UCONN | SCHOOL OF ENGINEERING

BUILDING THE FUTURE

SENIOR DESIGN

DEMONSTRATION DAY APRIL 27, 2018

COMPUTER SCIENCE AND ENGINEERING

Senior Design Instructors for 2017-2018

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COMPUTER SCIENCE & ENGINEERING

TEAM: 1
SPONSOR: IBM
SPONSOR ADVISOR: Michael Russo and Peter Kidwell
FACULTY ADVISOR: Dr. Dong-Guk Shin

From left to right: Tom Cowles, Merlina Escorcia, Samuel Pramer and Austin McKay

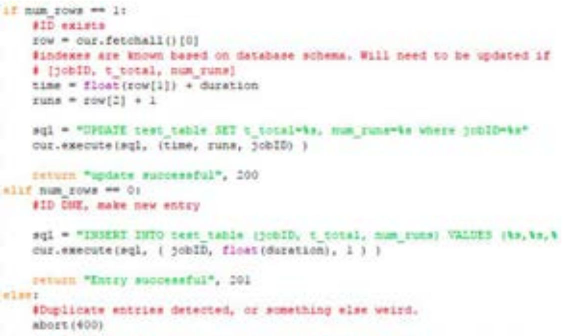
IBM Operational Awareness

As part of the services the company provides, IBM runs a considerable number of applications that compile financial data for IBM's internal accounting systems. It is vital that the data reaches the customer in a timely fashion, so the applications must constantly be monitored to ensure they are running as they are supposed to. The goal of our project was to facilitate this process by conceptualizing and improving operational awareness for IBM Financial Systems. In doing so, we help end users and application operations teams understand the overall state of IBM Finance critical applications and provide historical analytics and predictive analysis of key application execution.

There are two main components to our system. First, a web-based application, hosted on IBM's own Bluemix platform, in which the IBM team can view current and historical application processes in a user-friendlier environment. It is linked to a MySQL database that contains historical data and trends we have identified in the data. The IBM team will be able to see graphical data from any of the applications and compare currently running processes to previous instances of the job. This will help them identify inconsistencies and solve any potential issues the application is having.

The second component is the notification system. Our application constantly monitors the currently running jobs and compares it to previous instances of said jobs. If it is discovered that an application is running, or going to run, longer than it normally would, then a message goes out to IBM's slack channel that alerts them of the issue. The goal of this piece is to eliminate the need for an IBM employee to constantly monitor the applications themselves.

We hope that with our system in place, IBM will not only be more efficient, but more productive as well. By automating the monitoring job, we free up employees' time and allow them to focus on other tasks.



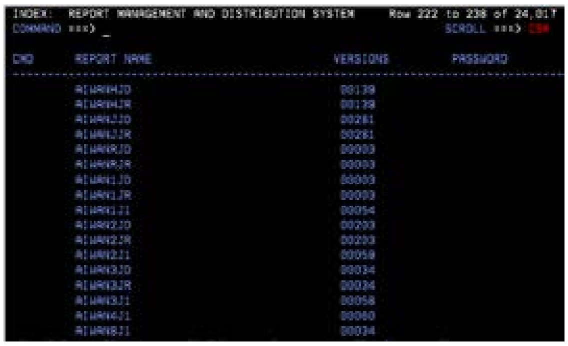
```
if num_rows == 1:
    #ID exists
    row = cur.fetchall()[0]
    #indexes are known based on database schema. Will need to be updated if
    # [jobID, t_total, num_runs]
    time = float(row[1]) + duration
    runs = row[2] + 1

    sql = "UPDATE test_table SET t_total=%s, num_runs=%s where jobID=%s"
    cur.execute(sql, (time, runs, jobID) )

    return "update successful", 200
elif num_rows == 0:
    #ID DNE, make new entry

    sql = "INSERT INTO test_table (jobID, t_total, num_runs) VALUES (%s,%s,%
    cur.execute(sql, ( jobID, float(duration), 1 ) )

    return "Entry successful", 201
else:
    #Duplicate entries detected, or something else weird.
    abort(400)
```



```
INDEX:  REPORT MANAGEMENT AND DISTRIBUTION SYSTEM      Row 222 to 238 of 24,017
COMMAND ===> _                                                     SCROLL ===> CSR

CMD     REPORT NAME                              VERSIONS         PASSWORD
-------------------------------------------------------------------------------
        RIWANHJD                                  00139
        RIWANHJR                                  00139
        RIWANJJD                                  00281
        RIWANJJR                                  00281
        RIWANRJD                                  00003
        RIWANRJR                                  00003
        RIWAN1JD                                  00003
        RIWAN1JR                                  00003
        RIWAN1J1                                  00054
        RIWAN2JD                                  00203
        RIWAN2JR                                  00203
        RIWAN2J1                                  00058
        RIWAN3JD                                  00034
        RIWAN3JR                                  00034
        RIWAN3J1                                  00058
        RIWAN4J1                                  00060
        RIWAN8J1                                  00034
```

COMPUTER SCIENCE & ENGINEERING

TEAM: 2
SPONSOR: IBM
SPONSOR ADVISOR: Debra Latsch
FACULTY ADVISOR: Dr. Dong-Guk Shin

From left to right: James Howe, Naagma Timakondu and Jason Barry

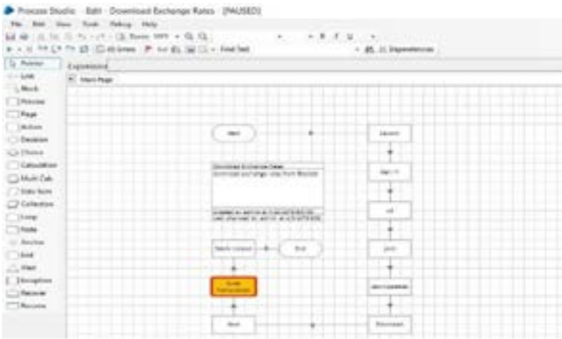
Sabrix Exchange Rates Automation and Tax Advisor Chatbot

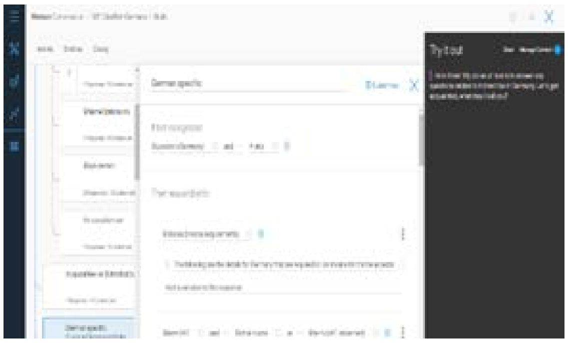
Within nearly every company, there exists some tasks that are repetitive and rote, yet are necessary and critical for the function of the business. One such task within IBM's Tax and Treasury Departments is the Sabrix Exchange Rates process. Currently, a team member manually downloads an exchange rates file, manipulates data within that file, and uploads the modified file to IBM's Sabrix Tax Database. While the process takes about 30 minutes manually, if automated, human interaction would no longer be required, minimizing human error and guaranteeing a successful completion even in employee absence.

The team has automated the Exchange Rates Process using Blue Prism's Robotic Process Automation (RPA) software. Blue Prism functions as a platform to automate repetitive processes such as the Sabrix Exchange Rates process. Using this RPA, the process has been modulated into small, distinct sections to simulate how a human might go about downloading, manipulating, and uploading the Exchange Rates file. To do this, the applications used to complete the process are carefully analyzed so they can be completed successfully by the robot. These applications include IBM Boulder, Microsoft Excel, and Thomson Reuters Sabrix Tax Solution. A completely developed robot can run the process on its own, allowing IBM employees more time for pressing matters. In addition, the work completed for this robot will lay groundwork for future automation projects within IBM Tax and Treasury.

With a vast amount of information dispersed across multiple sources, it can be difficult and time-consuming to find answers to simple questions. One remedy for this is a chatbot that hosts all relevant information for a given subject. The goal for IBM's Tax and Treasury Department's Tax Chatbot is to utilize the cognitive tools of Watson to consolidate tax information and simplify the process of answering relevant questions.

To complete this project, the team utilized the Watson Conversation, a service combining machine learning, natural language understanding, and integrated dialog tools to create a Tax Chatbot, hosting a hub of tax information to be utilized by tax professionals within IBM. The project's goal is to integrate external data sources such as databases and unstructured documents with the dialog flow to create a simple conversation between the user and the chatbot.





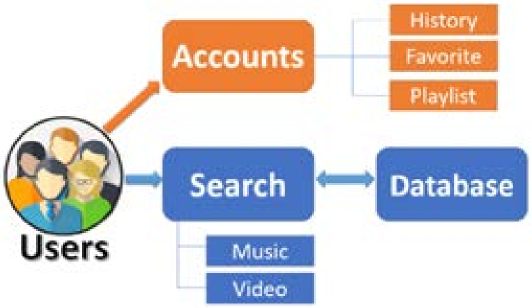
COMPUTER SCIENCE & ENGINEERING

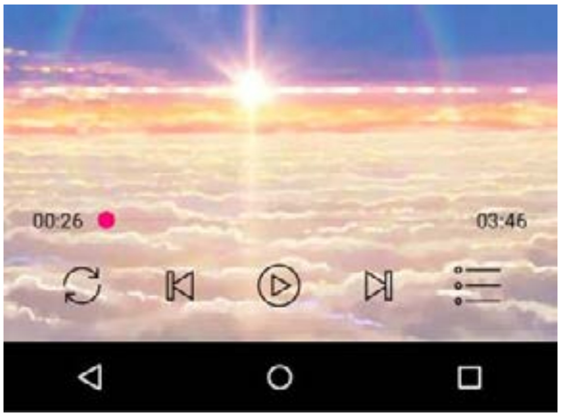
TEAM: 4
SPONSOR: Comcast
SPONSOR ADVISOR: Dr. Laurent Michel
FACULTY ADVISOR: Dr. Song Han

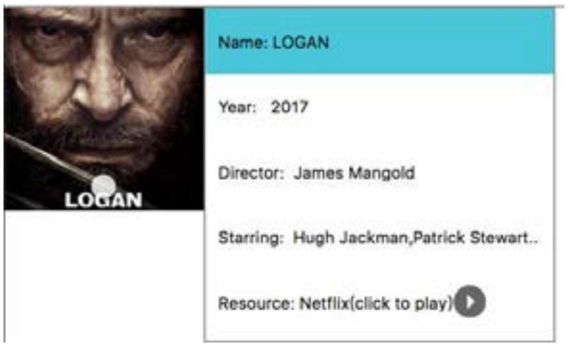
Video and Audio Search

From left to right: Shane Copley, Cheonjin Park, Nan Zhang, Chaonan Zhang and Ang Li

COMCAST






Name: LOGAN

Year: 2017

Director: James Mangold

Starring: Hugh Jackman,Patrick Stewart..

Resource: Netflix(click to play)

Nowadays, multimedia resources have become increasingly rich and heterogeneous in both home networks and on the Internet. To provide fast and efficient retrieval on those video and audio contents, a search engine plays an important role to connect users to those resources. For instance, with Comcast's platform X1, the search engine allows the users to access the Comcast databases of video titles for linear and Video On Demand (VOD), plus the contents available on Netflix. Comcast wishes to expand the access of the search engine to even more sources. In a competitive market, many alternative sources of video and audio contents are desirable as well. These data sources include those from the other content providers, including Hulu, Amazon Video, Sling TV, PlayStation Now, YouTube TV, Fire TV, Apple TV, Chromecast, Roku, and those from the equipment in the users' local home networks, including home DVD carousels and NAS drives.

This project aims to improve the user experience when searching for video and audio contents, by allowing the users to search multiple sources from a single interface, and display the search results effectively. To this end, the project develops a search engine based on open API to support video and audio searching from different data sources. It also provides a user-friendly interface on Android devices to display the search results, including meta-data for the content it locates but also links to play this content.

The prototype developed as a video and audio search app can search data sources on the user's home network, as well as YouTube. This is achieved by:
•Development of the application with a uPNP API that is able to load and display data through the user's home network.
•Integration with YouTube's APIs that provides the capability to search and display the YouTube video.
•Development of a database on Amazon Web Service (AWS) that store the users' profiles and history search results.

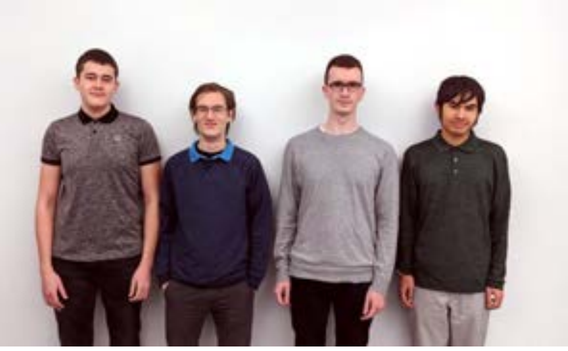
COMPUTER SCIENCE & ENGINEERING

TEAM: 5

SPONSOR: CGI Group, Inc.

SPONSOR ADVISOR: Kristin Baca

FACULTY ADVISOR: Dr. Swapna Gokhale



From left to right: Kristian Karanxha, Tristan Pepin, Dylan Muller and Ian Sajkowicz

Natural Language Processing of Software Test Cases

Natural language processing (NLP) is a field of computer science that intersects with linguistics and artificial intelligence. Although NLP has a history dating to the 1950s, recent advancements in machine learning (ML) and neural networks (NNs) have led to huge growths in NLP, allowing exciting new technologies like AI assistants and advanced spam detection. In our project, we use the NN-powered NLP library spaCy and the ML library Keras to automatically process software test cases so that they can be executed by CGI's test automation tool, TestSavvy.

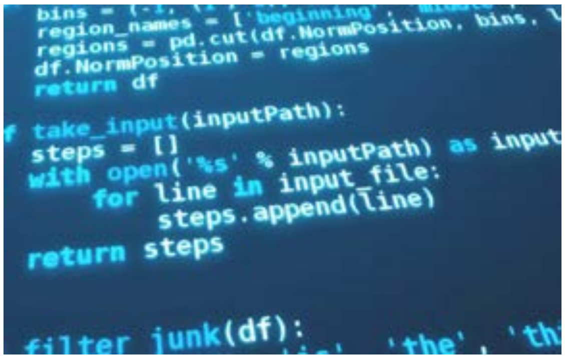
A software test case is composed of a list of human-readable natural-language test steps. Test cases are executed to ensure the proper behavior of an application after modifying the codebase. Consider this example test case, with four test steps:

1. From the login page, enter "TestSavvy" into the username field.
2. Enter "hunter2" into the password field.
3. Click "login".
4. From the main page, click log out.

