Session 1 – 10:15 – 11:35 a.m.

1A ~ Bolin 100

Quicksort in Parallel: An Analysis of Multiprocessor Quicksort

Braden Harrelson, Kevin Ellis, Ryan Luig
Dr. Eduardo Colmenares, MSU

Sorting datasets is a common & important task computers handle on a regular basis. In the modern era, datasets have become extremely large & the speed of standard algorithms is often too slow. Quicksort is generally regarded as the fastest sorting algorithm. It does sorting in place using less memory, which is important when sorting large datasets. In this study, we tested a parallel approach to Quicksort using MPI on Turing, MSU's distributed memory system. This presentation will discuss the results of the parallel algorithm using speedup & efficiency as metrics to determine how well the algorithm performed.

Quantum Computing: "The Quest For Tomorrow"

Brett Pitts, Dikshant Wagle
Dr Jawad, Cameron University

Quantum theory has made a debut in the field of computation. With classical computers not being efficient enough to perform powerful calculations like factorization, quantum computing can theoretically be used. It became popular in the early to mid-80s by P. Benioff, Y. Manin, R. Feynman, & D. Deutsch. Quantum computing uses the concept of the qubit. Quantum entanglement called "Spooky action at a distance," by Einstein, allows for quantum teleportation. In this presentation, we describe basic concepts, present important algorithms (Shor, Childs, Grover), describe quantum teleportation, & identify challenges faced in making quantum computing commercially viable.

Oculus Rift & OpenGL: The Past, Present, and Future of VR

Christopher Silva
Dr. Ranette Halverson, Prof. Richard Simpson, MSU

Though there were many attempts at Virtual Reality (VR) throughout the 1900s, none of them were able to achieve their goal of simulating realistic virtual environments. Improvements in the capabilities of hardware & software have allowed VR devices such as the Oculus Rift & HTC Vive to become viable for consumer & industrial usage. This presentation will cover the history of VR & the graphics API OpenGL, what was lacking in previous VR attempts, what has changed, & what the future of VR looks like. It will also present usage of the Oculus Rift & OpenGL to create a virtual museum environment.

Drones And Their Applications

Sudip Timsina, Claiborne Pherigo
Dr. Dr. Jawad Drissi, Cameron University

A drone, also known as unmanned aerial vehicle (UAV), is an aircraft without a human pilot aboard. They come in different shapes, sizes & serve different purposes. The flight of a drone can operate under remote control or automatically by onboard computers. The wide use of UAV's started in the early 1900s & initially focused on military activities. It was used in various forms in World War II & the Vietnam War. Since then, the use of drones has expanded to fields such as architecture & construction, delivery, engineering, environmental monitoring & conservation, media coverage & others. This presentation discusses various topics. First, the navigation & control technology embedded in a recently commercialized UAV. Second, UAVs used as nodes for delay-tolerant networks. Third, use of drones in agriculture & archaeology as examples of real world scenarios.

1-B B ~ Bolin 127

Multi-Chain Continuous Variable Transmission

Enaho Atemenwan, Abdullah Albakhurji, Garret Clampitt, Jaylen Love, Hannah Selzer, Matthew Stanley

Dr. Salim Azzouz, MSU

The project's purpose is to design a new chain-based Continuously Variable Transmission (CVT) for wind turbines to maintain a constant generator output speed upholding the mandatory electricity grid frequency of 60 Hz. The proposed design should raise the efficiency of future wind turbines. SolidWorks drawing & simulation SW is used to draw transmission parts & assembly. The transmission involves expandable sprockets, cam plates, & multi-chains. Kinematic theory & equilibrium equations are used to determine displacement, velocity, acceleration parameters of the system. Chain & probabilistic theories are used to calculate the CVT chain ratios. Chain theory is applied to dimension the chain length & its components. The results include expressions of velocities, power harvested by the wind turbine & electric energy output by the generator.

Making The Cyber World More Secure With Neural Networks

Johnny Tran

Dr. Ranette Halverson, MSU

A study from the Ponemon Institute shows that cybercrime has grown by 19% in the last year & is continuing to grow daily. We need a reliable form of cybersecurity to protect our privacy & information. One possible solution is using neural networks to create security software that learns to better identify malicious attacks. Neural networks aim to work like the human brain by having several thousand artificial neurons process information to identify patterns. This presentation will discuss how neural networks can improve cybersecurity & create software that will continuously evolve to better detect & prevent malicious attacks.

Heat Transfer Technology To Convert Plastic Trash To Oil

Cody Chancellor, Cameron Duckworth, Okan La Fleur, Zhiqi Mao, Reuben Denwe

Dr. Mahmoud Elsharafi, Dr. Salim Azzouz, Dr. Sheldon Wang, MSU

Plastic waste is a serious environmental issue. The inability of most plastics to naturally decompose quickly causes concern. One way to combat the issue is repurposing of the material. Plastic can be converted back into oil & gas. To do this, a steel reactor was filled with plastic & heated to the plastic's pyrolysis point. The resulting vapor is recondensed in a heat exchanger & the condensate collected. The results show a correlation between plastic type & resulting byproduct composition. Faster heating rates, larger plastic particle size, & higher temperatures should increase gaseous products.

