



Western Region Robotics Forum Winter Workshops

December 14, 2013, 8:30AM-4:00PM
Bannan Engineering Building
Santa Clara University
500 El Camino Real
Santa Clara, CA 95053-1500
[Google Maps](#) | [SCU Campus Map](#)

Agenda

8:30AM-9:15AM: Registration
9:15AM-9:30AM: Kickoff
9:30AM-12:00PM: 2.5 Hour Workshop
12:00PM-12:45PM: Lunch
12:45PM-2:00PM: 1.25 Hour Workshop 1
2:00PM-2:15PM: Quick Break
2:15PM-3:30PM: 1.25 Hour Workshop 2
3:30PM-4:00PM: Wrap Up

Bring your own lunch! We will provide sodas, water, and cookies.

Cost

\$5.00 per attendee

**One free registration discount for a team with 4 or more workshop attendees
registering* at the same time!**

* There seems to have been some confusion regarding this policy at the last workshop: 'registering' here refers to either checking in as a pre-registered attendee or signing up in person at the event, both on the day of the workshop.

PRE-REGISTRATION FORM:

(will close 12/11/13 at 11:59:59PM)

<https://podio.com/webforms/5892640/460000>

[Mobile Catalog BETA](#)

Class Offerings At a Glance: (Full Descriptions Below)

AM (9:30AM-12:00PM):

Animation: Character Animation, Dynamics, Simulations*
Autodesk Inventor 2014 Install Party/Session*
Business Organization & Team Management
Electronics: Basic & Intermediate*
Make A Decision! Synthesizing Robot Design Ideas
PID Robot Control: Explaining PID with an FRC Context
Subsystems of a FIRST Robot

PM 1 (12:45PM-2:00PM):

Animation Principles & Theory*
Becoming a Control System Detective – Troubleshooting on the Boundary
Between Electronics and Programming
Electronics: Basic Only*
GearMotor Acceleration; Time to Velocity & Distance
How Does FRC Influence Young Women's Career Choices?
Introduction to CAD with Autodesk Inventor (1 of 2)*
Introduction to Machine Vision (1 of 2)*
Success Principles of Competition Robotics Teams

PM 2 (2:15PM-3:30PM):

Animation Basics & Starting/Running An Animation Team in FRC*
Basic Document Design
Building a Drivetrain to Maximize Success in Both Competition and Build Season
FRC 2015 Control System Beta Testing Showcase
FRC RobotBuilder for Java and C++
Introduction to CAD with Autodesk Inventor (2 of 2)*
Introduction to Machine Vision (2 of 2)*
Recruiting & Retaining Volunteers of All Ages: Best Practices

***See Special Notices on next page**

SPECIAL NOTICES

If you are interested in taking ANY of the **ANIMATION, CAD, MACHINE VISION OR ELECTRONICS** workshops, please note the following:

Animation: Due to the workshops schedule, the animation classes are presented in reverse difficulty level (intermediate → basics theory → basics technique/tools); nevertheless, if you are a beginner student who would have been interested in taking animation theory and/or intermediate animation if it was presented the other way around, you are still advised to do so and sign up for all three. This way, at least you can get a larger sense of what you can do with animation past basic-level material, acquire a basic theory foundation, and then be ready to jump into the tool basics in the last class with those in mind.

CAD: Note that the Intro to CAD with Inventor workshop is a single class that consumes both PM timeslots – it is a 2.5 hour workshop despite being held in the afternoon (the only exception to that rule); therefore on the registration form if you are planning to take this class you should select Intro to CAD for both PM slots and plan to show up to both – they are NOT repeats, they are two parts of the same workshop. If you don't have a copy of Autodesk Inventor by then to follow along, bring a laptop and sign up for the preceding install session “class”, which will provide a time for you to get the software up and running with the instructors' help.

Machine Vision: Note that the Machine Vision workshop is also a single class that consumes both PM timeslots – it is a 2.5 hour workshop despite being held in the afternoon (the only exception to that rule); therefore on the registration form if you are planning to take this class you should select Machine Vision for both PM slots and plan to show up to both – they are NOT repeats, they are two parts of the same workshop.

Electronics: Note that the Intermediate class covers the content of Basic plus one hour more; people should sign up for/attend basic only or intermediate, not both.

Animation Basics & Starting/Running an Animation Team in FRC

Clayton Ou, FRC alumnus & animation mentor; Emma Lewis, Team 115 Media Director (+- 2 others) – PM, 1.25 hours. All audiences.

