

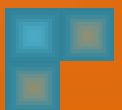
2011

SCHOOL OF SCIENCE AND  
TECHNOLOGY CORPUS  
CHRISTI

ROBOTICS  
TEAM

#4657

ENGINEERING  
NOTEBOOK



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## 1. Introduction

As we progress through our lives, we encounter mishaps and mistakes. All these mishaps have some type of solution. Very bright minds work daily to solve these common, world-wide problems. Who said that only old people had to do all the work? Maybe they are the only ones that have degrees, but all that does not matter if you're determined to do your best at all times! You **MUST** be courageous; have a positive and optimistic attitude. You must also have hope and you must set goals for yourself. Everyone in our group has created a five-year plan that shows time progressing along with our goals and missions. Decide what you want to accomplish and then work towards accomplishing that goal! We robotics students



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at the School of Science and Technology understand the importance of encouraging the next generation of children at our school to pursue careers in the math, science, technology, and maybe engineering fields. If we influence their lives, like the FTC competition did to ours, we would be able to accomplish as much as some of the greatest engineers and scientists worldwide, ranging from Albert Einstein to Isaac Newton. There has been a dramatic increase recently in the updating of the technology field. New technology is being created by the minute, and we should be able to understand the importance of engineering on these factors. Technology is just the ideas and computer based products. Using the concept of engineering, we are able to easily build and put our ideas into effect. We are the future. We are America's future engineers. FTC is the reason why we have many modified young engineers. These young individuals know what to do and when to do it, if there is something with engineering involved. One of the very common fields that lure people worldwide is technology. Technology is the use of science to create worldwide products. One excellent way to exercise this is to use physical objects. That's where FTC comes in. The First Tech Challenge competition in San Antonio is a fun, enthusiastic, and memorable event that changes and influences our lives. Technology is the use of science to create worldwide products. One excellent way to exercise this is to use physical objects. That's where FTC comes in. The FTC competition in Kingsville is a fun, enthusiastic, and memorable event that changes and persuades the life of many young people in the South Texas area. Teams prepare notebooks, presentations, and robots that will complete the assigned mission. The School of Science and Technology Robotics Team persuades the life of many young people in the South Texas area. Teams prepare notebooks, presentations, and robots that will complete the assigned mission. But what makes it challenging and fun is the new mission every year! Now let us go in depth about technology, its uses, and the influencing aspects to us robotics students at SST. Technology is the process by which humans modify nature to meet their needs and wants. Some very common examples of technology are I-pods, computers, and radios. Another one is ROBOTS!!! In modern day society, we take some common types of technology for granted. Technology is like the cells of our bodies. Without it, we wouldn't be able to survive. Our schools use technology to help us learn. It is the fuel that drives our



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lives. It is a mandatory item in our lives. From the Internet's entertainment, to cellular communications, computers have innovated our society today. It shapes the universe. As a student, I believe technology plays an important role in our lives. We use it to do almost everything. As a FIRST robotics contestant, I understand the importance of robots and computer programming. In this competition I will hopefully master all these subjects. We study electrical engineering, chemical engineering, engineering management, and architectural engineering. You use architect skills to build the robot. This year's first tech challenge encompasses all types of techniques and scoring methods. Ranging from ramps to tubes, it gives you robot a wide variety of choices. It's like a dinner buffet, where you have a diverse range of choices. You can choose from going up and down a ramp to through a thick PVC pipe on a rolling cart. The complicated part of this year's FTC mission, is the fact that you must get as much points as possible in the least amount of time. Your robot must fit between an 18\*18\*18 inch cube. Your robot must accomplish all the missions using a limited size mechanism. We expected the building of the robot to be a very easy part, but it turned out to be a total disaster. It felt as if the whole world was collapsing on top of us. The way that we first pictured building our robot, did not work at all, due to the size of the cart with PVC pipes lined along the top surface of the roller. We had to keep altering the method of building the base and corners of our robot. To all who review and look throughout our team process, please know that we acknowledge the fact that you took time off your busy schedules to judge our notebooks. Thank you, and please enjoy our team adventures!!!!