Within TestSavvy, each step is associated with an action and the object that the action is performed upon. Each step could also be associated with data, and may have a parent (the page on which the step is performed). Consider the step "Enter 'hunter2' into the password field. 'Enter' is the action, 'hunter2' is the data, 'the password field' is the object, and the parent of this step is 'the login page' (acquired from the previous step).

Real-world test cases can have hundreds of steps, and large companies run thousands of test cases with each iteration of their software. Manual execution is inefficient. CGI's TestSavvy is an application for the creation and automatic execution of test cases. Programmers must manually convert their existing natural language test steps into TestSavvy's input format. This is a time consuming process, and is desirable to automate.

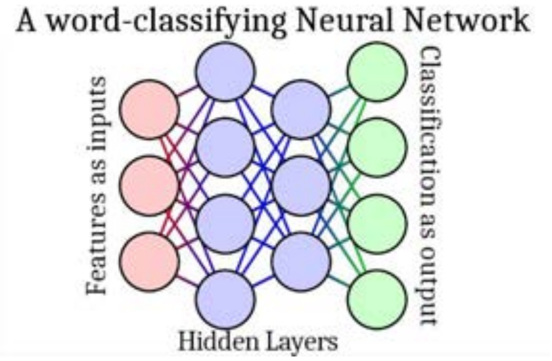
NLP was identified as a technology that allows us to automate this process. Our intended final product is a custom neural-network powered application that can take a test case (a list of test steps) and return a matching tuple of the format (action,data,object,parent) with a high rate of accuracy.



```
bins = (-1,
region_names = ['beginning',
regions = pd.cut(df.NormPosition, bins,
df.NormPosition = regions
return df

take_input(inputPath):
steps = []
with open('%s' % inputPath) as input
    for line in input_file:
        steps.append(line)
return steps

filter_junk(df):
```



COMPUTER SCIENCE & ENGINEERING

TEAM: 6
SPONSOR: Logicbroker
ADVISOR: Edward Kobloth and Jordan Robidas
FACULTY ADVISOR: Dr. Zhijie Jerry Shi

From left to right: Trevor Phillips, Matthew Rubenstein, Quinn Vissak and Siena Biales

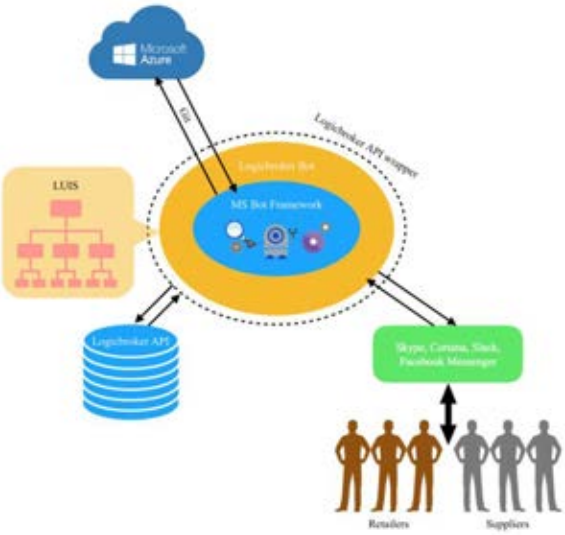
Logicbroker Chat Bot

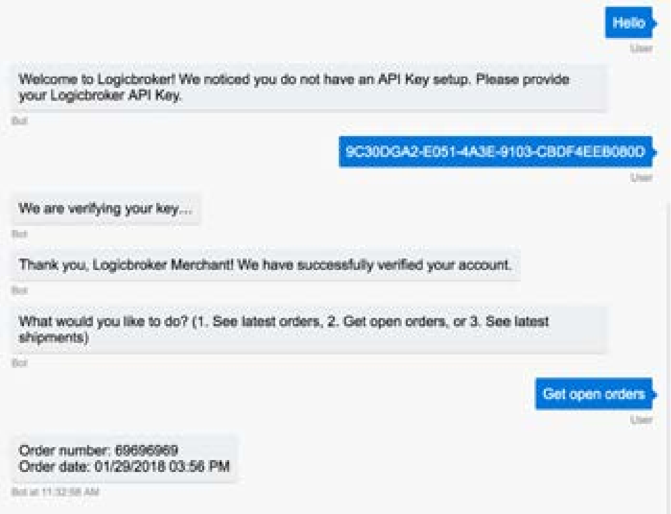
The Logicbroker chat bot simplifies communication between retailers and suppliers of products. Normally a store retailer receives products from many different suppliers and must communicate with all of their different APIs. Similarly, a supplier may ship items to many retailers and must communicate with all of their APIs. Logicbroker acts as a middleman, enabling both retailers and suppliers to communicate with only one API, the "Logicbroker Commerce API." This API allows clients to communicate through the entire order lifecycle with any partner using one connection endpoint. Regardless if the supplier or retailer sends orders in EDI, XML, CSV, or JSON the same format will be consumed, allowing for seamless integration without having to worry about custom formats or different connection points.

The main purpose of this project is to provide Logicbroker's supply chain information to customers in a way which simulates human interaction, rather than a standard web page which displays data. The bot utilizes the natural language understanding of the LUIS API to achieve this.

The bot works seamlessly across the Cortana, Skype, Slack, and Facebook Messenger platforms. It uses the existing Logicbroker API to retrieve data from the Logicbroker backend system and the LUIS API to interpret different phrases and actions that a user might input. Communication combines both user controls and natural language in order to guide users on effective operation of the chat bot.

The chat bot, pictured left, is created with the Microsoft Bot Framework on top of the Node Framework in JavaScript. A SQL database is used to store user data and remember where a conversation left off. The Azure cloud platform, connected to GitHub where our code is stored and run through continuous integration tests, is used for continuous deployment across all messenger platforms. Machine learning is implemented through a combination of the LUIS API and information stored in the SQL database to create a seamless experience for the user, simulating a fluent conversation.





Hello
User

Welcome to Logicbroker! We noticed you do not have an API Key setup. Please provide your Logicbroker API Key.
Bot

9C30DGA2-E051-4A3E-9103-CBDF4EEB080D
User

We are verifying your key...
Bot

Thank you, Logicbroker Merchant! We have successfully verified your account.
Bot

What would you like to do? (1. See latest orders, 2. Get open orders, or 3. See latest shipments)
Bot

Get open orders
User

Order number: 69696969
Order date: 01/29/2018 03:56 PM
Bot at 11:32:58 AM

From left to right: Peter Polis, Michael Feldman, Daniel Camilliere, Michael Pappas, Patrick Guyer and Michael Presch

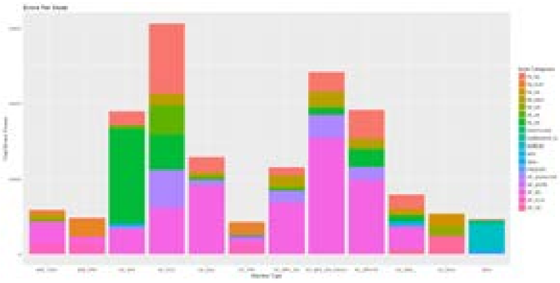
COMPUTER SCIENCE & ENGINEERING

TEAM: 7
SPONSOR: Pitney Bowes
SPONSOR ADVISORS: Paul Mayer and Bob Laprade
FACULTY ADVISOR: Dr. Swapna Gokhale

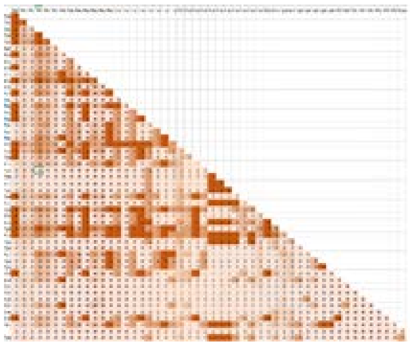
Inferencing Based on Machine Stoppages

Our sponsor, Pitney Bowes, provides a wide range of commerce and mailing services to its clients, including auto-mailing and shipping solutions. Their processing centers assemble thousands of pieces of mail every day, on a variety of machines. As with any complex mechanical operation, jams and other errors regularly require the running machine be stopped and examined to correct the problem. A range of data regarding these machine stoppages is recorded in a database file, including fields such as the machine on which the stoppage occurred, details of the job running at the time, time of stoppage, and elapsed stoppage time. Given this massive database of machine stoppage records, a solution could be developed to analyze stoppage data with respect to each machine and hopefully identify some predictable signs of required maintenance.

We were tasked with helping Pitney Bowes with statistical analysis of stoppage data to identify potential causes underlying issues. Our first course of action was to look at the raw error logs and take note of anything that seemed irregular or noteworthy. Some of these irregularities include immediate stoppages, and error codes that occur much more frequently than others. We identified relevant languages like R and SQL that would be useful for analyzing, visualizing, and altering large tabular datasets.



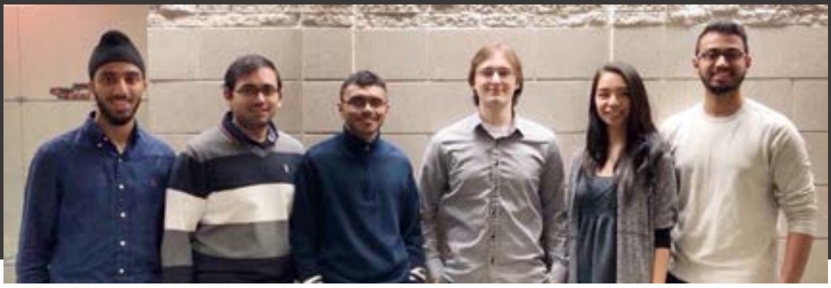
We were provided information on the physical machine configurations which showed where each device is located in the machine "pipeline". This allowed us to make inferences on which downstream errors correlate with upstream errors. Using the historical data, we were able to identify errors that could be related to the gradual degradation of the machine devices. We also were able to determine which errors could be a result of material variations in the jobs the machines were running.



This project’s goal is to provide someone on the floor an automated way to identify deviations from normal machine behavior. When provided with a history of machine operational errors, our tool aims to identify irregularities recorded in new datasets. It also does its best to establish likely causes.

COMPUTER SCIENCE & ENGINEERING

TEAM: 8
SPONSOR: Pitney Bowes
ADVISORS: Paul Mayer & Bob Laprade
FACULTY ADVISOR: Dr. Bing Wang

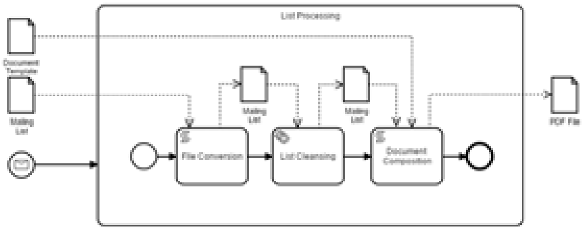


From left to right: Amitoj Kapoor, Satyam Patel, Siddesh Gannu, Joshua Beaudoin, Jaira Cruz and Sarthak Bhatnagar

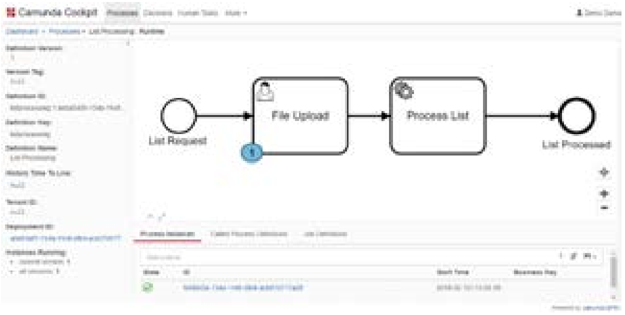
Monitoring and Ensuring BPMN Workflow Correctness

pitney bowes

Business Process Model and Notation (BPMN), depicts the tasks and execution of processes in which data is transferred between different users or departments. More simply, it's a type of flowchart diagram specifically used for business processes that is analogous to a UML (Unified Modeling Language) diagram for software design. Businesses are delving into the use of BPMN workflows to establish a common ground between business analysts and developers. This allows business systems to be tailored to specific customer needs more efficiently.



While workflows can be beneficial to the organization and efficiency of a business, lack of correctness and existing errors can cause more harm than good to a company that tries to implement them. The purpose of this project is to help those using BPMN models to more accurately develop and test their processes. This helps to more efficiently and effectively implement new business strategies.



This is challenging since our goal is to develop a methodology that is flexible and can be easily generalized. A process in BPMN can contain many tasks, making it difficult to pick up exactly where the error is coming from. In addition, correctness could mean different things for different processes and the pre and post-conditions of the tasks within the processes could vary. Coming up with a way to ensure correctness in all BPMN processes is just one of the challenges we face. Another challenge is making sure that the process does what it is supposed to. For a task to run properly, the program developed to carry it out must also be correct. This can be difficult to accomplish when the task is not clearly and concisely described to the person writing the program for a given task. There must be a clear understanding between the developers and stakeholders with regards to the requirements and actual outputs of the program.

ERROR in *List Cleansing Task.*
Input file must be of type .txt

Our approach is to create a methodology in which the workflows can be monitored and corrected to guarantee that the processes are operating properly. Correctness within a workflow entails that each task is completed within certain parameters. In order to achieve this, we monitor the program using pre and post conditions for each task. If a task is not completed within certain parameters, then there is an error. Everyone makes mistakes and our intent is to help reduce these errors. To demonstrate our project in a concrete setting, we focus on BPMN models in mailing processes such as those associated with Pitney Bowes. To model and execute BPMN 2.0, we work with Camunda which is an open source platform that provides powerful tools and comprehensive modeling of business processes with ease.

From left to right: Matthew Slivinski, Savanna Smith, Shemona Singh, Elaine Tsun and Chris Stumper

COMPUTER SCIENCE & ENGINEERING

TEAM: 9

SPONSOR: Q2i

SPONSOR ADVISOR: Steve Jenkins

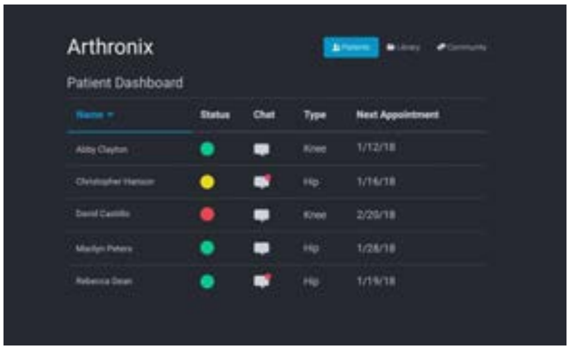
FACULTY ADVISOR: Dr. Song Han

Arthronix

Q2i

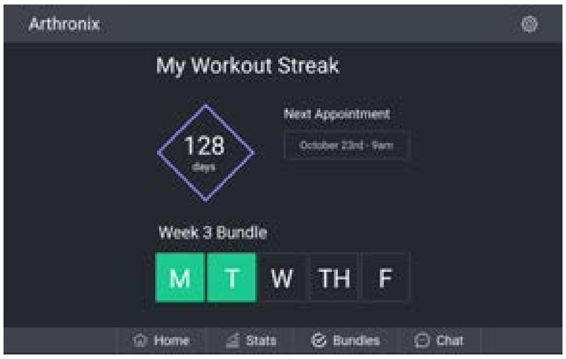
Arthronix

There are more than 1 million joint replacements per year in the United States, according to the AJRR 2016 report. With the aging population, the number of replacement surgeries is expected to rise so there is a need for efficient communication and data organization between healthcare providers and their patients to ensure successful recoveries. After the replacement surgery, patients must meet regularly with their physiotherapist to regain their strength and mobility. The physiotherapist selects exercises for the patient to do at home. From metrics like strength, pain, and range of motion, the physiotherapist can assess the patient's progress and adjust the exercises accordingly. The patient will continue advancing through exercises for several weeks until recovery. In order for this procedure to be successful, efficient patient-provider communication and accessible resources are essential.



