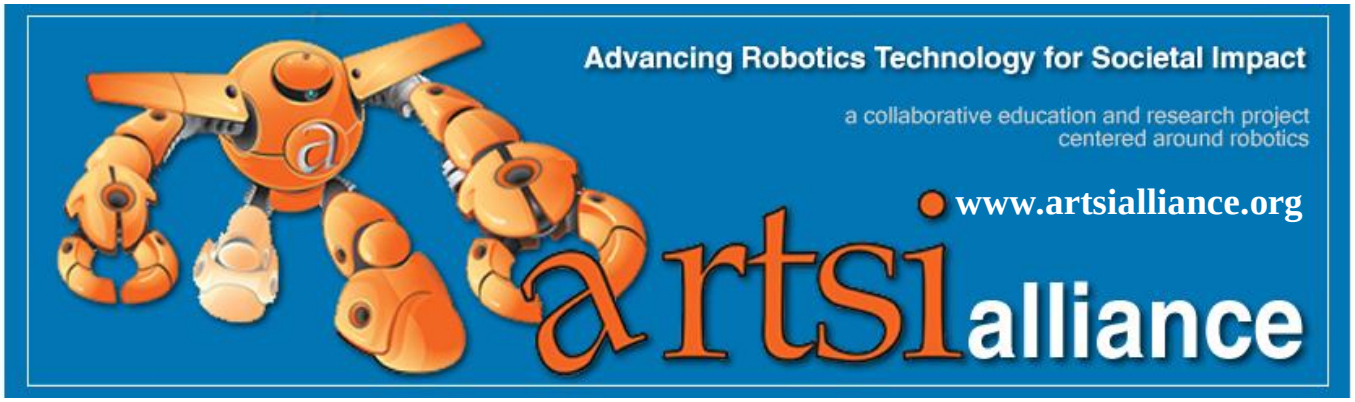


The Fifth Annual

ARTSI Student Research Conference

&

Spelman College Computer Science Olympiad XI

March 21 – 23, 2013

Morgan State University

Baltimore, MD

Broadening Participation in Computing Program

Message from the Conference Organizing Committee

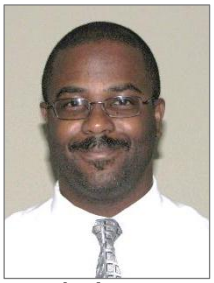
Welcome to the Fifth Annual ARTSI Student Research Conference and Spelman College Computer Science Olympiad XI, hosted by Morgan State University!

The ARTSI Alliance began as the successor to the C.A.R.E project, a collaboration between Spelman College, Carnegie Mellon University, Hampton University, Florida A&M, and the University of the District of Columbia. For the past seven years, ARTSI has grown into a consortium of 17 HBCUs and 10 major research universities. Over this past year, we ran a successful 2012 summer internship program for undergraduates, held a two-day summer workshop for faculty at the University of Pennsylvania, and conducted a variety of robotics-oriented outreach programs for middle school and high school students. ARTSI looks forward to active participation in the next form of our initiatives in computing education, a newly merged alliance, Institute for African-American Mentoring in Computing Sciences (iAAMCS, pronounced "I am cs").

This conference is an opportunity for our students to showcase their accomplishments, meet peers with similar interests, and get to know faculty at other institutions who might offer internship or graduate training opportunities. The conference events include a robotics competition, a poster session, and Computer Science Olympiad competition. Facilitated by Dr. Monica Anderson (University of Alabama), the iAAMCS CREU/DREU Research Program session features Dr. David Touretzky (Carnegie Mellon University), Dr. Juan Gilbert (Clemson University), Dr. CJ Taylor (University of Pennsylvania), Dr. Edwin Olson (University of Michigan), Dr. Stephen Guy (University of Minnesota), and Dr. Sekou Remy (Clemson University).

This is the last NSF-funded ARTSI conference, but the ARTSI Robotics Competition and student research poster session will continue as part of the ACM Richard Tapia Celebration of Diversity in Computing, commonly known as "the Tapia conference."

We hope everyone enjoys the events!



