Sandeep Zechariah George K
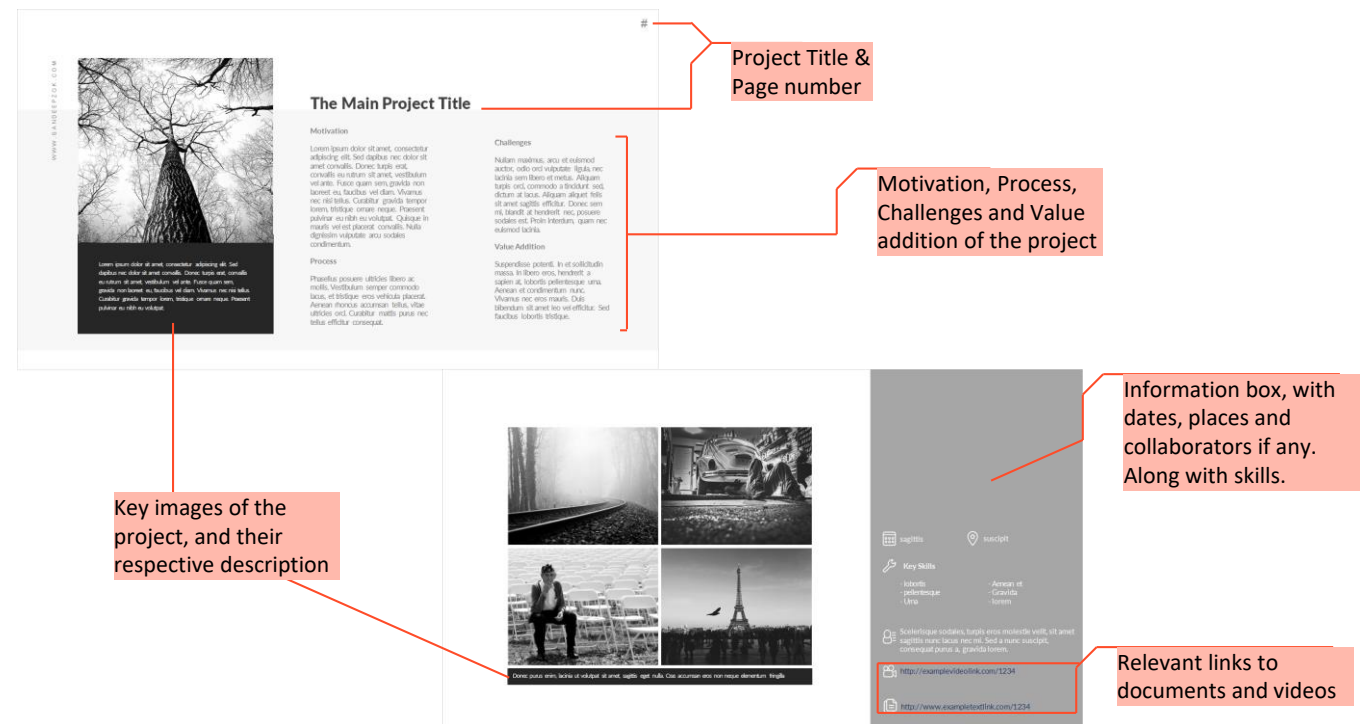
Portfolio of projects: in science, art and technology.

www.sandeepzgk.com

Index

The Main Project Title

Motivation

Challenges

Process

Value Addition

Project Title & Page number

Motivation, Process, Challenges and Value addition of the project

Information box, with dates, places and collaborators if any. Along with skills.

Key images of the project, and their respective description

Key Skills

Relevant links to documents and videos

We came up with a multitude of ideas, trying prototyping and testing against our persona, which we created based on stakeholder interviews. A variety of techniques were used in evaluating ideas and to develop the idea further.

WebCardio: Cloud based holter monitoring

Motivation

Modern day ambulatory electrocardiography devices or holter monitors are quite heavy and rely on data being stored locally, and transferred at a later stage. Procedures like holter monitoring are costly and inaccessible to the developing world. With the advent of smartphones and ubiquitous internet access in many regions it's possible to use smartphones as gateway devices to relay real-time ambulatory information.

Process

The key points considered in the design and architecture of the software system was simplicity and cost effectiveness. I was tasked to lead the software development team and produce effective UX designs for the application. We decided to rely on standard common interaction patterns, like Material Design.

Challenges

As the chief software architect of this project, the main challenge was to make this device cost efficient for easier deployment in developing markets. "Every single cent that could be saved should be saved" was the team motto. This lead us to explore software paradigms like micro-services to effectively scale our offerings as well as manage costs.

Value Addition

This project was useful in refining my skills in UX, research, software architecture, development and team management skills.
Rapid prototyping was used to make an early prototype that was showcased at IoT World, Santa Clara, United States.
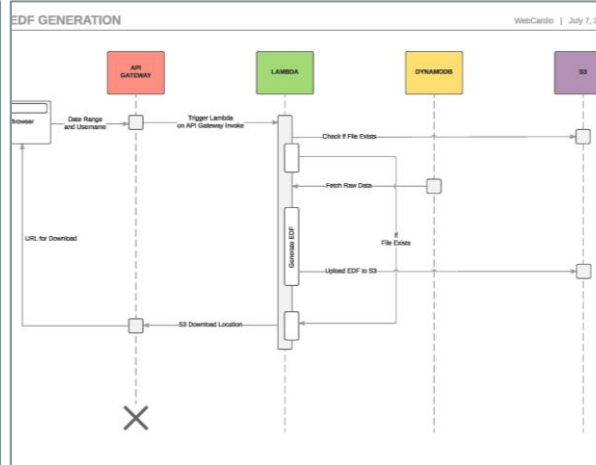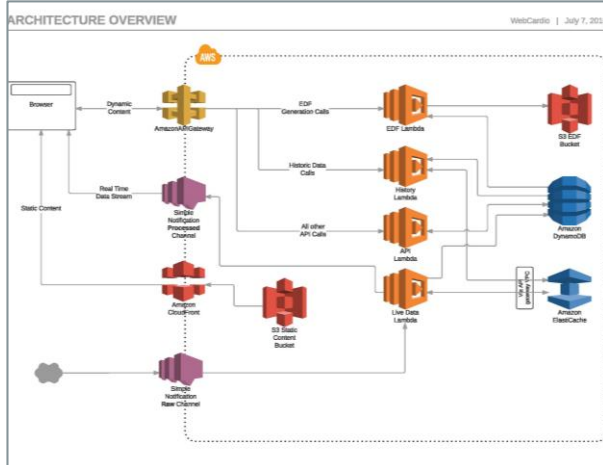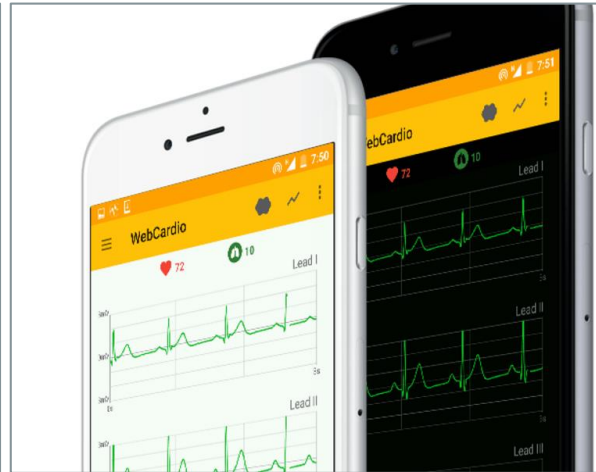
Application design of WebCardio Interface for clinicians, and scalable software architecture of the cloud infrastructure.
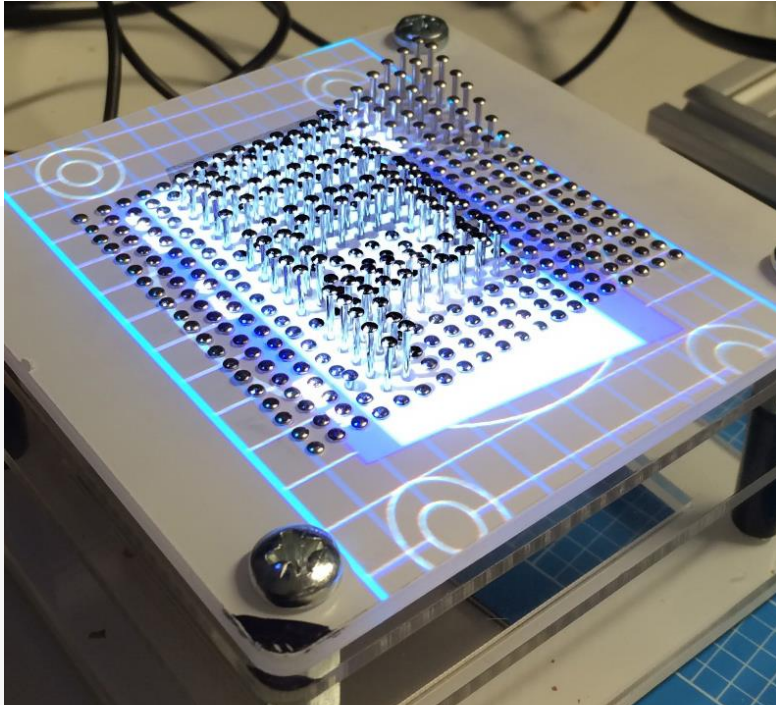
Most of 2016   WebCardio.in

