2011 FIRST Robotics Conference Abstracts

Autonomous Strategy: Creating Flexible, Scripted Autonomous Control
Chris Hibner, FRC51

Creating a new autonomous routine can take less than one minute. This presentation describes a strategy for autonomous programming which allows ultimate flexibility. Robot control is broken down into simple pieces that can be strung together with simple scripts that can be stored on the cRIO. Making an entirely new autonomous routine is as simple as creating a new script, saving it on the cRIO, then selecting it before the start of the match. Variations of this method have been used successfully since 2003.

Be Sustainable! Tips and Tricks for Managing your Team and Growing Successfully
FRC27

Wondering how to build a strong foundation that will allow your team to grow successfully? Managing a successful team can sometimes be more daunting than building a robot! This presentation's focus is on providing teams with resources for team organization, sustainability and growth. The mentors of RUSH - with over 80 years of combined experience - will be hosting the session and answering questions. RUSH will use its 200+ page Toolkit for Success, which all attending teams will receive, as the basis of the conference.

Topics to be covered include:

- Tips and Tricks to starting and sustaining a team
- Recruiting and retaining students
- Team Member Training and Leadership
- Examples of team/business operations
- Fund-raising, sponsorships and budgets
- Travel hints and tricks
- Examples of our "process of continuous improvement"
- Year-round activities and scheduling

Rookies and veterans alike will be sure to gain something valuable from this experience!

The Big Bacon Theory of Image and Marketing
4-H Exploding Bacon Robotics - FRC 1902, FTC 1902, FLL 9247

In *FIRST* it isn't so much who you know, but who knows you. You can be a great team and have a great robot, but you have to work hard to be noticed. We will teach you how to increase your visibility. A well known team can recruit more students, mentors and sponsors, and a company who is familiar with you is more likely to give you financial support.

In our session we will be teaching the importance of branding, marketing and community involvement. We will go over how to develop an image for your team, make it consistent through out your pit, your paperwork, your spirit wear and your robot. Branding is more than how you look; it is the personality of the team. We will help you to become recognizable inside the *FIRST* community and out.

We will also cover how to write a press release, how to write a newsletter, how to assemble a marketing package, how to cold call, how to judge whisper and the importance of sponsor invitations, alumni relations and community outreach.

Chairman's Award Chat - Talk with Championship Chairman's Award Teams
Hall of Fame Team Representatives, led by FRC365

The Chairman's Award is the top award in FRC and gets more competitive every year. MOE 365 will lead a panel discussion of representatives from past Chairman's Award teams. The panel will focus on questions/topics from the audience, which may include: experiences from each individual team's Chairman's Award journey, reasons to submit, telling your team's story, planning and organizing a submission, the written submission, the judge presentation, the video submission, etc. Teams should bring their Chairman's Award questions and be prepared for lively and (hopefully) helpful discussion.

Cyber Blue's Design Process - Innovation through End of Year Review
FRC234

For several years, Cyber Blue has been developing and modifying their design process. The team's process is modeled after ones used by their main sponsors, and the new cycle begins as soon as the competition season ends each year.

The team begins with lessons learned and then creates new opportunities for development and innovation during the summer and fall. The new *FIRST* season launches brainstorming, concept development, robot realization, independent reviews, competition and continuous improvement. Following the end of the season, the team completes lessons learned and starts the cycle over.

This presentation will discuss the basic design process used, the steps involved, and provide examples using the teams activities during the past two years.

Design of a Small UAV to Support Special Operations Airdrop
Dr. Billy Crisler - Assistant Professor of Aeronautics at USAF Academy, and Special Guest Presenter

Air Force Academy cadets do real research related to their technical careers. This year, they're studying three different sizes of Unmanned Autonomous / Aerial Vehicles (UAVs) to support a single-pass combat airdrop capability for Special Operations Forces in Southwest Asia. This same capability would support airdrop operations humanitarian relief (e.g., Haiti, etc.). The results of their work will streamline development of improved operational capability and provide inputs for technology planning and fleet sizing for the next generation of UAVs for the next 25 to 50 years.

