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06. Computer Science

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Abstracts from the 2015 Oklahoma Research Day

Held at Northeastern State University

05. Mathematics and Science

06. Computer Science

05.06.01 Inventory Database

Patrick, Harrington *Northeastern State University*

Salim, Hassan *Northeastern State University*

In order for a business to survive and grow, they have to be able to record and maintain their stock and inventory. Not being able to do so would result in poor customer service and ultimately, the failing of the business. The best and most efficient way to manage inventory and stock, especially as the business grows, is through a database. The purpose of this project is to provide a means of storing and managing the inventory and stock a business would need and use. The database would also need to be able to grow in order to accommodate the growth of the business.

05.06.02 Management Software for Preschools & Childcare Facilities

Bobby, Goines *Northeastern State University*

Patrick, Harrington *Northeastern State University*

Preschool and childcare facilities are required to maintain safe practices within their buildings based on standards established by the Oklahoma Department of Human Services (OKDHS). The use of software can help reduce the amount of paperwork involved to insure these safety standards. At the time of this project, there was no software designed to coordinate childcare providers and OKDHS in order to manage the requirements. The purpose of this project is to provide a means of storing the information required by OKDHS from childcare facilities in a database and create the necessary reports based on the stored information.

05.06.03 The State and Visitor Design Patterns in a Java Game Application

Debra,Hogue *University of Central Oklahoma*

This project takes an existing Java game application from the Spring 2014 Object Oriented Programming class and refactors it with the State and Visitor behavioral design patterns. The game, Go Corgi Go, is a one player, 2D game where the goal is to collect as many squirrels and dog biscuits while avoiding the constantly moving acorns which cause damage to the player's sprite, a corgi. The objective of refactoring is to practice using these two design patterns with the goal of understanding the how and when to use them. The State pattern encapsulates an object's routines based upon its state. Using the State pattern for the spawning, movement, damage, healing and death of the player and squirrel sprites improved the playability of the game. This was due to the polymorphic abilities that take place from using the State pattern. The Visitor pattern abstracts the functionality. This pattern was used for the player's Life count, the overall score, and kept track of the number of squirrels, acorns and biscuits on the screen. The advantage to using this pattern is when performing the check collisions operation, it is performed using a visit class without having to change the source. Utilizing both design patterns cleans up the readability, allows for easy modification and efficient troubleshooting. Both design patterns allow the addition of new functions without changing the classes themselves. This eliminates the occurrence of buggy code due to the classes being

05.06.04 Kingdom Saga

Debra,Hogue *University of Central Oklahoma*

Shira,Zachery *University of Central Oklahoma*

The popularity of mobile gaming has increased in the recent years due to the advancement of mobile device technology. Therefore it felt necessary to follow suit by developing a game for mobile devices. Kingdom Saga was developed for the Android operating system using Eclipse with the Android Software Developing Kit. This game ties the interactive story of an RPG, role-playing game, game application with four mini-games: Tic-Tac-Toe, Blackjack, Memory, and Galaga. Each of these four mini-games offer an unlockable "design pattern" which will aid the player with defeating the final boss in the RPG part of the game. This project demonstrates the creation of an Android game application with the use of the Java programming language.

05.06.05 (Unnamed)

Laura,Asaro *East Central University*

In order to place advertisements relevant to the content of the web pages on which they appear, a text classification process must be executed. This process is burdened by the fact that a person has to observe a web page and manually label it to create training data for the machine. Because there are millions of pages companies want to place ads on, categorizing those pages is both time consuming and expensive, especially when it needs to be done over tens of languages. This task could be made more efficient using machine translation (MT). Our team approaches this problem by automating the process of text classification for foreign-language articles by using machine-translated texts to train a classifier. We experiment with English, Spanish, German, and French articles under several of the Wikipedia Main Topic Classification categories. Training samples for foreign-language articles are built by translating Wikipedia articles from the chosen categories in English to the target languages (Spanish, German, and French) via the Google Translate API. Using Wikipedia's pre-existing classification, a binary classifier is built. In a similar fashion, we also built a binary classifier using native written target language articles. We then examine the effectiveness of MT training versus native language training and investigate the benefits and limitations of our MT model.