Radix-2 Fast Fourier Transforms: Sequential vs. Parallel vs. Massively Parallel Implementations

Andrew McKissick, Christian Norfleet, Benjamin Shelton

Dr. Eduardo Colmenares, MSU

Discrete Fourier Transforms are a widely used scientific kernel. As an embarrassingly parallel problem, they scale very well with the addition of more cores. Fast Fourier Transforms are algorithms which reduce the N2 complexity of a naïve DFT algorithm to Nlog(N). The Radix-2 FFT algorithm is the most commonly used due to its speed & simplicity. This presentation discusses the implementation of the Radix-2 FFT algorithm in C, MPI, & CUDA & compares the advantages of calculating Fast Fourier Transforms on multiple CPU or GPU cores versus a single CPU core for varying data sizes & numbers of cores.

1-C C ~ Bolin 320

Blue Eyes Technology

Christopher Gborgli

Dr. Ranette Halverson, MSU

Imagine a beautiful world in which humans collaborate with computers without speaking or touching them. Without a doubt, someday computers will be powerful enough to do this if they have a small fraction of the perpetual ability of humans. IBMs Blue Eyes technology aims to create computational machines with perpetual & sensory ability like those of human beings. It uses unobtrusive sensing methods, employing modern video cameras & microphones to identify the users' mood, condition & behavior. This presentation discusses early development of IBMs Blue Eye technology, overview of the architecture, implementations, & future

applications.

Development Of A Muon Tomography Imaging System

Romeo Botelua, Trevor Criddle, Xin Hu, Chase Meyer, Michael Olaya
Dr. Yu Guo, MSU

The design & development of muon tomography system is used for noninvasive imaging of previously inaccessible objects such as volcanoes, pyramids, underground pipes & infrastructure, nuclear reactors, & more. A single detector was built to employ a plastic scintillator as a detection medium, a silicon photomultiplier for light collection, & utilizes several electronic circuits & an Arduino microcontroller to analyze generated signals. The detector operated according to design specifications, detecting accurate muon counts. Future work involves networking individual detectors into a muon tomography array system capable of detailed imaging & developing a Compton scattering volumetric algorithm.

A Genetic Algorithms DNA Comparison For Many-core Architectures

Krishna Saka
Dr. Eduardo Colmenares, MSU

The purpose of this project is DNA comparison. In one person, these molecules are billions in range. In the same fashion, we have billions of people in the world. To compare a person's DNA against millions of other persons translates into a massive amount of data. To analyze such information, we need hardware with computational intensive capabilities. In this research, we exploit the massive parallelism of GPUs. We compare a parallel solution against sequential. Binary genomes are generated for one generation. The second generation is created using the N-point Cross Over Mutation technique, then finds the number of matches for DNA molecules, percentage match of DNA, & the fittest person.

Two Hands No Tie Down Drill Circuit

Daniel Carroll, Joshua Otterpohl, Mouhammed Balghonaim , Morgan Herrera, Jared Sharp, Qudus Sanni
Midwestern State University
Dr. Jan Brink, MSU

The engineer has an ethical & professional responsibility to consider safety in their designs. The purpose of the pneumatic 2 hands no tie down drilling application is to make the drilling operation of parts safe. A 2 hands no tie down safety circuit requires the continuous depression of 2 push buttons simultaneously so the drilling operation may take place. The design of the electrical control circuit in conjunction with the pneumatic circuit prevents the circuit from operating if one of the buttons is tied down. The team is in the process of building the entire drilling apparatus.

1-D D ~ Bolin
312

Remote Embedded Systems Lab (RESL)

Johnathan Auringer, Fernando Mosquera, Peter Ogunrinde
Dr. Robin J Pottathuparambil, University of North Texas

The Remote Embedded Systems Lab (RESL) is a development environment for embedded systems. The lab is remotely accessible through web browser, & allows users to upload compiled code to an embedded systems board & monitor the board's outputs by camera, microphone, & serial port. It includes hardware capable of interacting with the target board to activate sensors & buttons through the web interface. This includes relays, Peltier modules, & LEDs, to manipulate buttons, temperature sensors, & light sensors on the target boards. The Lab features an extensive database, permitting the management of boards, users, permissions, & statistics of usage. This lab provides a web-based method of developing embedded systems, which opens paths to distance education as well as helping reduce the required number of workstations & boards in traditional labs.

Cheating Technology In 3D Graphics

Da Dong
Dr. Ranette Halverson, Prof. Richard Simpson, MSU

Billboarding is a graphics technology that replaces the viewing of 3D objects with single image (texture). It is a cheating technology which uses an image to rapidly display the object instead drawing the mesh. This presentation will discuss 2 types of billboarding & their advantages & disadvantages. It will also explain the requirements of storing images in API programming.