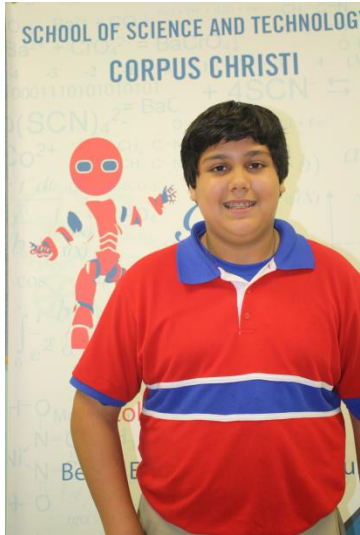
## 2. Brainstorming

### 2.1 Team Members



School of Science and Technology Robotics Team





Hello my name is Cody Mora. I have 1 brother, and one sister.



After I graduate from college, I will pursue a career as a graphic designer.



I joined the Robotics program at my school, to experience a new type of hobby, engineering.



Cody Mora



Hello my name is Joshua Kuhl, and i'm an only child.



After I graduate from college, I will pursue a career as an electrical and mechanical engineer.


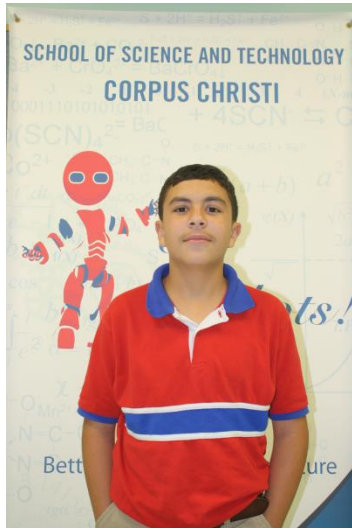


I joined the Robotics program at my school, to have experience to help me out when I receive a job in the engineering field.




Joshua Kuhl





Hello my name is Yoseph Mahmoud, and I have 2 brothers and 1 sister.




After I graduate from college, I will pursue a career as a cardiologist for toddlers and children.



I joined the Robotics program at my school, to experience a career other than the medical field.



### Yoseph Mahmoud



Hello my name is Brandon Martinez, and I have 2 brothers and 2 sisters.



After I graduate from college, I will pursue a career as an engineer working for the army.



I joined the Robotics program at my school, to gain experience in my career for when I grow older.