05.06.06 (Unnamed)

Akinola,Akinlawon *Cameron University*

Ioannis,Argyros *Cameron University*

We introduce a special class of real recurrent polynomials f_n ($n \geq 1$) of degree n with real coefficients. Then, as the first application, we find sufficient conditions under which each polynomial f_n has a unique positive root s_n such that $s_{n+1} \leq s_n$ ($n \geq 1$). The first root s_1 , as well as the last one denoted by s_n belonging in $(s^\infty, s_1]$ ($n \geq 1$). In the second application, we use this technique on Newton's method and show that the famous Newton-Kantorovich condition for solving equations can always be replaced by a weaker one.

05.06.07 Preventing Pressure Ulcers by Using Accelerometer, Voice-to-Text, Speech Recognition and Cloud Data Technology

Jicheng,Fu *University of Central Oklahoma*

Steven,Chambers *University of Central Oklahoma*

Pressure ulcers impose a serious threat to power wheelchair users. In order to prevent pressure ulcers, one must ensure to adjust his/her position in the wheelchair regularly. Remembering to do so can be difficult, but smartphones can provide a tremendous advantage in reminding a power wheelchair user of making these scheduled adjustments. In addition, the majority of the wheelchairs do not provide the mechanism to measure wheelchair tilt or recline angles. By using the smartphones accelerometer and voice to text technology, the users' tilt and recline angles are monitored in order to provide the user with real-time guidance to keep with a specific tilt and recline angle adjustment schedule. Accessibility in such an application is of utmost importance. In order to provide maximum ease of use, speech recognition technology is employed in order to allow the handicapped user to interact with the application primarily with voice commands. The application also takes the advantage of mobile data networks (either cellular or WIFI) to transmit the tilt and recline angle data to the cloud for storage and subsequent analysis.

05.06.08 Improving Game Systems Design Through the Use of Object Oriented Design Patterns

Hong,Sung *University of Central Oklahoma*

Joel,Darling *University of Central Oklahoma*

Developing a video game is a complex undertaking which requires tens of thousands of lines of code, with each block requiring extensive unit testing and at times refactoring in order to create a sufficiently complex game. The use of design patterns can simplify this process, giving developers a system by which they can compartmentalize and map-out this process. Four design patterns are used in facilitating the development of a small 2d video game. These patterns are: 1) State Pattern – For use in the implementation of the player animation and game states. 2) Observer Pattern – For use in detecting game events such as item collection as well as collision. 3) Visitor Pattern – For use in collision detection, updating and rendering objects to the level. 4) Command Pattern – For use in programming the response of user input. To test the implementation of these patterns and their usefulness, A game was refactored which was previously created using three other design patterns to facilitate rapid prototyping. While implementing the above 4 patterns, it was discovered that there are situations where implementing design patterns on what seems to be a similar problem results in adding unnecessary time or space complexity to the program. Two of these examples are covered as well as suggested implementations of both of these examples.

05.06.09 BIOINFORMATICS OF AMYLOID PRECURSOR PROTEIN (APP) IN DEMENTIA

Kellyn,Pollard *Langston University*

Sharon,Lewis *Langston University*

During my senior thesis, I decided to select a gene that was previously implicated in susceptibility to dementia. I chose to use bioinformatics to investigate and visualize the Amyloid Precursor Protein, which has the gene symbol of app. Amyloid Precursor Protein (app) mutations are suspected to occur in individuals with dementia. Looking to expand the knowledge of mental and emotional disorders, an investigation of dementia was performed. Dementia is a syndrome that involves a significant loss of cognitive abilities such as attention, memory, language, logical reasoning, and problem-solving with various extensions into other cognitive and chronic diseases (WebMd.com). The objective of this research is to use bioinformatics to investigate and visualize the app gene mutation in dementia and show the correlation and susceptibility of developing dementia with a mutation of this gene.

Bioinformatics began to surface in the mid to late 1970s and 1980s, and is the science of gathering and analyzing intricate biological data such as genetic codes using computers and statistical techniques. Bioinformatics includes multiple disciplines working simultaneously to extract meaningful knowledge from large biological datasets which are generated from high-throughput technologies such as arrays, mass spectrometers, and meta-sequencing techniques (Hodgman, T. C.).