Patient Dashboard

Name ▾	Status	Chat	Type	Next Appointment
Abby Clayton	🟢	💬	Knee	1/12/18
Christopher Hanson	🟡	💬	Hip	1/16/18
David Castillo	🔴	💬	Knee	2/20/18
Marilyn Peters	🟢	💬	Hip	1/28/18
Rebecca Dean	🟢	💬	Hip	1/19/18



My Workout Streak

128 days

Next Appointment: October 23rd · 9am

Week 3 Bundle

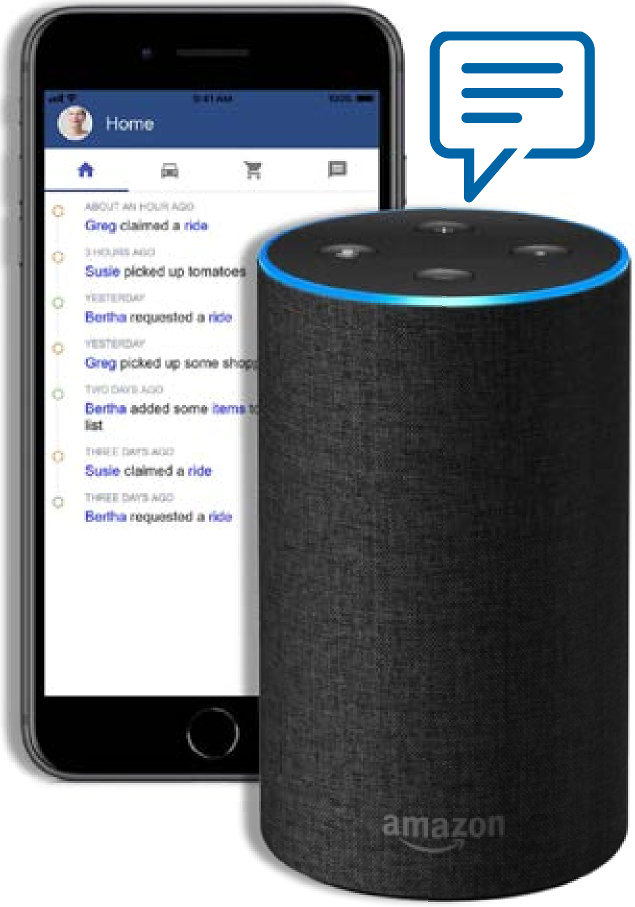
M T W TH F

Arthronix is a new web and mobile application available for physical therapy patients and providers, respectively. It is intended to support patients with their treatment plans through better connection and information exchange with their healthcare teams. It serves as a hub for resources that address patient concerns pre and post-surgery in a concise manner. This enables patients to learn more about their procedure which helps them gain confidence in recovery. Arthronix also allows patients to watch exercise videos at their own pace and provides patients with encouragement to meet their goals. Patients benefit from an organized and easy to use exercise plan. Additionally, Arthronix is a tool for healthcare providers to better manage their patient population and improve outcomes. It organizes the provider's patients in a way that effectively visualizes their progress. The physiotherapist can use the app's metrics to assess a patient's progress and tailor future exercises accordingly. Arthronix provides efficient communication and organized metrics that allow for invaluable collaboration and motivation in reaching healthcare goals.

COMPUTER SCIENCE & ENGINEERING

TEAM: 10
SPONSOR: Cigna
SPONSOR ADVISOR: Dr. Steve Mastrianni
FACULTY ADVISOR: Dr. Robert McCartney

From left to right: Mollie Begleiter, Bingyan Cao, Lucas Dziezanowski, Johnathan Samko and Hamza Khan



Home

ABOUT AN HOUR AGO
Greg claimed a ride

3 HOURS AGO
Susie picked up tomatoes

YESTERDAY
Bertha requested a ride

YESTERDAY
Greg picked up some shop

TWO DAYS AGO
Bertha added some items to list

THREE DAYS AGO
Susie claimed a ride

THREE DAYS AGO
Bertha requested a ride

Project Independence – a home health concierge to support aging in place

According to the National Aging in Place Council, "Aging in place is a term used to describe a person living in the residence of their choice, for as long as they are able, as they age." For many seniors, maintaining freedom in their own residence is the most desirable option, but is not always the most practical. As a person ages, maintaining their own residence creates many personal and logistical challenges. Simple tasks such as grocery shopping, errands, driving, staying in touch with friends and family, and getting to doctor's appointments on time may become difficult. This diminishes an aging person's quality of life.

As a global health services company, Cigna may be able to utilize emerging technologies to aid customers who are aging in place. This would allow a person to remain in their chosen residence longer, manage their health more easily, maintain their quality of life, and potentially avoid a costly relocation to an assisted living home. The best way to reduce costs while improving quality of life is to try to give a person who is aging in place some of their independence back by allowing them to stay at home.

The senior design team collaborated with Cigna to provide a solution that allows those aging in place to easily and more effectively communicate with caregivers and family. The solution employs a natural language interface capable of recognizing human speech and provides clear responses in a pleasant, human-like voice. No complex computer or cellphone interaction is required, and the solution requires little or no training.

The mission of Project Independence is to enable seniors to intuitively communicate needs to their caretakers through a communication portal, as well as aid coordination of services among caretakers. A senior will use a voice activated assistant to communicate these needs, and caretakers will use a portal to view and claim responsibility for them. A common problem for caretakers is the need to touch base with other people who care for the same senior. Our goal is to ease these efforts and eliminate time spent coordinating services by providing an application that centralizes these communications. Project Independence seeks to close the communication gap between a senior and their caretaker.

COMPUTER SCIENCE & ENGINEERING

TEAM: 11

SPONSOR: Fidelity Investments

SPONSOR ADVISOR: Mary Slocum

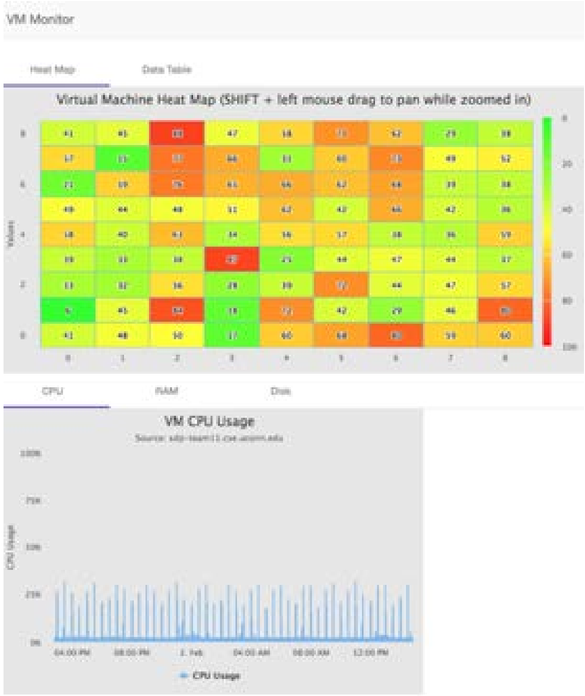
FACULTY ADVISOR: Dr. Donald Sheehy

Left to Right: Steven Lares, Andrew Farkas, Connor Hawley, William Baumbach, Joseph Hill and Justin Frazao

Virtual Machine Monitor with Data Visualization and Predictive Analysis

The use of virtual machines has become increasingly common for companies over the years. Determinations regarding the status of these systems are essential for ensuring effective management of a company's IT infrastructure. To aid in this fundamental task, software for computer system monitoring is often utilized. Our sponsor, Fidelity Investments, has given us the opportunity to develop a system monitoring web application that has been tailored to their specifications. The monitor uses data collected from virtual machines or physical systems to show trends and make predictions regarding the health statuses of the monitored systems. For instance, if the CPU usage of a machine is continually increasing, the software will determine whether an alert should be generated so that any predictable issue can be addressed.

Our system monitor is a web-based application built with Node.js and Angular using a JavaScript library called Highcharts for data visualization. A combination of InfluxDB and MySQL was used for storing time series data of system metrics and aggregate data for predictive analysis. These technologies allowed us to create a seamless, nearly single page experience that is visually pleasing and highly functional, avoiding some of the shortcomings we had found in other available monitors. The central navigational element of our user interface is an interactive heat map showing the overall health of each machine. Through this, users can access individual charts for several system metrics of the selected machine. A data table is also available as an alternative for users who prefer raw data over the heat map representation.



From left to right: Omar Amer, Thara Francis, David Jardim, Joseph Muhitch and Parth Patel

COMPUTER SCIENCE & ENGINEERING

TEAM: 12

SPONSOR: OTIS Elevator Company

SPONSOR ADVISOR: Sandeep Sudi

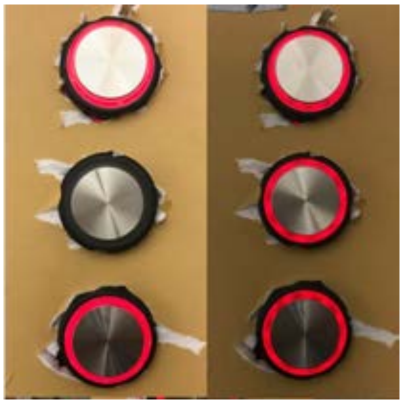
FACULTY ADVISOR: Dr. Robert McCartney

Image Analytics for Elevator Maintenance

OTIS Elevator Company leverages technology to improve the efficiency of elevator maintenance. A huge portfolio of supported repair requests is currently employed to provide customers a pleasant experience when riding inside an OTIS elevator. The call button panel, being the first and only interface when choosing a desired floor, is a high priority maintenance request. When a floor indicator button does not illuminate after pressed, the passenger is immediately aware. As it stands today, maintenance workers wait for messages from elevator owners regarding operating panel defects. A system is needed to automatically alert maintenance workers of specific interface failures. Such a system benefits both repair maintenance workers and customers by providing more timely and cost-effective solution.

A call button inside an elevator is presented with a significant amount of damage and abuse over its lifetime. Natural conditions such as sporadic temperature changes cause defective circuitry. Without costly components embedded inside the operating panel, it is difficult to detect the failure of a button. Utilizing a small in-car camera faced at the operating panel to detect a button's LED failure is a low-cost alternative. The main challenge is composed of identifying flickering and partial illuminated states captured from images at an angled position. Low-grade cameras with small lenses, despite high definition resolution, do not capture the required details for easy detection of error.

Our solution employs a number of image processing algorithms to filter out potential alterations in call button LED brightness levels. The aggregation of these advanced algorithms provide an indication of error with high probability. This solution has been extended with additional feature identification to check overhead lighting health in the cab. The Python programming language was chosen with open source image processing libraries to optimize performance on a low-powered Linux platform.



From left to right: Bowen Strack, William Gallagher and Kevin Grabowski

COMPUTER SCIENCE & ENGINEERING

TEAM: 13
SPONSOR: Knocking®
SPONSOR ADVISOR: Markus Reinmund & Stefan Dippl
FACULTY ADVISOR: Dr. Bing Wang

knocking®

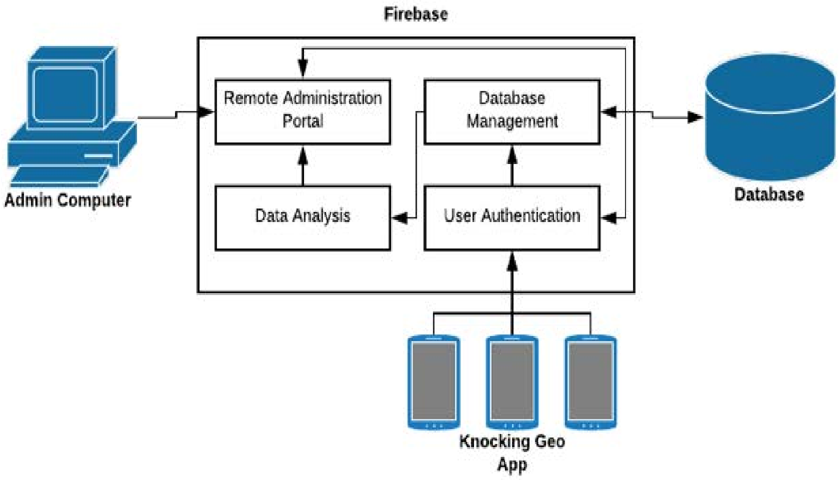
Knocking® Geo

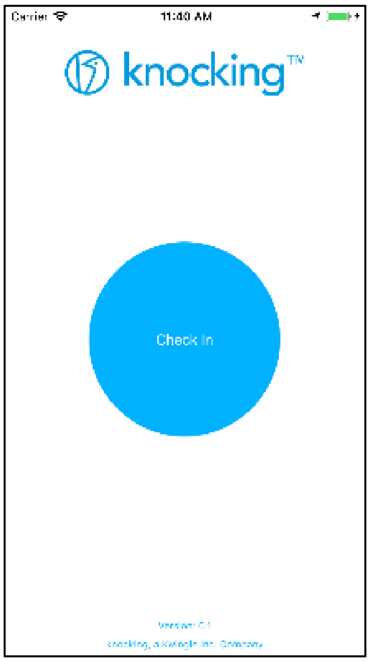
The prevalence of smartphones has created new opportunities for novel applications to improve the quality of our lives and work. In this project, we work with Knocking® to leverage the power of smartphones to revolutionize the sales rep performance tracking. Knocking® Geo combines geo tracking, reporting and analytics to bring a new level of measurability and efficiency to potential sales teams around the world.