Effective *FIRST* Strategies
Karthik Kanagasabapathy - FRC1114

This presentation focuses on three major areas, Strategic Design, Match Planning/Execution, and Scouting. Rather than spending time on equations and detailed calculations, the Strategic Design gives a more high-level overview of how to design an FRC robot. This portion of the presentation includes sections on such often neglected strategic design areas such as Game Analysis, Chokehold Strategies, Cost-Benefit Analysis, Task Prioritization, and Tradeoffs using a case studies from past games. The Match Planning/Execution section of the presentation discusses effective habits and strategies that will help lead a team to victory. This is a must for those who enjoy the strategic aspects of *FIRST*. The Scouting section deals with effective techniques to collect information on your partners/opponents, and how to make the most of this data. Advanced statistical metrics analgous to "Sabremetrics" in baseball will also be discussed. The presentation is filled with entertaining and insightful historical *FIRST* anecdotes from the past 13 years. With the information in this presentation, you can turn your team from a mere competitor to a perennial powerhouse!

Enhance our *FIRST* Team Collaboration with PTC's Windchill
PTC

Using PTC's Windchill Software, *FIRST* participants can collaborate, share and visualize new designs in an interactive, online environment. Learn how to create and manage projects, teams and designs to allow partners, sponsors and even other teams to see and share ideas in a secure manner.

***FIRST* Medicine: An Overview of Robotic Applications in Medicine and an Application to Students Today**
Jake Raymond, Faith Davis, Tyler McKinley, Justin Paawleski, Jeff Demaray - FRC3547

Applied advances in computers, microelectronics, robotics and materials have recently been integrated into medical diagnosis and procedures. The development of medical manipulators, robotic systems and computer assisted diagnosis is rapidly becoming common place. These systems in trained hands have resulted in dramatic medical improvements. Advantages include decreased blood loss, shorter hospital stays, reduced recovery time.

The da Vinci a standalone robotic surgery system is FDA approved for use in several surgical procedures including mitral valve heart surgery and radical prostatectomy. The system as of 2006 was in 509 hospitals worldwide. Prosthetics are being developed that will allow for thought controlled robotic arms and legs.

Robotic systems and manipulators will become increasingly important in areas of minimally invasive surgery (MIC) and Natural Orifice Transluminal Endoscopic Surgery (NOTES). Notes in particular will make new and extensive demands on the instrumentation. "Robotic Pills" are now being considered to do surgical procedures by working together.

The development of a whole new career track merging life sciences and technology is emerging. *FIRST* youth will be on the forefront of this growth that will if trends continue improve the overall human condition. The presentation will present current trends of medical technology relating a career path to the student. There will also be a leadership focus for mentors to recruitment of mentors and students with life science careers or aspirations.

FIRST Scholarship and College Strategy for the Robotics Student!

George Walls - Capitol College Director of Admissions/ CEO EMConsultants LLC

As a college recruitment expert, enrollment management consultant and admissions director for one of the top 3 largest *FIRST* Robotics scholarship partners in the nation, George Walls has a unique perspective on connecting teams and students with good fit colleges that want to say "YES"! This one hour workshop will show coaches and mentors how to garner support for their team while opening opportunities for their students to get into, and gain scholarship $$ for good fit colleges that recognize the value of *FIRST*.

MENTORS:

- Learn how to gain access to facilities, money, faculty and student mentors for your team, season after season.
- Create positive partnerships that turn the students you send to college into your next generation of mentors.
- Make your program an academic rocket launcher that gets full school support.

STUDENTS:

- Learn how to put your *FIRST* foot forward to make your college app shine.
- Learn strategies that find the schools that want YOU.
- Get inside information that will save you at LEAST $100 before you leave St. Louis!