05.06.10 Development of a Smartphone App to Collect Maneuvering Data from Pediatric Wheelchairs

Jicheng,Fu *University of Central Oklahoma*

Melicent,King *University of Central Oklahoma*

The analysis of wheelchair maneuvering data is a critical problem that requires greater understanding, and calls for innovation to benefit users of pediatric wheelchairs in particular. While adult wheelchair models can be fitted with a variety of data collection devices, pediatric wheelchairs are often too small to accommodate the hardware. This project proposes to develop a mobile/cloud computing platform to collect and analyze movement data from pediatric wheelchairs using cutting-edge machine learning techniques. Data will be collected using an Android application installed on the user's smartphone, eliminating the need to purchase and install dedicated hardware. This application will automatically upload data to the cloud, where it will be stored and processed via the Google App Engine platform. There, advanced machine learning algorithms will be used to draw conclusions about the distance and type of driving maneuvers made by the user, thus reducing the risk of secondary impairments in the development of social, cognitive, and motor skills.

05.06.11 A Novel Google Glass Application to Guide Wheelchair Users in Achieving Effective Tilt and Recline Usage to Reduce Risk of Pressure Ulcers

Jicheng,Fu *University of Central Oklahoma*

Melicent,King *University of Central Oklahoma*

Individuals with disabilities often benefit from the use of power wheelchairs to improve their mobility and quality of life. However, prolonged sitting associated with wheelchair use has been shown to cause pressure ulcers, which can be painful, expensive to treat, and even fatal. To reduce this risk, clinicians recommend adjusting the wheelchair's tilt (the angle between seat and floor) and recline (the angle between seat and back). Unfortunately, power wheelchairs are rarely equipped with hardware to measure tilt and recline. Users rely on their own proprioception when making these adjustments, and thus they often fail to achieve a dramatic enough adjustment to reduce the risk of developing pressure ulcers. This project proposes to employ the cutting-edge Google Glass technology to address these problems. We are developing an application to guide the wheelchair user in adjusting tilt and recline while providing immediate feedback. The application will use advanced algorithms along with sensors in the Google Glass to precisely measure tilt and recline. Data regarding usage will be collected by Google Glass and transmitted to the cloud for storage and processing via the Google App Engine platform. There, the data will be analyzed using state-of-the-art machine learning techniques to provide a clear picture of tilt and recline usage to users and healthcare providers. This application will provide an immediate benefit to both wheelchair users and the research community.

05.06.12 Battling Stickman – An Android Act Game using AndEngine

Hong,Sung *University of Central Oklahoma*

Wenxi,Zeng *University of Central Oklahoma*

Game engines that provide reusable components are widely used for rapid game development. In the Android platform, AndEngine is one of the most popular 2D game engines. In this project, an action game is developed using AndEngine. The main characters in this game are stickmen, and the UI of the game uses hand-painted style. Similar to most action games, the player can manipulate a controllable character to fight with enemies by using keyboard. AndEngine provides easy collision detection when attacking happens between the player and other game figures. In order to enhance combat experiences, two attacking methods are designed, a normal hit and a continuous hit. The normal hit happens each time when the attack button is pressed and released within a short duration. However, when the attack button is kept pressing without interrupt, the continuous hit is triggered. The player's weapon and moves change over time, and the score increases exponentially during the continuous hit period. In summary, using AndEngine's powerful physical engine and rendering mechanism, an action game with some complexity can be rapidly implemented and this project demonstrates it.

05.06.13 Using Gaming Technologies to Develop a Research and Training Simulation System for Young Children with Severe Motor Impairments