Single Source Shortest Path Using Dijkstra's Algorithm

Sharath Kumar Dayal, Shashank Namala
Dr. Eduardo Colmenares, MSU

Network analysis is an important function of GIS (Geographic Information System). One popular method used for network analysis is the shortest path problem. Dijkstra's shortest path algorithm is a classic algorithm which uses the greedy approach to obtain an optimal path from a single source to all the nodes with low cost. The performance of the algorithm gradually decreases with the increase in the number of nodes. This project presents sequential & parallel implementations of Dijkstra's Algorithm with comparisons in performance. The sequential approach is used to simulate the performance of Dijkstra's Algorithm on a single thread or process to establish a baseline in performance; the parallel approach is a modified version of Serial C implementation using CUDA, which is designed to harness the potential of GPU.

Indoor Navigation And Obstacle Avoidance For The Blind

Michael Canan, Mayur Kotamraju
Dr. Robin Pottathuparambil, University of North Texas

The Bat is a wearable, indoor navigation assistant for the visually impaired. It is designed to be discrete when compared to other aids, such as a cane or service animal, which can give the user more independence. The user can use the Bat to freely roam around the interior of a building or enable the navigation system to be guided, with verbal instruction, to an exit.

1-E E ~ Bolin 213

A Serial & Parallel Investigation of the Brute-force Algorithm

Kevin Lord, Johann Redhead, Tellon Smith
Dr. Eduardo Colmenares , MSU

Algorithms created to decrypt sensitive data are ranked according to their efficiency. The best algorithms are able to decrypt data in shortest time. The brute-force algorithm achieves its data decryption through exhaustive means, attempting numerous combinations of passwords until there is a match. Brute-force's inefficiency is greatly affected by the approach taken to develop the algorithm & the data set. With large data sets, the serial approach becomes very inefficient & parallel implementation offers better efficiency. This project investigates & compares the efficiency, execution times & speedup of both the serial & parallel MPI approaches over varying character sets.

MSU Smart Parking System

Abdullah Albakhurji , Enaho Atamenwan , Paul Yacho
Dr. Yu Guo, MSU

The aim of this project is to create & implement a method for drivers to find parking on campus using smart sensors & cellphone/web applications. Sensors are used to detect the presence of cars & the application shows users the location of vacant spots. Two methods are used to detect cars entering or leaving a parking lot. The first method uses individual sensors on each parking spot to detect vehicles parked in a spot, while the second method uses sensors placed at the entrances & exits of the parking lots to detect vehicles entering & leaving. The former gives users' specific locations of vacant spots, the latter shows an overview of the parking lot. Results from conducting this research will shed light on effective ways to equip campus parking lots with sensors.

Quantum Computers: The Next Step In The Evolution Of Machines

Mason Ellis

Dr. Ranette Halverson, MSU

Once a theoretical concept in quantum physics, quantum computers are quickly becoming a reality. These incredibly powerful machines can possess the potential to solve the world's greatest problems & smash through our most secure encryption systems. This presentation will discuss the potential benefits & repercussions of developing these incredible machines. It will also discuss our current progress & touch on the theoretical physics that makes them possible.

Collatz Conjecture Verification Using CUDA

Scott Gordon, Steven Kundert

Dr. Eduardo Colmenares, MSU

The Collatz Conjecture or Ulam's Conjecture is a famous unsolved problem from mathematics that has never been proven. The series of numbers created by the conjecture is known as the hailstone sequence. Although no proof exists, most mathematicians who have examined the problem believe it is true because of the large amount of experimental evidence to support it. Using the Turing Cluster, we designed 3 different algorithms, to perform Collatz Verification: one sequential version & two CUDA versions. This presentation will discuss the scope of the problem & delve into a discussion on the various algorithms & design choices. It will also frame a discussion on parallelism using CUDA while presenting the results of performance analysis.

Session 2 – 11:40 – 1:00 p.m.

2-A A ~ Bolin 100

Internet In Space: Dynamic Addressing In High Latency Networks

Jacen Kohler

Dr. Robin Pottathuparambil, University Of North Texas

We're trying to find a way for spacecraft to quickly & automatically connect to a network as it moves between networks, just like how your phone automatically connects to Wi-Fi as you move between locations. Due to the differences between networking on earth compared to space, there are many challenges that must be addressed. Due to the vast distances in space, a traditional DHCP handshake is too slow. It can take up to 2.248 seconds for a spacecraft to get an IP address at its shortest point in the orbit. We've found a way to predict the orbit & pipeline the DHCP handshake, cutting the time required to 25% of the original delay. You can read more on our GitHub project page: JacenRKohler.GitHub.io/IRIS

One Small Step For AI, One Giant Leap For Mankind

Ryan Luig

Dr. Ranette Halverson, MSU

In 1994, a computer beat a world champion checkers player. In 1997, a computer beat a world champion chess player, & in 2011, a computer beat the top 2 Jeopardy players. But it was not until 2016 that a computer was able to beat a world champion at *Go*, a classical Chinese board game. Why did it take so long? This presentation will discuss the advances in artificial intelligence that made this victory possible & how it is laying the foundation for solving abstract problems.

