



# MONTA VISTA ROBOTICS TEAM 115



FIRST Aid Kit

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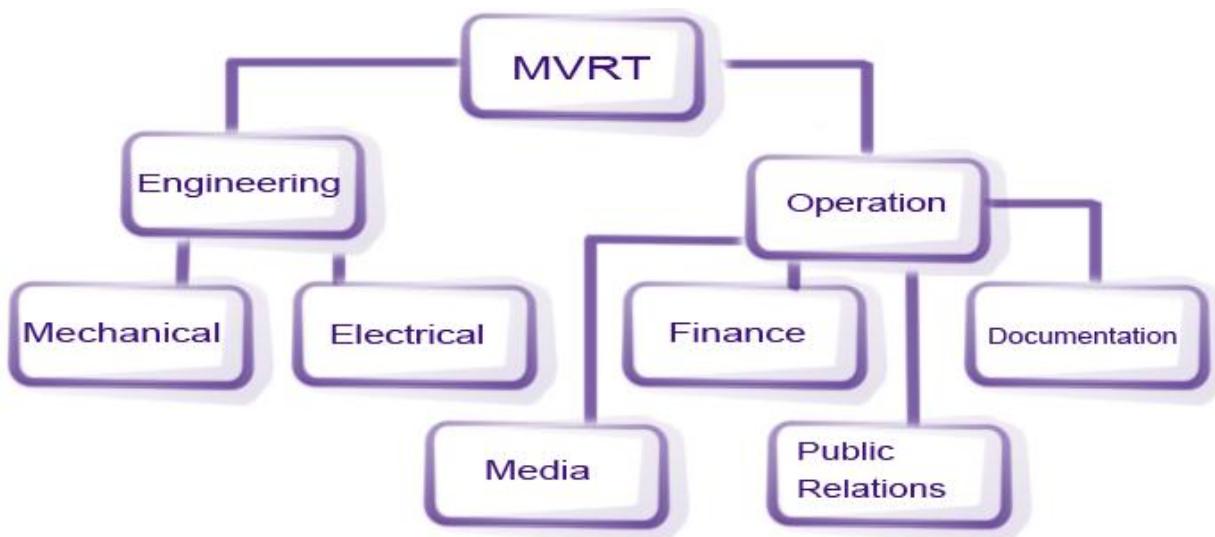
# About Our Team

## Team History

The Monta Vista Robotics Team (MVRT) was founded in 1997 by 12 inspired students. The team consistently competes in competitions with a performing robot every single year. Since then, the team has grown to 120 members and 30 mentors.

## Team Structure

MVRT structures itself based on the standard business model with a management hierarchy. The team is divided into two divisions, Engineering and Operations, which are then split into sub-divisions. Each division and sub-division is headed by a student officer, with the overall team led by the President.



In the Engineering Division, there are the Electrical Division and the Mechanical Division. The Electrical Division works on the software of the robot, including wiring and



programming the robot. The Mechanical Division works on the hardware of the robot, including designing, machining, and fabricating the robot.

In the Operations Division, there are the Media Division, the Finance Division, the Documentation Division, and the Public Relations Division. The Media Division specializes in the safety animation, animation award, t-shirt design, and the robot frame. The Finance Division specializes in writing grant letters to companies (such as BAE Systems, Google, Lockheed Martin, etc.) to raise money and deals with managing the team's budget. The Documentation Division specializes in archiving the team's events and happenings, and photographing, blogging, and managing the team's website. The Public Relations Division specializes in the community outreach of the team by promoting FIRST's message out to the public by: demo-ing at local events and museums, coaching middle school FLL teams, and applying for the Chairman's Award, which is the most prestigious award at competitions.

## **Outreach**

The team makes sure that the FIRST's message is spread around the community. The team demos at local events and museums (e.g. Local Fall Festival, Toys for Tots, and the San Jose Tech Museum) by showcasing our robot while our students talk to the guests about our team.

The team also mentors middle school FLL teams by providing coaches to facilitate the teams. MVRT also runs a ThinkFIRST program at a local elementary school where we teach the students basic physics and engineering concepts. The team runs a summer program (Future Stars) for underprivileged minority students where they learn how to work together and accomplish an engineering project.



MVRT also has started many of the teams in the Bay Area, including the Lynbrook Robotics Team (846), the Homestead Robotics Team (670), and the Cupertino Robotics Team (2473). The team continues to mentor local teams both during the off season and the build season.

The team also reaches out internationally. MVRT developed a robotics curriculum for BITS Pilani, an engineering school in India. We provided the program with funding so that they could attend robotics competitions in North America. At the competition, RoboGames, they placed third internationally. Our team also collaborates with EmpowerKids Foundation, a non-profit that supports underprivileged children in rural northern India by providing them with educational supplies. MVRT has partnered up with Empower Kids by writing PenPal letters with the students and raising money for the foundation through fundraisers and donations.

## Awards

The team has been blessed with many awards in its career. Most recently, in 2011, we received the Website Award and the Excellence in Design Award for our animation at the Seattle Cascade Regional and we received the Judge's Award and the Best Website Award at the Silicon Valley Regional. In 2010, we received the Chairman's Award at the Silicon Valley Regional, 2<sup>nd</sup> Place at the San Diego Regional, and the Website Award at both regionals. On the national level, our team has been recognized with the Website Award in 2008.



## General Management

### Mentors

Mentors are very important for building a strong base for the team. Although some teams can survive with one main mentor, it is good to have several mentors specializing in different areas to help spread out the work load. Look for mentors in your school, at local community outreach events, or even a parent of a team member. A strong mentor base builds the stability of a team as well as a more widespread foundation of knowledge.

It's important to keep up strong communication with your mentors. As a simple form of communication, we suggest developing a Google Group for all of your mentors and advisors that includes your officer team as well. This allows teams to easily pass information within the leadership in order to keep people updated. Information like FIRST Official Updates and emails should be forwarded within the group along with officer meeting notes and upcoming events and programs.

A good way to scout out new mentors is often through your school itself. We suggest contacting your Industrial Technology, math, and science teachers, especially physics teachers, who may be interested in supporting your team. Emails are a nice way to contact them, but personal invitations to your team meetings and work sessions go a long way in developing a relationship with any mentor. Another source of mentors is often through sponsors or local business contacts. It's often difficult to get full-time professionals to spend a lot of time working on FRC, due to the large time commitment, but invite them to come for a few hours on the weekend. Team members' parents are good people to get involved as well. On the student registration form, be sure to include a space for parents' names, emails, and employer name. This helps the team not only with determining what fields of engineering they may be knowledgeable in but also provide business contacts for



grants and other resources in the future. Some grants are only available if an employee volunteers with the team, and many ask how many employees are associated with the team.

Mentors and parents are busy people so you need to ensure you are making the best use of their time. Try to have tasks laid out so the mentors have designated areas that they may supervise. By having mentors continually inspect designs and oversee fabrication and assembly, the team can avoid costly mistakes. The team's overall management cannot be done without their support so be sure to include them on every team decision that needs to be made.

Be sure to be thankful for all the time and effort your mentors put in and respect their commitment as well. Do not expect more than you would expect of yourself and make sure to remind them how much you appreciate their help.

## **Recruitment**

The more dedicated members you have on your team, the more projects your team can accomplish. Starting teams may be a tough challenge, but once it gets started, it can grow quickly. MVRT started with only 12 founding members on the team. Since then, the team has grown to over 100 members on the team. The team may even start with only one member, but it could grow through word of mouth. Even with a mentor (Usually a Science or Math teacher) the team can start if the mentor advertises the club in his or her classrooms. When it comes the recruitment, it is important to highlight the excitement of FRC, whether this may be videos of competition or demo-ing a robot.

Some of the recruitment ideas that MVRT has employed in the past have been:



- Promotional Video: Videos can be taken from the FIRST website. Informational Meeting/Interest Meeting: The more people know about the team and what it does, the more their interest will spike.
- School Demo
- Fliers
- Talking in classrooms

Recruitment is a big priority for teams because a strong member base will be beneficial for the team.

## **Publicity**

- Get your team noticed!
  - After you get your team on stable ground, try getting the team noticed by the outside community and your fellow robotics teams. Some advantages to getting your team noticed include getting outside support, opportunities for grants, favoritism during competitions, and an overall good image of the team.
- Attend Local Events
  - MVRT goes to local events such as the Fall Festival and local school events to demo our robot and spread the message of FIRST. Email the event coordinator to see if you can get a booth to publicize your team.
- Volunteer at other competitions
  - Many FTC and FLL competitions need a lot of volunteers to run smoothly. Email the region's coordinator to see what your team can do to help. This would allow the team to get recognition in many fields. MVRT has volunteered in many events including FLL competitions in the area.



- Demos

- MVRT demos our robot for many different reasons. We spread the message of FIRST, look for potential mentors and sponsors, and support our current sponsors. MVRT holds many demos throughout the year, including at the Tech Museum Robotics Week, the BAE Toys for Tots demo, and demos at the facilities of our sponsors. See what events are going on in your community and find out if a robotics demonstration would be appropriate.

- Help Other Teams

- MVRT helps mentor and start several teams in the California area. This earns you a lot of references that help you gain credibility. Reach out and email other teams in the area, especially rookie teams, to find out what your team can help with.



# Build

## **What it should look like:**

- Week 1 = Ideas/prototyping
- Week 2 = Prototyping/design review
- Week 3 = CAD model/machining/finalize design
- Week 4 = Assemble/troubleshoot any problems
- Week 5 = Code/wire/program
- Week 6 = Driver practice

Ideally, the team should be working for about 16-20 hours a week; how to distribute that chunk of time will be up to the team and their mentors. Every day, all the different groups should be talking with each other. The space needs to be distributed between the different manipulators as well as the electrical components. When distributing space for electrical components, extra space should be left in between the different parts to make sure each part can be reached easily once all the manipulators are put on. When designing the manipulators, there will be trade-offs on how much space can be given to each. In addition, you should include the sensors in your manipulator designs to save time in the long run.

## **What to do if your team falls behind:**

Behind is really defined by the team; however, if the team is lagging by two weeks or more, something should be done to get up to speed. One method is making compromises, such as taking out parts that are more time consuming than they are necessary. In addition to that, build hours should be extended daily so members have more time to work on the robot. If brainstorming for ideas is the reason that the team is behind, just stick to the kitbot; it's relatively easy to assemble so that will play a part in saving time as well.



## Mechanical

- Keep the design simple
- Try your hardest to do a good 6WD. This will make you stand out from all the other teams. The kitbot is already set up for a 6WD with dropped center wheels.
- Don't go all out on a design, make sure you work towards consistently earning a medium amount of points for your team rather than inconsistently earning a higher amount of points.
- Finish the robot mechanically by week 4. Driver practice is 50% of how well you do at competition.
- GET HELP FROM OTHER TEAMS. Veteran teams and mentors are the best resource a rookie team has to being successful. Don't be shy because they're always willing to help.
- Mentors, mentors, mentors. A huge part of a rookie team's success is having mentor(s) who are knowledgeable in engineering, knowledgeable in FRC, or both. They will be seen as the authority figures so the team would have a strong leadership. These mentors and help from veteran teams are both very important.
- Use the stuff you get in the kit. You paid for it, and it works.
- Don't burn the team out. Work around 20 hours per week total and extend hours at the end. Be sure people get days off, especially if they are not needed on certain days. For example, a mechanical member can get time off after the robot is built while the electrical member programs the robot.
- Have a working driving base by the end of week 2
- For the first year, try to CAD everything, but ultimately, drawing parts is faster, especially if the part is really simple.

## Build Logs

Build logs are notes that are taken at the end of every day of build to see how far the team



has progressed, problems that the team encountered during the day, and where the team is at in the big picture.

### **What needs to be noted:**

- Progress on individual projects
- Parts that are needed
- Any issues surrounding personnel
- What is planned for the next day and for the next week
- If some compromises have to be made (This would be up to the officers and the mentors)

### **Who should take notes and have access to this:**

Build logs should be written by the lead in charge of engineering and kept within the team, preferably between mentors and officers, because build logs sometimes contain sensitive details that teams don't necessarily want to post on their website. If the team wants to show where they are at to parents, sponsors, or members that regularly read their website, they can consider putting some general progresses and such on a blog or something of that sort on their website.