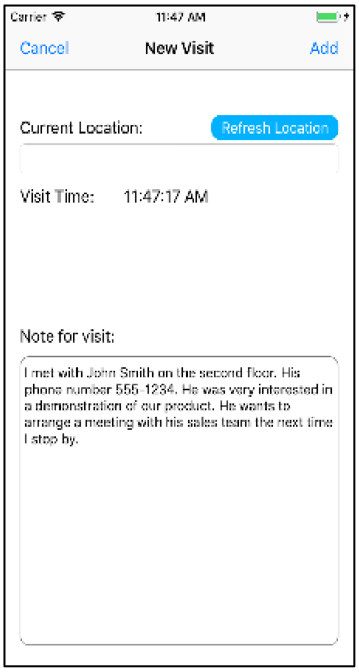
The primary purpose of the Knocking® Geo system is to help the sales manager's track, manage and reward their sales representatives based on their reps productivity around customer visits – such as visit dates, times, frequency or duration.

Users use two interfaces to interact with the Knocking® Geo system. A sales representative using the app will primarily use a "Check In" functionality when visiting a customer. Using the geolocation functionality common in smartphones, the location of the customer is automatically detected and stored along with the duration of the sales visit. Sales representatives can further share and store notes about the customer visit, which is readily available for viewing next time the sales rep prepares to make a stop at the customer's location. From the back-end of the system, managers are able to view all of the collected data by the sales representative or team, and are able to assign a target list of future customer meetings to a given team member.

We developed the Knocking® Geo mobile application in Xcode with Swift 4.0 and the app is available on iOS version 11.2. Apple's Xcode software provides an easy-to-use interface to develop iOS applications and allows for quick interface changes, which is necessary to adapt the app for future users. The backend is handled through Google's Firebase, a cloud based all-in-one solution, providing databases, user authentication, and cloud computing. Through Firebase, we can use Google's cloud computing interface to do most of the computations outside of the app to keep it as light and responsive as possible.







Current Location:

Visit Time: 11:47:17 AM

Note for visit:

I met with John Smith on the second floor. His phone number 555-1234. He was very interested in a demonstration of our product. He wants to arrange a meeting with his sales team the next time I stop by.

COMPUTER SCIENCE & ENGINEERING

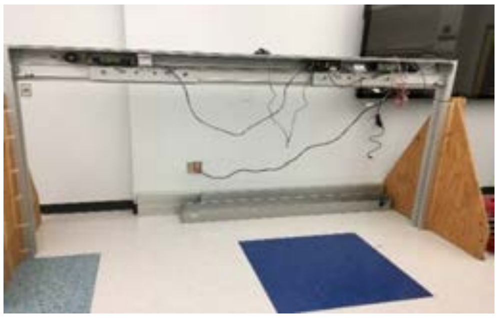
TEAM: 14

SPONSOR: Stanley Access Technologies

SPONSOR ADVISOR: Jonathan Braverman

ADVISOR: Dr. Song Han

From left to right: Jordan Layne, Bryan Maloney, John Friedman, Gregory Bibisi, Archit Singh and Sally Yang



Monitoring and Correctness of BPMN Based Workflows

Stanley Access Technologies is the leading manufacturer of automatic pedestrian doors in North America. Some of their products include sliding, swinging, revolving, and folding doors. Faults may exist in a sensor, motor, or wiring, and may not be easy to troubleshoot. Technicians who attempt to fix these faults often need to work in a crowded space of the header, where the door components and wires can make that very difficult. The purpose of our project is to develop a system to diagnose problems in the automated door systems. This system will run many tests through an Android application and give the technician using it a recommendation of what to fix and replace. Students majoring in CSE and ECE are working jointly to develop a microcontroller that will communicate directly with the android app. A solution implementing machine learning concepts will be used to diagnose any issues with the doors.

We have been given the number one selling automatic slide door in North America, the Dura-Glide slide door system, to perform our tests on, and an Android device with current testing application installed to assist us. Our system will ideally interface with the Door Control Units of the doors, which act as the central “brain” of the systems. Our system will either piggy-back on the signals to the DCU or completely intercept them. This would allow our system to monitor the signals during operation and detect anomalies or take control of the outputs and inputs to force specific states of the system. We will be altering the current troubleshooting function within the application to make it easier for technicians to use.

To accomplish our task, we will implement some machine learning concepts. The ECE members of our team will figure out how to produce usable data from the automatic doors, and the CSE members will take this data and generate a diagnosis for the issues present in the door.

From left to right: Jared Gruneiro, Michael Wynne, Parker Timmerman, Mya Rios, Shruti Alavala and Hannah Reed

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COMPUTER SCIENCE & ENGINEERING

COMPUTER SCIENCE & ENGINEERING

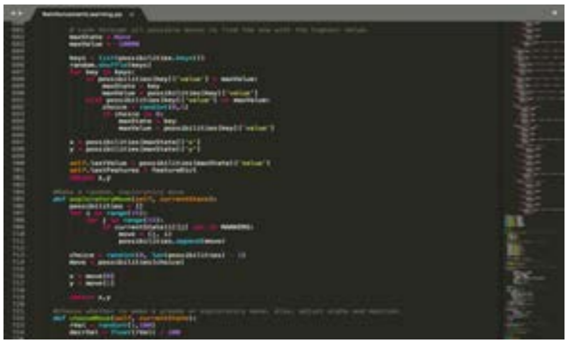
TEAM: 15
SPONSOR: UConn CSE Department
FACULTY ADVISOR: Dr. Yufeng Wu

Implementation of Board Game AI with Reinforcement Learning

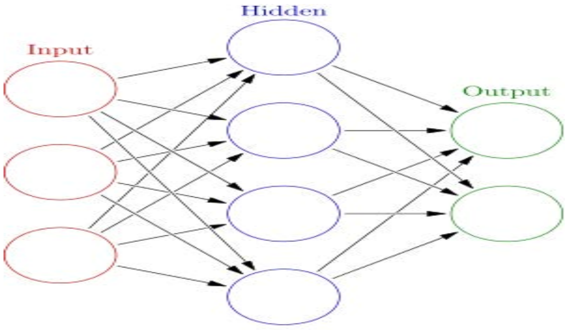
Our goal is to understand and implement reinforcement learning when applied to a board game. Reinforcement learning is a type of artificial intelligence where the AI agent learns by interacting with its environment and is not supplied with training data. The AI agent learns by evaluating its current state and choosing an action that will maximize a numerical reward signal.

Two distinguishing features of reinforcement learning are trial & error search and delayed reward. Reinforcement learning also focuses on considering the whole problem, rather than solving immediate sub-problems. This allows for a more complete and goal-seeking agent. Trial & error search means the agent discovers which actions yield the most reward by testing various possibilities. These actions not only affect the agent's immediate reward, but also delayed reward which encourages the agent to think more long-term. The agent must balance between greedy and exploratory moves. The greedy move guarantees a good move in the short term but the exploratory move might allow the agent to learn more and be helpful long-term.

There are three main elements of a reinforcement learning problem: the policy, reward function, and value function. The policy defines a mapping from the perceived environment state to the best action to take within those states. The reward function defines the goal of the problem and maps each perceived state and action pair to a corresponding reward. The desirability of the state is identified by this reward, which is maximized by the agent in the long run. The value function specifies the total rewards expected at each state. When making a decision, the agent should be more concerned with values rather than immediate rewards.



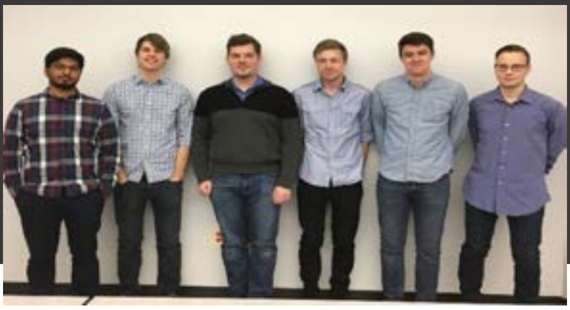
We applied reinforcement learning to the board game Gomoku. Gomoku is played by two players on a 19x19 board and the objective of this game is get five pieces in a row before your opponent. The large game board meant that we could not simply map each state with its best possible action and had to instead devise an approximation value function. In the fall semester we focused on developing this function in Python3. In the spring semester we moved on to solving this problem via deep reinforcement learning which employs the use of neural nets and the TensorFlow library.



TEAM: 16

SPONSOR: UConn CSE Department

FACULTY ADVISORS: Dr. Reda Ammar and Dr. Sanguthevar Rajasekaran



From left to right: Arun George, Brian Matuszak, Rafal Bezubik, Chris Skoczylas, Kevin Schumitz and Rich Infante

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COMPUTER SCIENCE & ENGINEERING

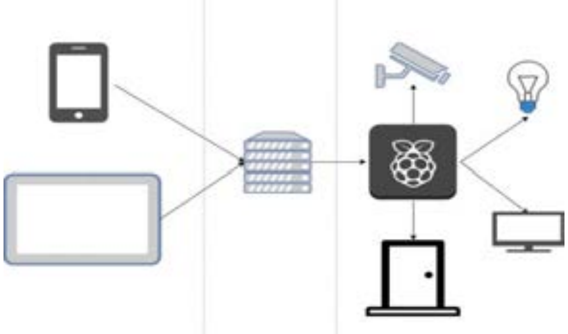
Smart Hotels

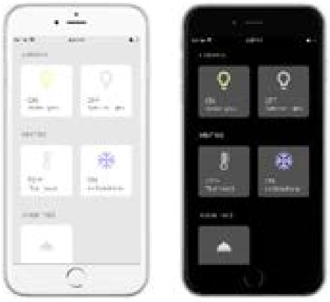
A Smart Home is a system where a number of Internet of Things (IoT) devices are linked together via a central server and can be remotely controlled to provide smarter and more efficient experiences. Various smart devices and systems already exist in the market and have become more common in households. However, these implementations have not yet been applied to large-scale commercial use. This is because these smart systems are often outside of a feasible price range and lack full support for devices that don't connect to a wireless network. The goal of our project is to correct these faults by developing an affordable, all-encompassing smart system for implementation in hotels. Hotels are ideal for a system like this, as multiple rooms and buildings can be controlled from the same server, while standardizing equipment across chains and making our product easier to adapt to new technologies. Hotels will also have the opportunity to select which IoT devices they need, in order to customize their system for optimal price, and functionality.

The idea is for customers to use a mobile application in order to control their hotel room for the duration of their stay. The mobile application will communicate between the central server, management, and the guest's room in order to satisfy requests. These requests can vary from controlling doors, televisions, shades, lights, thermostats, and other devices to ordering room service, and communicating with hotel staff.

Additionally, a management web-application will be created so that the hotel administration can monitor requests for room service or maintenance, and configure the system quickly without the need for an outside service. We will utilize affordable technologies in order to reduce the cost of implementation for hotels, without compromising the modular aspects of the system such as the IoT devices in each room. To achieve this, each room will be outfitted with a Raspberry Pi running a Python server, and will include IoT devices such as Wi-Fi enabled light bulbs, switches, and shades. Interfaces can also be created between the Raspberry Pis and non-IoT products that are already installed in the rooms.

Ultimately, our system will allow hotel guests to control their smart hotel rooms remotely, thereby improving their experience while being affordable and profitable for the hotels themselves.





From left to right: Jonathan Homburg, Eyal Minsky-Fenick, Anna Gorbenko, Oliver Kisielius, John McGowan and Doni Ivanov

COMPUTER SCIENCE & ENGINEERING

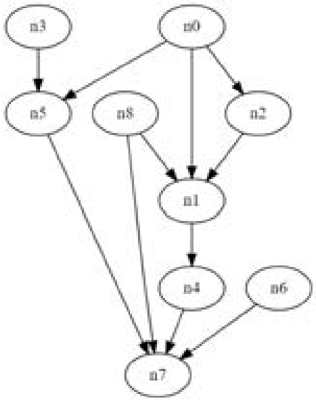
TEAM: 17
SPONSOR: UConn CSE Department
FACULTY ADVISOR: Dr. Donald Sheehy

Algorithm Visualization for Literate Programs

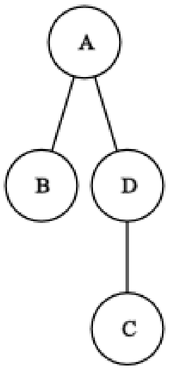
We made a literate programming system called "AlgViz" (for "Algorithm Visualization"), the purpose of which is to generate pictures of data structures. The main use of AlgViz is to make images to accompany formatted code blocks in a Markdown document. For each supported programming language, AlgViz provides macros that allow a user to take "snapshots" of the objects in their code during execution. Then AlgViz can draw the data structures captured in those snapshots. AlgViz supports standard data structures including arrays, trees, and graphs.

The most powerful feature of AlgViz is its ability to capture and illustrate snapshots of user-defined data structures. Naturally, this requires the user to implement simple APIs that allow AlgViz to take snapshots of the custom data structures. These APIs are quite flexible. For example, it is easy to make AlgViz interpret an integer literal as an array of bits or interpret an array as a binary tree.

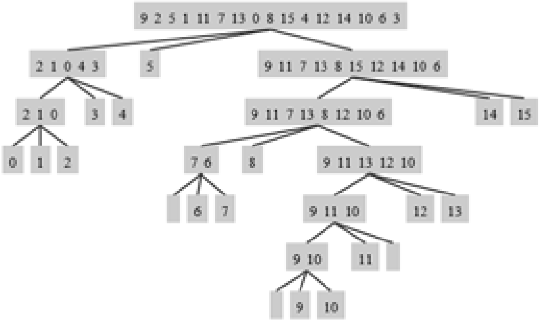
An AlgViz input file contains code blocks, configuration, and specifications for images, mixed with arbitrary document text. The output of AlgViz is a similar file, but with SVG images associated with the specifications and with the text preserved. Another AlgViz tool can then finalize the document by removing all AlgViz-specific content and leaving only the images, the document text, and selected code blocks. (AlgViz macros within the code blocks are omitted from this output by default.) Thus, AlgViz can be used to incorporate images into Markdown documents but could be also used to enhance other markup languages or literate programming systems.



AlgViz uses GraphViz to draw graphs.



Appearance is configurable



Recursive call tree for quicksort

COMPUTER SCIENCE & ENGINEERING

TEAM: 18
SPONSOR: UConn CSE Department
ADVISOR: Dr. Donald Sheehy

From left to right: Soumya Kundu, Sailesh Simhadri, Ian Dechene, Drew Monroe and Joe Sweeney

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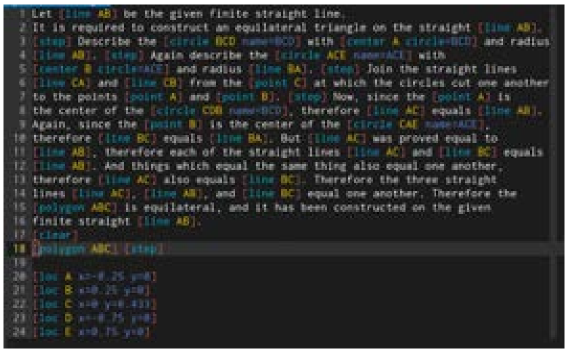
COMPUTER SCIENCE & ENGINEERING

A Visual Euclid's Elements

Geometry is a field of study that focuses on the arrangement of shapes. A key component of geometry is a visual representation of the relationships between points, lines, and planes. Individuals can better learn the subject matter when the connections between visuals and text are clearly expressed. Therefore, the goal of our senior design project is to design and implement a software tool that allows anyone to transform text that is rich in geometric content into an informative visualization. In order to accomplish this, we decided to create both a markup language and a way to turn this markup language into the corresponding visualization. The user should be able to create arbitrary geometric figures, potentially even figures in three dimensions, using our markup and generate a representation that they could include in things like websites, academic papers, or documentation. As such, we have tried to make design decisions that allow for our codebase to be flexible and easily modifiable as we anticipate the code changing quite dramatically during the development process.