Richard Pitts, Jr.
Morgan State University
Conference Host
and Local Organizer

Monica Anderson
University of Alabama
R1 Faculty Facilitator
iAMMCS CREU/DREU
Coordinator

Tamara Rogers
Tennessee State Univ.
Robotics Competition
Coordinator

Rebecca Caldwell
Winston-Salem State Univ.
Student Poster Presentation

Iretta Kearse
Spelman College
Olympiad Director

Mona Rizvi
Norfolk State University
Olympiad Coordinator

Chutima Boonthum-Denecke
Hampton Univ.
Lead Co-PI, ARTSI Alliance
Conference Committee, Chair

Elva Jones
Winston-Salem State Univ.
Lead Co-PI, ARTSI Alliance

David Touretzky
Carnegie Mellon University
Lead Co-PI, ARTSI Alliance
Robotics Competition

MORGAN STATE UNIVERSITY
2013 ARTSI Student Research Conference & Computer Science Olympiad XI
March 21 – 23, 2013

Thursday, March 21, 2012 [Courtyard Hunt Valley Hotel and CBEIS Building]

3:00 – 4:00 PM **ARTSI Registration** (Courtyard Hunt Valley Hotel)

4:00 – 7:30 PM **Robotics Competition Part I – Basic Skill Events** (CBEIS Bldg. lobby)

Bus: Hotel to MSU campus: 3:15pm , 3:45pm, and 4:15pm

5:00 – 6:00 PM **Dinner (**SEB Atrium, SEB 201 - 204)

6:30 – 8:30 PM **Robotics Competition Event - Practice** (CBEIS Bldg. lobby)
(Buses take participants back to hotel at conclusion of event)

Bus: MSU campus to Hotel: 8:00pm , 8:30pm, and 9:00pm

Friday, March 22, 2013 [USC Ballroom A-B and USC Conf. 210 & 212]

7:00 – 8:00 AM **Breakfast** (Courtyard Hunt Valley)

7:30 – 8:40 AM Buses take participants to MSU campus

Bus: Hotel to MSU campus: 7:30am, 7:45 am, and 8:15am

8:40 – 9:00 AM **ARTSI Conference Opening Session**

Welcome Address: Dr. David Wilson, President of MSU

Dr. Eugene DeLoatch, Dean of the School of Engineering

9:00 – 10:30 AM **Speakers: iAAMCS CREU/DREU Research Program - Dr. Monica Anderson - Facilitator**
Dr. David Touretzky (CMU), Dr. Juan Gilbert (Clemson), Dr. CJ Taylor (UPENN),
Dr. Edwin Olson (UMich), Dr. Stephen Guy (UMN), and Dr. Sekou Remy (Clemson)

10:30 – 10:45 AM **Morning Break** (USC Ballroom A-B)

10:45 – 12:45 PM **Robotics Competition Part II – Competition Event** (USC Ballroom A-B)

12:45 – 1:30 PM **Lunch** (USC Ballroom A-B)

10:30am – 1:30pm
R1 faculty will be available to meet with students

1:30 – 4:30 PM **Student Leisure Time** (@**1:30pm** buses take students to Hunt Valley Towne Center and/or Courtyard Hotel)
*** **Faculty meeting with IAAMCS Leaders (USC Conf. 212)**

4:30 – 5:00 PM **Posterboard Setup** (buses take student participants back to MSU)

5:00 – 6:00 PM **ARTSI Student Poster Presentations** (USC Conf. 210)

6:00 – 7:00 PM **Dinner** (USC Ballroom A-B)

Bus: Mall/Hotel to MSU: 4:00pm (student presenters) and 4:45pm

7:00 –7:30 PM **Olympiad Opening Ceremony** (USC Ballroom A-B)
*** **Faculty Leisure Time (@ 7:15pm** - bus takes faculty to Hunt Valley Towne Center or Courtyard Hotel)

7:30 – 8:30 PM **Olympiad Event 1 Cryptography – Cryptanalysis** (USC Ballroom A-B)

8:30 – 9:30 PM **Olympiad Event 2 Hardware/Software Integration** (USC Ballroom A-B)
(Buses take all participants back to the hotel at conclusion of Event 2)

Saturday, March 23, 2013 [Olympiad Events @ SEB/MEB; Dinner @ USC Ballroom A-B]

7:00 - 8:00 AM **Breakfast** (Courtyard Hunt Valley)