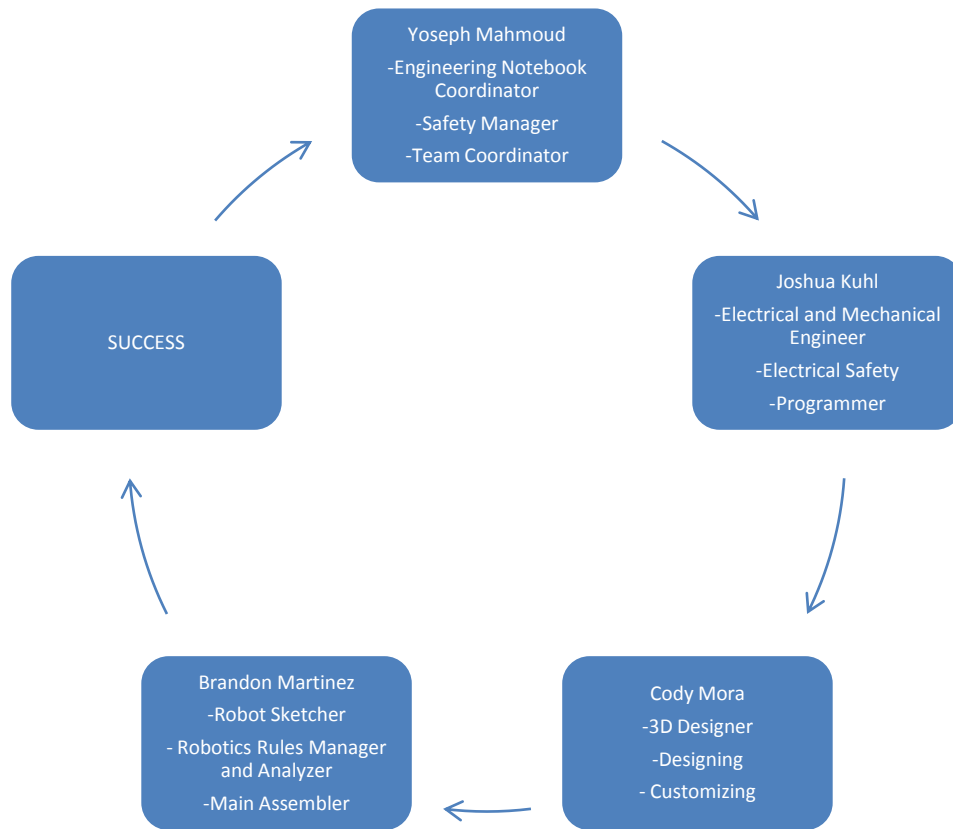
## 2.2 Members Jobs and Assignments



School of Science and Technology Robotics Team



Yoseph Mahmoud	Engineering Notebook Coordinator	Safety Manager	Helped Assemble Robot	Team Coordinator
Joshua Kuhl	Electrical Engineer	Mechanical Engineer	Electrical Safety	Programmer
Cody Mora	3D Designer	Designing	Customizing	Assembler
Brandon Martinez	Robot Drawer/Sketcher	Robotics Rules Manager	Rules and Mission Analyzer	Assembler



### 2.3 SST Robotics Mission and Vision



School of Science and Technology Robotics Team



## Vision:

“As Robotics students at the School of Science and Technology, we understand the importance of technology, math, and engineering, and also understand that the future lies in our hands.”

## Mission:

The mission of the School of Science and Technology Robotics team is to create a safe and healthy engineering and robotics learning environment that will nurture, motivate and enable ourselves to develop into mindful and responsible, people who contribute to their community and the diverse society in which we all live. Our Robotics program will guide us through the development of creative, critical thinking and learning skills and enable us to apply these skills through cooperative, interactive instruction in the technology, and engineering field.

## 3. Robot Design and Building Process

### 3.1 Getting Started

First, Mr. Rasulzada called all of us in and showed us the TETRIX parts kit he had bought. Then, we all analyzed the motors and aluminum parts. After that I, Joshua, built a “test bed” with the NXT to test each servo/motors (picture above). I had a few difficulties with the NXT because I had never used NXT-G before, after Cody and Yoseph showed me it, I was alright. Then we all got our own duties and designated positions. After, we started designing the robot and creating a strategy to, not only create the robot, but to use it during the competition. We all started putting in our ideas into a paper base (Brandon) until we had a fully functional design.

### 3.2 Design (Paper Base)



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### 3.3 Design (3D)

My name is Cody Mora .I am a graphic designer and 3D robot module creator.

I am going to talk how I design

Our robot for FTC 2010 “Get Over It”

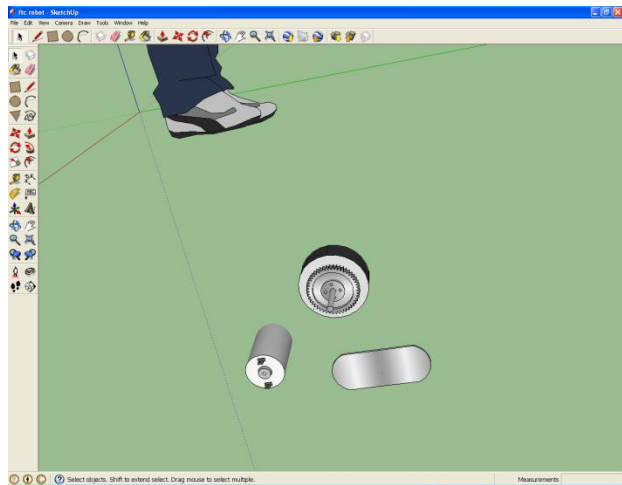
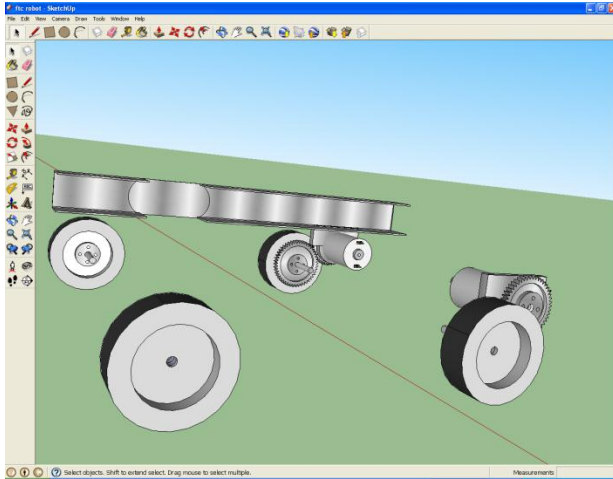
Designing the FTC “Get Over It” Robot