How to Organize a _FIRST_ Offseason or Preship Event for FRC, FTC or FLL

Kim Eckhardt, FRC1511

Are there no offseason or preship events hosted in your area? Well guess what, ITS EASY! YOU can setup and run one too! Since its inception, 1511 has run the Rochester Rally Pre-Ship Event and the Rah Cha Cha Ruckus Off-Season event. They also started equivalents for FLL, the Razzle-Dazzle and the Rumble! And if you watch it all come together these days, you would be amazed how easy it is! Come to this workshop to learn how to run your own offseason and preship events at any scale! We will offer ideas and organizational tips so that any team can get started!

Is Non-Profit Status Right For Your Team? Considerations and Application Tips

Mike Wenig - FRC2655

This session will give you some tools to enhance your team's ability to raise funds. You will learn:

- what is required to prepare and file an application for IRC §501(c)(3) nonprofit status with the Internal Revenue Service
- the steps you need to consider before undertaking this process.

We will discuss what business structure your team may want to consider in forming a nonprofit entity. We will also discuss how and where you can learn about the requirements for forming a business entity in your state. Next, we'll discuss the documents and other information that you need to gather to assist you in preparing the IRS Form 1023. Finally, we will discuss some of the rules related to applying for and maintaining nonprofit status. This program will provide the details of how to get started with the application for nonprofit status and discuss some of pitfalls you may run into along the way. *FIRST* Team 2655, Inc. successfully formed a nonprofit corporation and applied for an received recognition as a 501(c)(3) nonprofit organization in early 2010. The main presenter for this program a mentor for *FIRST* Team 2655 and a tax lawyer and CPA in the non-*FIRST* world

Know Thyself, Know Thy Opponent: Scouting Tips from a World Champion FTC Team
Caroline Bresnan, Paul Bresnan - FTC2868

Ever wanted to know the secret scouting strategies used by a World Champion team? Join members of Team 2868, Smoke and Mirrors, Captain of the Winning Alliance at the 2009 FTC World Championship, as they share their scouting tactics. Any level of FTC team can benefit from this presentation about how to gather and use intelligence about opponents and allies alike. The presentation will also include interviewing techniques with the goal of not just learning about a robot, but forming a connection with other FTC participants in the best spirit of Gracious Professionalism.

Making the Most of LabVIEW for FRC: Performance, Debugging, Architecture
Greg McKaskle, Doug Norman - National Instruments

Come learn from National Instruments experts the best practices and tips to be successful with LabVIEW. Topics include tools to test and improve performance, debugging timeouts and errors, and how to effectively use the robot framework.

Meet the Experts
Greg McKaskle is a seasoned LabVIEW FRC veteran. He has been a part of the NI/*FIRST* partnership since its beginnings in 2008 and a member of the NI LabVIEW team for over 20 years. He currently holds the title of Chief Architect. Greg's robotics expertise covers a broad range of topics including vision, communications, and general programming.

Doug Norman is a Senior Software Engineer who joined the LabVIEW FRC team in 2009 and has worked at National Instruments since 1994. Doug has a long history of bridging the gap between hardware and software on the LabVIEW team and is famous for his ability to build the mechanics of complicated demos. Doug's areas of expertise include general LabVIEW programming, hardware/software integration, and example creation.

Octocanum: An Introduction to a Novel Hybrid Drive System Using Pneumatics

Jonathon Skowronek, Carlin Huisman, Justin Brock - FRC3547

Drive systems on an FRC robotic system come in many variations including; 4-wheel drive, 6-wheel drive, 8-wheel drive, omni wheels, mecanum wheels, crab drive and swerve drive. These systems all come with inherent trade-offs, some may sacrifice mobility for traction, speed for strength, or some other combination.

Recently some teams have begun to drive and test a "hybridized" drive system. This system has recently been seen on *FIRST* community web sites and has been named "octocanum". These systems combine pneumatics along with traditional elements of drive systems. This new system is now seen in Michigan, Wisconsin, and Washington. Early test results are promising, the system seems to overcome some of the traditional trade-offs. The system is still in early development with field competition testing still pending. The 2011 Logomotion season will provide this data as teams field test the system in various forms.