7:30 – 8:30 AM Buses take participants to MSU campus

Bus: Hotel to MSU campus: 8:15am and 9:00am

9:00 – 12:00 PM **Olympiad Event 3 Robotics – Lego NXT** (Labs: SEB 114; MEB 140)
***** Faculty: Meeting/Discussion** (SEB 208/209)

12:00 – 1:00 PM **Lunch** (SEB Atrium; SEB 201 – 204)

1:00 – 3:00 PM **Olympiad Event 4 Programming/Web Design** (SEB/MEB labs)

3:00 – 6:00 PM **Olympiad Event 5 Google Android Apps Demo** (SEB Auditorium 241)

6:30 – 9:00 PM **Dinner / Awards Ceremony** (USC Ballroom A-B)

Bus: MSU campus to Hotel: 9:00pm and 9:45pm

Research-I Faculty Bio-Sketch

Dr. David Touretzky, Carnegie Mellon University **http://www.cs.cmu.edu/~dst/**

Dr. David S. Touretzky is a Research Professor in the Computer Science Department and the Center for the Neural Basis of Cognition at Carnegie Mellon University. He received a BA in Computer Science at Rutgers University in 1978, and earned a Master's degree and a Ph.D. (1984) in Computer Science at Carnegie Mellon University. Dr. Touretzky is the co-founder and lead co-PI of the ARTSI Alliance. Dr. Touretzky's research on robotics education for computer scientists began with the development of Tekkotsu, an open source framework for robotics applications available for free at Tekkotsu.org. His Tekkotsu Lab at Carnegie Mellon also develops hardware platforms for robotics education, such as the Calliope2SP robot, which is now the standard platform for ARTSI. Dr. Touretzky was interviewed about his robotics work by EEWeb Palse in August, 2011. Apart from his robotics work, Dr. Touretzky is also a co-PI on the CS4All project, which is exploring a highly scaffolded, three-stage approach to teaching computational thinking to K-12 students.

Dr. Juan Gilbert, Clemson University **http://www.juangilbert.com/**

Dr. Juan E. Gilbert is a Presidential Endowed Professor and Chair of the Human-Centered Computing Division in the School of Computing at Clemson University. He is also a Professor in the Automotive Engineering Department at Clemson University. Dr. Gilbert has published more than 130 articles, given more than 200 invited or keynote talks and obtained more than $19 million dollars in research funding. He has graduated more than 60 graduate students. Currently, the HCC Lab supports more than 20 graduate and undergraduate students under Dr. Gilbert's direction. Dr. Gilbert has research projects in naturally interactive systems, spoken language systems, advanced learning technologies, usability and accessibility, and Ethnocomputing (Culturally Relevant Computing). His research deals with innovative solutions to real world problems. For example, Dr. Gilbert is the creator of Applications Quest, a data mining software tool that addresses race-conscious admissions and school placement policies. He is also the inventor of Prime III, an innovative secure, multimodal electronic voting system. Finally, he is the inventor of the African-American Distributed Multiple Learning Styles Systems, which is a culturally relevant advanced learning technology. In 2011, Dr. Gilbert was given a Presidential Award for Excellence in Science, Engineering and Mathematics Mentoring by President Barack Obama.

Dr. CJ Taylor, University of Pennsylvania **http://www.cis.upenn.edu/~cjtaylor/**

Dr. CJ Taylor is an Associate Professor in the Computer and Information Science Department at the University of Pennsylvania. He received his A.B. degree in Electrical Computer and Systems Engineering from Harvard College in 1988 and his M.S. and Ph.D. degrees from Yale University in 1990 and 1994 respectively. Dr. Taylor was the Jamaica Scholar in 1984, a member of the Harvard chapter of Phi Beta Kappa and held a Harvard College Scholarship from 1986-1988. From 1994 to 1997, Dr. Taylor was a postdoctoral researcher and lecturer with the Department of Electrical Engineering and Computer Science at the University of California, Berkeley. He joined the University of Pennsylvania in September 1997. He received an NSF CAREER award in 1998 and the Lindback Minority Junior Faculty Award in 2001. In 2012 he was awarded the Christian R. and Mary F. Lindback Foundation Award for Distinguished Teaching at the University of Pennsylvania. Also, in 2012 Dr. Taylor received a best paper award at the IEEE Workshop on the Applications of Computer Vision. Dr Taylor's research interests lie primarily in the fields of Computer Vision and Robotics and include: reconstruction of 3D models from images, vision-guided robot navigation and smart camera networks. Dr. Taylor has served as an Associate Editor of the IEEE Transactions of Pattern Analysis and Machine Intelligence.