Key Skills

- Prototyping   - Team Management
- Software Architecture   - User Experience Design
- Software Development   - Information Architecture

Group Project: I contributed in various roles including Cloud and UX Architect, UX Designer, Software Developer and Engineering Team Manager.

http://www.webcardio.in

Graph overlay data being projected onto an actuated shape display rendering the text "UCL". The shape display manufactured in this project is low cost, portable, and retains the rendered shape until it is reset manually.

2.5D Tangible Shape Display

Motivation

Most shape displays are costly, bulky and not portable. To further research in the field of tangible displays it should be made available to the wider community by making a cheaper, cost effective shape display.

Process

The design and manufacturing were conducted in three phases which explored various technologies of actuation and design variants. Each phase of development focused on a particular aspect of the display namely cost-effectiveness, high resolution and even portability.

Challenges

Higher resolution variants were difficult to fabricate on a laser cutter as the latent heat of nearby display elements made the entire board warp, this was fixed with a heat press. Other challenges faced during development have been logged in the thesis report.

Value Addition

The project was designed as a part of my Master's thesis at UCL and received a distinction.
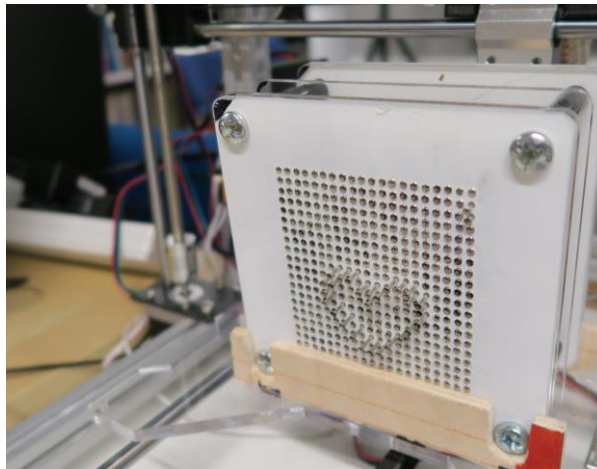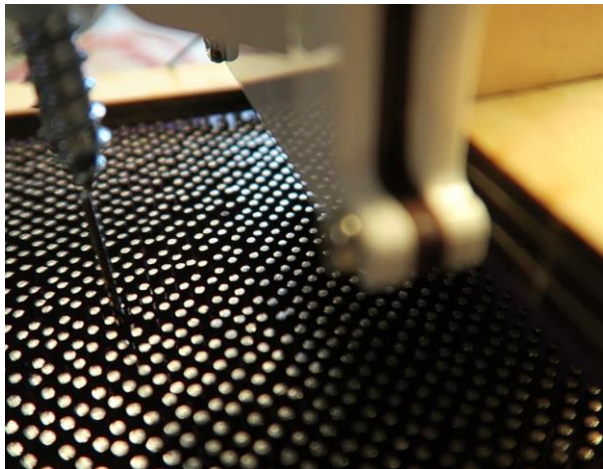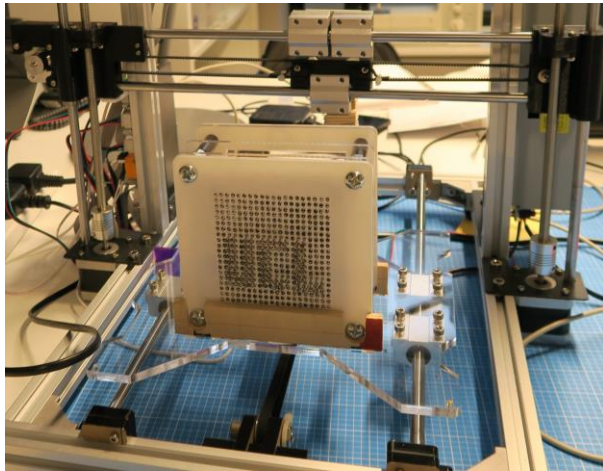
The final prototype mounted on a 3D printer as CNC, material explorations, exploring magnetic actuation and other samples.

Late 2015

University College London

Key Skills

- Digital Fabrication
- Digital Prototyping
- Designing

- Electronic Prototyping
- User Research & Testing

Individual Project

https://youtu.be/JKKD_WTRWmU

http://static.sandeepzgk.com/papers/hcie.pdf

This "no app" utilizes existing platforms and creates integrations in the cloud as a onetime setup to render its services. For example a picture taken today is usually synced to one of the cloud platforms like Google Photos, iPhoto or Dropbox, we iterate over new photos uploaded to find actionable photos, if we find any, we create a calendar item in the users calendar using iCal or Google Calendar which gets synced onto the phone.

Zero App ! eventual.ly

Motivation

Currently users are forced to install new apps on their mobile devices that only serve a single purpose. Users have shown a strong dislike towards installing applications that don't serve them constantly. With this background we set out as a team to solve a real world challenge without using an "app".
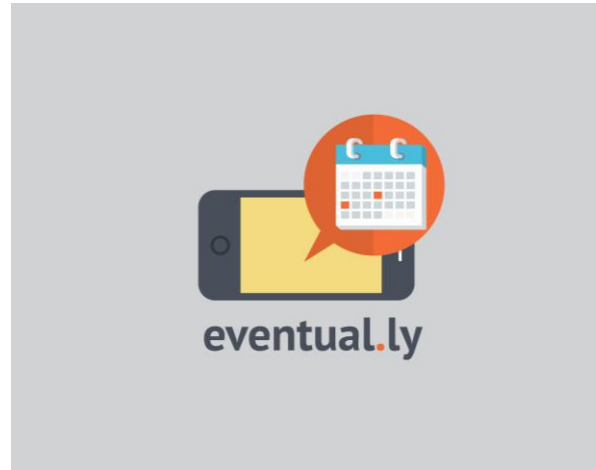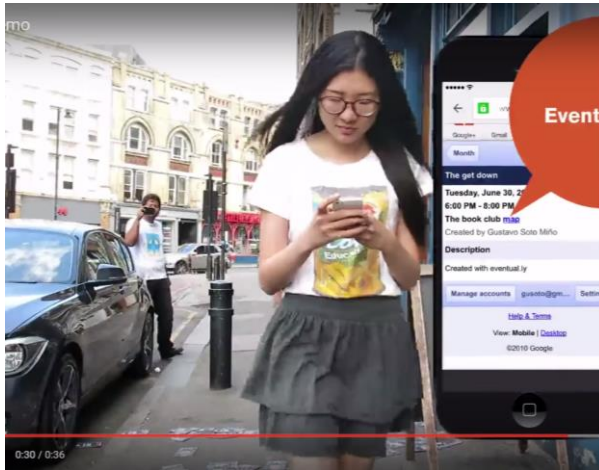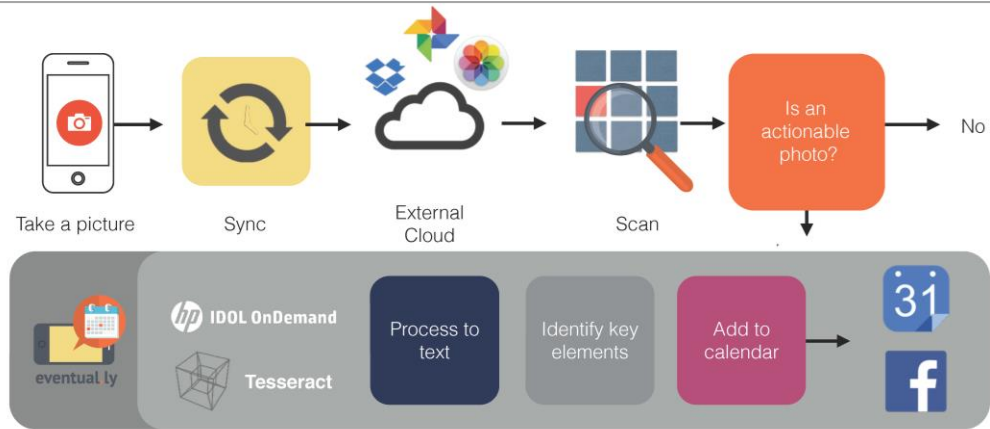
Process

