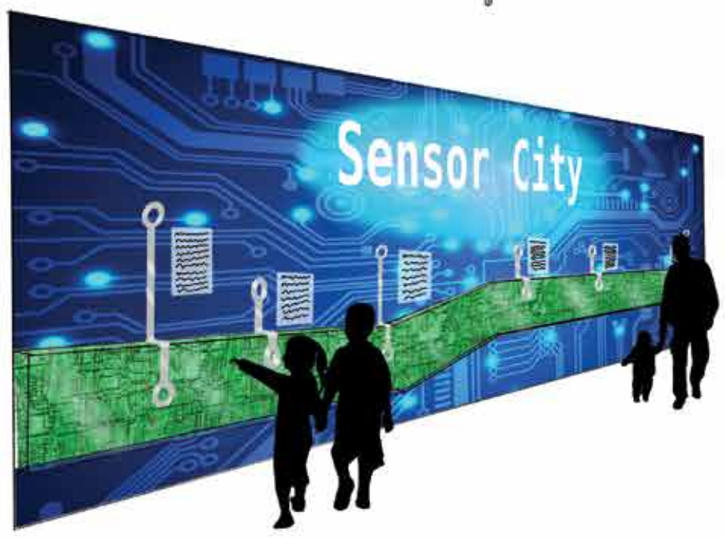
M- Entry zone for robotics assembly site

ARIZONA SCIENCE CENTER EXHIBIT: CONCEPT





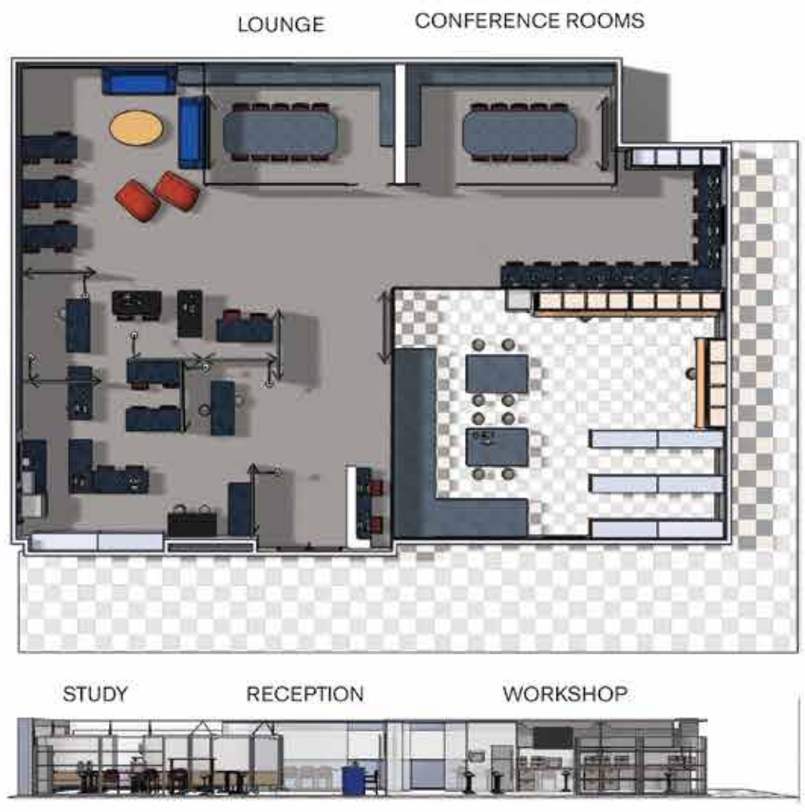




COLLISION: ACCELERATOR

Launched in 2018 as a proposal to ASU to provide a facility to house the Collision Accelerator program. A business fast track program designed by the Luminosity business team. Collision would include a program where elected students will be attending a semester long intensive boot camp, where they will hear from guest speakers, learn a new skill, team building and explore what it means to be an entrepreneur. Each student is expected to choose a skill that they will think will be useful when building a Startup. They then have to set objectives and a project that will demonstrate mastery by the end of the semester. There will be between 400 - 600 students from all different ASU schools that get into Bootcamp. They will be required to attend a once a week class that will be held at the Student Pavilion. This will give them 3 credits. The end of the program will conclude with a Hackathon where the lessons the student learned will be tested and showcased. Teams will be living in a student housing where each team is given its own complex. For an entire semester, the teams will accelerate from idea to a market-ready product. Kicks off with a weekend of open house where the public gets to see what the ten teams has come up with. There will then be demo days to allow the teams to pitch to the various funding and pitch competitions, and investors. The housing will be for a whole academic year, so after fall semester, the teams will continue to develop their businesses further after receiving funding.