The system is a 4x8 drive system and use is dependant on game circumstances. There is 4 mecanum wheels used for mobility and speed. There are also four plaction wheels deployed via pneumatics to add traction and power.

FIRST Team Virus 3547 will present a brief overview of traditional drive systems than explain the design and use of our octocanum system. Throughout this season we will invite other users of this system to share data and design suggestions. We will also invite interested teams to join us during the conference session.

Off Season Projects with LabVIEW and cRIO

Nate Holmes, National Instruments

Take advantage of the KOP during the offseason:

- Instill a philosophy of curiosity, problem solving, and lifelong learning.
- Build a foundational skill set for the future as an engineer.
- Make a difference in your community.

Nate Holmes has provided FRC and FTC competition support since 2009, and helped pioneer control system training and support through ni.com/first as well as on-site competition support systems. Nate comes from a background in mechanical engineering, and led the NI application engineering team for Vision and Motion for 2 years before moving on to product management for motion control and EtherCAT technology at NI.

Nate and the NI FIRST team have seen some amazing off season projects in the past few years, and being the engineers they are, have thought up a few crazy ideas of their own. Come see what's possible, what resources are available, and above all, get inspired to inspire YOUR team in the off season.

Optimize your Robot Design using PTC's Creo Elements/Pro (formerly named Pro/ ENGINEER)

PTC

Do you want to get the most out of using PTC's Creo Elements/Pro? Over 50,000 companies across the world use PTC's software to optimize the way their products are going to be used **before** the products are built. This presentation will focus on how PTC's 3D modeling software can be used to optimize your robot's performance. We'll be going a little beyond the basics to help you see the potential of using PTC's software.

Optimize your Robot Design using PTC's Mathcad
PTC

Mathcad is an engineering calculation engine which allows users to type their equations and view the results live in a document format. During the design phase Mathcad users can do what-if analysis and optimization of the parameters they wish to use in their CAD designs. In this presentation we will highlight how Mathcad Prime makes it easy for users to document their assumptions and compute their results to meet the design goals.

Preparing Your FLL Teams for FTC
Randy Hoskin - National Instruments

Is your FLL team ready to compete in FTC next season? Learn how to best prepare your team for FTC using new features of MINDSTORMS with TETRIX and preview the newly released LabVIEW for LEGO MINDSTORMS programming environment. The session is presented by Randy Hoskin, National Instruments engineer, FLL referee, and member of the Central Texas FLL Steering Committee. He has mentored students using LEGO MINDSTORMS for the last 10 years as a Master Mentor at National Instruments.

Presentation Skills: How to be Great In Front of an Audience!
Kim Eckhardt, FRC1511

Does the thought of getting up in front of an audience and having to speak scare you? Or are you comfortable standing up there, but want a few good tips? This workshop will cover a range of skills needed to be a charismatic presenter. From tips to help yourself calm down, to ways to really engage your audience, presentation skills are vital throughout your lifetime. Whether its giving your chairman's presentation, or presenting at work, these skills can help both students and mentors!

Public Relations for *FIRST* Teams – how to get on the media's good side and arrange for them to cover you
Lee Drake and student members of FRC1511

This 45 minute presentation will consist of a template and series of slides to cover the basics of PR, how to write a good PR release, why do it, when to do it, who to send it to, and what to cover. (Who/What/ Where/Why/When/How). In addition, it will cover the use of new modern social media tools like twitter,

Facebook and linked- in to develop a deeper connection and relationship with important PR sources, and how that can get you more coverage. The difference between television and written press and how to target one, the other or both, will be covered. Development of the organizational structure of a PR Sub-team on a FIRST team, and how to teach the PR process to team members will be included.
A web link off our website (www.penfieldrobotics.com) will be provided that has:

- Example Press releases
- Examples of Press Coverage
- Press Release Template
- All slides in the slide deck

Reaching out: How the *FIRST* Community Can Assist International and Remote *FIRST* Teams
Steve Garward FRC111, Sarah Heimlich - FRC3132

In 2010, FRC Team 3132 became the first Australian team to compete in FRC. Throughout the build season many issues were faced - from unavailable parts like batteries, to timezones requiring early shipment. Even prior to build season, no parts were available to allow the team to begin honing their skills. All of these challenges, in conjunction with being a rookie team a long way from help, gave Team 3132 a very unique perspective and experience of what it means to compete in FRC. Team 3132 is not alone in the challenges they face.