As a group we set out to solve the problem of memory offloading for event posters that you might see at cafes, pubs and other public locations. The key concept was to create a calendar reminder of the event in the user's calendar app by taking a snapshot of a poster.

Challenges

Creating a product prototype that tried to solve a real-world challenge of image recognition without ANY control over the application was indeed challenging. It was decided to hook into various existing apps and cloud platforms to solve the problem of sourcing the images, processing them on our servers and placing the calendar item onto the user's calendar.

Value Addition

The project won an award at the Hack The Visual, 2015 contest in London. It also won the acclaim of the jury as it addressed a particular user pain that most users face.

Take a picture → Sync → External Cloud → Scan → Is an actionable photo? → No

eventual.ly | HP IDOL OnDemand / Tesseract | Process to text | Identify key elements | Add to calendar

0:30 / 0:36

eventual.ly

Take a picture of a poster "Friday Jazz in Southbank Centre at 5:30 on June 10th" and the event will be created on your calendar with the correct date and time.

api

Cool!
An event will be created
"HackTheVisual" June 26-28 IDEALondon
Cancel   OK

event

eventual.ly
you'll remember and go.
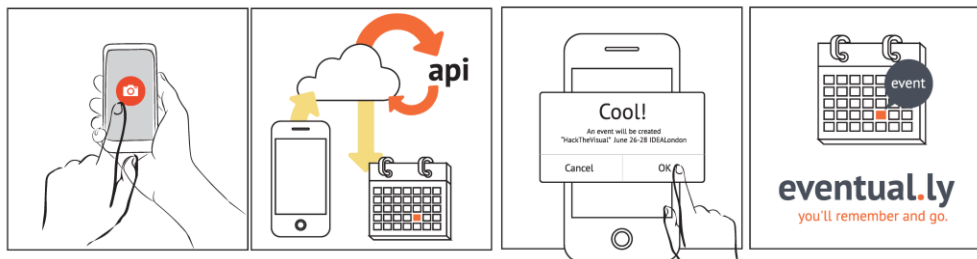
Workflow of our prototype, along with a storyboard explaining the interaction of the system.

Mid 2015   Hack The Visual, London

Key Skills

- Prototyping   - Cloud Development
- Designing   - User Research & Testing
- Software Development   - Software Architecture

Group Project: I was a key member in creating the concept for the project along with the software development and architecture for the project.

https://youtu.be/K7CtOtKWrYI

http://static.sandeepzgk.com/papers/event.pdf

WWW.SANDEEPZGK.COM

BBC: Situated Stories

Motivation

As a part of our Design Experience course the BBC challenged us to explore the use of location in stories in view of their popular TV series.

Process

This project was designed to be completed in a span of two weeks. The group decided to focus on quick prototyping and rapid evaluation of ideas to explore the given theme of location based storytelling.

Challenges

Initially, as the challenge was to explore location based stories, the team created several ideas around making viewers move to certain locations to unlock special content. Though this idea seemed very appealing, deeper introspection lead us to understand our users better. Users were not interested in traveling an arbitrary distance for which a reward of unlocking content was unknown. This was quite an interesting finding which helped us to pivot our idea and instead bring the locations to the users.

Value Addition

We were able to give valuable insights of our findings on location based stories to the BBC to potentially include in their future work.

Our prototype example of an Augmented Reality which showcases a "Tardis" at your home location, in which you are invited inside by Dr Who to explore the "Tardis" Inside out in a Virtual Reality environment.

This experience starts out as an augmented reality which converts into the wonders of virtual reality to bring a location to the user.

Storyboard of our interactive system that was designed along with a working prototype coded in JavaScript / WebGL which works with Google® Cardboard.

Mid 2015   University College London

Key Skills

- Prototyping & Validation   - User Research
- Designing   - User Testing
- Google VR Development

Group Project: I was a key member in creating the concept for the project along with independently creating the Augmented + Virtual Reality experience prototype.

http://static.sandeepzgk.com/papers/BBC-sum.pdf

http://static.sandeepzgk.com/papers/BBC-post.pdf

A hacked Care Bear with a virtual hug sensor, and led lights and internal speakers for communication. The Raspberry Pi Device providing the core computation for the toy is hidden away in its beanie.

Bobo : An Interactive Toy

Motivation

In today's society working parents don't have time to interact with their children all day. Instead they use a variety of technologies including cameras to keep a check on the wellbeing of their children. This toy merges the realms of interactive play with monitoring solutions.

Process

Popular toys were evaluated and the Care Bear™, was selected as an easy to hack prototype version of the concept. The internal wiring of this mechanical toy was re-routed through a Raspberry Pi, which was Wi-Fi enabled for two way communication. On the software side the Google Now Platform was used for a voice based interaction method where the parent could trigger a dance of the toy remotely. A physical "hug" of the device was translated to a virtual hug on the parent's mobile device.

Challenges

As a high-fidelity prototype it was necessary to have a prototype that was visually appealing and not have any wires hanging around. Given the limited time for this project this was achieved successfully by incorporating various sensors within the cloth structure of the toy and using stitching to hide the electronics and wiring.

Value Addition

Interactive toys have started to make their way into the market. This prototype toy is a valuable platform for potential user trials to evaluate the acceptance of such devices amongst parents and their children.
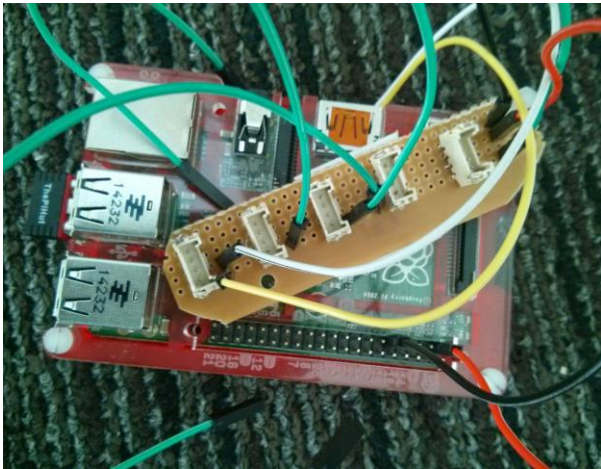
Series of electronic prototyping tools explored, along with the design variations explored for the project.