The surrounding renders showcase the facility that this program would be housed in allowing for a state- of-the-art makerspace to be able to develop their project with the Collision program.



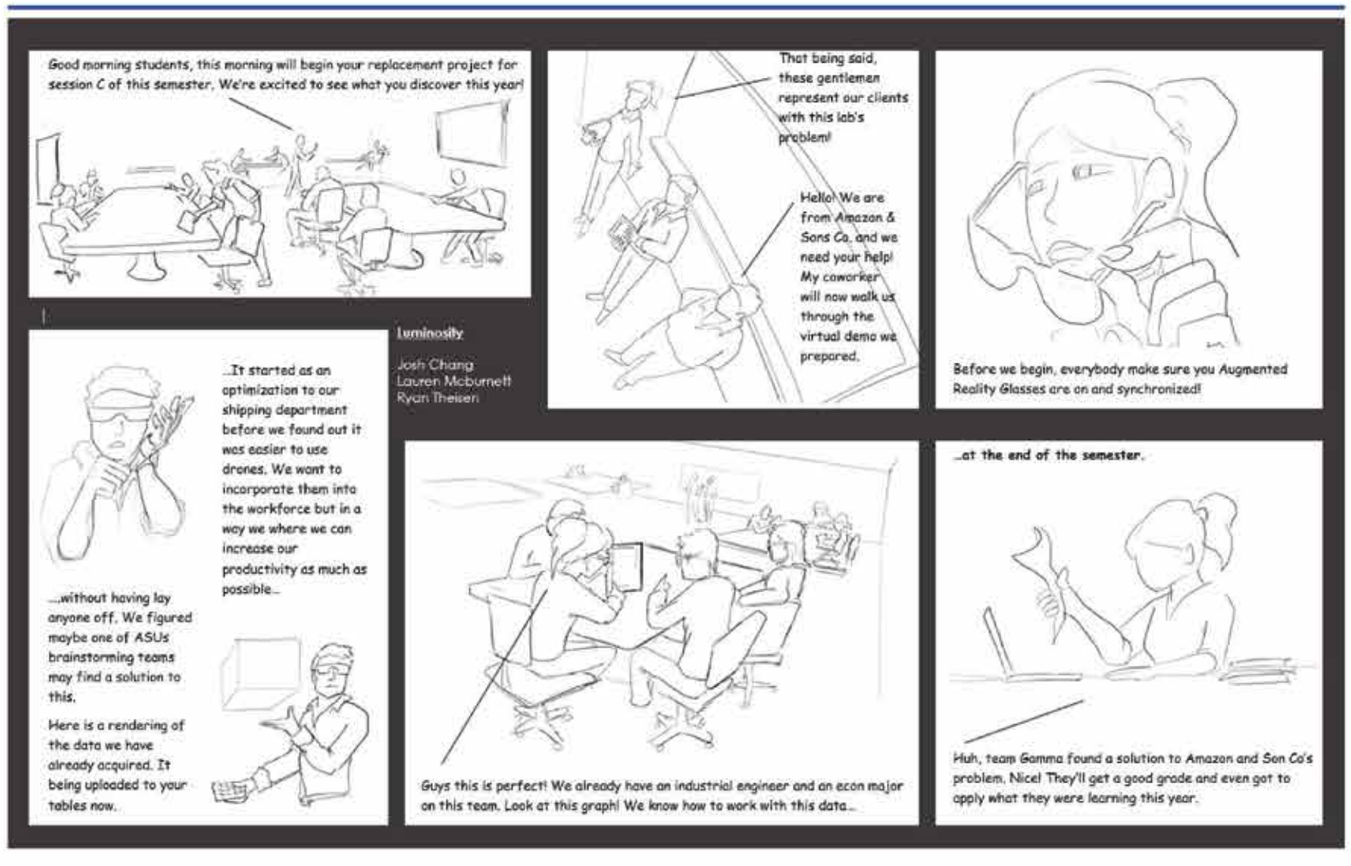
ASU, as the New American University, is redefining higher education by using design thinking and prototyping to lead the way to excellence. The creation of CVAR would be a bold step that would further establish ASU as such a leader. The critical objective of CVAR is to give ASU students the space to innovate AR/VR and make a valuable impact in the development of this field.