Cole,Garien *University of Central Oklahoma*

Jicheng,Fu *University of Central Oklahoma*

Young children with severe motor impairments face a higher risk of secondary impairments in the development of social, cognitive, and motor skills owing to their lack of independent mobility. Electric wheelchairs are a great tool to provide independent mobility and reduce the risk of secondary impairments for these children. However, the steep learning curve, safety concerns, and high cost may prevent young children from using pediatric wheelchairs at an early age. In this research, we are using gaming technologies to develop a 3D wheelchair simulation system, which allows children aged at 2 to 5 years to hone the key skills required to safely control a joystick-operated wheelchair. The use of gaming technologies allows us to mimic the physics of real wheelchairs so that the collected data will be useful and relevant. The simulation system has three modes of operation; manual, automatic, and shared modes. The automatic and shared modes utilize cutting-edge artificial intelligence techniques to assist the children with smooth and safe maneuvering. In the meantime, we also gather statistics about how the user moves through the environment to help us monitor a child's progress and show areas where the child needs improvement. In summary, our research system will overcome the limitations that are associated with real electric wheelchairs by providing a safe, affordable, and fun gaming environment to train young children and test various artificial intelligence algorithms.

05.06.14 Student Academic Advisement Appointment System

Faez,Chishti *University of Central Oklahoma*

This system allows students to sign up online for faculty advisement through a registration process. Students are required to create an account and an academic profile in order to proceed towards appointment sign up. The registration process consists of collecting students' information about their majors, the courses that they took in the past semesters and the courses they plan to take in the upcoming semester along with the grades that they achieved in the past courses. Once registered, student can see and edit their information in the profile section of the web site. They can also view the available time slots for appointment of the advisor and can sign up for one. The administrative area of the application allows faculty member to review the information of the students that have signed up for an appointment and can also add, edit or delete student profiles and their available time slots. This system is implemented using ASP.NET MVC 5 with MySql database. Drag and drop technology is immensely used to provide a rich user interface by utilizing the new advancements of HTML 5. This system ultimately provides an easy and fast way for academic advisors and students to communicate with each other and set appointments without having to visit a physical office.

05.06.15 An Experimental Study for Evaluating the Accuracy of a Smartphone App

Jicheng,Fu *University of Central Oklahoma*

Yuxuan,Wang *University of Central Oklahoma*

We have developed a smartphone app for measuring wheelchair tilt and recline angles. In this study, we attempt to compare the measurement precision of the smartphone app against a commercial angle gauge (Wixey, WR300). The smartphone and the angle gauge were placed side by side on the armrest of the wheelchair. The tilt angle of the wheelchair was adjusted by 5 degrees a time from 0 degree to 45 degrees. We repeated the experiment for 11 times to ensure the fairness of the comparison. Experimental results show that angle differences only occurred in the range of 30 to 45 degrees. The difference is no more than 1 degree on average. We also analyzed the experimental data with SPSS, which showed the difference of measurement results between the smartphone and angle gauge was not significant ($p > 0.05$) Therefore, we can conclude that our smartphone app offers high measurement precision that is comparable to the commercial angle gauge.

05.06.16 (Unnamed)

Gang,Qian *University of Central Oklahoma*

Stan,Gravchikov *University of Central Oklahoma*

This presentation introduces our implementation of a user authentication subsystem in an Android mobile application. The user authentication subsystem was used to identify the user of an Android app when it communicates with the Web and database servers. We cover the use of data encryption/decryption along with signature verification for Android app development. We also discuss Android storage mechanisms that support data storage and security.

05.06.17 VEHICLE TRACKING VIA MOBILE APPS

Amy,Apon *Clemson University*

Chris,Gropp *Clemson University*

Lycinda,Freeman *Clemson University*

Mary,Phillips *Southwestern Oklahoma State University*

Mei,Liang *Clemson University*

The Department of Transportation wants to establish an “Intelligent Transportation System” (ITS), where the vehicles and the road itself know where all vehicles are. The ITS has many advantages for both safety and convenience including reports of traffic accidents as well as road repairs. Data collection will be accomplished using an application programmed to collect GPS data in a fun manner for the user. It is the task of the researchers to create this application.