Early 2015

University College London

Key Skills

- Electronic Hacking   - Electronic Prototyping
- Digital Prototyping   - Mobile App Development
- Designing

Individual Project

https://youtu.be/JsIGH7EPn48

http://static.sandeepzgk.com/papers/bobo.pdf
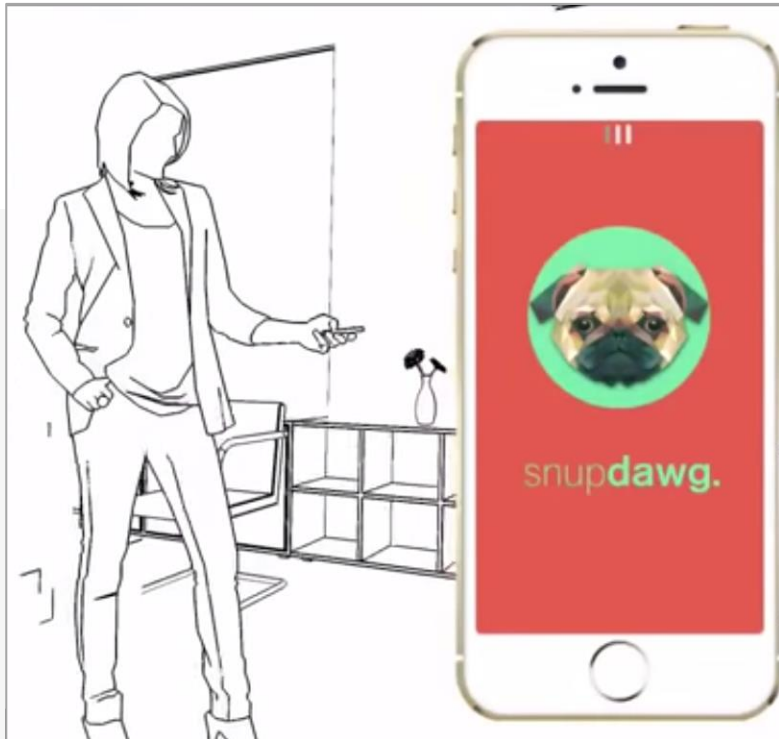
A concept art of a user interacting with the fitness tracker for pets initially named snup dawg, and later named Catch!

Fitness Trackers for Pets

Motivation

With obesity being one of the most common diseases for pets today, it is important to keep track of your pets' overall fitness. Catch! measures how many calories your pet burns throughout a day and notifies you when pre-set exercise targets are not reached.

Process

The prototype of this product was developed over several iterations as a part of UCL Advances entrepreneurial challenge. The prototype was further developed at a Seedhack London where we received support of OEM, hardware prototype toolkit manufacturers.

Challenges

To get a testable prototype it was necessary to find the right tools for creating a small version of the tracker. Making this was impossible with the current set of prototyping toolkits like Arduino and Raspberry Pi, which had a lot of unwieldy wires. Smartables, was the right platform at the right time and allowed us to create a reasonably sized rugged prototype.

Value Addition

Although we could not bring this prototype to market, it gave us valuable lessons in rapid prototyping and how to make a business case when showcasing our ideas to angel investors.
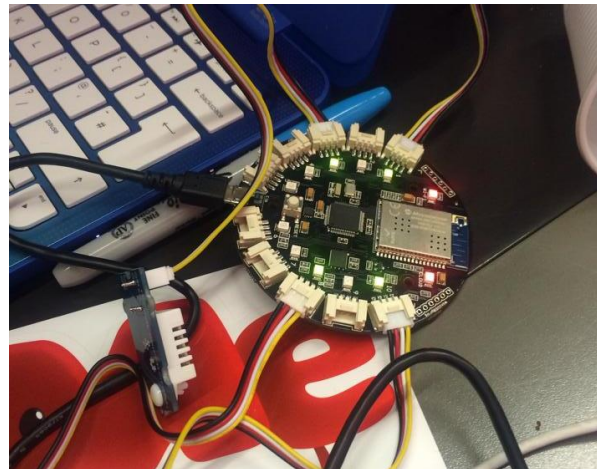
Various stages of prototype designing at Seed Hack, London

Early 2015   UCL Advances

Key Skills

- Electronic Hacking   - Electronic Prototyping
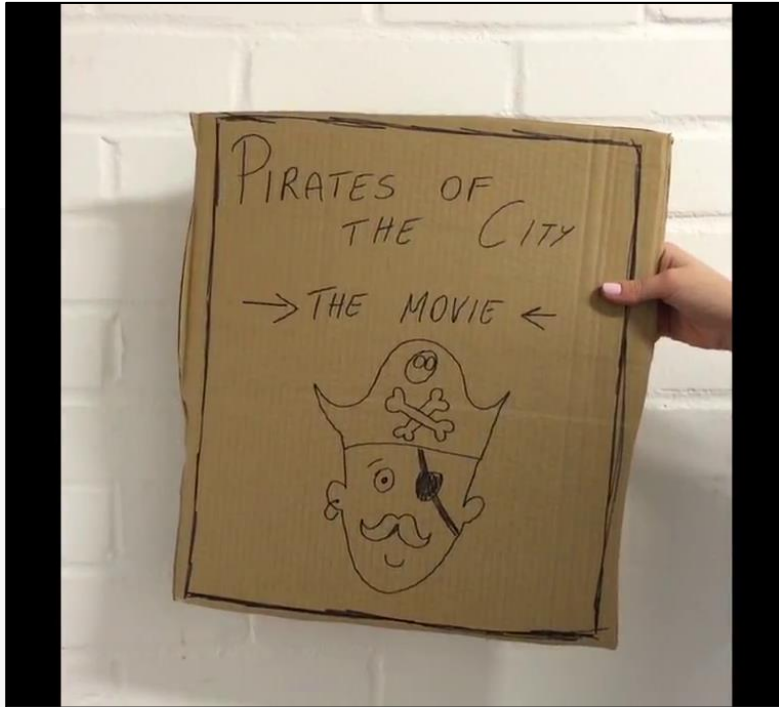- Digital Prototyping   - Mobile App Development
- Designing

Group Project: In this group project I contributed as the lead engineer in electrical, electronics and software programing aspects.

https://youtu.be/4oseyhJ2eOo

http://www.catchgreat.com/

An intro screenshot into the video showcasing our free-cycling service design concept. The attached video showcases how the system would potentially work.

Service Design: Pirates of the City

Motivation

This project was undertaken as a part of Service Design Jam 2015. A 48 hour hackathon to change the world.

Process

As a group we brainstormed the contest's abstract theme of a paper fortune teller and came up with various ideas. Once we evaluated the team's ideas we settled on exploring a free-cycling concept and how to use technology in aiding free-cycling. We interviewed potential users of the system and designed a service encompassing various stakeholders.

Challenges

Our understanding of the potential user base was limited and we assumed several aspects about the users. After we conducted several stakeholder interviews and potential user interviews we were able to confirm various assumptions and re-iterate other failed assumptions.

Value Addition

This being my first foray into service design, it was quite valuable for me to work with experienced individuals and students of service design to understand the finer differences between HCI and Service Design.
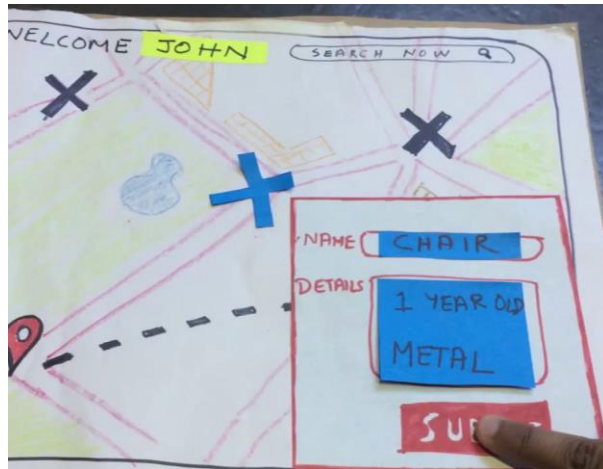
A series of screenshots from our video showcasing our service design.