This session will look at some of the challenges facing remote and international teams. Teams and individuals attending will be encouraged to use what they know to compete fiercely, while being mindful of the struggles remote and international teams face. This session will encourage *FIRST*ers to reach out to teams globally, not just those next door.

We will present some proposals for ways the FIRST community, in all *FIRST* competitions (FRC, FTC and FLL), can help international and very remote teams in their early years. We will explore how to proactively and creatively help these teams. By sharing the experiences and ideas of Team 3132, we hope the *FIRST* community can collaborate in new ways to help these teams as they in turn begin to inspire growth in STEM through *FIRST* programs in their region and beyond.

The Relevance of *FIRST* to Academic Success: An New Immigrant Perspective
FRC 1635, The Techonotics, Newtown HS, New York City

For 20 years *FIRST* has given students K-12 the opportunity to get engaged in STEM through competitive academic sport. FIRST has maintained its focus on reaching out to various groups promoting the benefits of *FIRST*. "FRC," "FLL," "FTC" and "FIRST Lego" have become familiar terms in academic and higher education. Our presentation focuses on a unique audience - the new immigrant population. Team 1635 is located in Queens, NY - the most diverse district in the New York, and most likely, the United States. Our school has students which represent over 100 countries, many of whom arrived in the United States within the past 3-4 years. Our team is enthusiastic to promote *FIRST* and we have had to create alternative marketing tools complementing the English language versions which are on the *FIRST* site - to much success! We have successfully been able to reach out to many communities (Spanish, Arabic, Urdu, Hindi, Chinese -speaking, and sign language), showing parents why *FIRST* is a safe after-school

complement to academic subjects and great improves their child's chances of getting into college/ university. Join us so we can share our methods with your teams.

Resume Writing for Success in the 21st Century

Tina Nicolai - Principal, Career Architect, Résumé Writer for Résumé Writers' Ink, LLC

Securing employment in 2011 and beyond requires a savvy approach to getting noticed--to obtaining an interview--to securing a job (in the industry of your choice).

With increased global social networking, remote work locations, and lagging written and verbal communication, Gen Y/Millennials (75 million, born between 1981-1999) are caught in a vortex of confusion discerning **FACT** from **FICTION** when writing résumés and seeking employment.

FACT or FICTION? Résumé should be optimized.

FACT or FICTION? My grades are exceptional. My résumé is not that important.

FACT or FICTION? Companies don't really care about résumés when you are in engineering, IT or any technical field.

FACT or FICTION? QR Codes are used on résumés.

This ***interactive*** session will cover:

- Résumé Basics
- Sample Résumés
- Social Media Networking Tips
- Inside SCOOP from Industry Recruiters
- Answers to the FACT or FICTION questions (listed above)

Attendees will learn about current trends, recruiter expectations and global facts! Attendee participation is encouraged!

Gen Y/Millennials, Gen X, and Baby Boomers will walk-away thinking about their résumés as ***"more than words on paper".***

Robotics Research and Development Overview

Jeffrey Wit, Air Force Research Laboratory

The Air Force's approach to ground robotics is to explore opportunities to provide capabilities that expand the effectiveness and efficiency of our existing forces. In general robotics should be initially integrated in areas to provide standoff protection from hazards and as a force multiplier to more efficiently and expeditiously complete operations that we just don't have the constrained human resources to perform.