## Parts

### Mechanical

There are FIRST sponsored vendors where you can buy most of the major mechanical components. **Andymark** is the vendor where you can buy several different types of motors as well as the gearboxes for those motors, but for general parts such as screws, nuts, and bolts you can either go to a local hardware store or you can use Macmaster-Carr where you can get exact dimensions needed for your part and be open to a larger variety of selection. **Macmaster** is useful for almost all the hardware you will need on your robot. For parts such as motors and gearboxes, remember that FIRST allows you to use only certain brands of motors and sometimes, specific gearboxes. Remember to consult with the rules before buying a specialty part. You can buy pneumatics from Bimba which is another FIRST sponsored company.

**Grainger** (<http://www.grainger.com/Grainger/wwg/start.shtml>) has local stores and a significant online presence. They have a huge selection, but be prepared to spend a fair amount of time at the counter when you order.

Everybody knows about **Home Depot, Lowes, and Orchard Supply (OSH)**. Since the previous version of this document, OSH's hardware selection significantly declined and its prices have significantly increased. Local ACE and True Value hardware stores, by comparison, have become much better. Many of them have a larger selection than the big box stores, and they are better organized. But if you can, make larger orders of screws & nuts from McMaster.

Although we don't use them too much, **Fastenal** (<http://www.fastenal.com>) carries a large



selection of nuts and bolts. They have stores all over the Bay Area, including San Jose, Fremont, and Palo Alto.

For weird & obscure hardware that you need immediately, **Olander Hardware** (<http://www.olander.com>) is the place to go. Their prices are high, but if you need something, they are likely to have it. Their address is 144 Commercial Street, Sunnyvale, CA 94086-5298. Commercial Street is off Kifer between Fair Oaks and Lawrence Expressway. The small sign near the side door of the warehouse is easy to miss. Their hours are M-F from 8AM -5PM.

### ***Metal***

We buy our aluminum and steel from either McMaster or Alan Steel. Alan Steel has excellent prices and an incredible selection. 505 E Bayshore Rd Redwood City, CA 94063 (650) 369-2526. Hours are Mon-Fri 8 am - 4:30 pm.

### ***Plastic***

We end up buying a lot of Lexan polycarbonate plastic sheeting. TAP Plastics carries an excellent selection, and will cut sheets to size for no extra cost. Note: acrylic shatters, so you must use polycarbonate. There are retail locations all around, including San Jose and Fremont. They are closed on Sunday.

***Port Plastics*** (<http://www.portplastics.com>) has lower prices on full sheets of polycarbonate. They also carry plastic tubing and cable management supplies. 550 E. Trimble Road #A, San Jose, CA 95131. As a normal industrial supplier, they are open M-F.



## Electrical

**AndyMark** (<http://www.andymark.com>) the company that hosts FIRST Choice, (<http://www.andymark.com/FIRST-choice-s/245.htm>) makes gear boxes and wheels for FIRST robots. It also supplies the miscellaneous electronic parts for FRC robots, such as the power distribution board and the digital sidecar. Their customer service is first-rate. If you decide to buy extra parts, however, order them as soon after kickoff as you can. They may run out.

The Jaguar motor controller is found at this link: <http://www.ti.com/jaguar>. In the past, **TI** has provided a link for FRC teams to buy Jaguars at discount (through Digi-Key). Remember, you need one controller per electric motor. Some teams prefer the simpler (and some say more robust) Victor 884 motor controllers, available here: <http://www.vexrobotics.com/victor-speed-controller.html> Many teams have found that each season they burn out at least one motor controller, so it is worthwhile to have a few spares.

**Jameco Electronics** (<http://www.jameco.com>) runs both a mail order and a retail operation. If you're desperate, their retail store is open 8AM-5PM M-F. Their address is Jameco Electronics 1355 Shoreway Road, Belmont, CA 94002.

**Fry's** has a spotty selection of electronics, so we usually have to try other places for components and connectors. Likewise, RadioShack, but if there's one near you, it's open late, and it just might have that resistor or wire you need.

**Anchor Electronics** (<http://www.demoboard.com/anchor.htm>) is a small store at 2040 Walsh Ave. in Santa Clara, just west of Scott Blvd. They have a large selection of



components, switches, and connectors. Their hours are 7:30AM-4PM M-F & 10AM-3PM on Saturday.

If you like browsing surplus equipment, then **HSC Electronics** (<http://www.halted.com>) is the place for you. Open 8AM-7PM M-F & 9AM-5PM Sat. 3500 Ryder St. Santa Clara. Note that HSC advertises nationally, so presumably their parts are considered COTS parts.

Even stranger surplus electronics can be found at **Weird Stuff Warehouse** (<http://www.weirdstuff.com>) at 384 West Caribbean Drive in Sunnyvale. Open 9:30AM-6PM M-S & 11AM-6PM Sunday.

For mail order, both **Mouser Electronics** (<http://www.mouser.com>) and **Allied Electronics** (<http://www.alliedelec.com>) have huge selections and will regularly send you their large print catalogs. They ship promptly. **Newark electronics** (<http://www.newark.com>) and **Arrow** (<http://www.arrownac.com>) are also places to look for that special component. Note that priority shipping can be quite expensive.

**Chief Delphi Swap**—On the Chief Delphi website, a small button near the top says CD-Swap; click on this to see what equipment various teams are willing to swap.

## Electrical Components

The wires that go from the digital sidecar to the speed controllers are 3 wire flat cables called PWM cable (or servo wire). **Hobby shops** that specialize in radio-controlled cars & planes sell them as servo extensions. If you decide to make your own, hobby shops sell servo wire and servo connectors & crimps (get Hitec or universal, not Futaba). You can also get the connectors and pins at **Jameco** (part# 157383, Connector, 1",1RW,3PIN HSG)



for less than the hobby shops sell them. These connectors will also work on miniature pins for connecting extra switches to the Driver Station.

Servo motors. FIRST has relaxed the rules for 2011 and you can now use any servo that does not exceed the power limitations. Our choice has been the Hitec HS-485B. ***California Hobbies*** (<http://www.california-hobbies.com>) carries them. They are located at 1702 Meridian Ave. Suite I San Jose, CA 95125 (408) 448-1449. Open 7 days a week. It also has a large selection of wires, screws, plastic, and aluminum hobby parts. Another good choice is ***Aero Micro*** (<http://aeromicro.com>) Located at 2090 Duane Ave Santa Clara, CA 95054 (408) 496-6699. Open Tues. through Sun. Aero Micro specializes in radio controlled airplanes and helicopters, but it does not carry much in the way of general hobby supplies.

The digital sidecars have a more secure connection for PWM cables. If you want to use those, the connector is a Molex 22-01-2037 housing and crimp terminals, also available at Jameco. To connect either type of cables to the metal pins, you'll need a crimping tool, but you don't really need the \$300 crimping tool listed for Molex.

An excellent description of how to crimp your own PWM cables is from ***Hansen Hobbies*** (<http://www.hansenhobbies.com/products/connectors/Connectors.pdf>). They sell the wire, the connectors, and crimping tools.

The Sauro CTF040V8 connectors on the power distribution block and the cRIO are available from AndyMark. They also carry the Wago connectors needed for much of the control system components.

If you use the I2C port, for a Lego NXT compass, just buy the cables. You can get them from ***Lego***, (<http://www.mindsensors.com>) or ***HiTechnic*** (<http://www.hitechnic.com>).



## General

We go through hundreds (maybe thousands) of zip ties each season. You will be repeatedly cutting them off & reinstalling them. We usually get them from Fry's Electronics.

We've used CPVC piping for prototyping, etc. It's smaller & lighter than regular PVC pipe, and it doesn't shatter. OSH and Lowe's carry it.

You will need lots of double-stick Velcro, both wide and narrow. OSH, Lowe's, Home Depot, & McMaster carry it. We use it to hold the robot controller, the Speed Controllers, the Spike Relays, and all sorts of other things.

Heat shrink tubing, available at Fry's & elsewhere, is great for insulating wire connections and providing a bit of extra protection. While you can use a miniature butane torch to heat it, a heat gun is a better bet.

Last year we started using red/black zip cord for robot wiring. The wires are bonded together, which makes routing and identification much easier. We also connect the wire to components with Anderson Powerpole connectors. Our source is Powerwerx in southern California (<http://www.powerwerx.com>). Shipping is prompt and reliable. Note that priority shipping for wire will cost more than the wire itself.

If you decide to use the window motors shipped in the kit of parts, you may want to know about the power plugs that aren't included. They are available at Mouser Electronics. They are Delphi Automotive Connectors: (Mouser part# 829-12129847-B) the Secondary lock (Mouser part# 829-12077904-B) and female crimps (Mouser part# 829-1212943). You need all three parts. Use a standard crimping tool for the crimps.



If you are interested in using Bosch aluminum extrusions, the local supplier is Valin (<http://www.valin.com>). The local office is 555 E. California Ave. Sunnyvale, CA 94086. (408) 730-9850. For teams interested in using Bosch, we are willing to advise you on ordering a selection of extrusions and connectors to get you started. You can view the online Bosch catalog at:

([http://www.boschrexroth.com/country\\_units/america/united\\_states/en/products/brl/product\\_overview1/mge/index.jsp](http://www.boschrexroth.com/country_units/america/united_states/en/products/brl/product_overview1/mge/index.jsp))

Note that there can be a 2 week lead time for Bosch orders.

You may need a 6 ft. folding table for competitions. Available at Home Depot, Office Depot, etc. You will also need a heavy-duty extension cord (and many people recommend a GFI as well) and at least 3 or 4 plug strips. You'll need them for battery chargers, the laptop, soldering irons, and the Operator Station.

## Batteries

12V battery. The kit-of-parts comes with only one battery. You will need two at an absolute minimum, and three would be better. Note that you must use the battery brand and model specified by FIRST. FIRST allows two different brands of batteries MK ES17-12 12VDC non-spillable lead acid battery, OR one EnerSys NP 18-12 (and only those brands and models). They are available through AndyMark.

Quick release battery connectors. The kit-of-parts provides two pairs of quick release connectors, but you will want to buy more, including one for the battery charger. These are Anderson Power Products SB50 power connectors. Part # 6331G1 from Allied Electronics or Powerwerx. You may also want some spare #6 contacts, part # 903G1. It will require soldering or a heavy-duty crimper.



## Computers

You pretty much have to have a laptop for programming the robot. It's much easier to get the laptop to the robot than getting a huge robot over to a desktop computer.

Note that the CompactRio has a DB9 serial connector on it for console output. If your laptop does not have a serial port, you'll need a USB to serial converter and a serial crossover cable. They're available at Fry's for about \$20.

We do most of our testing through the Wi-Fi interface. Even so, you probably want to have at least one longish Cat 5 Ethernet cable for tethered testing.



## Preparing for Competition

For competition you should have all the basic tools so that you can fix your robot, and to work efficiently you should have a system too.

### Mechanical

#### Tools

Our system for tools is to take out tool cabinets with us, but if that is not an option this is what you should include when you pack mechanical parts.

- Screwdriver
- Wrench
- Allen Keys Both standard and metric
- Ratchet with all necessary fittings
- Shears
- Dikes
- Pliers both for chain and for general purpose
- Chain cutter
- Scissors, and box cutters
- File
- Hammer
- Portable Bandsaw (if you have it)
  - Batteries/chargers for the bandsaw
- Portable Drill Press (if you have it)
  - Drill bits you may need
- Rivets



- Riveter
- Clamps
- Mini-vice
- Parts

Along with the basic tools, some basic parts will be useful during competition.

- Batteries and their charger
- Chain: all the sizes you need
- Belts if you have any on your robot. Make sure you have the right sized belts and bring extra pulleys as well
- Wheels: Have an extra set with all the gears attached and ready to go
- Stock
  - L-plate various sizes
  - 1x1 extrusion
  - Bosch if you use it
  - aluminum plates if you need it
- Custom Parts: If you have anything that is custom built it is good to have extras so when you pack. Be sure to pack those as well.