He Said She Said: The Use Of HLA In NASA Student Research

Christine Mounce, Chris Silva

Dr. Bingyang Wei, MSU

The Simulation Exploration Experience (SEE) is an annual, inter-university, distributed simulation event led by NASA. A primary objective is to provide a platform for college students to work in highly dispersed teams to design, develop, test, & execute a simulated lunar mission using High Level Architecture. During the SEE 2017 event, 14 federates developed by student teams from 3 continents, successfully joined the federation &

collaborated to accomplish a lunar mission. The MWSU teams participated in SEE 2017 by developing a communication satellite constellation federate to route messages between physical entities on the surface of the moon. This presentation describes High Level Architecture, the MWSU Sim Team experience, lessons learned, & recommendations for future teams.

Viscosity Measurements For Various Mixed Fluids Used To Enhance Oil Recovery

Reuben Denwe, Denzel Kinyua, Cody Chancellor
Dr. Mahmoud Elsharafi, MSU

Enhanced oil recovery (EOR) is a post water flooding process used to extract oil remaining in a reservoir. EOR techniques increase the amount of crude oil extracted by 30-60%. One method, chemical flooding, includes surfactant & alkaline-surfactant. Increment in oil production is achieved using alkaline & surfactants to change wettability from oil to water wet, thereby increasing hydrocarbon fluids mobility & using polymers to reduce water mobility. Results show variation of crude oil & alkaline-surfactant viscosity with increase in temperature, & variation of crude oil viscosity/mobility with increase in percentage of alkaline in alkaline-surfactant sample

2-B B ~ Bolin 127

Design and Implementation Of A Convective Heat Transfer Coefficient Measurement System

Janith Ambewela, Timothy Biggs, Xitong Li, Corbin Whan, Paul Yacho
Dr. Jeong Tae Ok, Dr. Sheldon Wang, MSU

The science of heat transfer through pipe systems is critical to innovation in engineering. According to the simplified form of energy conservation within the pipe system, higher fluid velocities tend to accompany lower pressures. In this project, heat transfer coefficient of water is estimated & cavitation to visualize heat transfer process. Plug flow model is often introduced to relate pressure drop with mass flow rate. We have built an apparatus that consists of pumping, tubing, heating, & data acquisition (DAQ) systems. A LabVIEW program was developed to calculate the temperature gradient from the DAQ system & estimate the convective heat transfer coefficient of water at various temperatures. Thus, cavitation was produced to visualize the heat transfer process, as the apparatus performed at different water temperatures. A direct relationship was established between the heat transfer coefficient of water & rate of bubble cavities formed.

Modular Graphic Programming: A Piece Of The Cake

Joshua Regino
Dr. Ranette Halverson, Prof. Richard Simpson, MSU

The use of computer graphics is demanding on both the CPU & GPU. Both units must process & communicate data back & forth to render objects seen on the screen. This presentation will discuss a method known as modular graphic design that efficiently renders objects for a smoother, visually appealing user experience. It will also discuss the advantages of modular graphic design such as re-usability, performance, & texture optimization.

Analyzing And Improving The Wichita Falls Country Club Indoor Tennis HVAC Facilities

Israel Ezeodum, William Rittenhouse, Dylan Hooper, Miranda Schroeder, Suman Bhandari
Dr. Sheldon Wang, MSU

The project focused on analyzing & improving the HVAC (Heating Ventilation & Air Conditioning) system at the Wichita Fall Country Club. Temperature of over 100F in the summer makes it unbearable for members to use the indoor tennis facilities. Understanding & calculating the heat transferred in and out of the tennis facility assisted in getting the standard air flow circulation that will not affect play time. The heat energy generated inside the building at different temperatures was simulated using Solid Works SW. The simulated results are utilized to identify distribution of thermal energy, wind speed (draft), air pressure & humidity within various locations at the facility. With calculated results and analyses, HVLS (High Volume Low Heat) fans were concluded to be used in this project.

Graphical Drone Delivery Simulation

Ivann Grande
Dr. Samuel Rodriguez, Texas Wesleyan University

Major delivery companies are currently in a race to release the first drone delivery service. Simulations of how this service could be implemented in a real-world environment proves to be a challenge due to many factors including weather change patterns, collision detection, & even cyberattacks. Goals include creating 3D models of a delivery truck & a drone, along with a 3D environment, & displaying how drones work in unison to complete separate tasks at hand. The importance of simulations like these is to help simulate everyday problems to ensure the return of the drones & efficiently cooperate with employees. This will only serve as a basic model to help future generations in exploring the numerous uses of drones.

2-C C ~ Bolin 320

Web Simulation Of Physics Problems

Prajwal Gautam
Dr. Yukong Zhang, Texas Wesleyan University

Our presentation is to demonstrate web simulation work of some physics problems normally covered in university physics classes to help college students understand fundamental concepts of those problems. The simulated problems include gravity induced free fall of objects in various media (air & water), projectile movement, & oscillating movement on fixed tracks (such as roller-coaster & pendulum), & elastic collision of balls. Energy conservation formulas are used to control the movement of objects. These formulas are the basis for the simulations, rendered & run through JavaScript programming & HTML5 canvas graphics packages.