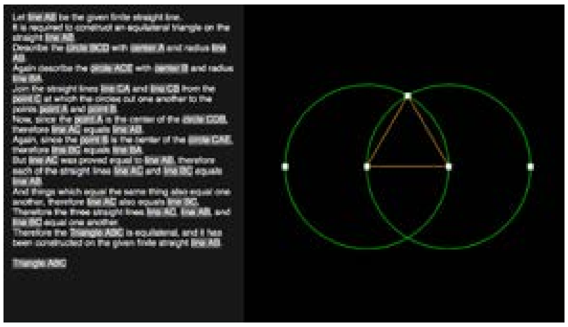
One of the most widely known standards for teaching geometry is Euclid's "Elements." Although the initial motivation for the project came from a desire to construct a robust and powerful markup language that can be used to create a modern, interactive version of Euclid's Elements, we quickly recognized the potential for this tool to be used for a diverse range of geometry-heavy markup projects and have since kept that broader perspective in mind when making our design decisions. Nevertheless, the text of the Elements has continued to be an essential resource for testing the ability of our software to support different types of geometric entities and relationships.

We have created a markup language that is capable of representing various geometric objects, as well as a parser written in Python. This parser turns our markup into HTML which can be viewed in the browser. We have a publicly facing website, https://youclid.github.io, which contains our documentation, discussion of design decisions, as well as links to several examples. Our future goals include trying to create representations for three dimensional objects, as well as an interactive version of Euclid's Elements.



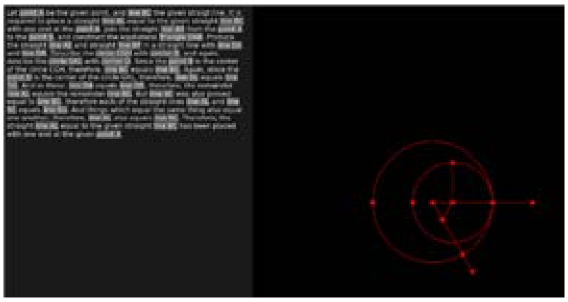
```
Let [line AB] be the given finite straight line.
It is required to construct an equilateral triangle on the straight [line AB].
[step] Describe the [circle BCD name=BCD] with [center A circle=BCD] and radius
[line AB]. [step] Again describe the [circle ACE name=ACE] with
[center B circle=ACE] and radius [line BA]. [step] Join the straight lines
[line CA] and [line CB] from the [point C] at which the circles cut one another
to the points [point A] and [point B]. [step] Now, since the [point A] is
the center of the [circle CDB name=BCD], therefore [line AC] equals [line AB].
Again, since the [point B] is the center of the [circle CAE name=ACE],
therefore [line BC] equals [line BA]. But [line AC] was proved equal to
[line AB], therefore each of the straight lines [line AC] and [line BC] equals
[line AB]. And things which equal the same thing also equal one another,
therefore [line AC] also equals [line BC]. Therefore the three straight
lines [line AC], [line AB], and [line BC] equal one another. Therefore the
[polygon ABC] is equilateral, and it has been constructed on the given
finite straight [line AB].
[clear]
[polygon ABC] [step]

[loc A x=-0.25 y=0]
[loc B x=0.25 y=0]
[loc C x=0 y=0.433]
[loc D x=-0.75 y=0]
[loc E x=0.75 y=0]
```



Let line AB be the given finite straight line.
It is required to construct an equilateral triangle on the straight line AB.
Describe the circle BCD with center A and radius line AB.
Again describe the circle ACE with center B and radius line BA.
Join the straight lines line CA and line CB from the point C at which the circles cut one another to the points point A and point B.
Now, since the point A is the center of the circle CDB, therefore line AC equals line AB.
Again, since the point B is the center of the circle CAE, therefore line BC equals line BA.
But line AC was proved equal to line AB, therefore each of the straight lines line AC and line BC equals line AB.
And things which equal the same thing also equal one another, therefore line AC also equals line BC.
Therefore the three straight lines line AC, line AB, and line BC equal one another.
Therefore the triangle ABC is equilateral, and it has been constructed on the given finite straight line AB.

Triangle ABC



[illegible]

From left to right: Thomas Swinicki, Michelle Voong, Kelly Huynh and Austin Rosenberg

COMPUTER SCIENCE & ENGINEERING

TEAM: 19
SPONSOR: UConn CSE Department
FACULTY ADVISOR: Dr. Donald Sheehy

Block Programming with Real Legos

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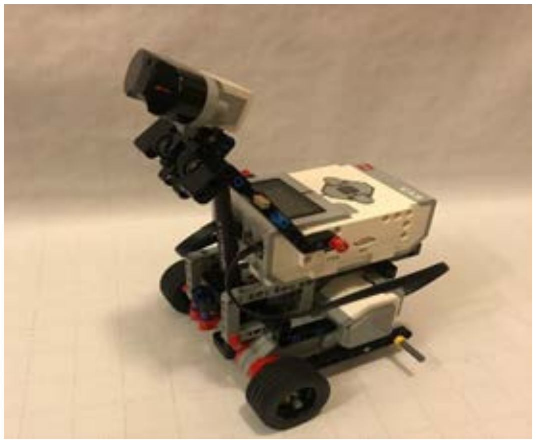
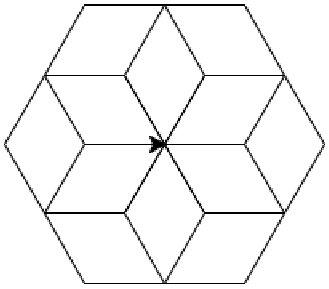
Several tools exist designed to help kids program using drag and drop style virtual blocks to make programs. Today, Scratch from MIT and Lego Mindstorms are popular methods of teaching children how to program. Block Programming with Real Legos aims to teach kids fundamental coding concepts, while encouraging creativity and reducing screen time. Kids stack Legos on top of each other to create programs to control a robot. The two applications the project is designed for are instructing the robot to solve mazes and draw pictures. Building these programs will teach kids about sequencing their code, loops/iterations, and creating/calling functions.

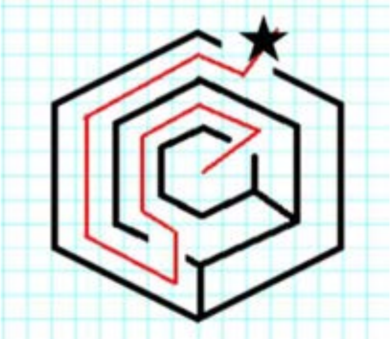
The team developed a syntax for programming with Legos, implemented a backend language to represent the Lego programming, trained computer vision accurately enough to distinguish between different components of the code, and designed a product that will truly be enjoyable for children.

To help introduce the language to kids, the team also developed a curriculum with lessons plans to walk a child through the basics. The curriculum slowly builds up a child's knowledge base while developing confidence in them to create more complex programs. Once the child has completed the curriculum, they should feel confident enough to create whatever programs they can imagine.

The user builds a program out of Legos following the syntax of our language. Once they are satisfied with their program, they will use a camera to take a picture. This picture will be sent to our computer vision library on the operating system of the Mindstorms robot. OpenCV is the computer vision framework used in this project. Classifiers were trained to learn the syntax of the Lego language. When an image is imported to OpenCV, the classifiers broke down the image and output each ‘line’ of code, resulting in a LOGO-recognizable program. LOGO is an educational programming language known for its use in turtle graphics. This code will then be sent to the robot, which executes it and performs the task the user desires, assuming there are no bugs.







COMPUTER SCIENCE & ENGINEERING

TEAM: 20
SPONSOR: UConn CSE Department
SPONSOR ADVISOR: Dr. Alexander Schwarzmann
FACULTY ADVISOR: Dr. Robert McCartney

From left to right: Kevin Konrad, Dylan Ramsay, Christian Carmellini and Adomous Wright

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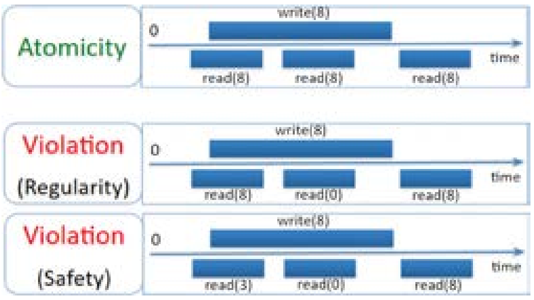
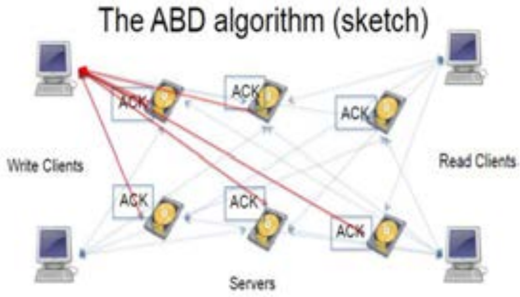
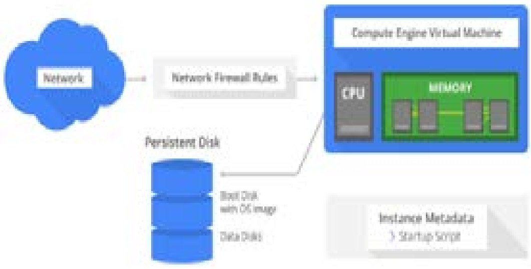
Atomic Distributed Shared Memory for Networks

With the advance of networking technology, communication has become a major systemic activity in the field of distributed systems. In a network with a central server processing read and write requests from several client machines, there exists a single point of failure that can bring the system down, the central server. Redundancy of data over multiple servers is the only way to guarantee availability, however it presents challenges with consistency. The client trying to read data, can consult all servers on the network to identify the newest value, but this approach is very inefficient and not fault-tolerant as it assumes that all servers are available. With this in mind, we explored a distributed shared storage/memory model for a network with single and/or multiple writers. In this project we developed an implementation of shared readable and writeable objects in message-passing systems that provides resiliency and consistency when the underlying distributed platforms are subject to processor failures and communication delays. This implementation of shared objects ensures the atomicity of data, despite failures of some nodes within the network

The algorithms we use, ABD and Oh-SAM [1], provide atomic, distributed data storage across unreliable network channels. These algorithms provide reliable and fault tolerant data storage through quorum-based voting to retrieve the latest version of the data. Both algorithms consist of a set of multiple data storage servers and a set of clients that store and retrieve data from them. They differ slightly in implementation: ABD delegates more work to the client while Oh-SAM reduces the number of messages the client needs to send but mandates that the servers send messages to each other. We implemented both of these algorithms and subjected them to rigorous testing in order to evaluate the trade-offs between the greater number of client messages from ABD to the increased load on the servers in the Oh-SAM algorithm. Additionally, we have constructed a client that allows us to manipulate the network conditions of the servers while also visualizing the internal state of the data as it moves between the clients and the servers.







References:
[1] Hadjistasi T., Nicolaou N., Schwarzmann A.A. (2017) Oh-RAM! One and a Half Round Atomic Memory. In: El Abbadi A., Garbinato B. (eds) Networked Systems. NETYS 2017. Lecture Notes in Computer Science, vol 10299. Springer, Cham

COMPUTER SCIENCE & ENGINEERING

TEAM: 21
SPONSOR: UConn Extension & Auerfarm
SPONSOR ADVISORS: Jen Cushman & Beth Bye
FACULTY ADVISOR: Dr. Steven A. Demurjian

From left to right: Michael DeMarco, Devin Patel, Jake Boncal, Daniel Caulfield, Connor Hornigold and Samuel Kelly

Mobile App for 4-H Education Center at Auerfarm

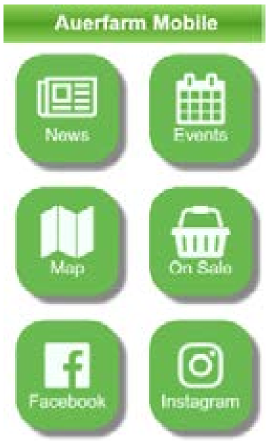
The proof-of concept Auerfarm mobile app developed in CSE4939/4940 in the past academic year supports the work performed by the 4-H Education Center at Auerfarm, a 120-acre farm that provides valuable hands-on experiences to more than 12,000 children throughout the year. Seasonal programs are offered to school classes, community groups, and the public in the Center's animal barn, gardens, farmland and orchards. The campus is open to the public year round allowing the farm to fulfill its mission to connect people, agriculture and the environment through education and recreation. The farm is also the home to multiple 4-H Clubs. The farm has various facilities that provide educational opportunities in the areas of animals, wildlife, plants and farm production. We seek to enhance the educational experience of the visitors by developing a farm app. The farm has been a great collaborator with UConn students in the past, serving as a site for many class service learning projects. We are open to suggestions or ideas from the students as well. Current capabilities include:

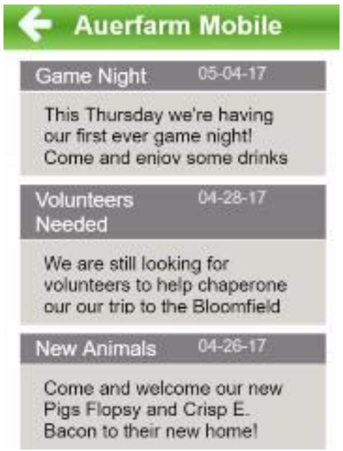
- Help users navigate the farm
  - Use google maps api and wireless location services to allow users to see where they are in relation to the farms attractions.
  - Allow staff to update locations and descriptions, through an admin web app.
- Keep users informed of upcoming events
  - Feed of upcoming news and events
  - Encourage return visits through push reminders on users phone lock screen.
- Promote the farms business.
  - List what the farms selling and show where relevant stands are on map
- An administrative web app to allow Auerfarm staff to maintain application.

The Auerfarm mobile application expands functionality with:

- Use of updated image for overview picture of facility. Possibly use of drone image.
- Embedding links of pictures, sound bytes or video to places on the map.
- Providing links within app to partners such as Foodshare, UConn and 4-H.
- Updating app to include hiking trails.
- Training staff on the updating of the application.