## Electrical

### **General List**

- Batteries – keep all the batteries you have
- Control Panel – keep all the parts of the control panel with extra stop buttons
- Crimps – keep extra crimps for all the different types of crimps you use
- Crimpers – keep crimpers for all the different types of crimps
- Electrical Clamps – these are smaller clamps used for holding items such as limit



switches and wire when soldering

- Electrical toolbox – keep parts in toolboxes because you want to keep the pit as organized as possible
- Ethernet cable – keep extra Ethernet cables
- Extra robot parts – robot parts can fry so it is always better to keep extra if it is a feasible option
- Heat shrink tools – solder joints are always strong with heat shrink
- Laptops – do not forget the chargers
- Little screw driver set – keep apart from mechanical screw drivers for small electrical applications
- PWM Cables – keep extra premade cables as well as parts to create a new cable
- Sensors – keep extra sensors for all the sensors on the robot
- Tools (dikes, needlenose pliers, scissors) – keep extra tools because they can get misplaced when in a rush
- Tape & Velcro – good for last minute patch ups but remember that tape is not allowed to hold any part in place
- Wires – wires are very fragile and can be broken easily so it is good to keep extra
- Zip-ties – more is always better because helps keep parts together when in a rush



### Sample Checklist:

- Batteries
  - Batteries (x8)
  - Battery chargers (x4)
- Power strip (x3)
- Control panel
  - Cypress Board (x1)
  - Joystick (x3)
  - Stop button (x2)
  - USB Hub (x1)
- Crimp box
  - Battery crimps
    - Large gauge (1 bag)
    - Small gauge (1 bag)
  - Battery plugs (5 plugs)
  - Jaguar crimps (1 box)
  - Limit switch crimps (12 male, 12+ female)
  - Powerpole
    - Red heads (1 bag)
    - Black heads (1 bag)
    - 15 Amp (1 bag)
    - 30 Amp (1 bag)
    - 45 Amp (1 bag)
  - Window motor crimps (x3)
- Crimpers (x5)
  - Motors (x1)
  - Powerpole (x1)

- PWM (x2)
- Mechanical (x1)
- Dikes (x8)
  - Small (x3)
  - Medium (x2)
  - Large (x3)
- Electrical clamp (x6)
- Ethernet cables (3 short + 2 long)
- Extra robot parts
  - cRio modules (2 Analog, 2Digital, 1 Pneumatic)
    - cRio (x1)
    - Digital side card (x2)
  - Gaming adapters (x1)
  - Gaming adapter charger (x1)
  - Gaming adapter converter (x1)
  - Jaguars (x8)
  - Power supply breaker/switch (x1)
  - Ribbon Cable Connectors
    - Female (x3)
    - Male (x3)
  - Ribbon Cable (2 rolls)
- Heat shrink tools
  - Heat shrink (2 boxes, bundle)
  - Heat shrink iron (red box)
- Label maker (x1)
- Laptops + chargers (x3)
- Little screwdriver set (x2)



- Multimeter
  - Alligator clips (1 bag)
  - Multimeter (x3)
- Needle-nose pliers (x5)
  - Long (x2)
  - Short (x3)
- PWM cables (4 bags)
  - Female-female (1 bag)
  - Male-male (1 bag)
  - Wires (2 bags)
- Safety Glasses
- Scissors (x1)
- Screw driver for power supply (x1)
- Sensor box (1 box)
  - Analog Encoder (x1)
  - Digital Encoder (x1)
  - IR sensor (1 bag)
  - Limit switch
    - Chassis (x5)
    - Telescope up/roller (x2)
    - Telescope in (x2)
  - Line sensor (x5)
- Sharpie (x3)
  - Red sharpie (x1)
  - Black sharpie (x2)
- Soldering tools
  - Solder (x6)

- Soldering sponge (x1)
- Soldering iron (x2)
- Soldering iron holder (x1)
- Spike (1 bag)
- Tape (x15)
  - Double sided tape (x2)
  - Electrical tape (x13)
    - Red (x2)
    - Black (x7)
    - Purple (x4)
- Velcro (1 bag, 2 boxes)
- Wires (x3)
  - 6 gauge (1 spool)
  - 10 gauge (1 spool)
  - 12 gauge (a little)
  - 14 gauge (2 spools)
  - 18 gauge (1 spool)
  - 20 gauge (1 spool)
  - 24 gauge (1 spool)
- Wire sticker labels pack (x2)
- Wire strippers (x6)
- Zip-ties
  - Large (3 bag)
  - Medium (1 bag)
  - Small (1 bag)
  - Zip-tie squares (2 bags)



# Competition

## Schedule

### Thursday Morning

- Bring everything to the pit with everyone's help
- 3 people set up pit
  - 1-2 people can try help from the outside but more than 3 people inside the pit makes it crowded when setting up
- Get the radio programmed
  - This should be done as soon as the robot is out of the bag/crate
- Pick up the official papers at the front desk
- Work on the robot and try to get to inspection as quick as possible
  - Have a priority list set before going into competition on Thursday. This is the only time you can prepare a priority list of what needs to be accomplished in advance. The rest of the competition the priority list is made as the competition goes along and the robot comes back from each match.
  - Even if another robot part needs to go on, get it inspected first and then get it re-inspected. The most important part of Thursday is to get into as many practice matches as possible and make the robot as close to finish as possible.

### Organizing Pit

- Keep the pit clean
  - Keep the tools organized and have a system to organize them.
  - Keep a white board for writing match numbers.
  - Clean when the robot is in line for cue in the matches because the pit gets messy in between matches.



- Assign jobs to people in the pit so that things get done quicker.
  - Make sure that there are not too many people in the pit at once.
- Have a pit lead usually helps keep things organized.
  - This should be someone responsible who knows the whole robot so that they can fix almost all the parts.
  - They should be organized and emphasize on cleaning.
  - Everyone should listen to their final decision and respect their decision if they tell someone to step out of pit because they are not doing much at the moment.

## **Scouting**

Information collected from scouting comes handy when teams are playing against a team or when it comes down to alliance picking so teams don't just decide on a random rbot without knowing its function or even how well it works.

### **Stand Scouts**

The stand scout team should be composed of *at least 8* people:

One person for each robot on the field so they don't miss out because they spend their time watching the *whole* game. These people need to be assigned a robot that they will trace in the game before the round starts so accidents such as two people scouting the same robots won't happen.

It would be best, if the number of scouts permit, to have one person in the partner group will be responsible for writing on the scouting sheet while the another person observes and report what is happening on the field. There should be also one "back up" group with two



people so that the scouts can switch off and take breaks. This would make the number of people on the stand scout team 16.

One person as a head scout who organize the scout sheets, turning them into the computer scout, and distributing them to stand scouts. This person should be in charge of the scout binder, containing all of the scout sheets, match lists, and everything else that pertains to scouting.

One person should be the computer scout that documents all of the collected data into an Excel document so it is more organized and can be read easily. This person should be in charge of the computer and remember to bring a charger to that stands.

It's usually good to have a meeting for the scouts before the competition so they know that they are chosen as scouts, know who the head scout is, know explicitly what needs to be on the scouting sheets and how to fill it out properly.

Scout sheets for the scouts to record on need to be created beforehand so that the scout don't just write notes on a black piece of paper. They are important because they have to be specific enough so that the scouts who are using them don't have to spend too much time thinking about organization when they are taking notes. It has to be designed in such a way that helpful data can be collected quickly and comprehended easily.

### **The information that should be collected from scouting:**

- What all of the participating robots did in *every* game
  - Ex: autonomous, scoring, penalties
- How well their robot does
  - Ex: scoring, speed, most importantly, whether it actually moved or not and if it works correctly



- How their team plays
  - Ex: whether they are good at assisting, defense, or offense, tactics
- Other comments that the scouts may have for the robot
  - Ex: whether it showed up at the match, disabled in the middle of the match, and etc
- It's also important to have the scouts write their names or initials down so that when there is confusion or the computer scout needs to ask about something, s/he can find the scout s/he needs.

MONTA

VISTA

115

Team Number							
<b>Autonomous:</b>		<b>Autonomous:</b>		<b>Autonomous:</b>		<b>Autonomous:</b>	
	Top Middle Bottom		Top Middle Bottom		Top Middle Bottom		Top Middle Bottom
circle starting lane and peg Übertube is placed on		circle starting lane and peg Übertube is placed on		circle starting lane and peg Übertube is placed on		circle starting lane and peg Übertube is placed on	
Notes:		Notes:		Notes:		Notes:	
<b>Teleoperated</b>		<b>Teleoperated</b>		<b>Teleoperated</b>		<b>Teleoperated</b>	
Tube Pickup: Ground / Human	Tube Pickup: Ground / Human	Tube Pickup: Ground / Human	Tube Pickup: Ground / Human	# scored, top:	# scored, top:	# scored, top:	# scored, top:
# scored, middle:	# scored, middle:	# scored, middle:	# scored, middle:	# scored, bottom:	# scored, bottom:	# scored, bottom:	# scored, bottom:
Number of Tubes Scored:		Number of Tubes Scored:		Number of Tubes Scored:		Number of Tubes Scored:	
<b>End Game (Minibot)</b>		<b>End Game (Minibot)</b>		<b>End Game (Minibot)</b>		<b>End Game (Minibot)</b>	
Deploy MiniBot? Yes No	Deploy MiniBot? Yes No	Deploy MiniBot? Yes No	Deploy MiniBot? Yes No	Deploy MiniBot? Yes No	Deploy MiniBot? Yes No	Deploy MiniBot? Yes No	Deploy MiniBot? Yes No
Time left on clock:		Time left on clock:		Time left on clock:		Time left on clock:	
Minibot Placing		Minibot Placing		Minibot Placing		Minibot Placing	
<b>Comments (Defense?) / Problems:</b>		<b>Comments (Defense?) / Problems:</b>		<b>Comments (Defense?) / Problems:</b>		<b>Comments (Defense?) / Problems:</b>	
Disabled? Dead? No Show?	Disabled? Dead? No Show?	Disabled? Dead? No Show?	Disabled? Dead? No Show?	Disabled? Dead? No Show?	Disabled? Dead? No Show?	Disabled? Dead? No Show?	Disabled? Dead? No Show?
Circle: Offense or Defense	Circle: Offense or Defense	Circle: Offense or Defense	Circle: Offense or Defense	Circle: Offense or Defense	Circle: Offense or Defense	Circle: Offense or Defense	Circle: Offense or Defense
<b>Normal Penalties:</b>		<b>Normal Penalties:</b>		<b>Normal Penalties:</b>		<b>Normal Penalties:</b>	
<b>Major Penalties</b>		<b>Major Penalties</b>		<b>Major Penalties</b>		<b>Major Penalties</b>	
Yellow? Red Card? Pinning?	Yellow? Red Card? Pinning?	Yellow? Red Card? Pinning?	Yellow? Red Card? Pinning?	Yellow? Red Card? Pinning?	Yellow? Red Card? Pinning?	Yellow? Red Card? Pinning?	Yellow? Red Card? Pinning?
Initials:		Initials:		Initials:		Initials:	

Logomotion

Stand

Sheet



## Pit Scout

Pit scouting is basically walking around pits and talking to other teams and see what their robot does. It's good to have people who have a good understanding of their own robots to pit scout because then they can scout while promoting their own team.

Pit scout sheets also have to be made separately because it isn't collecting the same information as the stand scouts' and requires a place for the picture of the teams' robot. Also, this information are collected before the matches start so it doesn't account for defects created during the matches.

Some things to take notes on:

- The robot's physical features
  - Ex: weight, drivetrain, manipulators, sensors
- Functionality
  - Ex: scoring, autonomous, whether it can move or not
  - If you have enough people, this is the time when you ask if they need help with anything and lend a helping hand.
- Driver Team
  - Ex: years of experience, human player



## MONTA

Team Number \_\_\_\_\_  
Team Name \_\_\_\_\_

**Height**  
**Weight**

**Scoring Capability:** High  
Middle  
Low

**Description of Motors:**

Drive: \_\_\_\_\_

Arm: \_\_\_\_\_

Deploy: \_\_\_\_\_

**Sensors:**

Line Yes No

Others: \_\_\_\_\_

**Drivetrain:**

**Autonomous (Starting, Strategy, etc)**

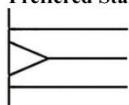
Aim Level \_\_\_\_\_

**Experience in other regionals? Y / N**

Place \_\_\_\_\_

Reginal? \_\_\_\_\_

**Preferred Starting Position (autonomous)**



Possible Problems: \_\_\_\_\_

**MANIPULATOR**

Type of Arm:  
\_\_\_\_\_

**Type of Grabber:**

\_\_\_\_\_

**Pickup:**

Human Player      Ground  
\_\_\_\_\_

**Human Player:**

Tube      Analyst  
\_\_\_\_\_

Scout Name: \_\_\_\_\_

PICTURE

## VISTA

115

<b>Driver experience:</b>	Competitions (1st) _____
	Competitions (2nd) _____
<b>Mini-bot/Deployment:</b>	Yes      No _____ sec to reach top _____

## LOGOMOTION

## PIT

## SHEET

### Scout Meetings

Scout meetings are held to talk about:

- The top teams on the list
- Teams that stood out as stand scouts during the day
  - Their own observations and opinions, which might be different for different scouts because they observed the team at different stages of the game.
- Your own team's performance
- Combine information from both stand scouting and pit scouting



People who should attend the meeting:

- Officers and leads
- Mentors
- Pit team
- Scouts (both pit and stand)

The thing that needs to be created by the end of the meeting is a list of 1 through 24 (your own team included) in your opinion of who to choose the next day during alliance selection.