This presentation gives an overview of the ground robotics development areas of the Air Force Research Laboratory at Tyndall AFB, FL. These areas include advanced technology development, integrated defense technologies, robotic EOD technologies, automated UXO response technologies, and robotics for airbase operations and support.

Society of Women Engineers: Grants, Scholarships and Community

Randy Freedman

Founded in 1950, the Society of Women Engineers (SWE) is the driving force that establishes engineering as a highly desirable career aspiration for women. At this presentation participants will come away with:

- information about SWE Program Development Grants. Grants that can be used to raise money for FIRST teams at any level. SWE would like to give away $100,000 this year.
- information about SWE scholarships. SWE provides nearly half a million dollars in scholarships.
- information about how to connect with a local SWE section and local SWE hands-on engineering events
- information on how pre-college students, parents, and educators can become associate members of SWE.

Software Testing Via Simulation

Chris Hibner - FRC51

In industry, modern control system software is thoroughly tested in simulation before it ever sees the actual hardware. With the tools provided by National Instruments, testing *FIRST* robotics software in simulation is easily withing reach. This presentation will cover modeling techniques and how to use the models to test control strategies and software.

SOS - Help for Raising Funds and Raising Minds

Randy Blackwood, Cheri Blackwood, Vivian Chen, Abby Ward - FRC2359

S.O.S. is Sciencing On Saturday, a program developed by Team 2359 to raise awareness of STEM to elementary school students and raise funds to help your program. This approach will increase your team's visibility in the community, grow young minds to be excited about technology, increase interest in joining your team when they reach high school, and help you raise funds for your team with very little capital outlay. Team 2359 has developed a series of science and technology activities for elementary school students, which are presented in 2.5 hours sessions on a Saturday. Our team promotes this program to the feeder elementary schools for our high school. S.O.S. has been a successful undertaking and has helped our team raise over $4500 on just four Saturdays, with our largest day being over 100 students participating and over $1500 raised. Learn how to duplicate this process or how to obtain a starter kit including lessons and other materials. What sums up this program the best is one of many parent compliments we have received: "Our children enjoyed every moment of the program, and would happily have spent the whole weekend there. Thanks for offering such a fun, educational experience!"

The Spirit of FIRST: Why the Chairman's Award is Essential to FRC

Carolyn Beyer - FRC 33, Renee Becker- FIRST Support Organization: GO FIRST, Libby Kamen - FRC 229 & FRC 1923

The Chairman's Award is an embodiment of the spirit of *FIRST*, the driving force behind the FRC program and is something within grasp of every single FRC team. Three members of the Non-Engineering Mentor Organization (NEMO) will be examining why the Chairman's Award is important to *FIRST* as a whole, why teams shy away from submitting the award, and the benefits of the submission process. This high-paced, dynamic discussion will help teams learn where they can access resources to help them submit Chairman's, ways to move forward with a submission for the team, and why the Chairman's Award is so critical to the *FIRST* program. Renee, Carolyn and Libby encourage you to come with questions and concerns regarding your own team's process for creating a Chairman's Award submission. Students, parents, and engineering, technical and non-engineering mentors are all encouraged to attend.

Today's Girls in Tomorrow's Workplace – A Panel Discussion on Careers in Science, Engineering, & Technology

FRC365

Girls – Are you thinking about a career in science, technology, or engineering? Are you interested in learning how any of these fields can be stepping stones to more choices of careers? Attend a panel discussion with women who work in a wide variety of industries and organizations. They will describe their career path, and reflect on the rewards, challenges, and opportunities along the way. The panel presentations will be followed by ample time for you to engage in large and small group discussions.

What's Your Message? Tips for Creating a Great *FIRST* Team Website

Kathie Kentfield - FRC Website Evaluator Advisor, Higher Education Website Coordinator

Does your *FIRST* team have a website? Have you thought about who your audience is, what your message is, and how you are communicating it? This session will offer suggestions for how to improve your team's website content - what to include and what to avoid. This is not a discussion of technical website development, but a session for website content.