Dr. Monica Anderson, University of Alabama **http://ua-robotics.net**

Dr. Monica Anderson is an Associate Professor in the Computer Science Department at The University of Alabama. Her research focuses on distributed autonomous systems that enable search, rescue and reconnaissance applications in unknown, complex environments. She is also dedicated to making both robotics and computer science accessible to everyone through novel programming interfaces. She is the creator of PREOP, a program which allows computer science novices to program robots graphically using an intuitive object-based interface. Dr. Anderson graduated with honors from Chicago State University in 1990 with her BS in Computer Science and from the University of Minnesota in 2007. In 2008, she received the 2008 UPE Excellence in Instruction award. In 2008, 2009 and 2010, she co-chaired the IJCAI/AAAI Robotics Workshop and Exhibition. She has authored 45 publications and has garnered grants in excess of $1.5 million dollars. She is an active member of IEEE and ACM and is an executive member of the ARTSI Alliance, a national consortium of researchers that use robotics to increase the number of African Americans in Computer Science.

Dr. Edwin Olson, University of Michigan **http://april.eecs.umich.edu/people/ebolson/**

Dr. Edwin Olson is Assistant Professor of Computer Science at Engineering and the University of Michigan. He received a PhD from the Massachusetts Institute of Technology in 2008 for his work in robust robot mapping. During his time as a PhD student, he was a core member of their DARPA Urban Challenge Team which finished the race in 4th place. Upon joining the University of Michigan faculty in 2008, he created the APRIL robotics lab, which studies Autonomy, Perception, Robotics, Interfaces, and Learning. His active research projects include applications to explosive ordinance disposal, search and rescue, railway inspection and safety, and automobile autonomy and safety. In 2010, he led the winning team in the MAGIC 2010 competition by developing a team of 14 robots that semi-autonomously explored and mapped a large-scale urban environment. For winning, the U.S. Department of Defense awarded him $750,000. He was named one of Popular Science's "Brilliant Ten" in September, 2012. Dr. Olson is active in both the open source software community as one of the original developers of the message-passing system LCM, and the creator of the OrcBoard robotics controller. Much of his current software is available under open source licenses.

Dr. Stephen Guy, University of Minnesota **http://www-users.cs.umn.edu/~sjguy/**

Dr. Stephen J. Guy is an Assistant Professor in the Department of Computer Science and Engineering at the University of Minnesota. His research focuses on the areas of interactive computer graphics (real-time crowd simulation, path planning, intelligent virtual characters) and multi-robot coordination (collision avoidance, sensor fusion, path planning under uncertainty). Stephen's work on motion planning has been licensed for use in games and virtual environments by Relic Entertainment, EA, and other companies; his work in crowd simulation has been recognized by best paper awards at international conferences. He received his Ph.D. in Computer Science in 2012 from the University of North Carolina.

Dr. Sekou Remy, Clemson University **http://people.clemson.edu/~sremy/**

Dr. Sekou L. Remy is the director of the newly formed Clemson Lab for Educational and Assistive Robotics (CLEAR) at Clemson University. CLEAR's aim is to reduce the barriers to effective use of intelligent systems in our homes, schools, and training centers. His research is positioned at the intersection of learning from interaction between robots and humans, mature and emerging web standards, service oriented robotics, and physics based robotic simulation. Dr. Remy is currently an Assistant Professor in Human Centered Computing, and comes to Clemson from the University of Notre Dame where he was a Moreau Postdoctoral Fellow. He also had the pleasure of serving as a part-time instructor in Computer Science at Spelman College. A graduate of the Georgia Institute of Technology (ECE) and Morehouse College (CS), Remy leverages both engineering and liberal arts to enable change.