## General Advice

- The leader needs to guide the way.
  - One person, who knows the robot well needs to make the decisive decisions. This leader can be a mentor or a student, as it is in our case. Many people will have their opinions on how to fix a problem, but to prevent time from being wasted in discussing these decisions one person should make them. This person should listen to others' opinions but everyone should respect their decision in the end.
- Always stay calm.
  - Being frustrated over some results or getting tense about getting to a match on time only slows you down. Staying calm lets you enjoy the experience and ensures everyone has a better time.
- Know the time.



- Look at the time between the current match and the next match and remember they cue you before the time written down. If you do not have enough time to improve something, do not make it so you cannot work at all.
  - Ex. If your drive's chain is loose. Only re-tension the chain if you have enough time
- Know who is the strongest at what to reduce the time it takes to fix a part.
- Fix what was working first.
  - If you come out of a match, first fix what was working then fix what was never working.
    - Ex. Program autonomous after you fix the minibot release (pertinent to 2011 game).
- Use the other teams.
  - If you do not have a robot part, then ask other teams for the part. Ask at the front desk as well as sending a person walking around asking individual teams. The overhead announcements sometimes get mixed in with all the noise in competition.
- Always be happy with your results.
  - Regardless of how well you do, be happy with the results. Knowing you tried your hardest should be the most rewarding part.
- Make sure your team can play defense so that all the robots can be used completely.
- Be organized. Do not clutter the pits too much. Create a system for tools.
- Connection issues can bring down even the best teams so make sure your wiring is 100% correct and the router is properly connected before every match.
  - Keep wiring legal.
- Make sure you cover electrical components while working on the robot. Metal shavings can short out electronics and cause problems during a match.



# Finance

## Grants

### **Step 1: Paperwork**

To qualify for most grants, you must be a 501(c)(3) non-profit organization, and you must have a Federal Tax Identification number. Also, every US-based FRC team must fill out a W-9 to FIRST Finance annually in order to accept any funds on behalf of the team. You can find this form and who you should send it to on the FIRST website.

### **Step 2: Finding Companies**

When searching for sponsors, it's ideal if you have a contact within the company. If someone you personally know works for the company, your chances of getting a sponsorship increase substantially.

Also, look around to see if the companies you're targeting support other FIRST teams. Technology based companies, for example, generally tend to cater their philanthropy department towards STEM (science, technology, engineering, math) programs such as FRC teams. There's a page on FIRST's website titled "FIRST Robotics Competition Team Sponsors" that has a comprehensive list of companies that support FRC teams. If the company isn't listed there, chances are, they won't sponsor you. Unless if, of course, you have a contact in the company. Also, research what types of FRC teams the companies tend to sponsor. NASA and JCPenney, for example, almost exclusively sponsor rookie teams.

Sometimes companies will even find you--they may send you a letter with an invitation code to their cybergrants page after competitions.



### **Step 3: Writing the Grant**

First off, keep the deadlines in mind! The deadlines generally have no exceptions so make sure you turn in your grants on time. They're also usually towards the end of the calendar year because that's when companies have leftover money. Most companies have a mission statement that states they donate to nonprofit causes, because it is good publicity. In order to live up to this, these companies donate a certain percentage of their profits to philanthropic causes. This is why if you ask for funding from a new company, it is beneficial to ask at the end of each fiscal quarter. Keep the style of writing professional, and be sure to mention FIRST. Some grants will be done online; others must be submitted as a hard copy, and even some as both. As far as content goes, that's relative to what your team does and/or how long your team's been around. Feel free to contact [finance@mvr.com](mailto:finance@mvr.com) for any help with grant editing.

### **Sponsors**

#### **Step 1: Maintaining Relationships with Sponsors**

You're obviously going to want to have sponsors come back next season and sponsor you again. Business thank you letters should be sent right after you receive any financial support. Since we live near many of our sponsors, we sometimes also go to the corporate sites of our sponsors (we toured Intuitive Surgical), volunteer at events they host (we volunteered at BAE Systems's Toys for Tots), or have them come in to give presentations (Lockheed Martin gave a career presentation to us).

At the end of an FRC season, you should send something out showing your appreciation. Aside from sending out a formal business thank you letter, we also include something like a yearbook signing page where members can write about how the company provided a unique opportunity for the members by sponsoring us, how the members will consider



pursuing a STEM field in the future possibly working for said sponsor, etc. We also mail out our team's shirt because it has the sponsor's logo on the back.

Furthermore, most grants will ask you for a grant impact report—meaning you have to write about what you've accomplished the past season, obstacles you encountered, and how you plan to overcome them by making changes for the next season.

### **Step 2: Sponsor Recognition**

Our team organizes our sponsors into sponsor levels, based on how much they donate to the team. The more money they donate, the more recognition they receive from MVRT.

- Bronze (\$25+) Your name/logo is shown on our award-winning website.
- Silver (\$100+) Your name/logo appears on our t-shirts, which is worn by our 100+ members.
- Gold (\$500+) Your name/logo appears on our banners, which are shown as backdrops at competitions.
- Platinum (\$1000+) Your name/logo appears on our robot, which is used at competitions and community demos.
- Diamond (\$2000+) Our team registers you as a major sponsor.

### **Finance Packet**

Included in the next few pages is the MVRT Finance Packet which we present at competitions and demos to help people understand our team and how we budget everything within it. It's often useful to have a business plan and budget for grants and presentations as sponsors require or encourage you to submit them.

The image features a large, stylized purple and white logo for the Monta Vista Robotics Team 115. The logo consists of the word "MONTA" in a tall, slanted font above "VISTA" in a similar style, with "ROBOTICS" and "TEAM 115" stacked below them. The background is a blurred photograph of a robotics competition. In the center, a purple banner with yellow text reads "MONTA VISTA TEAM 115 ROBOTICS". The banner lists names such as Dipak, Mairi, Umesh, Joseph, Ken, Yvonne, Rock, Arvin, Sandeep, and Red Shinta. Other visible text on the banner includes "Hurley", "The Bo", "The Ch", "Akash", and "Farm". The background also shows a large metal structure, likely a robot or part of the competition equipment.

# 2011 - 2012 Finance Packet



# Executive Summary

The Monta Vista Robotics Team (MVRT) strives to support FIRST (For Inspiration and Recognition of Science and Technology) and involve high school students in their communities. The team creates these opportunities for students to explore science and technology through annual robotics competitions. Studies have shown that FIRST Robotics participants are<sup>1</sup>:

- Four times as likely to pursue a career in engineering
- Twice as likely to pursue a career in science and technology
- More than twice as likely to volunteer in their communities

To ensure students have the proper infrastructure to participate in competition, MVRT is operated like a corporation, though it is entirely student-run. The team is comprised of different divisions specializing in diverse areas. The Engineering divisions, Mechanical and Electrical, design and build the robot. The Operations divisions are Media, which makes the annual animation and creates promotional items; Finance, which raises funds; Public Relations, which spreads FIRST's message of gracious professionalism; and Documentation, which documents the team's efforts. MVRT requires its members to join one Engineering and one Operations division each year so members experience the many sides of the robotics team.

As a well-rounded team, MVRT's multi-faceted members give back to the community by organizing demonstrations of the team's robot at local schools and developing the interest in science and technology in young minds by showing them how interesting and innovative it is.

The Monta Vista Robotics Team is a non-profit organization that depends on the support of its community. Donations are tax-deductible and sponsors are publicly acknowledged by having their names displayed on:

- The team t-shirt
- Our nationally acclaimed website
- The season's robot
- Team banners and promotional items

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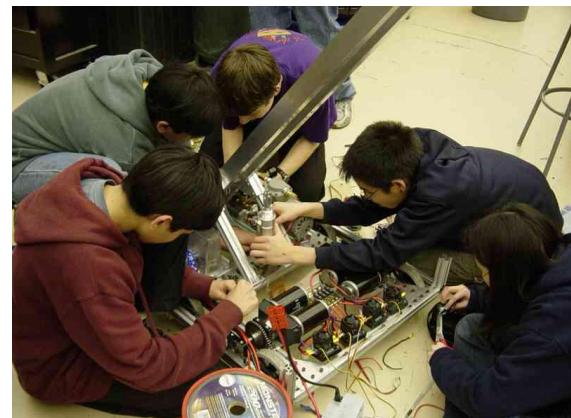
<sup>1</sup> According to a study done by FIRST and Brandeis University. More information can be found at: <http://www.usfirst.org/who/content.aspx?id=46>



## Our Mission



The Monta Vista Robotics Team is a student-led organization at Monta Vista High School that participates in the FIRST Robotics Competitions. Founded in 1997, we have grown into a multi-cultural team of over a hundred members.



Dedicated to fostering a passion in science and technology within our community, we run public outreach programs at local schools and compete annually in internationally recognized robotics challenges.



## Why You Should Help Us

As an official school club, we are a non-profit organization, and we depend on the support of organizations and individuals from the community. Sponsoring MVRT is an outstanding way to give back to the community. Furthermore, your contributions will help us accomplish our mission. Your assistance will help foster the next generation of:

- Engineers
- Scientists
- Graphic artists
- Business leaders

Sponsor benefits include:

- Public acknowledgment of your sponsorship on our<sup>2</sup>:
  - Team T-shirt
  - Award-winning website
  - Robot, which is publicized in local and national media
  - Team Posters
  - Other team promotional materials
- Tax-deductible donations



<sup>2</sup>For details, please refer to the Budget portion of this packet.



# How You Can Help

Because the MVRT runs a wide range of programs, we look for support in many different forms. We accept support in the form of:



- Monetary donations
- Contribute advisor support or paid volunteering hours for employees
- Offering facilities, such as machine shops, for the team's use
- Donating equipment or software, especially laptop computers
- Donating or providing a discount on goods and/or services

## Sponsorship Levels:



**\$2000+**

Our team registers you as a major sponsor.

**Platinum**

**\$1000+**

Your name/logo appears on our robot.

**Gold**

**\$500+**

Your name/logo appears on our banners.

**Silver**

**\$100+**

Your name/logo appears on our t-shirts.

**Bronze**

**\$25+**

Your name/logo is shown on our website.



## FIRST

For Inspiration and Recognition of Science and Technology (FIRST) was founded in 1989 by Dean Kamen (pictured right) in order to inspire the next generation of scientists and engineers by instilling interest in the fields of science and technology while building self-confidence, leadership, and life skills.



***"Why not make stars out of engineers?"***

*-Dean Kamen*



FIRST is a world-wide organization, with teams participating from far away countries such as Australia, South Africa, and Turkey. FIRST challenges students to work as a team and manage their time while gaining hands-on experience.

FIRST organizes different robotics competitions aimed at different age levels. They are:

- Junior FIRST Lego League: Grades K - 3 (ages 6 – 9)
- FIRST Lego League: Grades 4 - 8 (ages 9 – 14)
- FIRST Tech Challenge: Grades 9 – 12 (ages 14 – 18)
- FIRST Robotics Competition: Grades 9 – 12 (ages 14 – 18)

For more information about FIRST visit <http://www.usfirst.org>



## FRC

The FIRST Robotics Competition (FRC) is a team-based technology game for high school students to provide a hands-on experience in engineering. With the guidance from professionals across various disciplines, students tackle engineering, finance and management challenges.



With a budget of over \$40,000 a year and a team size of more than 100 people, students must efficiently organize themselves as a team. Considering the scope of the challenge, students work much like a high-tech startup, an experience that a traditional robotics or engineering course cannot provide.

The program's highlights include:

- Construction of 5' tall, 120 lb. robots that are designed and built completely by students.
- Integration of mechanical, electrical, and software elements.
- Time constraint of six weeks to build and ship the robot to competition.