Want to help your team with the Safety Animation (or other projects) but don't know how? Considering starting an animation division in your team but not sure why or where to start? Or, veteran team member or mentor curious as to what all those media people are doing? This workshop should get you up to scratch on the basics, refresh your existing modeling knowledge, or satisfy your curiosity. The workshop will introduce you to the Autodesk Maya (or 3ds, if the other instructors can make it) interface and organizational tools, get into some basic modeling (extrusion, NURBS vs. polygons, proxies, parenting/grouping), materials (texturing), really basic rigging, and then talk about some of the unique challenges involved in starting and maintaining an animation group on an FRC team....and why you should do it anyway.

This class will have a bit of lecture but is mainly hands-on: please come with a copy of Autodesk Maya or 3ds Max installed. (Students & educators can get [a free copy & license from Autodesk.](#)) It is intended for students/mentors/team leads with little to minimal (a couple months' or less worth) knowledge about 3D modeling & animation, either technique or organization-wise. No prior knowledge required, but being familiar with Maya/3ds interface will be useful.

Animation: Character Animation, Dynamics, Simulations

Clayton Ou, FRC alumnus & animation mentor – AM, 2.5 hours. Intermediate to advanced.

Intended for students who know their basic modeling, texturing, and animation and want to get into more of what Maya is capable of. This workshop will touch on (or try to, depending on time) animation with the Graph Editor/paths/Trax Editor etc., basic biped character animation (FK vs. IK, walk cycles etc.), fluid & cloth simulations, dynamics (physics simulations) with nDynamics and Bullet, fur/hair creation, mental ray's physical sun & sky, integrating other tools into the pipeline (Sculptris, Makehuman, etc.), CAD import, and a bit of particle effects or Maya Python scripting (again, if time allows). If that entire description just flew over your head, you're probably taking the wrong workshop.

The workshop will mostly be hands-on, so please come with a copy of Autodesk Maya installed. (Students & educators can get a free copy & license from <http://students.autodesk.com>.) This workshop is intended for intermediate to advanced students – you should know your way around Maya more or less, at least the modeling tools, and know the basics of setting up a rig (i.e. skeleton, IK controls etc.). *However*, basic students can come too to see what Maya can do as you get deeper into it.

Animation Principles & Theory

Clayton Ou, FRC alumnus & animation mentor; Domenic Allen, Team 100 Multimedia Mentor – PM, 1.25 hours. All audiences OR beginner to intermediate, see last paragraph for details. (CONT. ON NEXT PAGE)

A software-agnostic look at basic animation theory. Learn about animation's relationship to movement, its principles, the importance of timing and weight, how knowledge of other fields such as dance, theater, photography, and film can help you with your animation work, and of course, how to apply all this to improve your team/personal animation projects (or just to appreciate the next animated film you watch). If time allows, we'll also get into a non-mathematical explanation of what goes on behind the scenes of your 3D software of choice, whether you're assigning materials or hitting render.

The class will be mostly lecture/Q&A, with a bit of live demonstration. No prior knowledge required; the content is suitable for all audiences if you're just interested in the theory side – the principles are software/medium-agnostic – but having beginner to intermediate skill level in (or at least being familiar with) working with almost any 3D tool (Maya, 3ds, Softimage, Blender, Cinema 4D) will definitely help in understanding how the theory connects to doing animation.

Autodesk Inventor 2014 Install Session

Anurag Makineni, Rahul Iyer, & Miles Chan, Team 846 – AM, 2.5 hours. All audiences.

Installation party where Autodesk Inventor 2014 will be installed on attendees' computers. Software will be delivered via USB flash drives.

Intended for general students and adults. No prior knowledge required. Bring a laptop with a Windows 7 or 8 OS (may be running Windows on Mac Boot Camp) [older versions of Windows may work but are officially unsupported, use at your own risk], a mouse, and your device's power supply. Free disk space: 15GB; RAM: 4GB minimum. See autodesk.com for detailed requirements.

Basic Document Design

Rachel Leung, Team 840 Multimedia Director; Kenzo Makitani, Team 840 Engineering Lead – PM, 1.25 hours. Beginner.

Learn the basics of Adobe InDesign, and design and document layout in general.

No prior knowledge needed.

Becoming a Control System Detective – Troubleshooting on the Boundary Between Electronics and Programming

Laura Rhodes, Team 100 Mentor – PM, 1.25 hours. Intermediate.

So your shooter won't shoot, your drive train won't drive. It used to work. What went wrong? Is the problem in the code? In the hardware? Where to begin to look? In this class you will learn to use the features built into the FRC electronics and software packages to quickly isolate the problem source so you can fix it. Learn how to decipher the LED light codes on the digital side car and speed controllers. Use advanced features of the Driver's station to track down what went

wrong in the last match. Observe demonstrations with real FRC control electronics hardware. Improve your ability to quickly isolate the cause of a FRC robot control system malfunction so it can be quickly remedied.