Early 2015
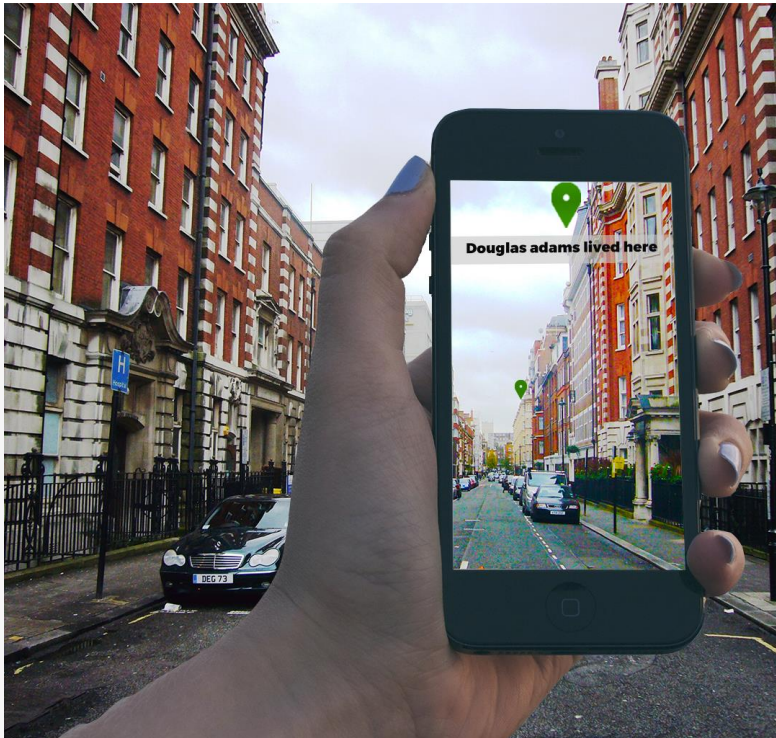
Service Design Jam, London

Key Skills

- Designing
- Interviewing
- Prototyping

- Idea Evaluation
- Service Design

Group Project: In this group project I contributed as an active participant in interviewing and creating concept art for prototypes.

https://youtu.be/L6ZFw217Sxs

A concept art of one of the many ideas developed for the project. An Augmented Reality based "app" which overlays historical information over the real image of an actual location. Thereby bringing history "alive" to the modern world.

Designing for new cultures

Motivation

The CHI 2015 student competition brief was the key motivation for this project. We partnered with the Mill Road history society to bring the history of the area alive to the general public who are not always technology savvy.

Process

We came up with a multitude of ideas, trying prototyping and testing against our persona, which we created based on stakeholder interviews. A variety of techniques were used in evaluating ideas and to develop the idea further. After the development process the team decided to focus on creating an interactive billboard with the fun aspect of clicking a photo of the user in the past. Our design had a specific focus on using a simplified interaction model to cater to older individuals who might be technophobes.

Challenges

Evaluation of abstract ideas and concepts were difficult and we had to rapidly prototype examples of our solutions. Once a rapid prototype was available it was easier to evaluate it against a rubric defined by our persona.

Value Addition
The outcome of the ideation and design project has been captured in a video showcasing our concept for the project, Along with a design document showcasing our iterative methodology exploring various ideas and techniques.
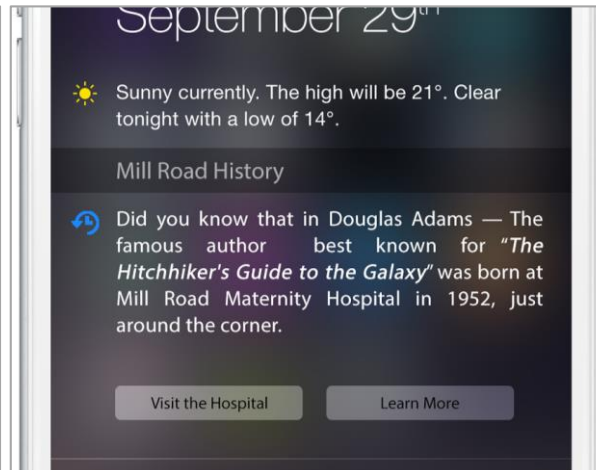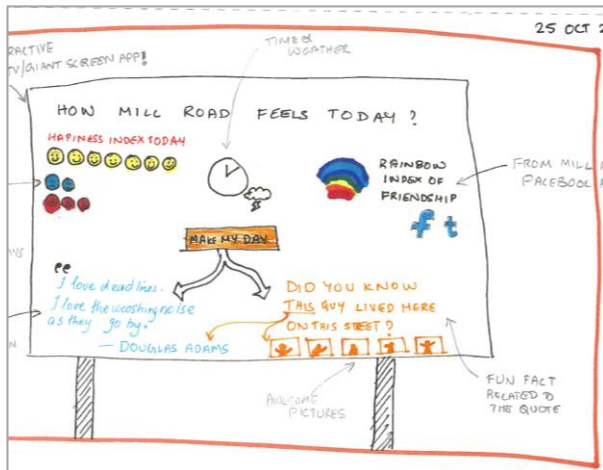
Concept arts of various ideas generated to explore the right match for the target persona.

Late 2014

University College London

Key Skills

- Persona Development
- Designing
- Design Evaluation
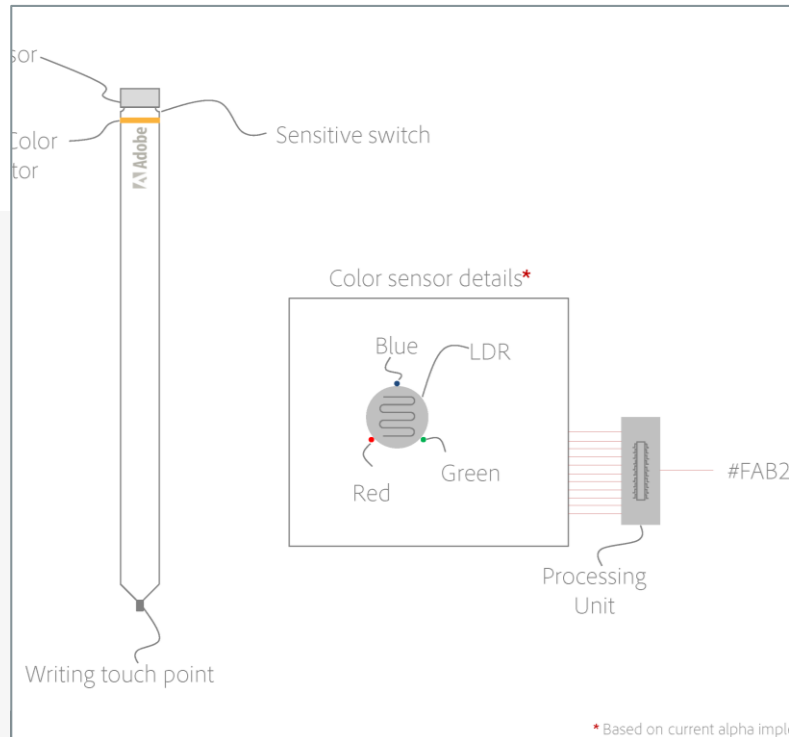- Rapid Prototyping
- Idea Evaluation

Group Project: Every element showcased in this portfolio along with document and content linked below are my contribution.

https://youtu.be/x20T_0scrZl

http://static.sandeepzgk.com/papers/designP.pdf

Color sensor details*

Blue   LDR

Red   Green

#FAB2

Processing Unit

Writing touch point

Sensitive switch

* Based on current alpha impl

Concept art of the electronic color sensing stylus and how it would recognize colors. It uses the "eraser" part of the pencil to house the color sensing electronics. Once a color is selected this color is highlighted via an LED illuminating and confirming the selected color.

Electronic color Sensing Stylus

Motivation

Most digital artists use a stylus for input. Almost all of the applications use a non-intuitive color drawer to select a color for artwork. This design was inspired by work from MIT Media Lab's I/O Brush.

Process

The key idea of the prototype was to be as small as possible. We were using an LDR based system, that was calibrated to the light of different wavelengths illuminated by the pen. Once the illumination values were received by the LDR these values were re-calibrated to the selected color. The selected color was highlighted via an LED display on the top of the pen.