05.06.18 A New KNN Distance Metric for the Classification of Power Wheelchair Maneuvering Data

Jicheng,Fu *University of Central Oklahoma*

Tao,Liu *University of Central Oklahoma*

Smartphones are convenient and easy to use for monitoring wheelchair user's daily activities and collecting the maneuvering data, which can quantify their physical activities and motivate to improve the quality of life. In our previous study, the k-nearest-neighbor (KNN) algorithm was applied to analyze data, which often yields competitive classification results despite its simplicity. However, due to the variety in design, different smart phones may generate different readings even for the same driving trajectory, and the unpredictable background noise may also impact the accuracy, hence, KNN with traditional Euclidean distance metric is not able to yield satisfying classification accuracy. To overcome these challenges, we focus on the acceleration and calculate on each 10-element data section to present a 7-tuple set as a vector for KNN distance metric which takes into account: the number of positive values, the accumulated positive value, the number of positive values greater than a threshold, the number of zero values, the number of negative values, the accumulated negative value and the number of negative values less than a threshold. Then KNN is applied on this new distance metric, i.e., the 7-tuple vector. The experiment results showed that significantly higher accuracy in the classification of wheelchair maneuvers (i.e., stationery and moving) was achieved by employing this new distance metric than by using the original approach.

05.06.19 A Complementary Training Method for Young Children with Severe Motor Impairments with LEGO Robots

Cole,Garien *University of Central Oklahoma*

Jicheng,Fu *University of Central Oklahoma*

Wenxi,Zeng *University of Central Oklahoma*

Wheelchair simulation systems have been used for children with severe motor impairments to avoid the high price and steep learning curve associated with pediatric wheelchairs. However, the limited cognitive ability may prevent young children from using such simulation systems effectively. Thus, we propose to use a wirelessly controlled LEGO robot to complement existing simulation systems. The use of LEGO robots is not only safe and affordable, but it also allows us to easily create appropriate training environments, such as strictly forward movement, navigating in narrow corridors, locating objects, etc. By applying advanced control mechanisms, the robot is able to return to its starting location when a mission completes, as well as to stop in front of a detected obstacle. The manipulation of the robot is monitored by a scoring system. In other words, children have to practice repeatedly in one stage until they achieve the stage's preset goal. Moreover, a with-infrared-beacon-robot will be built as a tour guide to interact with the child and his/her robot. In summary, the LEGO robots will enrich existing training approaches by providing an affordable and entertaining way to enhance young children's wheelchair maneuvering skills.

05.06.20 Studying the Impact of Smartphone Sensor Sampling Rates on Battery Power Consumption

Chuanwei,Chen *University of Central Oklahoma*

Jicheng,Fu *University of Central Oklahoma*

Wenxi,Zeng *University of Central Oklahoma*

Smartphones with built-in sensors have been widely used to collect data in biomedical research. As the use of sensors consumes significant power, the battery life has become a major barrier to use it in a practical manner. Sampling rates, as a primary configurable parameter, are directly related to the smartphone sensors. The goal of this study is to investigate the impact of the sampling rate on battery power consumption. In order to accomplish our purpose, an application has been developed and deployed in a Google Nexus 5 smartphone. All of the four predefined sensor sampling modes were tested in our experiments. To ensure the fairness of comparisons among different sampling modes, the smartphone was fully charged before the experiments. Every trial lasted for 120 minutes. The battery percentage and voltage were recorded into a file every 10 minutes. Experimental results show that the mode with higher sampling rate consumed significantly more battery power. To the best of our knowledge, this is the first study investigating how sensor sampling rate impacts battery power consumption. Our experimental results may generate immediate benefits to other research projects, in which smartphones are used to collect data.

05.06.21 Climb the Beanstalk: a simple touch-based mobile game

Renan,Kuba *University of Central Oklahoma*

In this project, a simple touch-based game called Climb the Beanstalk is developed for Android-based mobile devices. The storyline of the game is borrowed from Jack And The Beanstalk fairy tale. The player taps on the screen to climb the beanstalk. The objective of the game is to climb as high as possible by avoiding the beans that appear randomly to block the climb path. At the same time, the objective is to climb up as fast as possible under the given time constraints. This game was developed using object oriented programming paradigm. Classes are defined to represent all the game figures including the player, enemies, beans, and other items. Without using sophisticated libraries to build animation and scenarios, this project provides players with fun interactions and live colors in graphics.