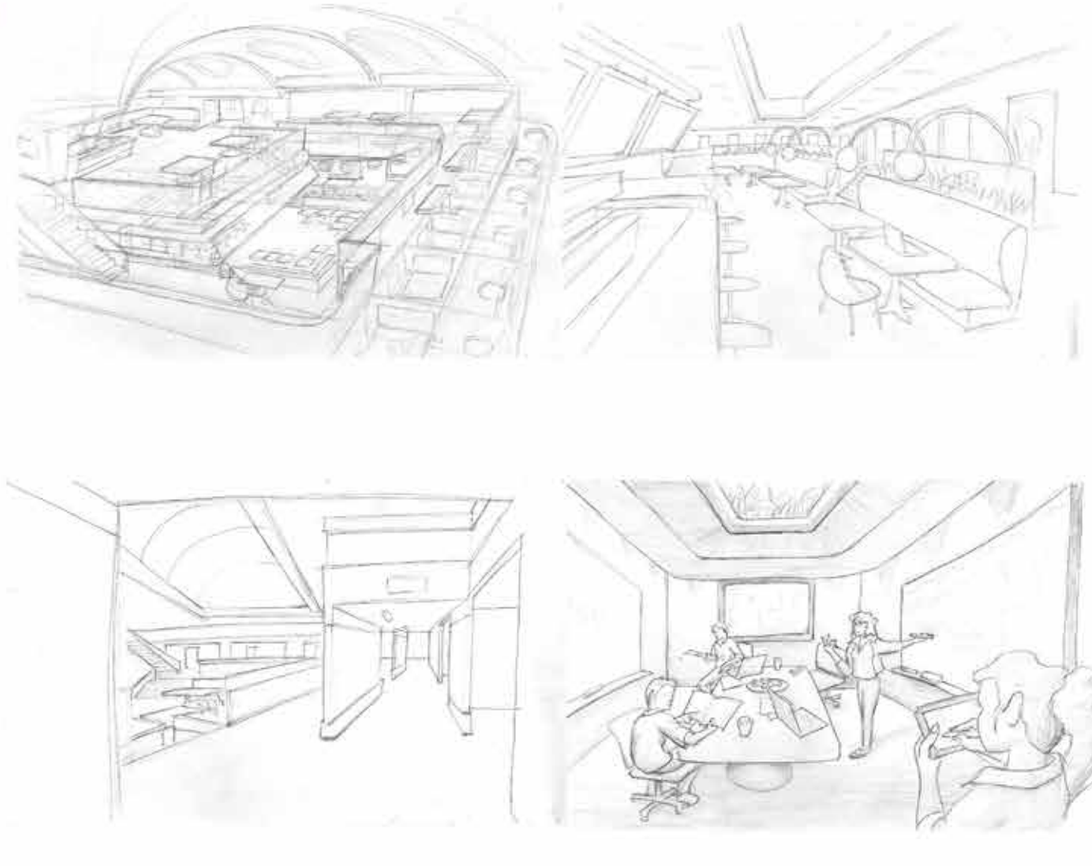
Major Education and Research Hub
CVAR will be part of an education and research hub. There are immense opportunities in learning to be researched and explored via AR/VR, elaborated on in the Use Cases section. These possibilities advance ASU's mission of improving education by shedding rigid Industrial Revolution era classroom styles and bringing learning into the 21st century.

Entrepreneurial Opportunities
ASU, as the New American University and #1 Most Innovative university for the second year in a row, is redefining higher education by using design thinking and prototyping to lead the way to excellence. The creation of CVAR would be a bold step that would further establish ASU as such a leader. The critical objective of CVAR is to give ASU students the space to innovate AR/VR and make a valuable impact in the development of this field.

This center will increase support for entrepreneurial opportunities. Like the examples noted in the Innovation Implications section, CVAR could serve as a startup incubation and/or testing center for local entrepreneurs, partnerships that would revitalize community outreach. CVAR would take care to not emulate LaunchPoint, a business accelerator that opened in 2013 and failed to pick up speed due to its location and lack of proper space and equipment.

Achieving Education Goals
Aside from gaining publicity for ASU nationwide, the founding of CVAR would increase student influx to the ASU Mesa campus, highlight the unique opportunities that ASU offers, and thus expand enrollment, contributing to the achievement of the state's 2025 education goals.





GLOBAL SILICON VALLEY BOOTH: 2018

In the spring of 2018 Luminosity was invited to be one of the main exhibitions as the Global Silicon Valley Summit for the first time, allowing them to present their new innovations to the education leaders of America. Shown on this page are excerpts of the exhibit that was built. Luminosity has been back to GSV several times since.