# Monta Vista Robotics Team

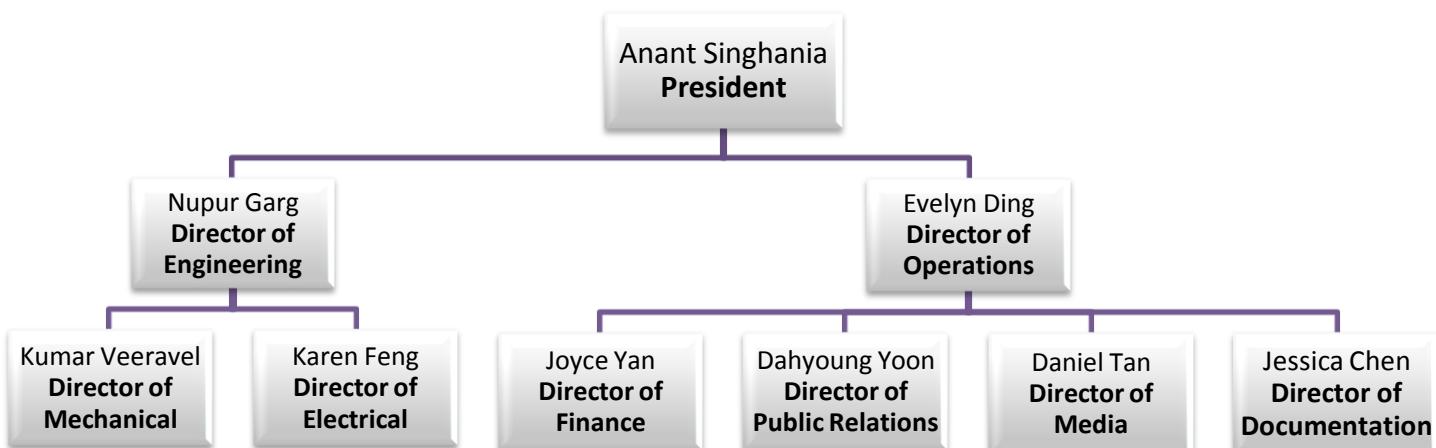


## MVRT

The Monta Vista Robotics Team (MVRT) was founded in 1997 by a group of ten students and has since grown to a team of more than 100 members. Each year's robot is completely designed, prototyped, tested, programmed, and built by students. MVRT values student leadership, teamwork, and respect within the team and among the local FIRST teams.



As a noted community leader, MVRT runs a variety of outreach programs, such as FIRST Lego League teams at local middle schools, a regular science class at a nearby elementary school, and mentorships of other FRC teams. In 2011, the team sponsored a Future Stars program, a summer engineering camp for unprivileged minority middle-school children. MVRT also demos its robot in various public events at its school, local museums, and company show casings. The team is also extremely committed to giving back to its community, running events like recycling drives, donating toys to children in need, and providing financial support to causes like the Haiti earthquake disaster fund. Because of its diverse interests from engineering to public outreach, MVRT is efficiently organized, with officers and other team leaders directing individual projects.

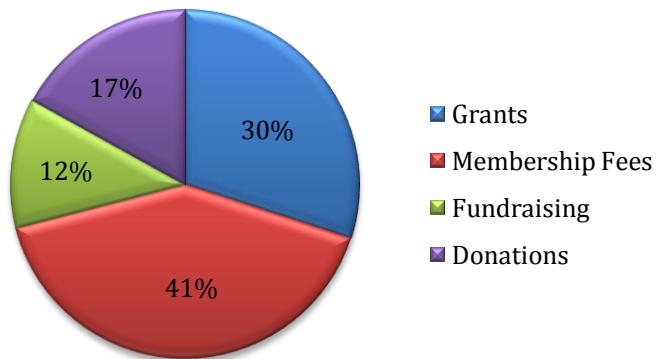




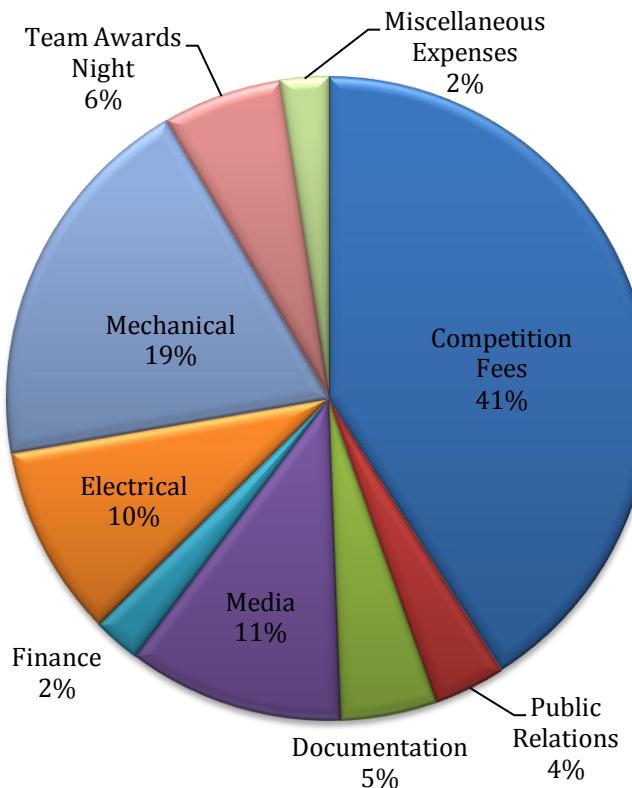
# Our Budget

The budget consists of each division's expenses, competition entry fees, and transportation fees for students, tools, and the robot to competitions. A majority of our funds come from corporate sponsorships and membership dues.

## Sources of Income



## Projected Budget 2011-2012



## Projected Expenses Breakdown

Competition Fees	\$17,000
Public Relations	\$1,500
Documentation	\$2,000
Media	\$4,500
Finance	\$1,000
Mechanical	\$8,000
Electrical	\$4,000
Team Awards Night	\$2,500
Miscellaneous Expenses	\$1,000
<b>Total</b>	<b>\$41,500</b>



# Recognition

We have received recognition on numerous occasions for our accomplishments during our history. These include:

- Judges' Award at the Silicon Valley Regional (2011)
- Best Website Awards at the Silicon Valley and Seattle Cascade Regionals (2011)
- Excellence in Design Award in 3D Animation at the Seattle Cascade Regional (2011)
- Chairman's Award at the Silicon Valley Regional (2010)
- Finalist at the San Diego Regional (2010)
- Best Website Award at the San Diego Regional (2010)
- Engineering Inspiration Award at the Davis Regional (2009)
- Best Website Award at the Davis Regional (2009)
- Finalist at the Davis Regional (2009)
- Best Website Awards at the National Championships and Davis Regional (2008)
- Champions at the Davis and Silicon Valley Regionals (2008)
- Johnson & Johnson Gracious Professionalism Award (2008)
- Best Website Award at the Silicon Valley Regional (2008)
- Kleiner Perkins Caufield and Byers Entrepreneurship Award (2007)
- Best Website Award (2007)
- State Congressional Recognition (2007)
- Best Website Award (2006)
- Woodie Flowers Mentor Award for advisor Ted Shinta (2004)
- General Motors Industrial Design Award (2003)
- Champion at Silicon Valley Regional (2003)
- Xerox Creativity Award (2003)
- 3<sup>rd</sup> Nationwide at the National Championships (2001)
- Honorable Mention for Autodesk Animation Award (1998)





# Contact Us

## Officers

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# Media

## Members

Media Divisions in FIRST teams historically have had logistics problems because of too little members. Although there's really no way you can force more members to join the Media Division, there are steps that you can take to make sure you can keep whoever you get.

Make sure trainings are hands-on. No one likes listening to hour-long lectures. If you're going to teach the whole time, at least make sure you get them on the computers so they can do it along with it.

Also, make sure you don't waste time during trainings. Have new members jump straight into the animation software as fast as possible, because then they'll see Media as much more exciting and cool and want to continue.

Don't forget to talk to the members and learn their names. It sounds stupid, but sometimes having that personal connection will cause new members to keep on going in a division.

## Animation

Here's a sample calendar of how to plan "animation seasons". The numbers in parenthesis are approximate numbers of hours that should be spent on each part of the Main Animation process. For the Safety Animation, simply halve the suggested time of each stage (except for the brainstorming part).

**First day (2 hours):** Members meet, brainstorm, and plan a storyboard for the animation. Make sure the prompt is actually being followed. Then break down each scene in the



animation into objects that have to be created for them, and assign those out to media members.

**First to third weeks (9 hours):** Create the models. At the end of all of this, you should compile all of the objects into each scene of the animation.

**Fourth week (3 hours):** Animate/keyframe the models.

**Last week:** Render the scenes, put the video together, and upload it to where it needs to go. Having one week to do all of this ensures that any hitches that have occurred will not prevent your animation from being submitted.



## Website

Every website requires a domain and a web hosting service. Depending on what kind of website your team wants to create it may require monthly payments. But if your team chooses the right company to buy the domain and web hosting service from it will be very cheap. The best domain provider that I have seen is Name.com (<http://name.com/>) as they usually provide low prices and discounts. Now the web hosting service one is tricky, but the best one and most promising company to provide web hosting service is HostGator (<http://hostgator.com/>). All in all, whoever you choose to buy from make sure you understand what you are buying and that the company has good reviews.

The best tip that anyone can give to a person designing or programming a website is to keep it simple and clean. Make sure that other people are checking up on the website while it's in development. Just because something may look good to you, doesn't mean it will look good to everyone else. Remember, always keep it professional.

Organization will also play a role in how easy another person can look through the source code of the website. Make sure the code is easy to read and that the organization makes sense. One way to organize is to keep all the pages in a separate file in within a folder and make the name of the file the name of the page. This way it'll be in alphabetical order and it'll be much easier to find and edit a page. Another plus to having good organization is that when the role of the webmaster is passed on, the next person will be able to quickly understand how the website works.

Remember, there are many online communities out there dedicated to web programming. If you ever run into an issue most likely someone else has ran into the same issue, came up



with a solution, and posted it online. Whatever you and your team decide to do with the team's website, you will have the help of thousands of people at your disposal.

### **Smooth and Easy Navigation**

Providing easy-to-access navigation will be a big plus for any website. If the navigation is too complicated the user will get frustrated and leave the website. It's a good idea to provide as many links as possible but you don't want so many that it takes the whole screen to show them all. Make sure the navigation is easy to read so the users can easily find a page they are interested about. The better the navigation, the longer the users will stay on your website.

### **Optimize Loading Time**

Users absolutely hate loading time. If you have a bunch of images on a single page, take out a few images and optimize the images by lowering the quality. A very useful tool for optimizing images is Photoshop, which is a product sold by Adobe. If you want to use a free tool we recommend using [Image Optimizer](#) which is a free online service that does a pretty good job of optimizing images. Another way to help minimize loading time is minimize the use of JavaScript. The more JavaScript you use, the longer a page will take to load. [Website Speed Test](#) is a useful tool to test how long it takes for your webpage to load. Just keep optimizing your page until you believe it's fast enough!

### **Validating A Website**

It's always a very good idea to validate your website using [W3C Validation Service](#). You can check for errors in your HTML or CSS codings and it will tell you exactly what the problem is and which line it's in. The less errors your code has, the faster it'll load. Once your code validates 100% then you can proudly put up validation icon up!

## Cross Browser Compatibility

Checking for cross browser compatibility is a huge annoyance especially when it comes to Internet Explorer. Chrome and Safari both use webkit which means both browsers process the code the same way. What that means is that if the website works on Chrome, then it works on Safari. For Firefox it's fairly easy to cover since all versions of it are alike, so if it works on one version most likely it works on the others. For IE, we have found a very useful tool where you can check your website in multiple versions such as IE 5.5, 6, 7, and 8. The program is called IE Tester and we highly recommend it! Checking each browser can be a pain, but never give up. Over time, the problems can be easily fixed.

## Check For Broken Links

Broken links have always been a problem on the Internet. W3C provides a service called Link Checker which is a very useful tool provided for free. It'll go through all your webpages checking for any broken links and then give you the results and any errors it found.

## How To Create A Favicon



The icon circled above is called a favicon. Most popular websites such as Google, Facebook, and Yahoo have an icon to the left that shows up on the left side of the address bar. If the page is bookmarked it will also show up there as well. Adding a favicon provides an unique identity for your website and it'll make it easier for users to find the bookmark for your site.