Challenges

Individual LDRs had a different response rate for the same wavelength of light. This was potentially because LDR is not designed to capture wavelength information. We overcame this problem with individual calibration of LDR values. Another potential way was to use a better photo receptor for the prototype.

Value Addition

This prototype gives us a valuable tool to evaluate how digital artists use color drawers and to see if a natural color selection tool would fit into the toolkit of a digital artist.
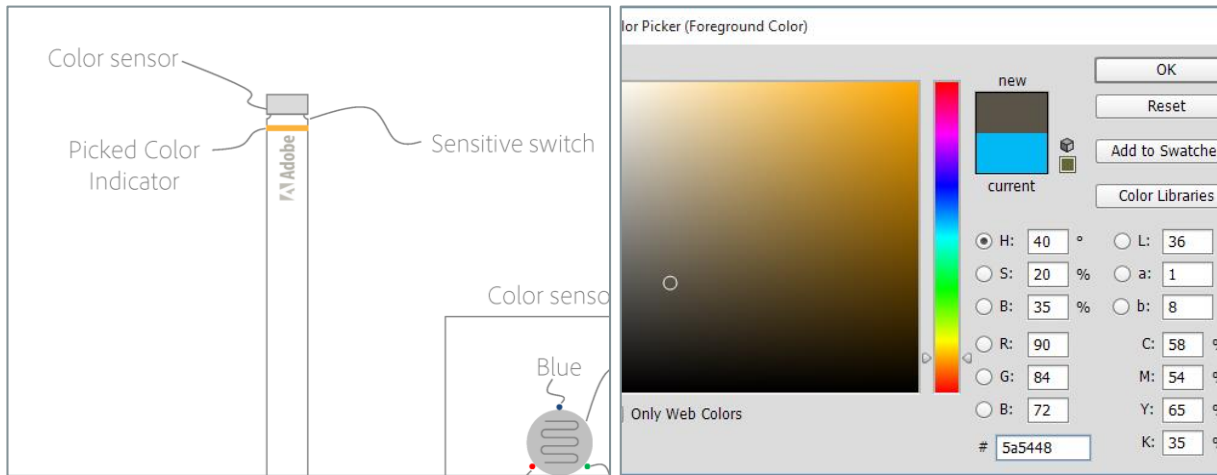
Concept arts of various ideas generated to explore the right match for the target persona.
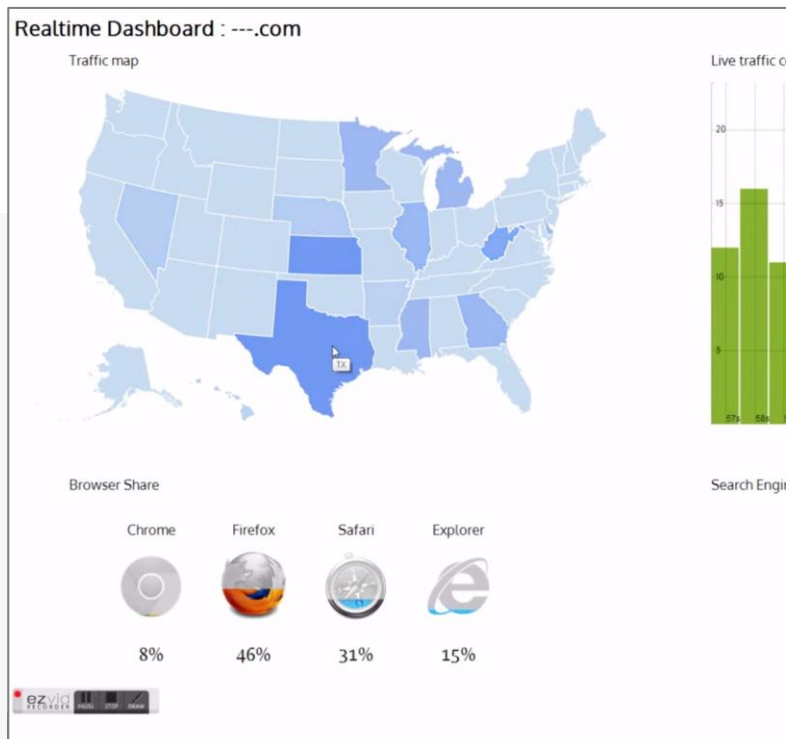
Early 2014

Adobe Research Labs

Key Skills

- Rapid Prototyping
- Software Development
- Electronic Prototyping

Group Project: The group consisted of two members who contributed equally to the project.

http://static.sandeepzgk.com/papers/color1.pdf

http://static.sandeepzgk.com/papers/color2.pdf

Realtime Dashboard : ---.com

Traffic map

Live traffic c

Browser Share

Search Engi

Chrome — 8%
Firefox — 46%
Safari — 31%
Explorer — 15%

A real-time traffic map of a very popular customer of Adobe's Digital Marketing Suite. This visualization showcases a heat map of the state from which the user visited the website, the current rolling sum of customers on the website and the browser which they use.

Data Visualization: Real Time

Motivation

In the fast paced world of data analytics, most analysts take hours or days to identify meaningful insights that can be used in visualizations.

Process

This project involved a complete overhaul of traditional data analytic workflows and rewrote it using modern tools like Storm and Redis. The goal was to aid the new paradigm of visualization. I made an end to end functioning prototype of this new model.

Challenges

The key challenge was the ability to ingest data at the same rate it was being produced. At the same time the system had to also create a data summary, extract meaning and showcase that meaning in a comprehensive visualization. This was achieved by the use of Storm and Redis.

Value Addition

Variations of this have been implemented in advanced versions of Adobe's Digital Marketing platform. With this we were able to process and showcase the data within about 30 seconds after the data point had been encountered by the monitoring service. A paper was published regarding this technology.
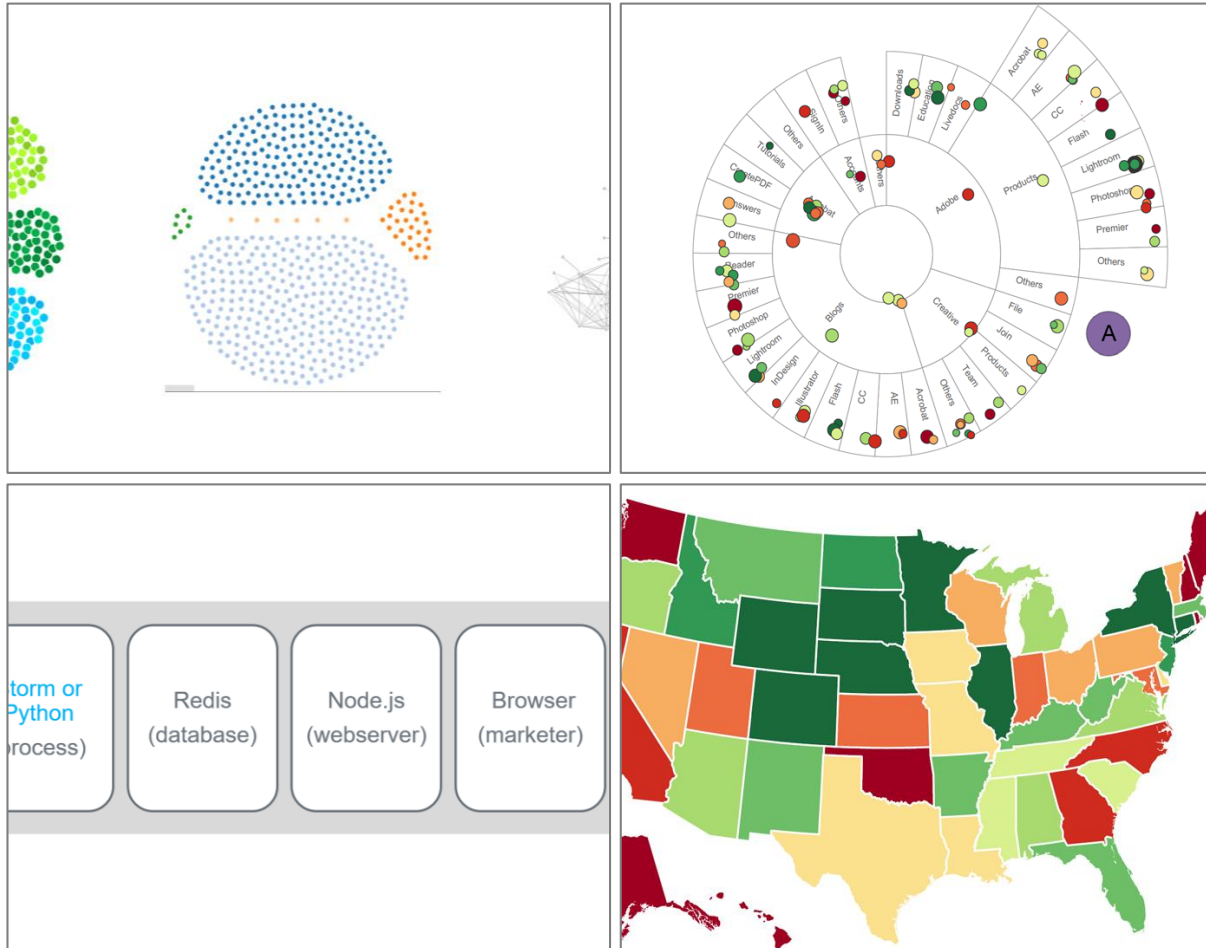
Different components of the visualization network, Heat maps, Data flowchart, and other visualization examples.