This is an intermediate level class. Both students and adults should be able to glean some usable robot electronics trouble-shooting skills from this class. It is designed to be language agnostic and should appeal to those whose teams use any of the three available languages: LabVIEW, C++, or Java. Some familiarity with the FRC control system electronic components is helpful. This will be a lecture with a live FRC electronics demonstration. No programming experience is required.

Building A Drivetrain To Maximize Success In Both The Competition And Build Season

Andrew Lawrence, Team 256 Captain – PM, 1.25 hours. All audiences.

Focused on tank drive. Individuals in the workshop will learn about how to make a successful drivetrain in the least amount of time, the importance of tradeoffs, and why any drivetrain that takes over 2 days to build is too complex through an interactive lecture.

This presentation will span from basic knowledge to advanced ideas. Individuals with no prior knowledge will learn anything they need to know, and advanced attendees will be able to apply new information to their current methods of build and design.

Business Organization & Team Management

Ashwin Mathur, Team 115 Alumnus – AM, 2.5 hours. All audiences: students, mentors, parents.

How do you lead and manage a group of students towards a common goal? How do you get the funds to have a successful team? How do you keep all your projects on schedule? Learn techniques to answer these questions and other aspects of the business side of FIRST. Topics will include leadership and project management, building a sustainable team structure, and finance topics such as business plans, budgeting, grants, and sponsorships.

Intended for student leaders, aspiring student leaders, and/or business/operations/finance/PR students. Parents and mentors welcome as well, as well as anyone wanting to learn how to effectively organize your team and build season. For both new and veteran teams.

Electronics: Basic Only

Mike Schmit, Team 1351 Mentor & WRRF BOD VP, AMD Program Manager – PM, 1.25 hours. Beginner.

This workshop covers everything from the ground up. Very basic introduction to the terminology of volts and amps, wire gauges, etc. Beginning theories of electricity such as Ohm's Law will be covered.

Electronics: Basic and Intermediate

Mike Schmit, Team 1351 Mentor & WRRF BOD VP, AMD Program Manager – AM, 2.5 hours. Beginner to intermediate.

This workshop covers everything from the ground up. Introduction to the terminology of volts and amps, wire gauges, etc. Beginning theories of electricity, such as Ohm's Law will be covered. Learn about all the power distribution and electronic components in the FIRST kit of parts as well as common mistakes and pitfalls for new teams and new students.

FRC 2015 Control System Beta Testing Showcase

Jimin Park, Team 115 Vice President of Engineering, & MVRT 115 – PM, 1.25 hours. All audiences: all levels of students.

MVRT 115 is part of the beta testing for LabView for the possible 2015 control system. They will be showcasing the control system for other teams.

Prior knowledge of the current control system is encouraged, but not required.

FRC RobotBuilder for Java and C++

Laura Rhodes, Team 100 Mentor – PM, 1.25 hours. Intermediate.

Introduce and demonstrate the new RobotBuilder design tool and a robot program based on the Command-Based Programming design pattern supported by WPILib. FRC RobotBuilder is a new software tool introduced for the 2013 season and provides a graphical user interface to organize robot design into smaller, separately operated subsystems and automatically generate wiring lists and code skeleton in Java and C++. Explore the Command Based Programming design pattern for organizing robot programs, which supports activities that happen over time, handles concurrent activities (e.g. driving and raising elevator), supports testing individual activities, and can combine commands to quickly create autonomous programs or driver-assist actions.

This is an intermediate level class geared to programming team members already familiar with Java or C++. *However*, beginners and electrical team members will get something from the class. Java will be the language demonstrated, however, the concepts will also directly apply to C++ (but not as much to LabVIEW). Some familiarity with the FRC robot components such as actuators and sensors is helpful. This will mostly be a demonstration/lecture, but those who bring laptops configured for programming in 2013 can follow along with the actual programs.

GearMotor Acceleration; Time to Velocity & Distance

David Giandomenico, Team 846 Coach – PM, 1.25 hours. Advanced.

Explores how to solve the basic differential equation that describes the acceleration, velocity, and distance traveled for our robots, and the effect of gear reductions. (CONT. ON NEXT PAGE)

Heavy on math and physics, with emphasis on theory (not practice). (Previously presented October 2013, with positive feedback from audience. New WRRF presentation.)

Intended for advanced students and adults. Students (senior or junior) should know derivatives of functions like $exp(x)$ and be taking physics. Not recommended for rookies.

How Does FRC Influence Young Women's Career Choices?