The end result is an Auerfarm mobile application App and associated database/server as domain knowledge, user interface, and database design input to develop a cross platform (iOS/Android) Auerfarm mobile application app that is deployable for use by Auerfarm.





Game Night 05-04-17

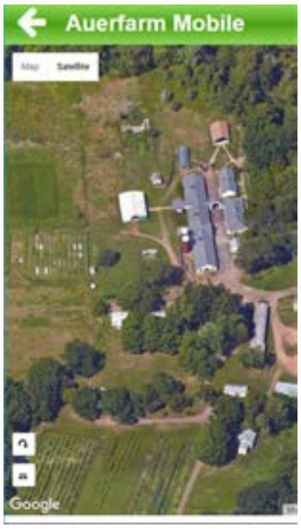
This Thursday we're having our first ever game night! Come and enjoy some drinks

Volunteers Needed 04-28-17

We are still looking for volunteers to help chaperone our our trip to the Bloomfield

New Animals 04-26-17

Come and welcome our new Pigs Flopsy and Crisp E. Bacon to their new home!



From left to right: Arah Yim, Ahamed Houwari, Natalia Gutiérrez, Ariel Virgulto and Brandon Lumbra

COMPUTER SCIENCE & ENGINEERING

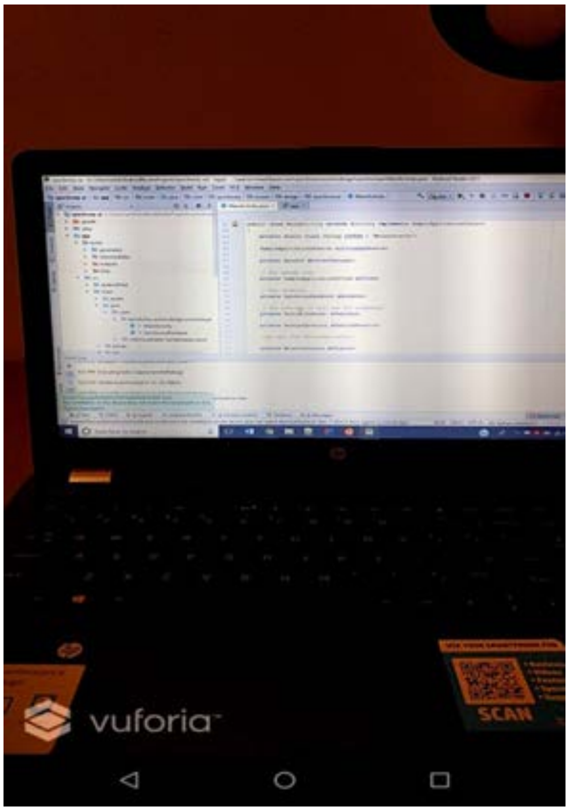
TEAM: 22
SPONSOR: Synchrony Financial
SPONSOR ADVISOR: Leonardo Casale
FACULTY ADVISOR: Dr. Bing Wang

Synchrony Financial Augmented Reality Shopping Experience

Synchrony Financial serves over 60 million cardholders in thousands of retail stores across the US. With the increasing popularity of online shopping, drawing users into retail stores is becoming a challenge. Because of this, Synchrony Financial was looking for an application to showcase how technology could be used to draw more people into an exclusive retail shopping experience. This application employs augmented reality to enhance the in-store retail shopping experience by displaying relevant information to shoppers. The proposed application has been developed for primarily retail operations. The team created an application using Vuforia and Android Studio to create an application that would recognize retail items or VuMarks (encodes data, acts as an augmented reality target) and present information on said items and give the customers the ability to select item options.

Users will open the application on their phone, which will bring them immediately to their camera. The application will start scanning its environment for VuMarks and items already in the database. Once an item is scanned as an item in the database, relevant information will be displayed on the screen, including material make up, color and size options, and manufacturing details. This application enhances a user's shopping experience, making it easier for an individual to obtain product details and a more immersive shopping experience.

Though having been around for decades, the technology for augmented reality has just recently become readily available. Augmented reality transforms data and analytics into images overlaid on the real world. Because of the recent access to these technologies and resources, not much has been created in the way of tutorials and research into these technologies. This has been one of the greatest challenges while creating this application. To understand the integration of these softwares, it required significant research and hands on experimenting. After researching the topic and watching tutorials, we applied our prior computer science knowledge to the new information to create our application.



COMPUTER SCIENCE & ENGINEERING

TEAM: 23

SPONSOR: UConn College of Agriculture

SPONSOR ADVISOR: Richard Meinert

FACULTY ADVISOR: Dr. Zhijie Jerry Shi

From left to right: Ahmad-Fikri Anuar, Charles Glaser, Mitchell Salvatore and Anthony Clark

GPS Farm Recording Keeping System

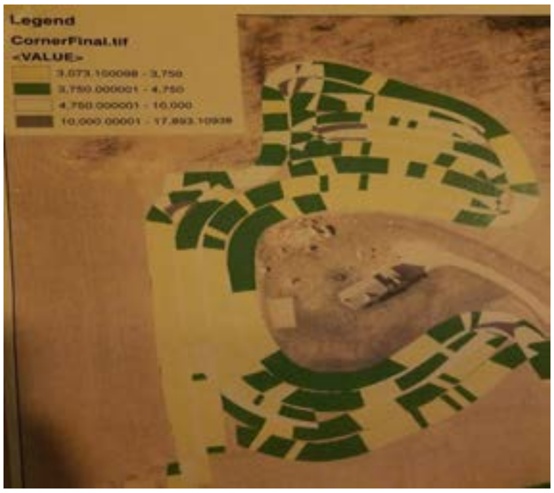
UCONN COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

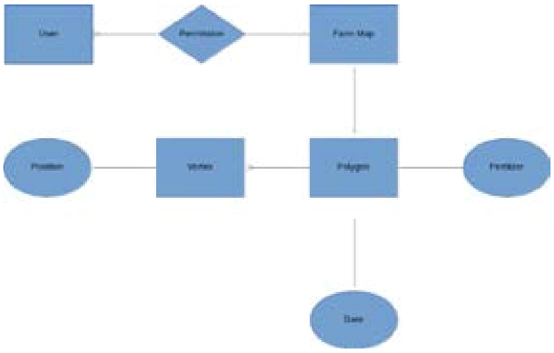
EXTENSION

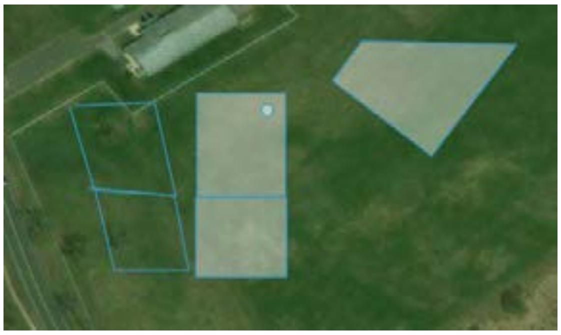
Farms distribute fertilizer on their land every year. Optimizing fertilizer usage is important in terms of time and cost to the farms. If farmers know exactly where to put their fertilizer and how much to spread, they can reduce the time spreading fertilizer and the money spent from using too much fertilizer. Currently, farmers who desire data about their fertilizer usage must create maps of the fertilizer spreads themselves. This process takes up a great deal of time in creating and organizing the maps. Moreover, farmers do not always have the expertise required to parse and display the data. Farmers also need to apply fertilizer at specific rates to avoid creating excess nutrients in the field that can leak to ground or surface water. Automating the processing of the data and the map, along with centralizing the storage of data maps, would save farmers substantial time and money.

The F.A.R.M website is a hub where farmers can easily upload and save their data. The website parses GPS data to provide a map of fertilizer applications for farms. Farmers spread fertilizer in the field with GPSs attached to their tractors. They next upload the data to the website via USB. Farmers enter information regarding the equipment they used in the field such as tractor and fertilizer type. Then, the website displays a map of the farm with polygons indicating the path of the tractor. The polygons also provide information about the type and amount of fertilizer spread.

The website allows convenient management of farm information and maps. Each farmer on the website is an administrator of their own farm. They can view their own farms maps and change settings about their farm such as name or size. Farmers can also allow other guest users to have limited access to their farm's data. Guests provide a farmer with the option to have others help manage the uploading of data and maps. Users can view data for the farm for any date range specified. This helps the farmer to not only see trends in fertilizer spread over time, but also allows them to collect data to submit to state regulatory bodies.







COMPUTER SCIENCE & ENGINEERING

TEAM: 24
SPONSOR: UConn Extension
SPONSOR ADVISOR: Marlene Kennedy
FACULTY ADVISOR: Dr. Steven A. Demurjian

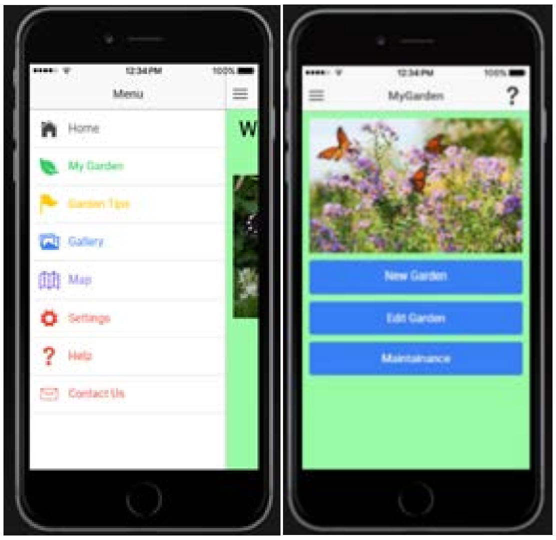
From left to right: Prem Patel, Tristan Desilets, Eric Koelewyn, Thomas Heroux, Andrew Armstrong and Jason Elliott

Monarch Garden Manager Mobile Application

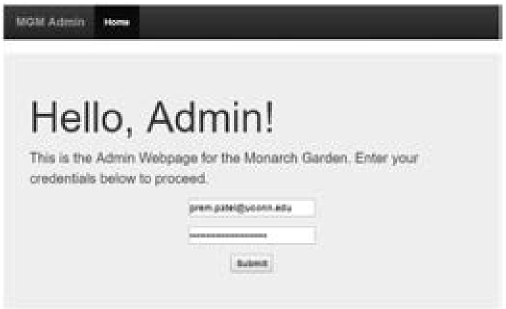
The Monarch Garden Manager Mobile App, for iOS and Android, is intended to teach children and adults how to create a monarch butterfly garden in Connecticut, but it is extendible to use in all planting zones in the United States. The app provides the user a clear and understandable guide on building their very own monarch butterfly garden. With these clear instructions, our hope is to revitalize the monarch butterfly population and bring them back to Connecticut. Users can select to build a low maintenance garden or low cost garden based on their preferences.

Features in the Monarch Butterfly Garden App are:

- Recommend ideal seeds, plants or bulbs to buy based on given information.
- Photographic gallery of insects, flowers, and gardens to inspire users for their own gardens.
- Instructions on the way to cleanse your plants of harmful insects without destroying the plant and the Monarch butterflies in the process.
- Links to articles pertaining to the plight of the monarch butterfly and the state of their decreasing population.
- A listing of commercial nursery or nonprofit organization websites that identify deer resistant plants, such as Burpee and White Flower Farm, both of which are commercial.
- Lists of plants that are native to or that grow well in Connecticut, as well as other states across the country.
- Functionality to search our database for specific plants that match given search criteria.
- Contains information on the lifecycle and biology of the monarch butterfly.
- Links to the USDA Planting Zones, which allows searching by state and zip code.
- Instructions for laying out the garden, including a list of supplies needed.
- A modifiable home page that will provide the user with helpful information through widgets such as maintenance timers or tips of the day.
- Links to video tutorials on YouTube on gardening.



An admin webpage has been set up for management of the information within the database that contains: Plant information, Butterfly information, Images, User data and Permissions.



MGM Admin Home

Hello, Admin!

This is the Admin Webpage for the Monarch Garden. Enter your credentials below to proceed.

prem.patel@uconn.edu

Submit

From left to right: Austin Schwarm, Nathan Milne, Sharra Neely, Kelsey Butler-Waitkus, Philip Ira and Cooper Halvordson

COMPUTER SCIENCE & ENGINEERING

TEAM: 25

SPONSOR: UConn College of Agriculture

SPONSOR ADVISOR: Dr. Michael O'Neill

FACULTY ADVISOR: Dr. Robert McCartney

Connecticut Winery Mobile Passport Application

UCONN

COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

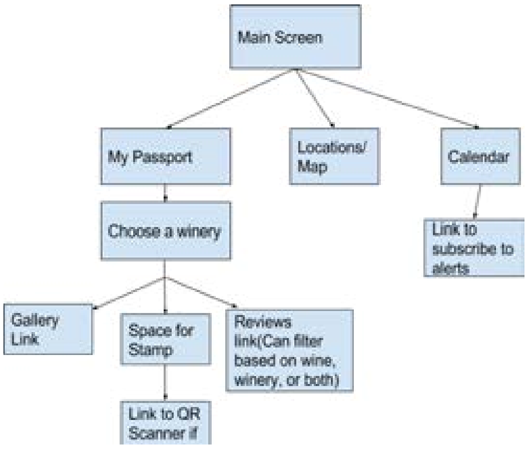
EXTENSION

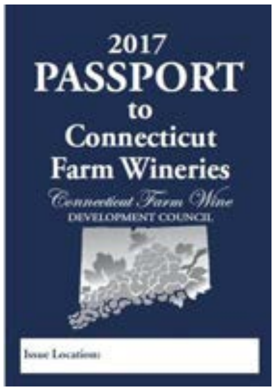
Connecticut Farm Wine DEVELOPMENT COUNCIL

The Connecticut Farm Wine Development Council hosts a yearly contest called the passport program. Patrons of participating vineyards can opt to have their "passport" stamped, and once they accrue 16 or more stamps, they can enter a contest for various prizes, depending on the total number of stamps they have. The initiative to create a mobile passport application was motivated by potential for significant monetary savings, increased convenience of entry, and the ability to track currently unavailable data, such as how many people start the program, but never turn their booklet in. The Connecticut Farm Wine Development Council estimates that the cost of printing these paper passports is between $4,000 - $6,000 per year, an expense that will be alleviated by replacing the current passports with a mobile passport application.

The passport feature of the application mirrors the current paper passport, providing users with location hours, and contact information, as well as the ability to rate various aspects of each vineyard. Participants are able to rate the wine quality, their overall experience, and take notes on the vineyard to provide as feedback for the respective vineyard or save notes privately for personal reference. This mobile application aims to not only replace the current paper passport application, but also to provide users with further information including a calendar of events hosted at vineyards and a photo gallery featuring images from every vineyard.