There's a free service called [favicon.cc Generator](http://favicon.cc) which helps you make a favicon from scratch. You can even import an image and it will convert it to an ico file for you! You can also create a moving animation to make your favicon more flashy. Once you have created your favicon, download it and then add the code below inside the `<head></head>` section part of your code.

```
<link rel="shortcut icon" href="NAMEHERE.ico" />
```

Replace NAMEHERE with the file location and the name of your favicon file. Once you have done all this, you are done!

### Contrasting Colors

Over the years more and more webpages are difficult to read simply because they aren't contrasting colors. If you were to put a light text on a light background or dark text on a dark background then it'd be very difficult to read.

Example 1:

Difficult:

This is very difficult to read, yes?

Easy:

This isn't very difficult to read, yes?

Example 2:

Difficult:

This is very difficult to read, yes?

Easy:

This isn't very difficult to read, yes?



## Award Submissions

### **Chairman's Award**

Chairman's is divided among three components. There is an essay submission, a presentation, and video submission. In order to compete for Chairman's, you are required to submit all three portions. In general, the essay will be due around the time of the Ship date, while the presentation and video need to be prepared by the Regional that you decide to submit Chairman's for. Chairman's can be submitted at only one regional and can be submitted through STIMS account that your team leader should have access to.

### **Essay:**

The Chairman's essay is the most effective way at telling the judges a concise record of your team's accomplishments in the past year. We will generally start by developing a theme for our entire submission. In the past we have chosen themes such as "Students Learn, Teach, Give, and Spread" and broke up our essay into four components. In each component we will explain the different aspects of our team that will fit inside it. For example, within the Students Learn component, we talk about our trainings, our mentors, and team structure and how students on the team learn through these aspects. After developing a theme, list all the events and aspects of your team that would like to talk about in the essay. Start to categorize them into each section of your theme and create a general outline. Remember while doing this, to mark references for all the events who you can talk to and get information and personal experiences from. This will help you write the essay from a personal point of view. Once a general outline has been complete, begin writing each section of your essay. Save your introduction and conclusion for the end. You will want to keep your word count in mind, but don't let it restrict you on your first draft. Keep in mind that this essay will require many edits from many different people before eventually being submitted. Once you have completed each of the sections within the essay, start working



on the introduction and conclusion. Make sure that your introduction hooks the judges and gets them interested in your team and makes your theme very clear. After you have a working draft, start to cut sections to reduce your word count to below the maximum. Make sure that during the editing process, you get it read by mentors, alumni, and fellow members. Make sure you leave about two weeks before the deadline for editing and revisions. After submitting your essay it's time to move on to preparing for your presentation.

### **Presentation:**

At the regional that you submit Chairman's to, you are required to give a 5 minute presentation. Keep in mind that the 5 minutes you get start the moment you enter the room so don't attempt to bring in any material that would require you to spend more than a few seconds to set up. In the past, we have bought printed poster boards as visuals during our presentation. Make sure that you limit the information on your visuals and keep the judges interested in what you are saying rather than the visuals you have brought with you. Stick to your theme while presenting. Try to focus on the most important segments of your submission as five minutes is not enough time to cover everything that your team does. You are allowed three people in judging room so divide the speaking time as evenly as possible. If you are using boards, make sure you are rotating who is changing the boards/flipping to a new one, so that the same person who is speaking is not changing the boards. Try to include personal anecdotes while presenting as it adds depth to the presentation and shows how your team and its events and programs have impacted you and the people of your community. A good idea is to complete a working presentation about a week before the regional and present it to as many people as possible such as mentors and alumni, not only to gain feedback, but to gain practice presenting in front of people. You want to look as unpracticed as possible, while showing as little flaws as possible. In simple terms, being relaxed and comfortable while presenting gives the judges



the best impression of you. Judges also like to ask questions to test that all the presenters know everything about the team. Sometimes they will ask questions to a presenter on what another presenter said. Make sure you know everything about your team forwards and backwards. At the end of the regional, you will receive a feedback sheet based on how you did. Use this as a building block for future years-it took us eleven years to win Chairman's; don't be discouraged if you don't win right away.

### **Video:**

In addition to the presentation and essay, all teams are required to submit a video at the regional. Your video adds depth to your entire submission as it will show the emotions of individuals through all the events that you do. It's important that your team makes a clear plan and timeline when creating the video. Scripting and storyboarding should take approximately two weeks, filming approximately two weeks, and editing 4 weeks. That will generally give you 8 weeks to complete your video which puts you right around the time of the regional that you might submit for Chairman's. Depending on the regional, you might have to adjust that timeline. Remember to be in line with the theme discussed in the essay. If at all possible, do interviews with an HD Camcorder and use a professional video editing software such as Adobe Premiere Pro CS5 to edit your videos. It will give you the best quality when exporting your videos and burning them onto the DVDs.

### **Binder:**

In addition, MVRT creates a binder which comprises of everything that the team does. It includes all the manuals, award submissions for the year, event descriptions and pictures, letters of recommendations, and news articles that MVRT has been featured in. It is a record of the team's structure and history in a presentable binder. We hand the judges this binder as we present Chairman's as a supplement for them to review and consider while judging us.



### **Award Descriptions:**

#### **Regional Chairman's Award**

FIRST's most prestigious award, it honors the team that best represents a model for other teams to emulate and best embodies the purpose and goals of FIRST. The Regional Chairman's Award helps keep the central focus of the FIRST Robotics Competition on the goal of inspiring greater levels of respect and honor for science and technology.

#### **FIRST Dean's List Finalist Award**

This award celebrates outstanding student leaders whose passion for and effectiveness at attaining FIRST ideals are exemplary. The Kamen family hopes this honor not only recognizes these student leaders' tremendous recent accomplishments, but also inspires them to continue their great work for FIRST as alumni. FIRST Dean's List Finalists will compete at the championship for the FIRST Dean's List.

#### **Engineering Inspiration Award**

The Engineering Inspiration Award celebrates outstanding success in advancing respect and appreciation for engineering and engineers, both within their school, as well as their community.

#### **Woodie Flowers Finalist Award**

The Woodie Flowers Finalist Award celebrates effective communication in the art and science of engineering and design. Dr. William Murphy founded this prestigious award in 1996 to recognize mentors who lead, inspire, and empower using excellent communication skills. The Woodie Flowers Award is presented to an outstanding engineer or teacher participating in the robotics competition who best demonstrates excellence in teaching science, math, and creative design.



### **Regional Winners**

This award celebrates the team or alliance that wins the competition.

### **Regional Finalists**

This award celebrates the team or alliance that makes it to the final match of the competition.

### **Coopertition™ Award**

The Coopertition™ Award celebrates the team that best demonstrates the ability to help their opponents compete. The Coopertition Award will be granted to the team that earns the most Coopertition Bonus points during the competition.

### **Creativity Award sponsored by Xerox**

The Creativity Award celebrates creative design, in process, execution, or via a creative or unique strategy of play. It is focused on a feature or features of the machine or development process.

### **Engineering Excellence Award sponsored by Delphi**

The Engineering Excellence Award celebrates an elegant and advantageous machine feature or features. This award recognizes any aspect of engineering elegance that reinforces the principles of FIRST.2012 FIRST Robotics Competition.

### **Entrepreneurship Award sponsored by Kleiner Perkins Caufield & Byers**

The Entrepreneurship Award celebrates the entrepreneurial spirit and recognizes a team which has developed a comprehensive business plan in order to define, manage, and achieve team objectives. This team displays entrepreneurial enthusiasm and the vital



business skills to ensure a self-sustaining program.

#### **Excellence in Design Award sponsored by Autodesk**

This award honors clear and compelling evidence of excellence in design development, documentation, communication, and presentation. The intention of the Award is to inspire, recognize and celebrate design as one way in which you can change your world.

#### **Gracious Professionalism™ Award sponsored by Johnson & Johnson**

The Gracious Professionalism award celebrates outstanding sportsmanship and continuous gracious professionalism in the heat of competition, both on and off the playing field.

#### **Highest Rookie Seed Award**

The Highest Rookie Seed Award celebrates the highest-seeded rookie team at the conclusion of the qualifying rounds.

#### **Imagery Award in honor of Jack Kamen**

The Imagery Award is in honor of Jack Kamen, Dean's father for Jack's inspirational dedication to art and illustration, his gifted creativity and devotion to FIRST. The Imagery Award celebrates attractiveness in engineering and outstanding visual aesthetic integration from the machine to the team appearance.

#### **Industrial Design Award sponsored by General Motors**

The Industrial Design Award celebrates form and function in an efficiently designed machine that effectively addresses the game challenge.

#### **Industrial Safety Award sponsored by Underwriters Laboratories**

The Industrial Safety Award celebrates the team that progresses beyond safety



fundamentals by using innovative ways to eliminate or protect against hazards.

### **Innovation in Control Award sponsored by Rockwell Automation**

This award celebrates an innovative control system or application of control components – electrical, mechanical or software - to provide unique machine functions.

### **Judges' Award**

During the course of the competition the judging panel may decide a team's unique efforts, performance, or dynamics merit recognition. To recognize these unique teams, FIRST offers a "blank" judges' award. The judging panel will select a team to be honored as well as the name of the award.

### **Quality Award sponsored by Motorola**

The Quality Award celebrates machine robustness in concept and fabrication.

### **Rookie All-Star Award**

The Rookie All-Star Award celebrates the rookie team exemplifying a young but strong partnership effort, as well as implementing the mission of FIRST to inspire students to learn more about science and technology.2012 FIRST Robotics Competition

### **Rookie Inspiration Award**

This award celebrates a rookie team outstanding success in advancing respect and appreciation for engineering and engineers, both within their school, as well as in their community.

### **Team Spirit Award sponsored by Chrysler**

The Team Spirit Award celebrates extraordinary enthusiasm and spirit through exceptional



partnership and teamwork furthering the objectives of FIRST.

### **Website Award**

The Website Award recognizes excellence in student-designed, built, and managed FIRST team website

### **Past Submissions:**

#### **Winning 2010 Chairman's Award Essay**

### **About Us**

Fueled by innovation, ambition, and passion for impacting our community, the Monta Vista Robotics Team has been changing lives since 1998. Since our founding, we have received 44 awards at FIRST Regionals and the Championships. Last year we won the Engineering Inspiration Award and the Best Website Award. However, FIRST has always meant more than just competition. Presented with the Mayor's Award of Community Excellence our second-year, we have continued to foster partnerships with our local government, companies, and community to spread interest in science and technology. We have also continually worked on FIRST's goal of bringing more girls into engineering. Last year we made a web page regarding the Girl Engineering Scholarship and Introduce a Girl to Engineering Day, and this year we are working with UsFirstGirls to further this project. Members on the team constantly give to the community, learn from our mentors, and use this knowledge to teach other FRC and FLL teams while promoting the message of FIRST through our many outreach programs.



## Students Learn

When joining the team, members are required to choose one Engineering and one Operations division, thereby exposing them to the different aspects of FIRST. The engineering division consists of the Mechanical and Electrical sub-divisions. The operations comprises of Public Relations, Finance and Media. With a clear hierarchy of divisions and proven sustainability, we won the Kleiner Perkins Caufield & Byers Entrepreneurship Award for providing students the experience of working in a corporation. Being a part of both the engineering and operations divisions, members develop key skills that they use throughout their life. We are able to apply our knowledge from our science and math classes after school into building a five foot tall robot.

The year starts off with the weekly trainings from October to November. The veterans teach the new members the fundamentals of engineering, animating, and financing. Each lesson is meticulously prepared, from PowerPoint presentations to the hands-on activities. All of our PowerPoints are on our website so other teams as well as our team can refer to them. Our goal is not only to prepare the new members for build, but also to make leaders and engineers who can continue to take care of the legacy of the team the following years and work amongst our valuable mentors. At key decision points during the season, we hold design reviews, nights when we present our current progress to local engineers for feedback.

Our members learn more than just the engineering aspect of FIRST. As a student lead, student run organization, members learn leadership, time management, financial, and public speaking skills. A lot of these qualities are emphasized by our alumni when they come back to mentor us.

Our alumni help us a lot. After graduation, all of our members head off to college. In a recent survey, we found that over 30% of our alumni have interned by their sophomore year of college. Many come back to FIRST to mentor us or other FIRST teams including



SpaceCookies and CheesyPoofs. Once members learn the fundamentals of Engineering and Operations, they spread this knowledge amongst the community.