Student Poster Presentation 5:00 PM – 6:00 PM

P1. Testing of Physical Activity Monitor System (PAMS) for Manual Wheelchair Users

Christopher Okonkwo and Shivayogi Hiremath

Norfolk State University/University of Pittsburgh/
Faculty Advisor: Dr. Dan Ding (University of Pittsburgh)
Dr. Thorna Humphries and Dr. Mona Rizvi

Abstract Recently there is a growing focus on developing software and hardware that will improve the quality of living of people with disabilities. Physical inactivity is extremely high in people with disabilities and engaging in an active lifestyle is beneficial for maintaining quality of life. Physical activity is difficult to measure in people with disabilities because of the changes in their health. One purpose of this project is to examine the Validity/reliability of the Physical Activity Monitoring System Data Logger (PAMS-DL) to measure wheel rotation and send collected data to a cell phone as a backup device for data processing and storage to estimate the distance travelled by a wheelchair with 95% accuracy. The second motivation for this project was the development of an application to send and receive data wirelessly, to help manual wheelchair users, and anyone else that might benefit from the PAMS activity monitor system. This poster describes the data obtained from testing eight protocols within a laboratory environment. The tested protocols includes propelling forward (20m, 15m, and 10m), backward, and up and down on two ramps of different slopes and lengths. A phone stores the data collected and the collected data analyzed using MATLAB software.

P2. Multi-UAV Surveillance

Mark Deschamps, Chris Crawford and Shameka Dawson

Norfolk State University/ University of Alabama /
Faculty Advisor: Dr. Monica Anderson (University of Alabama)
Dr. Thorna Humphries and Dr. Mona Rizvi

Abstract Unmanned aerial robotic applications are changing the way military missions are designed. These machines are being used for different covert missions. Most of the systems currently in use only use a single machine as well as a single operator. Furthermore, operators who are new to the system can have difficulty using the UAV interface. However, suppose that multiples machines were available. The coordination of multiple machines would allow an increase in the awareness of regions of interest and could decrease human casualties. Video feeds can be collected from each machine which can then be reviewed. In addition to the above, cooperative searches can provide an operator with more useful information about the environment. In this research, we designed the controller for the AR Drones that connected to an existing graphical user interface that was created by Dr. Monica Anderson's Research Group. The goal of this research was to design and implement a control system that was simple to use and that enable communication with more than one drone.

P3. Exploring Robot Control Mechanisms Through The Use Of An Android Device and A Lego Mindstorms NXT Brick

Arthur Billingsley

Norfolk State University /
Faculty Advisor: Dr. Mona Rizvi

Abstract As human technology continues to evolve, we find ourselves becoming more and more dependent on technology throughout our daily lives. One integral form of technology is the use of mobile phones. They have taken on a variety of uses, such as monitoring medical information and serving as miniaturized computers with access to the Internet. In this project, an Android application was developed to control a Lego Mindstorms NXT Intelligent Brick. Through the use of a bluetooth connection between an Android phone and a Lego NXT Mindstorms 2.0 Intelligent Brick, a connection is established so that the two devices exchange

data that results in the execution of a requested action by the Lego robot. The Android application was developed using the Eclipse IDE and coded in Java.

P4. Robot Navigation Using RSSI Measurement

Derrick Jones, Dominic Byrd, Cesar Flores, and Ju Wang

Virginia State University /
Faculty Advisor: Dr. Ju Wang

Abstract We report the design and implement of a land robot whose primary task is to "patch" a Wireless Sensor Network. The project originated from the need to provide a quick fix to the High Tunnel greenhouse Wireless Sensor Network at VSU's Randalf Farm. The main task is formulated as a guided-navigation problem: given the rough location of the network outage, navigate the land robot to the problem area to re-connect the network. Two navigation algorithms are discussed: the first one assumes the GPS ordinance of the target location is known, and the second algorithm does not assume any prior knowledge of such. The GPS ordinance of the wireless sensor nodes are documented at network planning stage. The second method, a network sensing based approach, utilizes the received signal strength indicator (RSSI) field in each received packet. RSSI measures the power of the signal at the receiver and based on the known transmit power, the effective propagation loss can be calculated. The results of both methods are summarized.