05.06.22 Malware in the Retail Industry

Steven,Anderson *University of Tulsa*

In recent years there have been multiple large-scale data breaches that involved the leaking of credit card and other personal information. The majority of these data breaches were caused by malware infecting Point of Sale (POS) machines. After the malware infects a POS machine, it attempts to spread to other POS machines on the network. It then continually scrapes the computers RAM (memory), looking for credit card information. When a credit card is swiped, the data is stored in the RAM, found by the malware, and submitted by the malware to a command & control (C&C) server. Once there, the person responsible for the malware gains access to it. This poster uses the Home Depot data breach to represent research performed into BlackPOS, its technical aspects, and the prevention of its use.

05.06.23 An Introduction to STIX with Examples

Ryan,McCarthy *University of Tulsa*

Structured Threat Information Expression (STIX) is a standard developed by Mitre that is being backed by the Department of Homeland Security (DHS). STIX aims to standardize the way companies and governments share indicators of compromise so we can better protect computers across the world. STIX attempts to achieve this goal by defining a standardized language to represent cyber threat information. Standardizing the threat indicators allows for computers to become much more automated in how they handle and use these indicators. Computers can work with data much more efficiently than humans can and this allows them to ingest and act on information much quicker than humans ever could. This makes it possible to share and use indicators around the world in near real-time. The advantages and attributes of STIX will be demonstrated while analyzing a sample of malware to see how STIX conveys an in-depth knowledge of attacks and targets.

05.06.24 A 256-bit AVX2-based C/C++ Library for the Smith-Waterman Algorithm

FNU "Ray",Renaldi *University of Central Oklahoma*

Gang,Qian *University of Central Oklahoma*

The Smith-Waterman algorithm (SWA) is the standard approach to producing the optimal local alignment between two biological sequences. The striped Smith-Waterman algorithm is an effective algorithm that improves the efficiency of SWA by properly utilizing the parallel SIMD commands provided by modern processors. This presentation introduces a 256-bit Intel avx2-based library that implements the striped SWA. Our implementation is derived from an existing C/C++ library developed by Mengyao Zhao, et al. While the original library is based on Intel's 128-bit SSE SIMD instructions, we use the newer 256-bit avx2 instruction set. Our experimental results show that our implementation achieved an average increase of 25% in the alignment speed over the original library. We have also analyzed the bottleneck of the striped SWA, which prevents us from achieving a 100% performance improvement.

05.06.25 Mobile Work Orders

Colten,Boston *Northeastern State University*

Rad,Alrifai *Northeastern State University*

Most work places use Work Orders to record, track and prioritize service requests. This mobile application allows for very simple, but powerful, tracking of work orders found in many business environments where employees can use their android smartphone for this purpose. This application was developed using the Android SDK within the Eclipse IDE to program the app in Java and XML.

05.06.26 Mathis Electronic Store

Rad,Alrifai *Northeastern State University*

Tyler,Mathis *Northeastern State University*

This website lets customers check a store's inventory online to see if it sells the item(s) they're looking for. The store hosts a database that holds a list of its inventory, registered users, and orders to be processed. The store can add and remove inventory as they see fit, as well as, edit the details of an item and list if it is available. The customer can access the site, add any items they want to their cart, and purchase them online. When the customer pays for their items, an order form is created listing the bought items. This project was developed in C#, HTML and SQL Server 2012.

05.06.27 Auction Clerking System

Justin,Crozier *Northeastern State University*

Rad,Alrifai *Northeastern State University*

This project aims to recreate the clerking system for auction houses by using a modern programming language and modern graphical user interface. The auction clerking system is used to manage information needed to run an auction. It tracks information about buyers, sellers, and items being sold. The application performs all necessary calculations and generates receipts for buyers and sellers. This application was developed in C# programming language and Microsoft Access 2013 for database storage.

05.06.28 Auto Attendance App for Android

Matthew,Stewart *Northeastern State University*

Rad,Alrifai *Northeastern State University*

Many instructors like to monitor classroom attendance, and many students come to the classroom carrying with them mobile phones or tablets. This app allows students to record their attendance. Thus, it provides an easy solution for instructors to track attendance while preserving class time from being wasted on roll calling. Instructors can login to the system to manage classes and students information to view and report on attendance history. This project is developed in Eclipse IDE with the android ADT plug-in and android 4.2 SDK. It was coded in java, XML, and SQLite.