### Students Teach

MVRT believes in inspiring people early on and help them develop key life skills. For elementary school students, we have inspired over 120 students since 2005 by hosting the Gifted and Talented Education Program at Lincoln Elementary. Every week, MVRT members expose GATE students to the world of science and technology through interactive projects such as water rockets and cardboard bridges.

For middle school students, we founded First Lego League teams at Lawson and Kennedy Middle School. In fact, one of our alumni received the Outstanding Mentor Award at Northern California State Tournament for his dedication. Last year, MVRT began to volunteer regularly at FLL and FTC tournaments and helped kick off the season for the team from Los Altos Middle School with a game analysis. As the sole FRC team helping out at the Nor-Cal FLL tournament at Google, MVRT helped run the 64-team event. One month later, we were there again at Championships. This year we increased our efforts by starting our own FLL team in Miller Middle School. Meetings were held on a weekly basis to guide the kids in building the robot. Finally, for high school students, we mentored FRC teams at Homestead, Saratoga, Lynbrook, Harker, Cupertino, Mission San Jose, St. Francis High Schools, Woodside Priory, and Gunderson, 3 of which have received the Rookie All-Star Award. Throughout the year, we invite them to our robotics trainings and social events. We hold Kickoff in our auditorium for local teams, revealing and analyzing the game every year. Also, we were one of the founding teams of the Intradistrict Robotics Council, which facilitates communication among the five local FRC teams to earn corporate sponsorships and coordinate fundraising events. This year we took this to another level and were one of the three teams on the west coast to be chosen to Beta test the new LABView software.



After testing, we conducted workshops in Sacramento and in local Cupertino to teach other teams about our discoveries.

### Students Give

MVRT members are more than just future engineers on a robotics team. Members give back to the community at the local and the international level. At the local level, we regularly demo our robots at the Cupertino Library, San Jose Tech Museum, and local parks to inform parents about the opportunities available to their children. With purple business cards, poster-boards, and award displays, MVRT presents to interest the community in science and technology. Many of our inspired members also help at community events like Habitat for Humanity and Toys for Tots.

We also take part in many events to help out schools internationally. During the Cupertino Fall Festival last year, we met Vivek Kumar who wanted to aid the schooling system in rural India by providing teachers and facilities. Our team offered our technical and media expertise to design his initial website and logo, and help in a business plan that garnered the group's initial round of seed funding. The result was an organization that plans to rebuild rural communities of 150 underprivileged children for less than \$5,000 per community. MVRT also sponsored Asia's first Robotics institution at Bits Pilani by providing resources and monetary support. Our support enabled them to come to the US and win third place internationally. Although our team color is purple, our continuing goal every year is to go green. It began last year with a trashcan labeled "Cans Only, Please Recycle." We moved on to a four-day cleanup where we recycled 25 pounds of scrap aluminum, and finally a month-long green campaign. Through a partnership with the school's environmental commission, we began an eWaste fundraiser last February and organized the same this year. The money we earned was donated to the first environmentally green school in Mexico, the Costa Verde International School. In addition,



daily lunchtime activities were held during April to promote environmental consciousness. We showed "An Inconvenient Truth" and invited a speaker personally trained by Al Gore.

In light of recent events in Haiti, MVRT-er's held a Haiti fundraiser week in school by partnering with One Dollar For Life. We had envelopes in classrooms and had promotions to get people to each donate a dollar. We also coordinated with different clubs on campus for the same purpose. As a club we donated \$350 towards this effort. In the future, we hope to have more events to continuously help this cause.

Finally, we also want to give back to the FIRST community by spreading the message of FIRST. We spread this message in various ways.

### Students Spread

Our award-winning website has allowed us to communicate effectively to our members and fellow robotics teams. Many FRC team websites and the USFIRST homepage are linked to [www.mvrt.com](http://www.mvrt.com), particularly for the Resources section. Here, we publish PowerPoint presentations from all our trainings and a new video library resource section to facilitate a smoother build period for other teams. We now feature tutorials on using Bosch, navigating Inventor, and putting together AndyMark gearboxes. MVRT also uses YouTube to document our progress and gain publicity. Our videos include match analyses, and footage of every match that we have participated in. We have also been working with Mr. Dean Kamen on promoting FIRST through Facebook. MVRT has gained publicity outside the robotics circle and used this to spread the message of FIRST. We have been featured in school newspapers, the local newspaper such as the Cupertino Courier, a Chinese newspaper, and even on the KTVU news network. This year, MVRT demonstrated our robot at the JavaOne Conference in order to promote FIRST in the Java world. As such, we were part of the keynote presentation and interacted with several potential mentors for the FIRST community. Finally, when Congressman Mike Honda requested support for his and President Obama's



Enhancing Science, Technology, Engineering, and Mathematics Education (STEM) Act last year, MVRT was there to help. At his press conference, we demoed our robot and more importantly, spoke on the connection between the goals of STEM and FIRST. Albert Beltran, a representative from Mike Honda's office, attended our kickoff event and spoke on the importance of FIRST to Congressman Honda's initiative.

Our team is committed to instill a passion for science and technology throughout the community. We are eager to see the growth of our partnership with parents, schools, government, community, and companies. Though we are proud of our history of technical excellence and community service, nothing can match our satisfaction of creating the leaders for a better tomorrow.

### **Winning Woodie Flowers Award Essay**

#### **2004 Silicon Valley Regional: Mr. Ted Shinta**

Mr. Shinta's story is about wealth, riches, and accumulating and growing assets.

However, the Mr. Shinta we are talking about has a salary below median earnings. He drives a ten-year-old white pickup truck and lives in a small apartment.

Mr. Shinta works as a teacher's assistant, but his passion is to mentor the MVRT.

The MVRT consumes over eight hours a day, fifteen on weekends, entirely voluntarily, and requires him to sacrifice himself even beyond the members, mopping the floor for hours after all have left, just so they can finish homework. What meager pay he receives from his school job he opens to the team. We buy parts on his credit, and he only reimburses himself



what the team can afford- this year alone, he donated over \$2,000, a substantial part of his salary. By all common measures of status- money, time, freedom, Mr. Shinta has sacrificed everything for the team.

But Mr. Shinta is not poor- he is rich. He is rich in education, in experience. He is rich in creativity, in ingenuity. He is rich in compassion, in morality. And most importantly, Mr. Shinta is the greatest embodiment of *FIRST* the team knows- a model for gracious professionalism and inspiration in engineering.

Rookies, when they first enter the team, feel intimidated and discouraged by the monumental task of building a robot. But Mr. Shinta closes the gap between veteran and rookie through his inspiring lessons and energetic demonstrations. Since Mr. Shinta has joined the team, every robot has featured critical rookie-designed components. The drive train, chassis, and important mechanisms have all been, in one year or another, entrusted to rookie members inspired by Mr. Shinta.

Mr. Shinta's teachings have extended far beyond the build. Many of his proteges have gone on to become great mentors. For example, under Mr. Shinta's guidance, Patrick Wang grew from a shy, in-the-corner freshmen, to the designer of an elaborate elevator mechanism his sophomore year, to a renowned team president junior and senior year. Today, he passes on Mr. Shinta's teachings as a mentor of Kehillah Robotics Team.

Mr. Shinta does not come to work each day for a paycheck, but for the robotics team that loves him. He does not wake up at five in the morning for fun, but to machine parts early so that he can supervise students in the afternoon. He does not drive out to buy falafels at midnight to catch a snack, but because vegetarian members are hungry on days when the team dinner consists of only meat entrees.



Mr. Shinta's mentoring is also personal. He keeps track of every member's grades, to insure that they are not falling behind in school during the build period. To help keep their grades up, Mr. Shinta sends members home early so that they can finish their homework. He even tutors them for free.

MVRT is a successful team with a great legacy, full of passionate, accomplished members. But we did not get there alone. There was Mr. Shinta to teach and guide us. Robotics is like art. Mr. Shinta hands us a full set of brushes, a beautiful palette, and a perfectly blank canvas. That is right- Mr. Shinta does not design the robot. He does not dictate the strategy. But Mr. Shinta taught us how to paint.

Again, Mr. Shinta is a rich man. He is rich with the knowledge that he made a difference in the lives of many future engineers, entrepreneurs, and scientists. He is rich with the warmth and admiration of his team. He is rich in the currency of life- love and happiness.



# Electrical

## Programming

The first step in choosing which language to program your FRC robot is to find students and mentors with programming experience. If they have extensive experience in one of the languages supported by FRC, then that is probably the best one to choose.

## LabVIEW

LabVIEW programs are collections of “virtual instruments,” or vi’s. Each vi consists of a front panel--with switches, knobs, graphs, and indicator lights—and a block diagram consisting of data wires that connect to basic logic elements and other vi’s. Data flows into a vi, where it’s modified, and flows out again.

- Positive
  - In general, easier to people who have not programmed because it presents the information graphically
  - More user friendly for beginners
  - Adding even complex meters and controls to the front panel is easy.
  - Easy to debug
  - Real-time analysis without re-downloading the code
  - Data can be probed while running.
  - Example code for the sensors and motors includes wiring diagrams
  - Does not require a separate development environment. The vi is the development environment.
  - Is inherently multi-tasking. The user does not have to control threads.
  - Automatic memory management
- Downside
  - Slow uploading time to the robot



- Fewer people are familiar with LabVIEW and its dataflow computing than are familiar with C++ or Java.
- Resources
  - National Instruments' FRC 2011 Training Material and Resources  
<https://decibel.ni.com/content/docs/DOC-8923>
  - Tutorials and videos for students and teachers:  
<http://www.frcmastery.com/>
  - Resources page under our website

### C++

C++ and Java are both derived from C. They are the most commonly used programming languages in the world.

- Positive
  - Fast uploading time to the robot
  - Familiar language to some people
  - Easy for experienced programmers to build sophisticated programs
- Downside
  - The FRC C++ system uses the Eclipse/WindRiver development environment, which is extremely complicated. There is a steep learning curve required just to figure out how to use it.
  - Harder to debug
  - Hard to get data back in a visual format that is easy to understand
  - Debugging requires recompiling the code.
  - Multiple threads are controlled by the programmer rather than the system.
  - User must manage memory. Easy to have memory leaks.
- Resources
  - <http://firstforge.wpi.edu/sf/docman/do/downloadDocument/projects.wplib/docman.root.c and java documentation/doc1197>



## JAVA

- Positive
  - Fast uploading time to the robot
  - Familiar language to many people especially because of Computer Science classes provided in some schools
  - Easy for experienced programmers to build sophisticated programs
  - Automatic memory management
- Downside
  - Harder to debug
  - Hard to get data back in a visual format that is easy to understand
  - Easier to debug than C++
  - Multiple threads are controlled by the programmer rather than the system.
- Resources
  - [http://firstforge.wpi.edu/sf/docman/do/downloadDocument/projects.wplib/docman.root.c\\_and\\_java\\_documentation/doc1199](http://firstforge.wpi.edu/sf/docman/do/downloadDocument/projects.wplib/docman.root.c_and_java_documentation/doc1199)

## Python

- Positive
  - Familiar language to some people. Widely used in academic & scientific communities
  - In many ways, it is easier to use than C++ or Java.
  - Errors do not crash the robot.
- Downside
  - Need to write extra code for it because very little pre-written code
  - Must be familiar with C++ in order to use some features and to modify code
  - More obstacles to overcome and much more challenging because not an official language of FIRST



### Other factors

- Consider what languages your team already knows and what computer & mentoring resources are available to you.
  - Robot programming is different from other code so regardless of previous knowledge, there will be substantial learning involved.
  - All robot programming involves working with hardware: reading sensors and running motors, cameras, & pneumatic solenoids. There is no “pure” programming.



## Frequently Asked Questions

***Do you know the actual dates for payment of the enrollment and regional?***

FRC Payment and Dates: <http://www.usfirst.org/roboticsprograms/frc/frc-payment-terms>

This website shows that the first competition you attend will cost 5000 for veteran teams, and 6500 for rookie teams which includes the Kit of Parts during Kickoff and Registration for one competition. The due dates for competition fees are December 2nd for the first regional, and January 27th for the second regional if you want to attend.