P5. Software Simulation of Surface Enhanced Raman scattering (SERS)

Alfree Conklin, Gibbs Hope, Ju Wang, Krishian Agrawal, and Chandan B. Samantaray

Virginia State University /
Faculty Advisor: Dr. Ju Wang

Abstract Surface-enhanced Raman scattering (SERS) plays an increasingly important role in studies of molecules adsorbed onto metal surfaces. The project investigate issues related to software simulation of Single-molecule SERS. We use SemcadX to simulate SERS with different nanostructure. The impact of cell size to the stability and accuracy of the simulation results will be investigated. Techniques to optimize simulation model will significantly reduce the simulation time by adaptive gridding and choose of time step size. Such could be achieved through the integration of the FDTD solver and a python script support. The reduction of simulation time is reported for typical simulation scenario with GPU acceleration.

P6. Design Issues for Robots (Vision, Navigation, and Manipulations)

Thelonious Walker

Winston-Salem State University /
Faculty Advisor: Dr. Elva Jones and Dr. Rebecca Caldwell

Abstract Color is commonly used to represent categories and values in many computer applications, but differentiating these colors can be difficult in many situations (e.g., for users with color vision deficiency (CVD), or in bright light). Color vision deficiency (CVD) is also known as color blindness. Color blindness is the complete inability of distinguishing colors of the spectrum, with all objects appearing as shades of gray, black, and white, varying only as to lightness and darkness; achromatopsia. A carrier of the deuteranopia genetic eye disorder possibly will have difficulty depicting the difference of red & green traffic lights in which could create traffic accidents. We propose to create a robotic mechanism that is programmed to alert the individual whenever they approach different types of traffic lights and traffic and signal the meaning of the signal's color.

P7. Rones For Everyone: Simplifying Robotic Programming With Python

Troy Hill

Winston-Salem State University / Rice University /
Faculty Advisor: Dr. James McLurkin (Rice University)
Dr. Elva Jones and Dr. Rebecca Caldwell

Abstract Rones, a prototype robot created by James McClurkin of Rice University, are very maneuverable hockey puck sized robots, made to one day be used in the field for traversing, localizing, and mapping out unknown buildings and areas. This research simplified code to make programming the Rone easier for everyone, expert and novice. The results of the simplification were evaluated using first time high school programmers.

P8. Robotic Locomotion And Computer Architecture: How Are They Related?

Bryant Johnson and James Lancaster

Winston-Salem State University /
Faculty Advisor: Dr. Elva Jones and Dr. Rebecca Caldwell

Abstract Robot locomotion is the various methods that robots use to transport themselves from place to place. Computer architecture is the study of the factors influencing the design of hardware and software elements of computer systems. We study the parallel between designing robotic locomotion paths and hardware/software communication in computer architecture. Precision is critical in planning a robot's locomotion path. Likewise a goal in computer architecture is to determine and improve the precision by which a CPU communicates with the motherboard. In this study we seek to determine and improve the precision by which the Create robot executes the locomotion path design in robot-to-robot communication.

P9. Using Robotic Manipulation Of Objects To Increase Understanding Of Algorithms And Data Structures In Computer Science Education

Khendra' Reid, Kionna Davis, and Cari Webb

Winston-Salem State University /
Faculty Advisor: Dr. Elva Jones and Dr. Rebecca Caldwell

Abstract Robotic arm systems are very functional in the industrial, educational, and research communities. They speed up processes and make tasks much easier to accomplish. Different categories of robotic arms are employed in object manipulation. Each of these arms requires algorithms, coding and data structures to implement the execution of specified tasks. We use the iRobot calliope robot's arm to execute a series of tasks, including building geometric shapes and figures. We test the application of the skills employed by students in programming the robot to increasing the understanding of key concepts in data structure and algorithms.

P10. Assistive Robotics: Vision, Navigation and Manipulation (Comparing Calliope to Kari)

Jerron Jamerson

Winston-Salem State University /
Faculty Advisor: Dr. Elva Jones and Dr. Rebecca Caldwell

Abstract In today's society there is an ever growing need to assist the elderly and physically disabled. There was previously a limit on the ways these people can be helped, usually including personal assistants or high priced technology, neither of which are available to all citizens especially that don't have money to afford them. Robotic technology has progressed to the point where almost any task is obtainable to complete if you have the imagination to create it. Robotics can be used to assist the elderly in simple everyday tasks like, finding a person's medicine and bringing it to the person, or recognizing the person might be in trouble and calling 911. The technology of the robot is only limited to the imagination of the person programming it, therefore almost any task can be achieved. This project implements a Self-Assist Robot called the KARI

(Kinect Assistive Robot Innovation). The primary function of the KARI is to perform difficult tasks for people with disabilities. The solution works with the Calliope2SP technology to perform robotics tasks previously relegated to humanoid robots.