Virtual Reality: Applications In Education And Military Training

Christopher Reif, Jerome Moody
Dr. Jawad Drissi, Cameron University

Virtual reality allows extremely realistic user interaction with computer-simulated environments, whether that environment is a simulation of the real world or of a fictional one. Virtual reality began in the late 1920s with the creation of the Sensorama, an interactive theater experience. In the 1970s it became the center focus for the military to reduce cost & improve training tactics. With the development of the internet in the 1990s, the gaming industry quickly evolved. Today's benefits of virtual reality are used in various areas such as military & police training, gaming, music, medical, & education. How does virtual reality work? How can it change the way we train and educate? This presentation will answer those questions & focus on the benefits of virtual reality in military training & education. Also, challenges with implementing virtual reality are discussed.

Robotics For A Better Life

Abdullah Alathel
Dr. Ranette Halverson, MSU

Humans have long been intrigued by the concept of automaton. First, by incorporating artificial humans into myths & legends, then by inventing countless ingenious automatons throughout the centuries. However, many were impractical & did not accomplish what they were built for. Robots as we know them today were first built in 1954, by George C. Devol. Since the 1960s, robots have transformed & changed many aspects of our lifestyle, from the industrial revolution into the information revolution. This presentation will cover a brief history of modern robots, & touch on some fields where robotics have been beneficial, with a particular focus on the medical field

The Use of Virtual Reality In Medical Training

Angela Cappiello
Dr. Jawad Drissi, Cameron University

Virtual Reality is a simulation of our environment experienced through sensory stimuli to emulate reality. Beginning in 1957 with the Sensorama, virtual reality has caught the attention of the world. In the 1970's, virtual exploration became a possibility. By the 1980's, NASA was using virtual reality for projects & research into new forms of human/computer interaction. In the 1990's, people began marketing virtual reality gear for the public. Present day virtual reality is used widely from gaming to medical applications to military training. This presentation examines uses of virtual reality. One application describes an object-oriented framework for building training environments. Another use is for a medical scanner that gives an accurate 3-dimensional model. A third application uses remote connections to facilitate a shared virtual environment for distance or group training.

2-D D ~ Bolin 312

Convolution: A Sequential Version And A Parallel MPI Version

Victor Nnabuenyi, Adrian Hurst, Jereme Webb

Dr. Eduardo Colmenares, MSU

Convolution is mathematically important in image & signal processing. Applications include filtering, edge detection, image recognition, correlation, simulation, & compression. As processed data continuously increases, there is need for quicker approaches. In this 1-D convolution presentation, an array of image, kernel, and result (image & kernel combined) was created. The results of speedup & execution time the sequential & parallel versions are shown graphically.

Multiple Materials Part Center Drilling & Drilling Operation Using An Automated Palletizing System

Daniel Arrington, Huiluo Chen, Adam Culley, Fernando Dutra, Tonderai Madamba

Dr. Jan Brink, MSU

There is a demand in automated manufacturing for reliable & robust robotic processes. Interruption to any process results in down time & loss of money for the manufacturer. The intent of this senior design is to add variety to autonomous block identification & a center drilling operation. The existing robot manufacturing cell is in need of design improvement to ensure the operation is safe, reliable, & highly repeatable. A center drilling operation is needed to ensure accurate hole placement by drilling a pilot hole to prevent the bit from "walking" on the surface of the part.

DNA Sequencing

Anthony Enem, Ali Khalid, Kenadi Campbell

Dr. Eduardo Colmenares, MSU

In DNA sequencing, the shortest common superstring applies to the reconstruction of a genome from fragments or chunks of that same genome. This process can be referred to as the assembling of genome fragments. Sequencing small chunks of DNA is relatively easy. Problems arise with sequencing larger molecules. It is similar to assembling a puzzle without knowing what the final product would look like. The goal is to put together fragments of DNA to create a whole-genome sequence consisting of each of the fragments. While it is an article of faith that the shortest superstring formed from all fragments will be the most likely sequence, this seems to work reasonably well in practice. Our goal is to implement a sequential & parallel solution for the problem using the C++ & MPI (Message Passing Interface) library, then measure the performance.

Large Deflection Non-linear Coefficients Of A Free Vibrating Laminated Composite Shallow Shell Panel

Suman Bhandari, Kyle Gordon, Israel Ezeodum

Dr. Salim Azzouz, MSU

The goal of this project is to shed light on the nonlinear vibration response of shallow shell panels to large deflection experienced by aircrafts during supersonic and hypersonic flights. A Finite Elements (FE) nonlinear formulation, based on the first-order shear deformation theory, the von-Karman large deflection theory & the Marguerre shallow shell theory, was developed. The mathematical representation of the MIN3 shallow shell finite element was used as the backbone of the current formulation & implemented in the form of hierarchical subroutines into Matlab software. A full study was done in which the linear frequencies, first-order & second-

order nonlinear coefficients of a free vibrating isotropic & composite laminates shallow panels were obtained & plotted against their height rise. The coding for isotropic & composite laminated shallow shell panels was finalized & the linear frequencies, mode shapes, & first-order & second-order nonlinear coefficients were obtained.

2-E E ~ Bolin 213

Early Computer Science Education: How Young Is Too Young?

Aimee Phillips
Dr. Ranette Halverson, MSU

The recent growth of interest in computer science has created a movement to more readily introduce computer science in K-12 classrooms. But how young is too young to teach programming concepts to children & what is the best way of teaching them? This presentation will discuss the advantages & disadvantages of early computer science education and what's being done about it locally and in Texas. It will also provide a showcase of some applications that are available for children to use to easily learn computer concepts.