The full list of regionals for the upcoming year are posted on the FIRST site at:  
<http://www.usfirst.org/roboticsprograms/frc/regional-events>

***Does your mentor know how to use TIMS to register and get information send to all FRC teams?***

The link is located here at <https://my.usfirst.org/frc/tims/site.lasso>. Make sure that your team is registered through TIMS because that is where you will be registering for competitions.

***What do you say in a sponsorship meeting? What are the enterprises interested in?***

When you are giving a presentation to a sponsor, you need to figure out who your target audience is. We have done a variety of sponsor presentations, and recognize that who is listening to you is key. When presenting to people who know little about FIRST, you need to spend some time introducing the program and what its goals are. Often times, the companies may have worked with you in the past, and already know about FIRST, in which you would focus more on showing how your team embodies the spirit and idea of FIRST.



Located in this packet are example sponsor presentations. Generally, we introduced FIRST and FRC along with the competition, and talked about what students gained out of the experience in FIRST. What do they learn, and how do they develop. We talk about the unique opportunity to work alongside professional mentors and engineers and how the competition spreads worldwide with over 20,000 people spectating at some competitions.

Your goal is to show the sponsor why they should put their time and money into your team. Ultimately the reason any sponsor wants to donate money into a program like FIRST, is to develop engineers that will return to work for them in the future. You don't need to state that specifically although, make it apparent that the students that develop through your program and better suited to handle professional engineering environments than standard education. The time pressure and limit budget FIRST forces on us simulates a real world engineering environment that things like science fairs, and other competitions simply cannot relate to.

When talking to the sponsor, make sure you have someone that can talk clearly and can show confidence. Try to have one of two people speak and change between them in a somewhat unnoticeable pattern. The goal is to look unrehearsed like you are just talking from your common knowledge, but at the same time, you need to rehearse to get to that stage. If you would like, send MVRT any materials you are planning on taking to a sponsor demonstration and we will be happy to review it for you.

***What's your working plan before the challenge is announced?***

We spend the entire fall training our rookies. Starting on this coming Monday, our team is hosting trainings at our school for everything that the rookies need to know for the build season. If you look on our trainings page, which is also located as a resource on the FIRST website:



FIRST Website: <http://www.usfirst.org/roboticsprograms/frc/top-web-sites>

MVRT Website: <http://mvr.com/?trainings>

We post all the PowerPoints we use during our trainings. The PowerPoints should give you a basic understanding of some concepts although you will need to provide the rookies/members with hands on experience in order for them to grasp the concepts. We also made a few video tutorials on Autodesk Inventor.

Depending on how committed your mentor is, you would preferably meet as much as possible during the fall. We meet every single weekday, and hold events throughout our community on the weekends. We host FLL Teams and FTC teams, and take our robots to events like local festivals and events to show what FIRST is about.

If you are still new to FIRST, we would suggest focusing on building up your team and forget about working too much with the community. That would mean, focusing on finding mentors that can come during the fall to teach students engineering concepts. You want to focus on things like design using a CAD Software, Autodesk Inventor for example, coding the cRIO using either Java, C++, or LabVIEW. We use LabVIEW because we find that teaching rookies visual coding is simpler and easy for us to handle. You also want to focus on concepts like wiring, soldering, machining, and overall engineering concepts like drive trains, gear ratios, and pneumatics.

Since our team is over 100 members, we divide our rookies and veteran trainings apart, although depending on the size of your team, you may want to simply keep the trainings together.



***What kind of specialized officers (mechanical, design, electronics, etc) did you need?***

Our team is mostly student run team meaning that the majority of the knowledge that is passed down between students comes from other students and not directly from the mentors. The mentors that we have are experienced professionals. It is good to have one mentor who is specialized in Electrical concepts, while having another mentor that knows CAD Design very well. These mentors are essential for having them double check your work will ensure you aren't spending enormous amounts of time working on the same design that continues to fail. Having someone who is experienced in a machine shop is essential as well, in that you will be needed to cut materials all the time and having an experienced supervisor is not only smart but safe as well.

In terms of how we divide up our team, we have 6 divisions that we encourage students to join. Two of the divisions are Engineering divisions which focus on building the robot, which are Mechanical and Electrical. The mechanical side deals with everything hardware related on the robot, from designing, fabrication, and assembly of the robot and its parts. The electrical side is more focused on the "brains" of the robot and deals with the wiring of the control system and the coding of the robot and its sensors. It's important to have both of these divisions running at full potential in order to have a successful robot. The other 4 divisions are operations divisions which deal with anything non-robot related such as media, community outreach, finance, and documentation. These are essential to have although aren't specifically necessary to have as divisions for young smaller teams.

I would suggest focusing on the Engineering and keeping the non-robot stuff among a small group of individuals who are willing to take on a larger responsibility. Our team has 9 officers, each for one of the six divisions, two Directors/VPs who run engineering and operations, and a president. Having a management structure will keep your team on task



and on schedule which is extremely important during the Build season, when you cannot let time slide away. If you need more mentors, I would suggest asking parents who may be involved in Engineering, asking sponsors if they can send someone to help the team in their free time, or even schools with science, math, or engineering teachers who can be resourceful.

***Do you have any tips for the website?***

The website is an extremely difficult thing to maintain and focus on if you do not have someone dedicated on keeping it updated. We have a webmaster dedicated to only the website and because he spends so much time on it and cares so much, we have won the Best Website Award at competitions for almost 6 years straight as well as a Championship Best Website in 2008. I would suggest finding someone who is willing to spend time on this. Once you have someone, register a domain for about 20 dollars a year through a domain site like GoDaddy.com. From there, your webmaster is going to need to learn HTML coding to begin coding the website. Keep in mind, this is only if you want your website to be self-designed. For rookie teams, I suggest keeping things simply by using sites like Weebly and Wordpress to design their websites. It requires no coding, but simply has pre-designed sites that you can type the content directly into. If you look on our Website Tips page: <http://mvr.com/?webtips>, there are a bunch of tips to keep in mind. If you look at our website, you can see some of the stuff we put online include information about the Team, FIRST, Members information, Calendars, Pictures, Videos, and Sponsor and Mentor Recognition.

***What are the electronic components you use for the robot?***

We mostly use the electrical components provided with the robot. The main parts include a cRio and digital sidecard, and Jaguars. In the past, FIRST only provided 8-slot cRios so we used to use those. We are now strongly considering using the new 4-slot cRio because it



reduces the weight and we have not had to use more than one module of any one type. By this we mean, we have never exceed 1 digital module, 1 analog module and 1 pneumatic/relay module. This also means we only have 1 digital sidecard on our robot. In case you do not know, the digital sidecard is the part of the robot where you can connect the digital sensors. We recommend connecting the digital module and digital sidecard with a ribbon cable because the cable provided has damaged our modules in the past. We have never run into the situation where we needed to have 2 digital sidecards. For motor controllers, we choose to use the Jaguars over the Victors because we found the Jaguars more reliable even though they are heavier. Other teams still use Victors as their motor controllers. These are the main electronic components where there is a decision to make on how many and what you want. The other parts, which include a breaker and the power distribution board do not have much room for movement or choice. We also have a training on our website called "New Control System" which has a brief description of the parts.

When wiring the robot, make sure you look at the wiring diagrams provided on FIRST's website. They provide the recommended way to wire the kit of parts electronic components. Also, make sure you follow the wiring rules and regulations. For certain electronic components, there are wire gauge requirements. If you do not meet those requirements then you will not be able to pass inspection in competition and will not be allowed to compete. In addition, FIRST does not let you split wires or join wires into one, other than in very selective cases. In general, never combine any wires for it will likely not pass inspection.

Also, on the issue of creating a legal robot, in case you have not looked at the robot requirements, I strongly suggest you look over them before build starts. A large part of the requirements remain the same from year to year so it is to your benefit to know the requirements from past years. One year, a new team missed the size requirement and built



an oversize base which was not allowed in competition. They did not read carefully enough and did not realize that all bolts had to be within the size limit provided by FIRST so we had to cut down their chassis at competition to allow them to compete. Even then, when build season does roll around, make sure you read the new set of requirements because once in a while they have a new, crucial requirement.

***What do you program? And in what language?***

NXTs are used mostly in the FLL program that we run. They are the small controllers which are programmed with RoboLab, which is a graphical based on LabVIEW. For our robot we use LabVIEW because we feel it is easier to teach new members. Since it is graphical, we feel it is easier for new programmers to grasp. We have many LabVIEW powerpoint tutorials on our website including an introduction to the robot project. Also, <http://www.frcmastery.com/> provides video tutorials on LabVIEW, starting from the very basics and going into more detailed areas of the robot code.

***What does your Media Division do? How do you develop a safety animation?***

In terms of the media division, what we generally go about doing is ensuring that we create a safety animation for the fall, a main animation for the competition, as well as t-shirts, graphics, side panels, and any other design work that the team needs.

We like to begin by gathering a group of individuals who are willing to be dedicated towards that project and discuss a story for the animation. Once you have completed a story, a good thing to do is to draw out what you would like your animation to look like in a story board. Once that has been completed, we divide the team up into objects. Within the animation, different objects need to be created, so 1-2 members will spend their time working specifically on designing and animating those objects. Make sure you schedule out when you want to complete certain tasks and stay on schedule as much as possible.



The general rule I follow for the Safety Animation is about 5 hours to model and an hour and a half to actually animate. As for the Main Animation, we suggest giving Media members at least 9 hours for modeling and 3 hours for keyframing. With both animations, don't forget to leave the last week or so for rendering and putting the actual animation together, so you'll have ample buffer time in case if something goes wrong. Try to avoid submitting on the final day because the servers may back up and you may not be able to submit it.

MVRT's Animations: <http://www.mvrt.com/?animations> (All of our animations can be found here)

### ***What facilities are required (mechanical)?***

Some of the basic tools that you will need are outlined above in what to pack for competition but there are other facilities that are required to work efficiently. Our team uses the facilities of our school's wood shop to make parts for the prototyping stage of the robot. Our school's wood shop also contains a mill, which is what we use to make our custom parts. This is not necessary as you can send custom parts to a machine shop. We have also contacted a local community college and we have asked them to help us machine parts this year. This college's machine shop includes a CNC machine as well as a mill and it allows us to create lighter and sturdier parts at a better quality. A CNC machine or a mill is not required to operate a mechanical division but it helps increase the quality of the pieces. If you plan on making custom parts, however, you need to find a machine shop near you so that you can get parts milled in time.

### ***How can MVRT help you?***

With over 15 years of experience in FRC, 5 years of FLL, and 1 year of FTC, MVRT is one of



the most experienced teams in all of FIRST. If you need help with any specific information on running your team, from the management structure to specific questions on technical specifications of your robot, we would love to help out. Our students are well-versed in all aspects of FIRST, from CAD Design to programming. When build comes around, we have over 100 students, working among 6 divisions to complete everything that FIRST tasks us to do and more, and we would love to teach you all that we do, and help you reach your team's full potential. During the build season, we offer to help out other teams at our school. We're open to taking a look at your robot and helping you troubleshoot any problems you may have.

MVRT is known as a resource for engineering throughout FIRST. Its training pages are located on the FIRST website, covering mechanical, electrical, and general engineering concepts from pneumatics to sensors. We present these trainings to our rookies each year, along with hands on experience in tools and other skills necessary for Build. We suggest that teams not only use these powerpoints as a basis for training rookies, but take the concepts explained in them one step further by developing hands on trainings to give students necessary skills in each of them. If you need help in developing these trainings, feel free to contact us and we will get back to you immediately and begin working with you on these.

Our experience in FLL, led us to create our own FLL Manual to run teams. It has helped us year after year to ensure the continuing success of our FLL program. If you would like to use this in running and managing your own FLL Teams, we highly encourage it. It will cover scheduling, budgeting, and other information that helps to make sure you remain on track throughout the entire season. As a previous Chairman's, Engineering Inspiration, and Woodie Flowers Team, we have a lot of experience in developing awards submissions as



well. Feel free to contact us on help or refer to our posted submissions from previous years.

Remember that we are available as a resource for any questions that you may have about FRC, FLL, FTC, or anything about robotics in general. Our team covers past engineering, and would love to help you in the Media, Finance, and Outreach sectors as well. Occasionally, MVRT will hold weekend workshops and invite other teams to attend, where we teach both technical and management skills to run your team. If you would like to attend one of these, please contact us.

Please direct any questions that you may towards either one of our division officers or to [mvrt@mvrt.com](mailto:mvrt@mvrt.com)

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