The application was created by utilizing the application development tool React, which has built-in elements that allowed us to create our project exactly as we envisioned it and allows us to port the application to both Apple and Android devices. Information collected is stored in a MySQL database; we found this to be the best database option as the setup was easy to create scripts for and any desired data can be pulled quickly and easily whether it be statistics regarding patrons or even a contest winner.





2017 PASSPORT to Connecticut Farm Wineries

Connecticut Farm Wine DEVELOPMENT COUNCIL

Issue Location:

COMPUTER SCIENCE & ENGINEERING

TEAM: 26
SPONSOR: New London County 4H
SPONSOR ADVISOR: Pamela Gray
FACULTY ADVISOR: Dr. Steven A. Demurjian

From left to right: Sunny Trivedi, David Qin, Cody Lutzel, Rahul Jevisetty, Marco Wong and Smit Shah

UConn 4-H Bug Superheroes App

The UConn 4-H Bug Superheroes app is intended for children and youths to learn about bugs via a set of games/activities that will showcase the unique strengths of individual insects. In addition, a fun fact about the insect will appear periodically about each bug found in the game, combining education with entertainment. Furthermore, Bug Superheroes allows students to compete against their classmates for high scores, encouraging replayability and thus, more learning. 4-H Bug Superheroes will be playable on iOS and Android.

The game takes place over five events on an Olympic Track and Field. Each event stars a bug superhero and a youth avatar. The bugs will be expanded to human size, in order to showcase their unique traits compared to humans. A user can choose their own diverse avatar in order to customize the experience for themselves. The five unique events are:

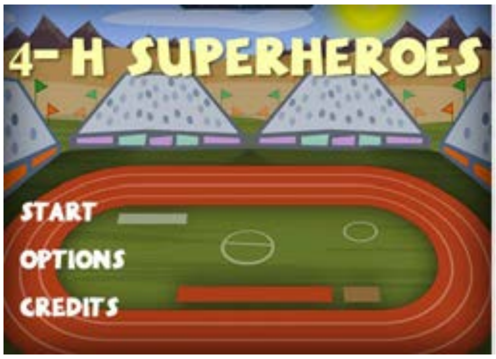
Event 1:
Event 1 focuses on a flea. The user will be in a jumping competition with the flea. The student must aim their jumps carefully in order to reach the end of the field in order to compete with the humongous leaps of the flea.

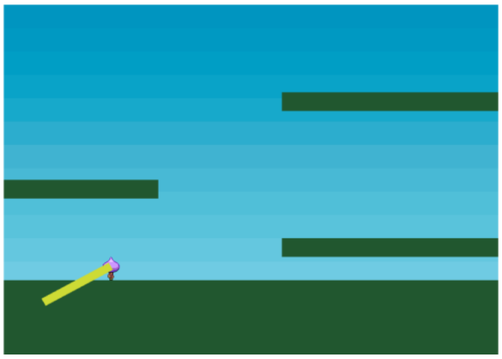
Event 2:
Challenge a Biting Midge to a flapping battle. The Biting Midge can flap its wings a thousand times in just ten seconds. The player must repeatedly swipe back and forth to try to out flap this bug.

Event 3:
Knowing that a cockroach can run 3.5 miles in two minutes. The avatar will need to compete against a cockroach on a 3.5 miles track in 2 minutes to see who can run the fastest.

Event 4: Who can crawl faster? Compete against a Fly Maggot in a race to the 4-H Clover, where the Fly Maggot can crawl 250 feet in merely two minutes! Use a pinching motion with your fingers, and your avatar will do the army crawl on the ground!

Event 5: Face off against a team of ants in an exciting game of tug of war! The player will have to repeatedly swipe backwards to pull the team of ants across the line in order to win. However, be warned - an ant can lift up to 50 times its own body weight!





COMPUTER SCIENCE & ENGINEERING

TEAM: 27

SPONSOR: UCONN College of Agriculture

SPONSOR ADVISOR: Dr. Pengfei Liu

FACULTY ADVISOR: Dr. Zhijie Jerry Shi

From left to right: Mitchell Lombardi, Scott Bisaillon, Colin McNeil, Owen Wilcox, Jason West and Joseph Goncalves

UCONN

COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

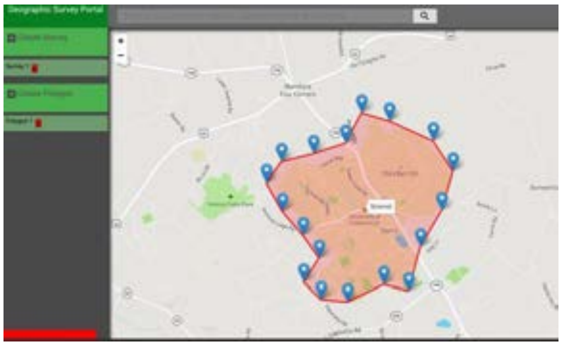
AGRICULTURAL AND RESOURCE ECONOMICS

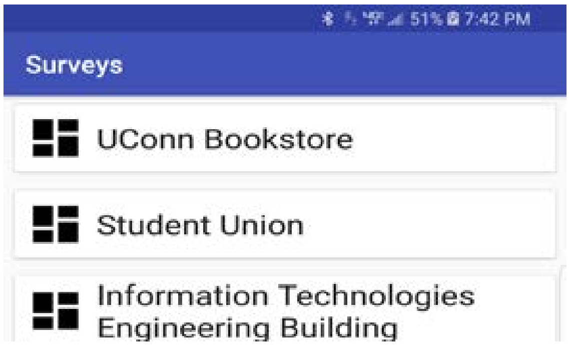
Geographic Survey App

This project is revolved around aiding researchers in collecting data regarding recreational sites including National and State Parks. The current problem is that the respondents are often asked to fill out the surveys while they are not physically in the park. This can lead to inaccurate data as the responders are filling out the surveys based off of their memory. Alternatively, ecologists could go out, but this is an inefficient use of resources. After this project is completed, data, including both pictures and surveys, will be able to be collected by citizens while actually in the park.

The goal of this project is to assist researchers with a more convenient and accurate way of collecting data without relying so heavily on memory. This is achieved by creating several separate applications that will work perfectly in unison. The first is an administrative web application that contains an attractive user interface and allows the admins to map areas where survey retrievals are desired. The data will be fed to mobile applications created in both Android and iOS environments. The mobile applications will notify users any surveys in the area through built in location services. The survey can then be filled out on the mobile device. Users can also upload pictures of the area in the mobile applications. All the data acquired by the applications (location areas, surveys, pictures, etc.) are stored on a server.

An administrator will be able to define one or multiple locations for collecting responses through an interegrated survey instrument (e.g., Quatrics). Upon users entering the area (top image), the mobile applications (2nd & 3rd image) will display a list of surveys available to users. The users can select the survey they wish to complete. The survey questions are displayed directly within the mobile application and the users can complete surveys without ever leaving the app.



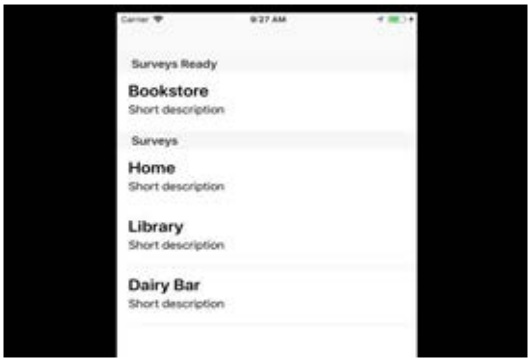


Surveys

UConn Bookstore

Student Union

Information Technologies Engineering Building



Surveys Ready

Bookstore
Short description

Surveys

Home
Short description

Library
Short description

Dairy Bar
Short description

From left to right: Kris Guzman, Brian Patino, Jesus Pulido, Ashily Varghese and Mubassar Tariq (not pictured)

COMPUTER SCIENCE & ENGINEERING

TEAM: 28
SPONSOR: Synchrony Financial
SPONSOR ADVISOR: Daniel Murphy
FACULTY ADVISOR: Dr. Song Han

Synchrony Financial Virtual Realty Shopping Experience

Synchrony Experience is a virtual reality application that was developed to address the rise of consumer virtual reality products. Virtual reality is predicted to move into the mainstream and surpass a $40 Billion market by 2020.

Synchrony Experience allows users to experience shopping for products in a virtual world where there are fewer constraints compared to a physical retail store. Similar to the convenience of online shopping and with additional features, virtual reality shopping will allow users the following:

1. View items available for purchase
2. Rotate, move, duplicate, and expand items in any direction in space
3. Demo items in multiple environments, not just inside a retail store
4. Provide a tailored user experience

What if a customer found great looking swimwear but wasn't too sure how it would look like at the beach. With the power of VR, customers can now take the swimwear to the beach. Once the customer is ready to make the purchase, they can easily complete the transaction without the hassle of waiting in a line.

The Synchrony Experience VR Application is built to work with the HTC Vive headset. The HTC vive provides users with room-scale tracking with controller support to interact with virtual objects. The app was built using the Unity Game engine along with Steam's OpenVR SDK. The data storage technology used is Google's Firebase NoSQL solution. The entire project repo is stored on https://github.com/amaredeus/sync-vr-app.

COMPUTER SCIENCE & ENGINEERING

TEAM: 29
SPONSOR: The Hartford
ADVISOR: Ron Utterbeck and Murali Narasimman
FACULTY ADVISOR: Dr. Swapna Gokhale

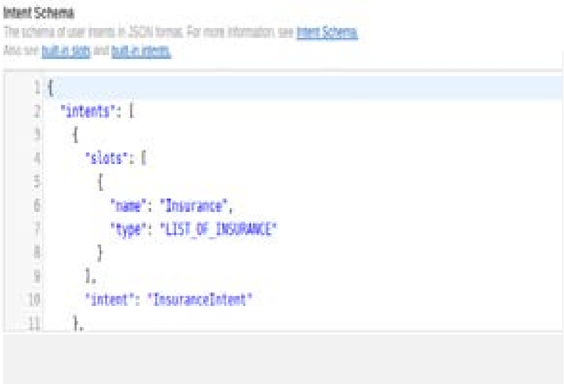
From left to right: Joshua Lemkin, Julie Pham, Chioma Chelsey Ezete, Alexander Zaleski and Flavio Lici

Enabling Customer Service through Amazon Alexa Device

As a company in business for more than 200 years, The Hartford has helped people and businesses prepare for the unexpected, protect what is uniquely important to them, and prevail through life's challenges and opportunities. The Hartford does this by delivering industry leading property and casualty insurance, group benefits and mutual funds to their customers, creating a diverse and inclusive culture for their employees, financial performance for their shareholders, and by engaging with and serving the communities in which they work and live.

Since the Alexa has one of the largest shares of voice-assistant devices in the US, this Alexa App should enable the customers to interact via this channel to get the service conveniently from their home. The platform aims to provide guidance for customers to help them find the answers to their inquiries about their specific plan, in addition to information concerning general insurance knowledge that the user may have. By using this Alexa App, users are able to better understand the meaning of various insurance terms and also receive advice on how to handle challenging situations that may arise. Users may either utilize a "quick question" feature of the Skill to directly ask Alexa a question or if needed, navigate through a menu of options with assistance from Alexa to formulate a question specific to the user's inquiry. The Alexa App would allow customers the opportunity to learn more about their insurance plan so they can receive the optimal coverage in the most efficient and user convenient manner possible.

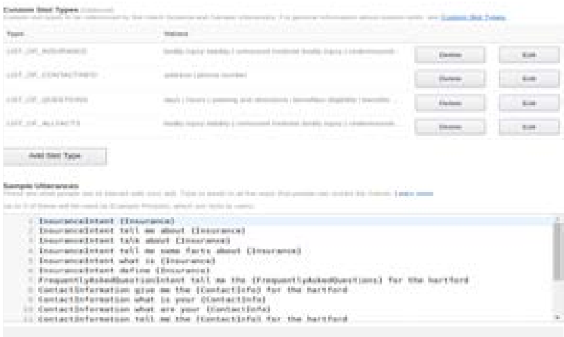
The App is built using the Amazon Alexa Web Service as the serverless computer platform, Node.js as the backend, and a rest API to connect to the database.



Intent Schema

The schema of user intents in JSON format. For more information, see Intent Schema.
Also see built-in slots and built-in intents.

```
{
  "intents": [
    {
      "slots": [
        {
          "name": "Insurance",
          "type": "LIST_OF_INSURANCE"
        }
      ],
      "intent": "InsuranceIntent"
    },
```



Custom Slot Types [illegible]

[illegible]

Type	Values		
[illegible]	[illegible]	Delete	Edit
[illegible]	address | phone number	Delete	Edit
[illegible]	[illegible]	Delete	Edit
[illegible]	[illegible]	Delete	Edit

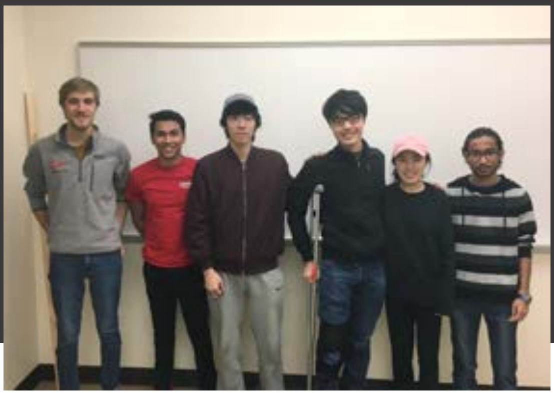
Sample Utterances

[illegible]

```
InsuranceIntent {Insurance}
InsuranceIntent tell me about {Insurance}
InsuranceIntent talk about {Insurance}
InsuranceIntent tell me some facts about {Insurance}
InsuranceIntent what is {Insurance}
InsuranceIntent define {Insurance}
FrequentlyAskedQuestionIntent tell me the {FrequentlyAskedQuestions} for the hartford
ContactInformation give me the {ContactInfo} for the hartford
ContactInformation what is your {ContactInfo}
ContactInformation what are your {ContactInfo}
ContactInformation tell me the {ContactInfo} for the hartford
```

COMPUTER SCIENCE & ENGINEERING

TEAM: 30
SPONSOR: UConn College of Agriculture
SPONSOR ADVISOR: Dr. Bruce Blanchard
FACULTY ADVISOR: Dr. Bing Wang



From left to right: Keregan Schoenherr, Sandesh Shrestha, Ruolin Meng, Mengying Yu, Wah-Jian Lin and Darab Kiyani

MLSC 4311: The Hematology Educational App

The Hematology Education App is an online application that allows students in the Medical Laboratory Sciences (MLS) program to review material. A notoriously difficult section of MLSC 4311 tasks students with identifying various types of cells in bone marrow and peripheral blood smears. Our app supplements what is learned in lecture and laboratory by providing microscopic, digital images of bone marrow and peripheral blood smears to reinforce identification of the different types of cells that are being studied. An online SQL database stores hundreds of images and related questions that are used to generate quizzes based on the user's performance on previous results. To further the effectiveness of the program, these results are shared privately with the professor through an admin account, allowing them to address flagged areas of difficulty as pointed out by the application. Using a Scrum framework, we broke down the many features requested by our sponsor and completed them in weekly sprints.