Minimum Spanning Trees: Prims's Algorithm

Nanda Kishore Reddy Thineti, Tejaswi Prakhya
Dr. Eduardo Colmenares, MSU

MST algorithm can be used for constructing an efficient electricity network. The key property that drives many MST algorithms is the light edge property. Prim's algorithm is more suited for parallelization but it either breaks down to operations with reduced parallelization opportunities or ends up with overly complex parallel procedures, which require heavy use of fine-grained synchronization that substantially reduces the possible speedups. This project includes a sequential version of Prim's for finding MST in C & parallel version of Prim's for finding MST in CUDA. The results of sequential & parallel code obtained are used in computing the execution time, speedup & efficiency, with a various number of problem sizes provided.

Indoor Navigation Using Beacons

Sadman S. Ahmed
Dr. Robin Pottathuparambil, University Of North Texas

The project named Beacate is an indoor navigation & user interaction iOS application using the Bluetooth Low Energy Signal. The goal is to build an indoor navigation system to be used in a specific indoor environment but can be implemented on different locations all around the world. Beacons will get the signals & using that signal, the application will find the user's location & help them navigate & a lot more, such as save parking spot, adding notes & reminders. We found that there is no practical application that is used to describe the user's position within inside the buildings & stores, & satellite technology is used on roadmaps is not an alternative. So, we are trying to find a solution using Beacons to locate the user inside the building & help them navigate inside the building precisely.

As The World Turns: Construction Of A Magnetically Driven Foucault Pendulum

Connor Cheek
Dr. J.C. Sanders, University Of Science & Arts Of Oklahoma

Foucault pendulums are relatively simple devices that demonstrate the rotation of the earth. However, due to the elasticity of the suspending wire & dissipative forces such as friction and air resistance, the swinging pendulum will exhibit elliptical motion & the amplitude of oscillation will gradually decrease. The pendulum's ability to measure the rotation of the earth requires minimizing these additional effects. As a result, Foucault pendulums are usually quite large (> 30 feet). This project discusses building a small-scale Foucault pendulum (3 feet) to utilize magnetic forces to compensate for the pendulum's elliptical & damped motion.

Session 3 – 2:20 – 3:50 p.m.

3-A A ~ Bolin 100

Root Calculation By Bisection

Joshua Regino, Johnny Tran, Clarence Williams
Dr. Eduardo Colmenares, MSU

This presentation will discuss the calculation of roots of a function in both serial & parallel computing using MPI. The Bisection Method was used to analyze & compare the performance of both implementations. In numerical analysis, the bisection approach is the simplest method to calculate the roots of a function. The serial implementation while simple, has its own limitations while dealing with higher degree polynomials. The parallel approach demonstrates its advantages in performance over the serial implantation when dealing with higher degree polynomials.

Artificial Intelligence: An Introduction

Austin Anderson, Hannah Bolaji
Dr. Jawad Drissi, Cameron University

Intelligence is defined as the ability to learn, understand, or to deal with new or difficult situations or problems; the ability to apply knowledge or to think abstractly. In artificial intelligence, machines exhibit these traits. In computing, an intelligent machine is a flexible & rational agent that perceives its environment & takes actions to maximize its chance of success at some goal. In 1950, Alan Turing developed the Turing Test. This technique tests a machine's ability to exhibit behavior that is either equivalent or indistinguishable from that of a human. This paper examines features of artificial intelligence, its history, AI techniques, examples, & what the future holds.

Temperature Dispersion: A CUDA Implementation With Visualization

Amy Knowles
Dr. Eduardo Colmenares, Prof. Richard Simpson, MSU

As a common scientific kernel, the heat equation arises in the modeling of several natural phenomena & can be applied to problems in financial mathematics, particle diffusion, & Brownian motion, just to mention a few. Efficient execution of this kernel is vital to its applicability to these varying scientific problems. In this presentation, the parallel LaPlace implementation in CUDA is compared against a traditional serial implementation. Timings were acquired for both communication & computation separately for the parallel version. A graphic visualization of the heat dispersion occurring in the CUDA implementation was written using OpenGL. Both implementations, along with the visualization, were executed on the Turing Cluster at MSU.

3-B B ~ Bolin 127

Periodically Excited Pendulum With Feedback Control (PEPFC)

Craig Stevens, Kiran Chapagain, Indeesha Wickramarachchi, Alwin George, Tharusha Wanigasekera
Dr. Yu Guo, MSU

Detailed vibration analysis of a structure is crucial in determining what external loads & frequencies the structure can withstand before it fails. The objective of this project is to design a Periodically Excited Pendulum with Feedback Control. The PEPFC allows students/operators to adjust the amplitude & frequency of the pendulums pivot &, through the use of sensors, observe how stress/strain develops within the pivot as a result of the pendulums motion. The apparatus can also be used to drive the pendulums pivot in such a way that internal stress/strain caused by external forces acting on the pendulum will be negated/lessened.