P11. Using Mobile Devices To Interact With Large Visual Displays

Avery Andrews and Arsenio Jeffreys

Winston-Salem State University / Duke University /
Faculty Advisor: Dr. Rachael Bradley, Dr. Ryan McMahan (Duke University)
Dr. Elva Jones and Dr. Rebecca Caldwell

Abstract This research project bridges the gap between human interaction and technology through media displays and Bluetooth. Duke University's "Links Media Wall" consists of 48 computer screens, ten web cameras and a set of directional speakers, all driven by a 104-core computing cluster. The cameras, positioned on the ceiling, are programmed to detect viewers' positions or movements and use that data to determine what's represented on the screen. Duke installed its "media wall" thanks to a grant from the Andrew W. Mellon Foundation, and it is maintained by the university's Visualization Technology Group.

We attempt to connect human interaction with the media wall via cellular device and Bluetooth connections. The goal was to receive the RSSI (Receive Signal Strength Indication) and get a constant value to triangulate the position of the device. Prior work reported in "Bluetooth Indoor Localization with Multiple Neural Networks", found a way to get a consistent RSSI. They have designed a multiple neural networks architecture that can withstand failure of base stations, and changes in RSSI values due user orientation. After connecting the devices using a connection A.P.I., we obtained the RSSI feed to get an approximate diameter of the range for connections. Our results showed an inconsistency in the range of some of the Bluetooth devices.

P12. Neptune: Aquatic Search and Rescue Robot

Albert Toledo and Blake McMillian

Hampton University /
Faculty Advisor: Dr. Chutima Boonthum-Denecke

Abstract Robotics is a field that has many facets that make it special. One pivotal aspects of robotics involves aquatic autonomous search and rescue. The traditional means of finding lost individuals is inefficient and time consuming. The research is attempting to change that. A prototype is built from a battery powered motor boat, which is connected to the Handy Cricket Microcontroller board, where other sensors are added, including infra-red (IR) sensor to detect a distance between a boat and an object. Switch sensors are used as a trigger when a human is up on a boat or holding on to a life-tube or lifeline. "Neptune" is a proof-of-concept prototype of a aquatic robot that is able to successfully search and find lost persons at sea.

P13. Silent Alert Robot

Devon Hawkins

Hampton University /
Faculty Advisor: Dr. Chutima Boonthum-Denecke

Abstract Have you ever missed any important telephone call, especially when it was set on vibrate? Would it be nice to have a robot that can bring a cellphone to you wherever you are in the house? "Silent Alert" is an answer to that. Silent Alert Robot is designed to act like a phone holder with a programmed function to autonomously seek and alert an individual when the phone is indeed ringing or vibrating. We used the Handy Cricket Microcontroller with touch and IR sensors placed on a small 2-wheel car. This poster will show the research ideas as well as design and implementation of the Silent Alert Robot.

P14. The Key Retriever Robot

Tarana Farhat, Lawrence Rachal

Hampton University /
Faculty Advisor: Dr. Chutima Boonthum-Denecke

Abstract Simply put, robots have the potential to make life a lot easier as well as a lot more efficient. In this case, robots have the potential to make life more stress-free. Have you ever been in a hurry or running late and couldn't find your keys to save your life? Don't you hate that? What if there was a robot that could find keys for you? This simple idea is the premise of the key retriever robot, a concept that was proven through this research. The key retriever robot is a functional robot that is receptive and is able to find any keys (or similar object) that may be attached to an IR sensor that sends out a signal. This concept robot could prove to be a tremendously useful launch pad for those seeking to seriously create and mass produce an object location robot.

P15. Exploring the Performance of the iRobot Create for Object Relocation in Outer Space

Hasani Burns

Hampton University /
Faculty Advisor: Dr. Chutima Boonthum-Denecke

Abstract This research explores the performance of the iRobot Create machine for optimizing object relocation in an outer space environment. It is an ultimate goal to have it become a symbol of innovation for robots that are sent into outer space. Functioning as a tool-bot, and an active assistant, this robot aims to assist in small duties and respond to commands. With its arm and color blob recognition capabilities, this robot has the potential to receive a request, register and associate it with existing objects in its line of sight, and maneuver the arm to act accordingly, grabbing the correct object and giving it to a worker or engineer. This poster and presentation explains current progress and implementation of the iRobot Create for this purpose.