05.06.29 Critter Emporium: An online pet store

Jackie,Searcy *Northeastern State University*

Rad,Alrifai *Northeastern State University*

Critter Emporium is an online pet store with responsive user-friendly interface that allows a user to browse pet products. This project provided an introduction to designing a website. It serves as an overall model of the general construction of websites. The application uses HTML5 and CSS to create a user-friendly interface that is visually appealing. C# sets up and allows for LINQ to query the database.

05.06.30 Shellcode for Buffer Overflow Attacks

Cole, Penning *University of Central Oklahoma*

A shellcode is a short segment of code that is used as a payload for software exploitation. Programs written in C++ or C languages are specifically vulnerable if they do not automatically check boundaries when information is inserted into buffers, or arrays. This is a critical problem because inserting more information than expected can overwrite other parts of the memory. For instance, using shellcode as a payload of buffer overflow exploits, an attacker overwrites the return address of a currently active function so that the shellcode is executed to spawn a root shell rather than the program's intended execution path. This work presents what hackers should consider to create a shellcode that exploits a buffer overflow vulnerability in a C or C++ program. To be specific, my research includes bypassing security measures such as ASLR and Canaries, creating position-independent and Null-free code, and encoding shellcode to go undetected. I will demonstrate buffer overflow attacks, shellcode writing techniques, and ways attackers can thwart system security measures. My future research plan is to study how shellcode is used in writing viruses and malware.

05.06.31 Gamifying Discreet Math With Programming

Douglas, Schlumbohm *Cameron University*

Han, Xiong *Cameron University*

Gaming environments have been used to teach mathematical topics such as addition and division in a fun manner. This is called "gamification" However, when it comes to college level mathematical concepts such as the use of the quadratic formula, there are very few software that explain these concepts in a fun, or gamified way. We are currently developing a video game using the Unity 4 developing environment to teach the subject of sets from the study of discreet math in a fun way thus gamifying the subject. We are taking 3d models, 2d sprites, and animations that our multimedia teammates have created and are breathing life into them using the c# programming language. We are using these c# scripts to move these models, perform calculations, and display the results of players' interactions with the game. Through playing this game that is powered by c# coding, players will actually have fun while learning the concepts of the intersection and union of sets.

05.06.32 Gaining HTC Resources in an Indifferent Environment

Alanna,Riederer *University of Central Oklahoma*

Bradley,Paynter *University of Central Oklahoma*

Cory,Beadle *University of Central Oklahoma*

Jake,Burdine *University of Central Oklahoma*

Jordan,Michela *University of Central Oklahoma*

Robert,Smith *University of Central Oklahoma*

There are many researchers across the country working at primarily teaching universities. These researchers usually have limited access to high-performance computing (HPC) resources. In these cases, high-throughput computing (HTC) solutions such as HTCondor are attractive as they require significantly less infrastructure cost. Unfortunately, implementation of this resource can meet major resistance from university IT departments worried about the cluster increasing their workload, and from users worried about the impact on their ability to use their desktop computers. In this poster we present a solution using virtual machines that shows promise in providing HTC resources in a way that minimizes IT maintenance needs and user impact.

05.06.33 Mobile Device Analysis Corpus

Mike,Morrison *Southwestern Oklahoma State University*

There is an exponential amount of mobile devices released to the public every month. For a Digital Forensic Examiner, it is their profession to be a subject matter expert on these mobile devices and to thoroughly understand how they operate. The researchers goal was to assemble and analyze a digital forensic library consisting of approximately 50,000 mobile devices.

05.06.34 Web-based Database Inventory Project: for the Information Technology Department of A Local Hospital in Lawton, OK.

Demilade,Adenuga *Cameron University*

05.06.35 Country Comparisons of Proven Energy Reserve Utilization

Myung Ah,Park *University of Central Oklahoma*

Service learning in higher education aims at educating students as a life-long responsible citizen. It has been shown in the literature that service learning can make positive impacts on students in various ways. However, there is a little work that has been done in security education to provide a service learning experience for students. In the last two years, the author has attempted to incorporate a service learning component into security education through course assignments and research experiences for undergraduates. Specifically, the research experiences were intended to address gender inequity issue in information security field. The beneficiary of the services has been the Office of Information Technology of the university the author is affiliated with. The details of how this work has been conducted will be presented.