Help My Brain – Assisting Children With ADHD Through Brain Training Software

Rephael Edwards
Dr. Ranette Halverson, MSU

Children with Attention Deficit Hyperactivity Disorder (ADHD) have trouble with paying attention & controlling impulses. Neurotransmitters do not release sufficient dopamine in children with ADHD, so they do

not respond to reward as other children would. This disorder affects their ability to function & develop normally in every area of their lives. Their behavior must be controlled in other ways. While ADHD can normally be treated with medication, which has side effects, it may be possible to retrain the brain using software to function as it should. This ideology has been applied in the area of sports, in which brain training software has been utilized by teams around the world. This presentation will show that it is possible to manage some of the issues caused by ADHD with brain training software.

Hire The Hacker: From Criminal To Critical

Christian Norfleet

Dr. Ranette Halverson, MSU

The exponential increase in digital data has opened the floodgates to a wave of new system vulnerabilities. Corporations are unable to hire those with the skill-set necessary to protect company assets due to the limited supply of cyber security experts. However, surprisingly there is an untapped source of qualified talent out there...hackers. This presentation will discuss how hackers can use unconventional methods to benefit society & better protect our digital information and systems. In the mind of the hacker, the ends really do justify the means.

Dynamic Contact Angle Measurements

Jomarie Leblanc, Chiedza Tokonyai

Dr. Mahmoud Elsharafi, MSU

Contact angle measurements are important to determine surface tension between solids & various fluids. In the oil industry, water wet conditions on the rock surface are needed to extract oil. If it is oil wet, the oil company may need to change the rock wettability. The aim of this project is to determine the contact angle of different fluids when they interact with each other & the solid surface. We will determine wettability (water wet or oil wet), analyze how the effect of different brine concentrations on wettability & contact angle measurements using the Dynamic Contact Angle Analyzer (DCA 315).

3-C C ~ Bolin 320

Unfolding Creativity In Artificial Intelligence

Devin Ritter

Dr. Ranette Halverson, MSU

Many companies are becoming more involved in the use of neural networks & deep learning algorithms. Both are widely used for data processing, function approximation, & robotics, but recently these elements have evolved to produce artificial creativity. This presentation will discuss neural networking, & how it utilizes deep learning. It will also describe milestones achieved by Microsoft & Google, & the potentials these milestones open up for the future.

Modeling And Testing For Slippage Of Sucker-Rod Pumps

Ravi Prasanth Baskaran, Kyle Gordon, Connor Kirby, Martin Moore, Hyungmo Yeon

Dr. Sheldon Wang, MSU

A sucker-rod pump is a positive displacement pump consisting of a plunger & barrel. A sucker-rod pump, during its operation, typically will lose some pumping capacity due to slippage through the clearance between the plunger & barrel. This research aims to establish an experimental setup to validate an idealized physical & mathematical model of slippage which considers pump dimensions & downhole conditions. Custom pressurized chambers are attached to both sides of a sucker-rod pump assembly to allow manual control of the pressure differential across a pump through use of an external hydraulic system. Setting the pressure differential introduces slippage across the pump. Relevant sensors are used to detect the pressure differential across the pump, resultant force, & displacement of the pump. From the acquired values, we hope to relate observed variables mathematically to traditional fluid mechanics, specifically Couette & Poiseuille flows.

Auto-piloting A Drone Using Computer Vision

Zeltzin Reyes

Dr. Yu Guo, MSU

This project aims to implement automatic navigation of a drone using computer vision technology. Drones' ability to be used by remote control or through pre-programmed flight allows them to be used in surveillance, photography, & other recreational uses. In this project, the drone, 3DR Solo, is used together with a Raspberry Pi to achieve auto-navigation. Programs are created on the Raspberry Pi to dictate tasks such as object detection & object tracking using Solo's on board GoPro camera. Based on the object detection results, Solo is piloted by to follow the specific object, which could be a soccer ball, robot or anything else Solo has been programed to identify. As future work, Solo will be programed to collect aerial feed of a specified region. Geographical & routing information could then be extracted through image processing & shared with a robot on the ground or other drones.

Implementation Of Breadth-first Search Algorithm Using CUDA

Waseem Azher, Saikiranreddy Nagulapally

Dr. Eduardo Colmenares, MSU

Graphs plays very important role in the field of science &technology. One common application in multiple fields is to find the shortest distance between 2 points. In this research we present a well-known graph traversal algorithm, Breadth-First Search (BFS). We implement a sequential version of BFS which is compared to a many-core implementation. The research highlights the computational power of a GPU & how adequate harnessing through CUDA can lead to a considerable increase in performance. The results & claims are validated by the performance analysis.

3-D D ~ Bolin 312

Creating Better Software: The Importance Of The Users

Austin Cullar

Dr. Catherine Stringfellow, Dr. Ranette Halverson, MSU

The primary goal of any software engineering project is fairly straightforward: produce a successful piece of software. In striving to accomplish this goal, there is no voice more important than the user's. However, despite this obvious truth, it is often the case the user's voice is not given a proper platform in the development & post-development processes. This presentation will discuss the benefits & challenges associated with including the user in the development process, as well as how companies can implement an effective system of communication with their users in the interest of optimizing their software.