The features of this first exhibit were developed up to the minimum viable prototype and each were function for the exhibit:

MYRA (Page 13)

Smart Mirror (Page 22)

Axio (Page 36)

Airbud (Page 4)

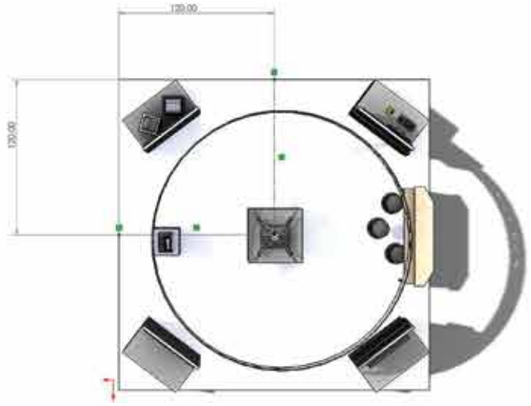
Haptics project (Not shown)

In addition to the exhibits, live drawing reviews of the Airbud project, haptic project, and a sketch was made of the Goldwater facility to discuss the environment in which each of these project were developed.

OPPOSITE

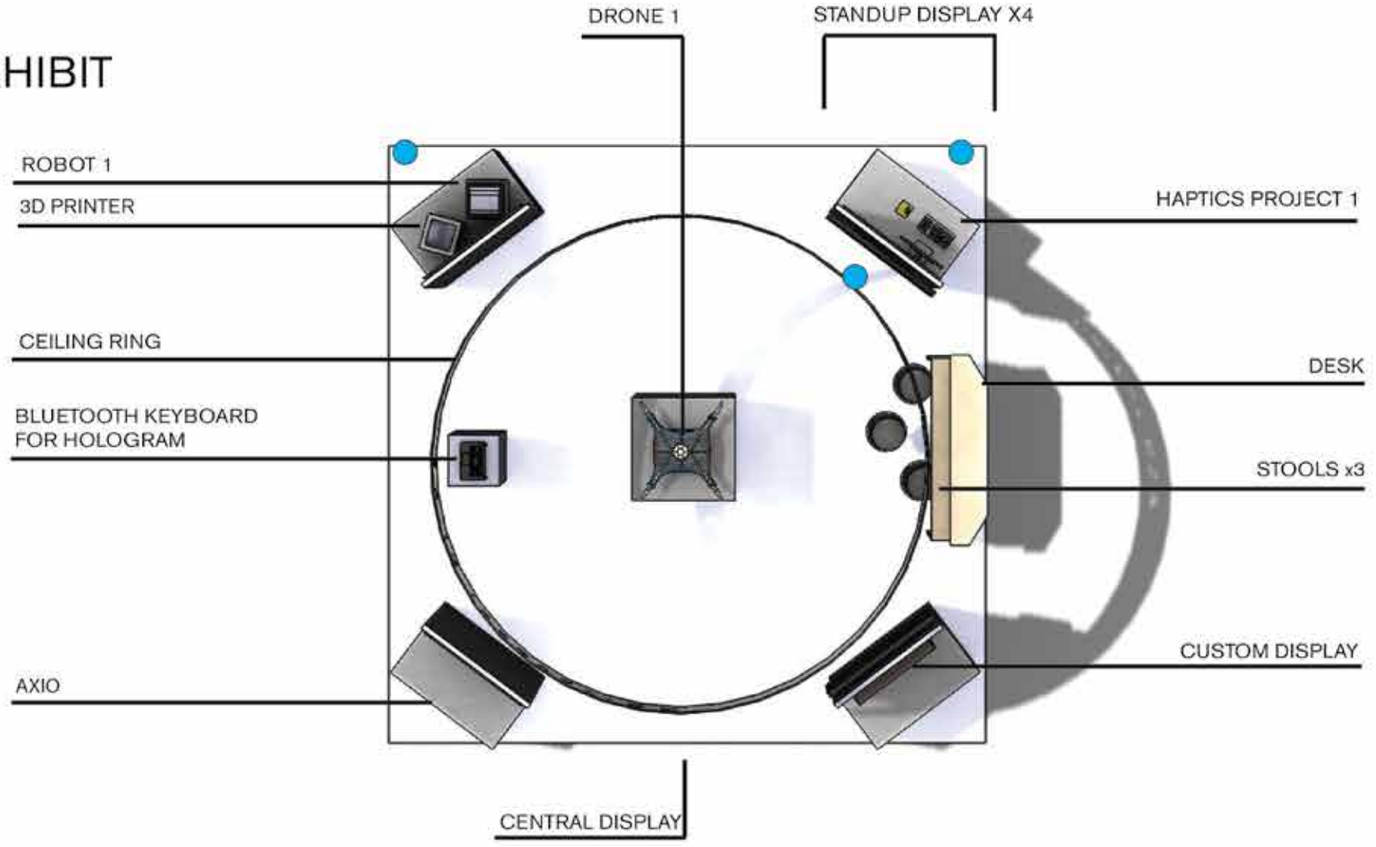
ISOMETRIC

TOP



SIDE

EXHIBIT



GLOBAL SILICON VALLEY BOOTH: 2018

Smart Mirror (Page 22)

Airbud (Page 4)

MYRA (Page 13)

Luminosity GSV Exhibit 2018

EMERGENTECH: HACKATHON

EmergenTech was a hybrid hackathon and pitch competition where participants competed in multidisciplinary teams to apply state-of-the-art technologies with the purpose of transforming a variety of public and private industries. Over a period of 36-hours, participants will form teams, select a topic, and develop their prototypes. The challenge will culminate in a pitch competition with a live audience and an elite judging panel. Prizes will be awarded to the top three teams, and students will walk away with tangible ideas, prototypes, and potential startup concepts. The challenge will be to utilize one of four topics to revolutionize an industry of choice. For example, combining virtual reality and healthcare to create a system which would allow for remote virtual surgeries. Presentations were judged on technical merits, design, and concept feasibility.