Late 2013

Adobe Research Labs

Key Skills

- Designing
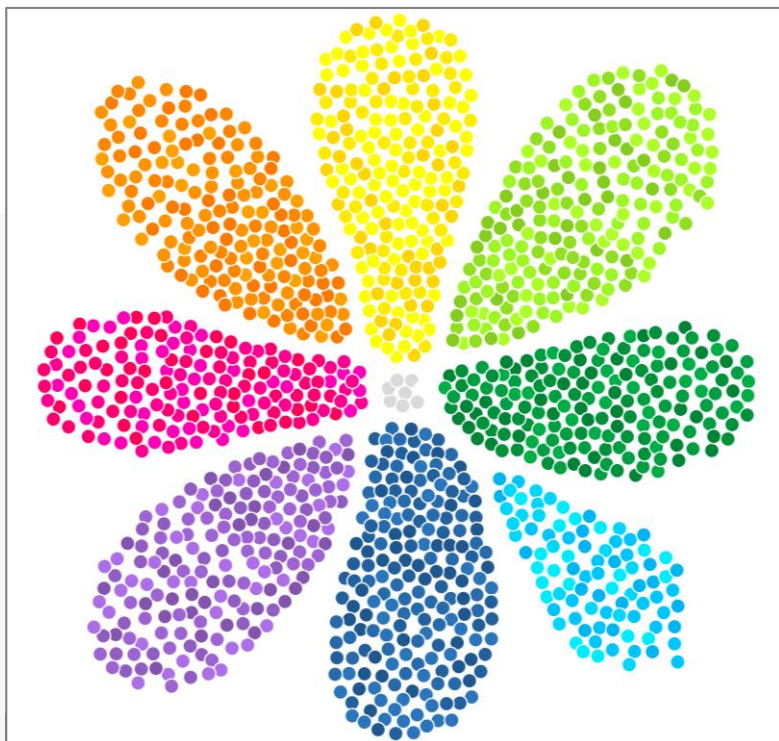- Design Evaluation
- **Data Visualization**
- **Data Summarization**

Individual Project

https://youtu.be/K0keiXo-xzY

http://dl.acm.org/citation.cfm?id=2611180

Visualizing emotions using Plutchik's Flower Petal model of emotions, each colour represent a vector of emotion, and the intensity of the colour in each petal showcases the intensity of the emotion expressed. Each element in this visualization showcases a unique tweet by an individual about a topic.

Data Visualization: Emotions

Motivation

Adobe Research Labs developed an algorithm to classify the emotional content, i.e. the degree of emotions, contained within a tweet. I was tasked to create a compelling visualization that showcased the variety of emotions contained in the spectrum of incoming tweets.

Process

Traditional graphs and pie charts were evaluated and found to be insufficient to communicate the varying degree of emotions contained within the tweets. Dr. Robert Plutchik, created a visual representation of emotions, called the flower petal model of visualization. It was understood that this was the best model to showcase emotional content within the tweets. I had to explore various technologies and methods to create a compelling visual display of the identified emotions.

Challenges

In this project the two main challenges that were confronted were engineering and design perspective. Initially it was decided to showcase each individual tweet as a bubble, as shown in the accompanied video, which quickly became troublesome as the number of tweets for certain keywords were enormous. We solved this by data summarization in which we showcased aggregated emotions and the user could delve into further details of that emotion and identify individual tweets.

Value Addition

This prototype was showcased at Adobe's Digital Marketing summit. The prototype idea was further developed by the engineering groups at Adobe to include it within Adobe's Digital Marketing Platform.
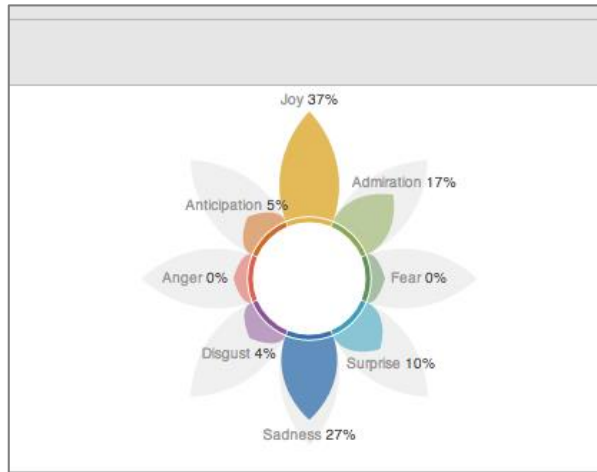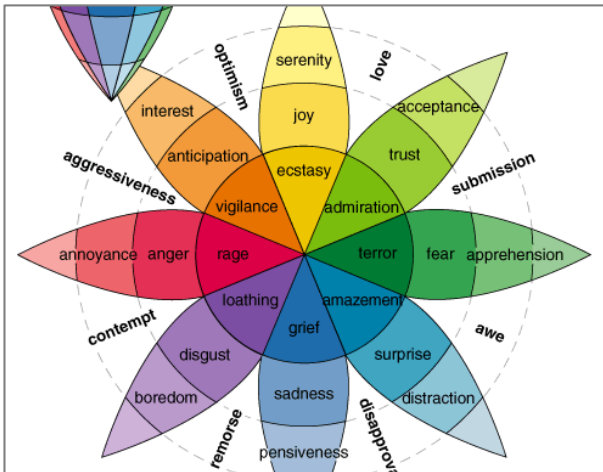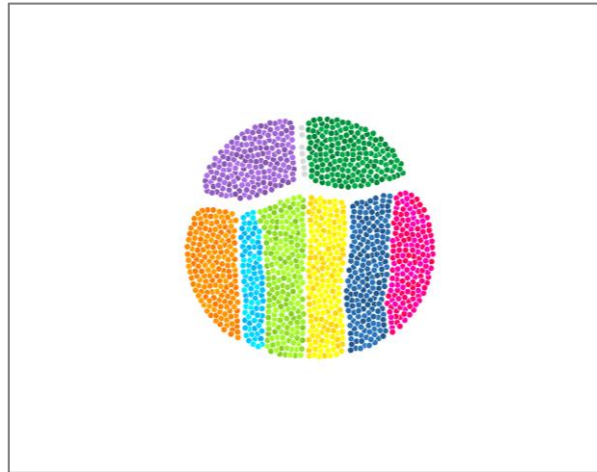
Evolution of emotions, Emotions shown in different shapes, Heart, Mind and then Plutchik's Flower Petal Model

Late 2013   Adobe Research Labs

Key Skills

- Designing   - **Data Visualization**
- Design Evaluation - **Data Summarization**

Individual Project

https://youtu.be/OMipkgnDht4

Adobe Unicom working in Desktop mode showing the office plan of Adobe's San Francisco office location and the available meeting rooms.