Ceal Craig, retired engineering programs director, now a researcher on the influences of robotics programs on young people – PM, 1.25 hours. All audiences: mentors, teachers, parents, students.

Proposed model describing how FRC influences young women's career decisions will be shared from the instructor's dissertation research. Some recommendations will be provided as well. Opportunity for feedback.

Introduction to CAD with Autodesk Inventor

Team 846, Funky Monkeys, Lynbrook HS – PM x 2, 2.5 hours+15 min break. Beginner.

Attendees will build a basic robot assembly and learn how to create parts. The class takes a top-down approach by first doing an assembly, and then making a part. Concepts are applied on a "Need to Know" basis. For example screen navigation is explored when assembling parts, rather than introducing it as a subject by itself.

No prior knowledge required, but do have Autodesk Inventor 2014 installed on a Windows 7 or 8 OS machine (may be running Windows on Mac Bootcamp) [older versions of Windows may work but are officially unsupported, use at your own risk], a mouse, and a power supply.

Introduction to Machine Vision

Tim Craig, Software Engineer – PM x 2, 2.5 hours+15 min break. Intermediate to Advanced.

Gives an overview of machine vision potentially useful for FIRST robotics.

Intended for people new to the concepts of machine vision. Algebra would be useful, calculus helpful but not required. As it is assumed the attendees will be doing the vision programming for their robots, they should be experienced programmers or they'll not be able to apply what they learn. The class is designed to be more descriptive than rigorous so low impact on the math. What the class is NOT is a tutorial on the NI Vision library available to the teams nor any coverage of how to program.

Make a Decision! Synthesizing Robot Design Ideas

Ceal Craig, retired engineering project director, responsible for new product development definition and schedule development, prior FRC mentor, now a researcher – AM, 2.5 hours. All audiences: beginner to advanced students, parents, teachers, and mentors.

Learn & practice brainstorming techniques, idea evaluation approaches, and consensus building tips for those crucial days at the beginning of the FRC build season. This workshop has several interactive breakout sessions interspersed with explanations and directions.

PID Robot Control: Explaining PID with an FRC context

Sami Nijim, Applications Engineer at Maxim Integrated, BSEE CWRU 2013 Alum, Mitty Robotics 1351 Alum – AM, 2.5 hours. Intermediate.

Upon completing this class, students should understand and appreciate the need for control systems in robotics, know the definition of a system and identify examples of systems all over the robot, have a notion of what (negative) feedback is, understand and articulate the basic concepts of reference, error, and control effort signals, understand the need for and the effects of proportional, integral (sum), and derivative (difference) gain, and have a notion of what a stable (versus unstable) system looks like. Provided will be a set of slides which are intended to be extensive for instructorless self-study. Lecture slides for the workshop will be trimmed down and a visual simulation language will be used to build a control system during class in order to explore the effects of PID.

Students should have a BASIC prior understanding (or intuition) of physical systems (e.g. batteries supply energy, motors convert energy) and a SOLID understanding of algebra 1 (i.e. time domain graphs). It is recommended that students have at least a year of FTC or FRC experience. Calculus strongly encouraged as a corequisite.

Recruiting and Retaining Volunteers of All Ages: Best Practices

Ceal Craig, retired engineering programs director, now a researcher on the influences of robotics programs on young people – PM, 1.25 hours. All audiences: mentors, teachers, parents, students.

Learn about recent research on volunteer management: recruiting & retention. Discuss how this could apply to recruiting mentors & coaches for FRC teams & robotics events.

Subsystems of a FIRST Robot

Anurag Makineni, Brent Yi, Srinjoy Majumdar, & Eric Yeh, Team 846 – AM, 2.5 hours. Beginner.

Overview of 4 common systems in FIRST robotics: drivetrains and their basic physics; pneumatic systems; electrical systems; and electronic sensors, speed controllers, and controls.

Excellent for rookies. Introductory level. No prior knowledge required.

Success Principles of Competition Robotics Teams

Alan Federman, Team 751 Mentor – PM, 1.25 hours. All audiences: mentors and team leadership.

A lecture/multimedia presentation with question/answer audience participation. The instructor has mentored the 2000 FRC National Champion, the 2001 National Botball Champions and the 2004 FRC Chairman's Award Winner, and will present the factors that led to these successes to National Conferences like Robonexus. For example: In 1999, Foothill High School's rookie FRC Year, they finished in 192nd place out of 228 teams at the Nationals. One year later, they were the lead seed in the winning alliance. The personal strengths and talents of the individuals comprising a team of “losers” from a continuation school combined to make a formidable champion.

No prior knowledge required.