A Planetary Gear-Based Control System For A Wind Turbine

Chanuka Perera, Eduardo Garcia, Henry Lance, Delton Shed, Travis Taylor, David Baer

Dr. Salim Azzouz, MSU

This project focuses on building a wind turbine lab apparatus that maintains the speed of its generator constant, while the speed of the rotor varies. This goal is achieved through the design of a controller. A Programming Logic Controller (PLC) with an implemented proportional & integrative (PI) control system is used to regulate the speed of the electricity generator. Depending on its electrical load, the generator speed is maintained constant by varying the speed of the gearbox planetary ring gear. Torque & speed sensors installed within 3 key power transferring shafts feed signals to the PLC. The information is processed to regulate the generator's speed. The results achieved are to provide the electrical schematic circuitry necessary for the controller to be functional & how shaft speeds & torques are distributed throughout the system.

Intelligent Robotics Using Computer Vision

Huiluo Chen, Xitong Li, Mpathi Nzima

Dr. Yu Guo, Dr. Bingyang Wei, MSU

The project aims to develop an auto navigation program to automatically navigate a robot based on the feedback received from camera, distance sensor, & compass. The technology of artificial neural networks (ANN) is used to obtain vision information from the camera. Cascaded specifiers of different objects to be detected are created through training the ANN. Then the cascaded specifiers are used by the detection program to recognized objects from images collected from the camera. The position & size of the object in the viewport is obtained & combined with the distance data received from distance sensor to help with decision making of the robot. Finally, the calibrated compass data is used to interpret global heading directions during the navigation.

New Developments In Assistive Technology

Raul Escatel

Dr. Ranette Halverson, MSU

The progression in computing has led Assistive Technology (AT) into the fast track. AT has made exceptional strides in the world of wearables, virtual reality & augmented reality. Numerous companies have recommitted to the field due to the advancements of computing technology. But with these advancements in AT, privacy challenges along with social & ethical issues raise concerns to many. This presentation will discuss the current & future state of AT, & the challenges to overcome.

3-E E ~ Bolin 213

GPU Programming: Depth-First Traversal of a Graph using GPUs

Olayinka Soyinka, Oluwaseyi Tinubu,

Dr. Eduardo Colmenares, MSU

High performance computing is a growing branch of computer science & can be applied to many fields, especially fields with large data sets in areas like graph processing, data mining, & data processing. This project compares the depth first search algorithm executed sequentially on a CPU against that executed in parallel on a GPU. In the sequential approach all nodes are selected iteratively & from the single source node all other nodes are recursively visited. In parallel, the bottleneck of waiting which comes with sequential execution is removed as all source nodes are executed in parallel. In this project, we harnessed the potential of the GPU as problem size increases. Performance analysis & curves are presented. The outcome shows the effectiveness of high performance computing as more work is done effectively in less time.

A Data Modelling Approach: Can Small Independent Pharmacies Compete With Big Chains

William Fletcher, Desmond Jombe

Dr. Jie Zhang, MIS, MSU

Independent pharmacies typically generate the majority of the business' revenue from prescriptions filled by the pharmacy. Small pharmacies run into a dilemma between filling prescriptions or driving towards orienting sales of over-the-counter medicines, health & beauty products, & food. This presentation will focus on how small pharmacies can improve stocking items which receive the most profit & sales. We used SAS data analytical software to process & analyze extracted, anonymized data from the AmerisourceBergen POS Data Warehouse of independent pharmacies to determine what specific products a pharmacy should always have in stock.

Hackers: The Good, The Bad, And The Ugly

Victor Nnabuenyi

Dr. Ranette Halverson, MSU

Computers are becoming increasingly vulnerable to attacks, making individuals & companies susceptible to breeches. Exploiting these vulnerabilities highly depends on the ranks & types of hackers. Some hackers are helpful while others are harmful; however, the term "hacking" has a negative connotation. This presentation will discuss examples of bad hacker groups & malicious software so individuals & companies are better

equipped with the knowledge & future of hacking.

Braingate: Turning Fiction Into Fact

Nathan Durst
Dr. Ranette Halverson, MSU

The concept of using thoughts to control robotic devices, which was once only possible within the realm of science fiction, is now a possibility. A new breakthrough in brain-computer interface systems that turn thoughts into action may lead to a better way of life for severely motor-impaired individuals. This presentation will discuss how the BrainGate system, developed by Cyberkinetics, proves to be a powerful & supportive tool in allowing victims of degenerative diseases to live lives more independently, & the social & ethical effects that arise from this innovative technology.

A Serial & Parallel Investigation of the Brute-force Algorithm

Kevin Lord, Johann Redhead, Tellon Smith
Dr. Eduardo Colmenares , MSU

Algorithms created to decrypt sensitive data are ranked according to their efficiency. The best algorithms are able to decrypt data in shortest time. The brute-force algorithm achieves its data decryption through exhaustive means, attempting numerous combinations of passwords until there is a match. Brute-force's inefficiency is greatly affected by the approach taken to develop the algorithm & the data set. With large data sets, the serial approach becomes very inefficient & parallel implementation offers better efficiency. This project investigates & compares the efficiency, execution times & speedup of both the serial & parallel MPI approaches over varying character sets.