Adobe UniCom

Motivation

Most large organizations have a multitude of communication methods like IM, Phone, Video and video conferencing solutions. The aim of this project was to have a unified communication solution which integrated all 3 aspects of communication along with a directory and maps.

Process

The key goal of the project was to have a single app that would work across Desktop, mobile and tablets. This was done in order to showcase the powerful Adobe Air platform. The process involved implementing an iterative design, development and test strategy in which we evolved our ideas. One of the key outcomes of this was to have a corporate presence mechanism, in which users need not explicitly add another individual in the office to see their presence information. This concept is now omnipresent in modern office communication tools like Slack.

Challenges

Designing and developing for a single platform is challenging enough and Adobe Air offered a solution to integrate many of these aspects. However there were a lot of issues regarding multiple screen sizes and the advent of High DPI display for newer iPhones and iPads. This posed an interesting challenge which we overcame with responsive design.

Value Addition

This product development showcased an ideal example of the power of the Adobe Air platform. This product was showcased at multiple venues including the Adobe MAX conference, and received a great deal of interest from DISA.
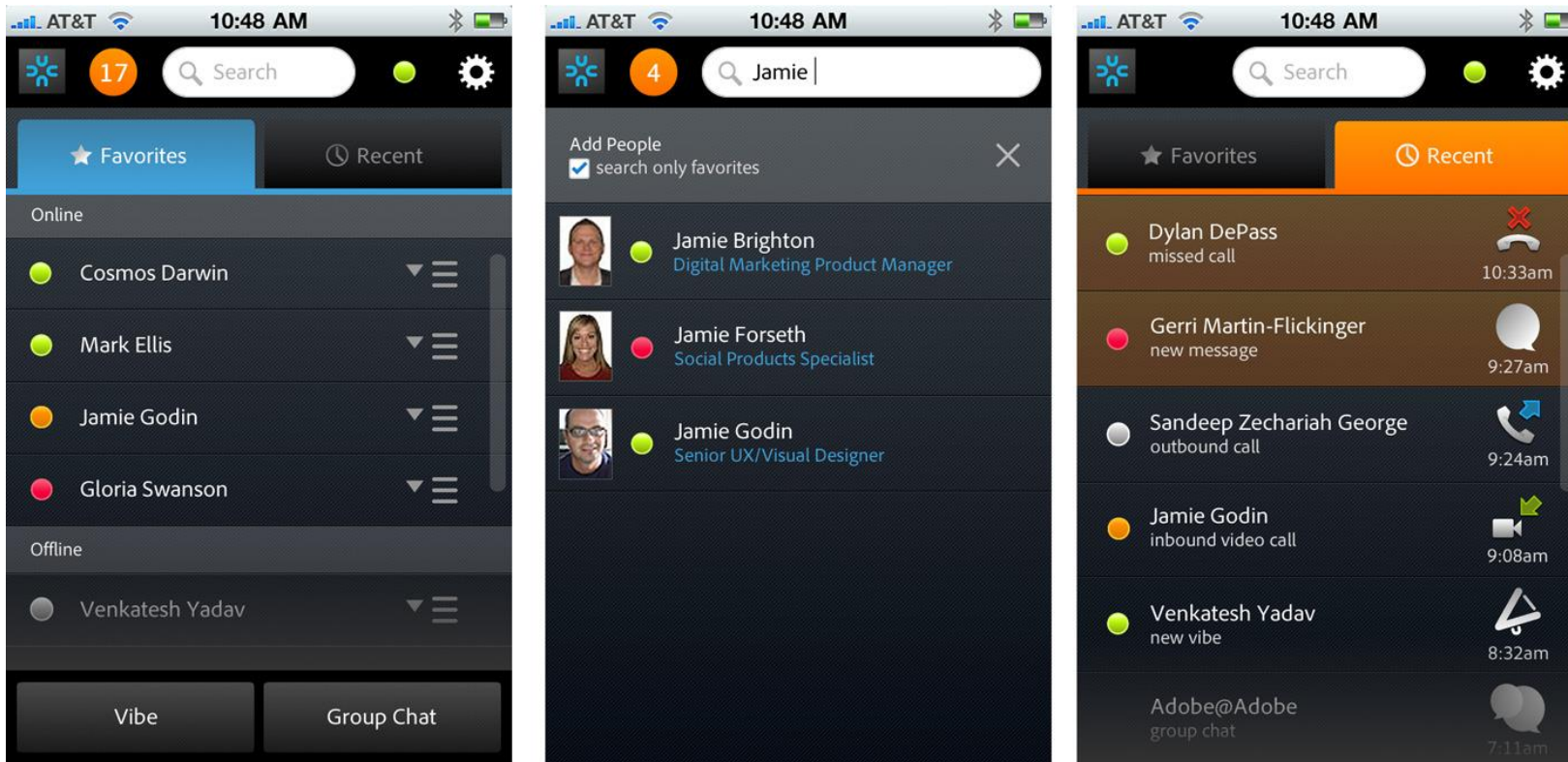
Concept Designs for various screens of Adobe Unicom working in iOS environment

Most of 2012   Adobe Systems

Key Skills

- Engineering   - Software Architecture
- Protocol Implementation   - Responsive Design
- Software Design

Group Project: This was a group project, in which I was the sole contributor for Voice and Chat features.

https://youtu.be/7FFmmzRGRlg

An example of statically mounted solar panels. Which can be moved to a sun tracking platform. A sun tracking platform can increase the efficiency of the entire platform from 5 to 10%.

Sun Tracking

Motivation

Statically mounted solar panels generate electricity at their peak during the solar noon for that day. However the mount location and direction makes panels sub-optimal at other times of the day. To utilize the maximum incident solar energy it was decided to point the solar panels in the optimal direction for greater efficiency by the use of a sun tracking platform.

Process
Solar panels were mounted on movable mounts, these mounts were controlled by a geared mechanism with a feedback loop. The optimal values were computed and fed into a Teensy 2.0 Arduino based Micro Controller.

Challenges

Two main challenges faced during this project were to cool the Microcontroller unit while at the same time making sure that it kept the correct time. Teensy by default does not have a piezo electric crystal managing its time. It was decided to add one to ensure that clock keeping was optimal. Along with this an enclosure was developed to prevent damage from the elements.

Value Addition

This platform is said to have increased the efficiency of the panel setup by 10% on an average day. The amount of savings and CO2 offset from this project keeps on adding through the years.

```
print("count : ");
phex16(count);
print("\nbalance : ");
phex16(bal);
print("\n");
for(int i=0;i<count;i++)
{
    _delay_ms( base );
    phex16(i);
    print("\n");
}
_delay_ms( bal );
```
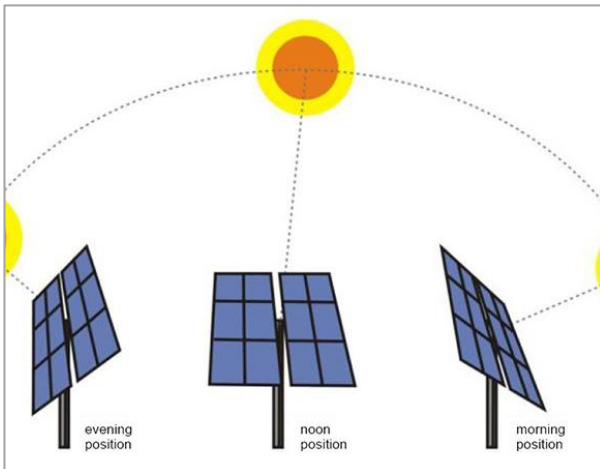
Teensy USB 2.0, a loop timer code, and schematic for sun tracking system, along with a servo motor powering the motion.

Mid 2012

Independent

Key Skills

- Electronic Prototyping
- Programming
- Mechanical Design

Individual Project

https://youtu.be/P7iTDZsGhsk