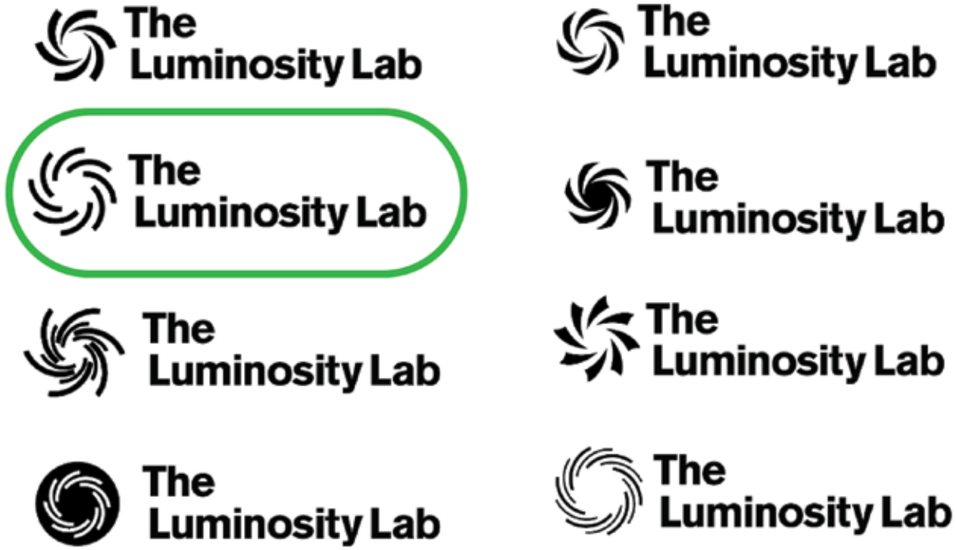
Photos by Anya Magnuson

LUMINOSITY: BRAND DEVELOPMENT

lu·mi·nous
ˈ lo ˈ om ˈ n ˈ s/
adjective
full of or shedding light; bright or shining, especially in the dark.
“the luminous dial on his watch”
(of a color) very bright; harsh to the eye.
“he wore luminous green socks”
PHYSICS
relating to light as it is perceived by the eye, rather than in terms of its actual energy.

Though Luminosity was a secret lab in 2016, its branding was established by the founding team, with its first logos, emblematic of a shining star, paying homage to the meaning of its name. Shortly after Luminosity announced its existence to the public in 2017, it brought on its first graphic designer team who re-designed the logo for its new public identity. The new logo also bears rays emerging from this time a hollow core, with, as the space for the star itself is empty, only the rays being visible. This once again draws focus to the luminous nature of the star, and the old logo, if over layed with the new one, fits perfectly inside the empty space, directly conveying its evolution to the original logo concept.

2016: Luminosity Logo 1.0



The Luminosity font type was also aligned with ASU’s converting all major documents to use of the Akzidenz Grotesk Font family.

theluminositylab.com

est.2016