P16. Introductory to CS-EE-ME: a-week long, high-school curriculum

Brook Macklin and Zachary Hinton

Hampton University / Rice University /
Faculty Advisor: Dr. James McLurkin (Rice University)
Dr. Chutima Boonthum-Denecke

Abstract The main research goal was to develop distributed algorithms for multi-robot systems. More specifically the goal was to develop a system of low cost-robots for a classroom curriculum for ENGI 128 - Introduction to Computer Science, Electrical Engineering and Mechanical Engineering course. This course was typically taught over a semester. We had only learned an entire course in four weeks and then re-design the ENGI 128 curriculum into a smaller curriculum that high school students could understand. A semester long was reduced to a week long course. The whole course utilized the programming language Python so we had to learn this language as well. We developed programs, lectures, pre and post-tests, design challenges, and a final project to display the new skills each student acquired. On the last day, parents and professors attended the final challenge to see what skills the students learned.

P17. A Leap into the World of Visualization Technology

Britney Johnson

Hampton University / Duke University /
Faculty Advisor: Dr. Rachael Bradley, Dr. Ryan McMahan, Todd Berreth (Duke University)
Dr. Chutima Boonthum-Denecke

Abstract The field of visualization, along with interaction, has begun to take the world by storm, especially within the personal lives of individuals. The goal set to accomplish was to investigate methods for interacting with large-scale public displays. With the obvious demand and attributes of the smart phone, it would provide a mean for interaction that users would enjoy. The utilization of its camera, along with its convenience, provides users with the opportunity to interface, control, and share data. Therefore, the use of marker-based techniques (e.g. QR Codes) to link mobile devices to custom exhibition applications was the project that my advisors believed would enhance my abilities and the interactive world. Interfaces using web-based standards, such as HTML5 and Javascript, along with communication standards, such as WebSocket, would also contribute to the project. The LINK Mediawall in Duke's Perkins Library was the display that would benefit from this project.

P18. PR2 Teleoperation

Blake McMillian and Jason Allen

Hampton University/ University of the District of Columbia / University of Pennsylvania /
Faculty Advisor: Dr. CJ Taylor (University of Pennsylvania)
Dr. Chutima Boonthum-Denecke and Prof. LaVonne Manning

Abstract For decades the traditional joystick style controllers have hindered the scientific community. By using the Vicon cameras along with the robot operating system (ROS) we were able to build a prototype that has the potential to dexterously control the PR2's gripper. This is done using a system that integrates ROS, the Vicon system, and a mechanical hand motor that allows the user to interact with the PR2 in an innovative way. When an individual is allowed to control a robot using the natural motion of his or her own hand, something special happens; telemanipulation spontaneously becomes unambiguous. Nearly anyone with a properly functioning hand instantly gains the ability to manipulate a previously complex teleoperational system with ease.

P19. Multi Robot Exploration: Sector Search with Rendezvous

Tommy Suriel and Evanna Reynoso

University of the District of Columbia /
Faculty Advisor: Dr. Briana Wellman

Abstract Communication in cooperative multi-robot systems is essential. It can prevent duplicate coverage and reduce robot interference allowing for an increase in team performance. Typically, continuous point-to-point communications can be used to coordinate robots. However, in scenarios that take place in unknown and unpredictable environments, such as bomb detection or search and rescue, the communications network is not always reliable or guaranteed. Therefore, new approaches to multi-robot cooperation and communication are needed. We present the approach, Sector Search with Rendezvous, and propose that it is a good alternative to continuous message passing. In Sector Search with Rendezvous, robots explore pre-agreed areas or sectors and periodically rendezvous to share information about what was found. Physical experiments were conducted to compare Sector Search with Rendezvous to a robot team that communicates during the entire time of exploration. Results suggest that Sector Search with Rendezvous is efficient in coordinating robots in a coverage task and can be an alternative to direct communications in real world experiments.

Notes:

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