Various different web development tools and techniques were used in creating our application. JavaScript is used for the client side of our application. Ajax is used to load the information received from the server and it is also used to send user session information to the server.

On the server side, we utilized PHP and SQL to set up databases and logins. The SQL server stores the logistics of our program and PHP is used to connect to those databases. Using PHP, the data extracted from the database is sent to the client side JavaScript.

On the front-end, we developed using HTML, CSS, and Bootstrap to build a responsive web page. This structure allows for the usage of mobile, tablet, and desktop support, all of which are commonly used among college students. We were challenged to create a cohesive design that was intuitive to use while displaying information clearly to the user. To ensure the interface was as user-friendly as possible, we tested it on multiple users with different levels of technological experience.

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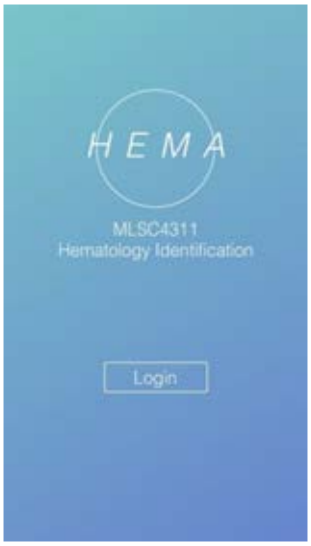
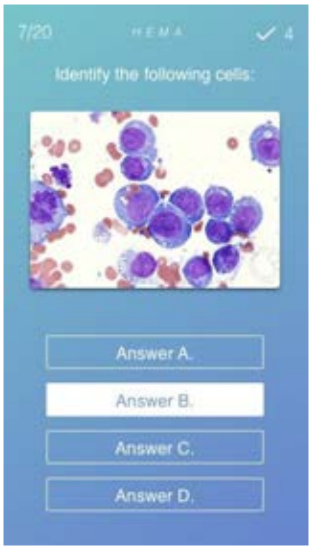
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES
ALLIED HEALTH SCIENCES

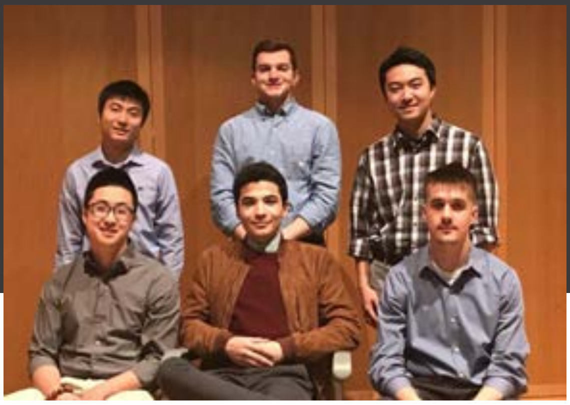


HEMA

MLSC4311
Hematology Identification



Identify the following cells:



Top from left to right: Qiansheng Hu, Chris Peterson and Chengchen Zhang
Bottom from left to right: Eddie Huang, Hunter Hollant and Michael Gentile

Munich RE

1866
Hartford Steam Boiler

COMPUTER SCIENCE & ENGINEERING

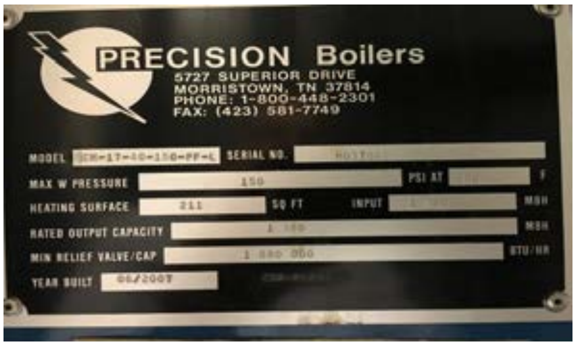
TEAM: 31
SPONSOR: Hartford Steam Boiler
SPONSOR ADVISOR: Dr. Wei Zhang
FACULTY ADVISOR: Dr. Dong-Guk Shin

Hartford Steam Boiler Nameplate Recognition System

The Hartford Steam Boiler Inspection and Insurance Company (HSB) specializes in providing equipment breakdown insurance. As a result of insuring millions of machines, the company is looking to develop a software program that can read machine nameplate information and parse the information in an organized manner. Our group's goal is to create a software program that will make extracting nameplate information easier and more accurate.

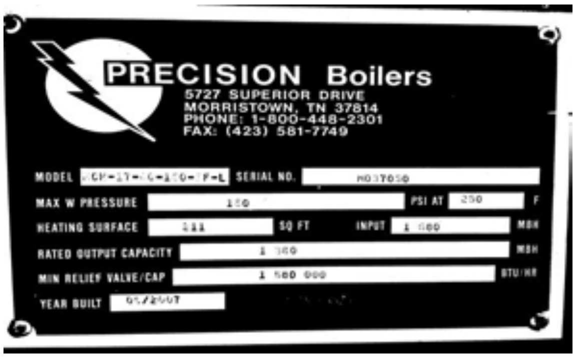
One of the most important challenges of the project involves processing the layout of the plate to identify the type of content stored on the nameplates. Though each plate stores similar information, there is no standardized format. This means that the manufacturer may display the same information in a different manner from another plate and may contain additional information that would not be used in our primary purpose. The nameplate information may be printed, stamped or etched and the orientation of where information is located may be different. In addition, some of the nameplates may be dirty, reflective, or damaged making it difficult to accurately record the necessary information.

Our software will be implemented as an iPhone application which communicates with a remote server. Once the user has taken an acceptable picture of a nameplate, the image will be sent to a server containing a script that will process it and extract the nameplate information. When the data arrives at the server, it will go through an image processing pipeline where our program will first utilize various software, such as computer vision library OpenCV, to clean the image for further processing. After the image has been prepared, the necessary information will be extracted and sorted into proper fields. The information will then be sent back to the mobile user to verify correctness. Once the user verifies the information is correct the information will be organized into a CSV file to facilitate data storage.



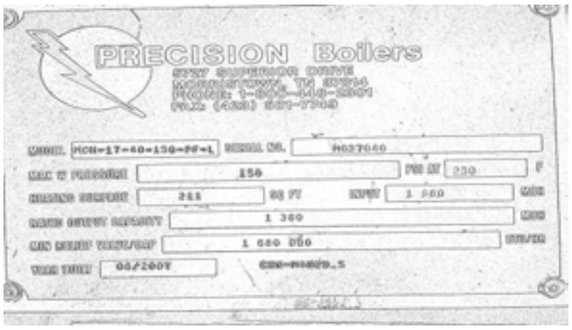
PRECISION Boilers
5727 SUPERIOR DRIVE
MORRISTOWN, TN 37814
PHONE: 1-800-448-2301
FAX: (423) 581-7749

MODEL HCH-17-40-150-PF-L SERIAL NO. [illegible]
MAX W PRESSURE 150 PSI AT [illegible] F
HEATING SURFACE 211 SQ FT INPUT [illegible] MBH
RATED OUTPUT CAPACITY 1 380 MBH
MIN RELIEF VALVE/CAP 1 880 000 BTU/HR
YEAR BUILT 08/2007



PRECISION Boilers
5727 SUPERIOR DRIVE
MORRISTOWN, TN 37814
PHONE: 1-800-448-2301
FAX: (423) 581-7749

MODEL CH-17-40-150-PF-L SERIAL NO. H037050
MAX W PRESSURE 150 PSI AT 250 F
HEATING SURFACE 211 SQ FT INPUT 1 600 MBH
RATED OUTPUT CAPACITY 1 380 MBH
MIN RELIEF VALVE/CAP 1 580 000 BTU/HR
YEAR BUILT 05/2007



PRECISION Boilers

MCH-17-40-150-PF-L H037040
156 250 F
211 SQ FT 1 600
1 380
1 640 000
08/2007 CRN-[illegible].5

From left to right: Agnieszka Kandybowicz, Kyle O'Neil, Vera Eleanor Castillo and Xinyu Wang

COMPUTER SCIENCE & ENGINEERING

TEAM: 32
SPONSOR: Team Members
FACULTY ADVISOR: Dr. Swapna Gokhale

Team Self Defined-
AI Evolutionary Algorithms

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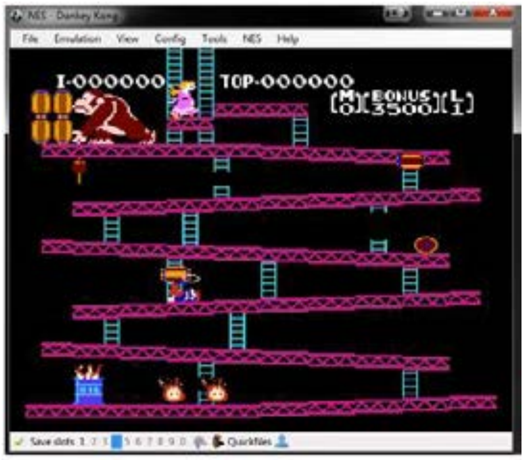
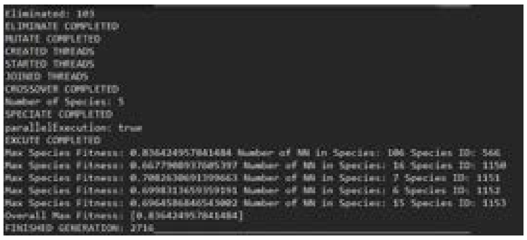
COMPUTER SCIENCE & ENGINEERING

Computer based artificial intelligence has been around for decades but the field has only recently managed to come into its own with a shift towards the implementation of machine learning and neural networks. Typically developing an artificial intelligence is an arduous process that once finished can only be applied to certain tasks within the limited scope of its initial design. Machine learning works on the concept that once a computer is given a task and a set of data it should be able to determine on its own the best method to success. This can be accomplished through the implementation and optimization of a neural network which is a mathematical model loosely based on its biological counterpart.

The methods of designing a machine learning artificial intelligence are as varied as their applications. Our project aims to use evolutionary algorithms and augmenting topologies (NEAT) to train neural networks to play the video game Donkey Kong as well as chess. This is significant as it will show that a single implementation of an artificial intelligence is capable of learning to play wildly different games. If applied further this approach could drastically cut the cost and time required to design artificial intelligence in video games. Additionally, video game artificial intelligence has traditionally been implemented through the use of state machines which often lead to unintelligence performance when players manage to exploit unhandled fringe cases. One of the key benefits of using neural networks is their capability to mimic a human's ability to intuit; therefore, a well-trained artificial intelligence has potential to be cleverer and more challenging as a result.


NES - Donkey Kong
File Emulation View Config Tools NES Help
I-000000 TOP-000000
BONUS L
3500 1
Save slots 1 2 3 4 5 6 7 8 9 0
Quickfiles



```
Eliminated: 103
ELIMINATE COMPLETED
MUTATE COMPLETED
CREATED THREADS
STARTED THREADS
JOINED THREADS
CROSSOVER COMPLETED
Number of Species: 5
SPECIATE COMPLETED
parallelExecution: true
EXCUTE COMPLETED
Max Species Fitness: 0.836424957041484 Number of NN in Species: 106 Species ID: 566
Max Species Fitness: 0.6677900937605397 Number of NN in Species: 16 Species ID: 1150
Max Species Fitness: 0.7082630691399663 Number of NN in Species: 7 Species ID: 1151
Max Species Fitness: 0.6998313659359191 Number of NN in Species: 6 Species ID: 1152
Max Species Fitness: 0.6964586846543002 Number of NN in Species: 55 Species ID: 1153
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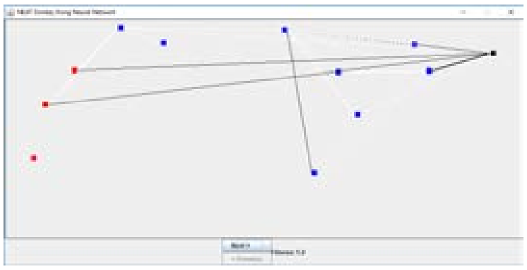


COMPUTER SCIENCE & ENGINEERING

TEAM: 33
SPONSOR: UCONN CSE Department
FACULTY ADVISOR: Dr. Dong-Guk Shin

From left to right: Daniel Marciniec, Daniel Caron, Patrick Cragan, Joseph Tonski, Steven Ferrucci

UCONN
SCHOOL OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING

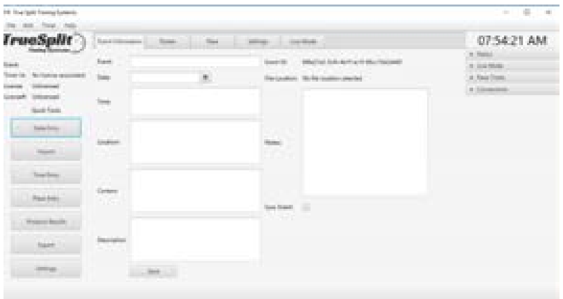
Fully Automated Timing System Using Radio Frequency Identification

Event timing has always been an extremely complex and technical process. Road running has become more and more popular, and race directors are looking for timing solutions that give their participants accurate results in a convenient manner while keeping costs low. Historically, large events would have to have a system custom built to handle the intricacies of their event. This can be very costly and requires race organizations and timers to have the technical expertise required to setup such a system.

We were tasked with creating a modular system that can be expanded to handle any size event while still providing all the features that participants have come to expect. Our solution is TrueSplit. TrueSplit combines an innovative approach to event timing with an automated web portal for participant information and results. This allows event coordinators and timers to quickly build a system that fits their races' needs right out of the box.

Once a race has begun, users will be able to see their results live on our TruRace platform. This is available on a mobile application and a web application. As participants complete the race or cross certain checkpoints their results are automatically pushed to our database. These applications can instantly read this information as it is posted, giving runners the opportunity to quickly and easily view their performance as the race progresses.

Backend servers were used to set up a connection between the timing software, decoders, and the website database. The server runs on its own definition library and communicates with our database. When a chip passes through a designated checkpoint, the table will be updated with the time of the corresponding chip identification number. The server runs its own message handler to take care of various protocols, such as updating times on the website page. The server is the main component that links together the timing software and the website together. This is what allows for automation and saves time and effort for users



Water resistant foam backed RFID tag is placed on the back of each participants bib

Antennas above or to the side of the course get connected to the RFID decoder that reads the tags