took a team work and a lot of time. Before I made the 3D design we all asked each other what the robot should look like and how it should work.

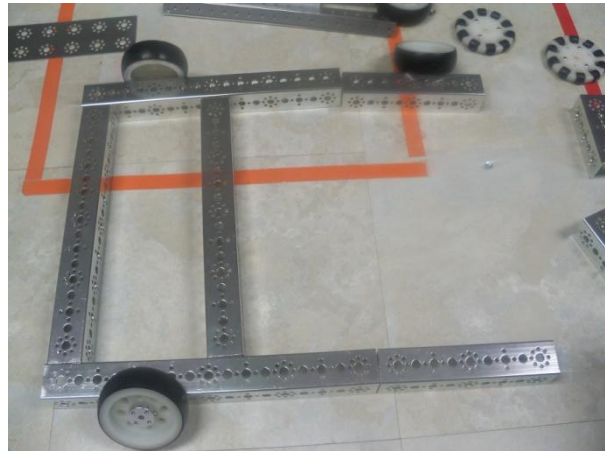
Brandon created the main drawing for Maven [our robot]. Along the way of building Maven we saw many things we visualized didn't work out the way we originally expected to. The main change was Brandon's idea to grab the batons with a FTC motor instead of using the servo we originally expected to. I later came up with the arm design to close for bringing down the balanced platform and to move around the batons objective. There were no more changes up to this day afterwards.

When we are done designing I help with building but at the same time I have to try to keep up with everything that's going around. Making Google sketch up is a slower process than making the actual robot for sure.

Getting a visual is not the only thing to making a sketch up well you could but it wouldn't seem like the robot that was actually made. Sometimes you even have to



have some copies of what you have made in order to grantee a perfect model also just in case the system glitches and erases what you just made.



### 3.4 Choosing Robotics Platform

There was a lot of dispute over the platform, whether it should be empty or plastic or just aluminum. After watching several FTC videos, we decided to make just a aluminum frame and (picture below) leave the rest open so we can just pull up to the trailers and dump our batons into it without having to adjust every time. Just slide it in and go! We originally had a frame with two front swivel so it could act like shocks on a car, but this idea didn't work properly and a straight base was better. The total robot was going to have four wheels, two on each side, and would turn by changing the motor output. In the end, it was able to be driven in "tank mode" with the two joysticks. The motors would be mounted on the top of the frame, but soon changed to below the frame to make it higher. Doing this enabled us to get the wheels over the "mountain" in the middle of the field easier.

### 3.5 Motor Placement

The TETRIX set we bought came with two large motors, so we used those two for each wheel because they have a lot of traction, which the smaller NXT motors do not have. That's why we used them for the arm. That would let us spin the arm faster and get more batons. We used two of the NXT motors for the arm for two reasons. The main reason was that arm was heavy and couldn't get the batons out of the dispenser, and we needed even weight distribution throughout the arm.



## 4. FTC “Get Over It!” Rules and Mission Understanding

### 4.1 Robot Building Rules

The robot is only allowed to be 18x18x18 in its six so that it fits in the playing area. Only a limit of eight Tetrax 12V DC drive motors are allowed on the robot any less is fine so long as it moves and has enough power to get over all the obstacles. A limit of 12 no more Tetris 180 degrees HiTec HS-475HB & HS-485HB and a continuous rotation servo (HiTec HSR-1425CR) in all the competitions . Only 1 WiFi commutation module with on USB a-b cable for the control to connect to the NXT “can use a 24’ or shorter must be used during the competition. Only four and no more DC motors and servos. TETRAX R/C Controller, Infrared Electronic Ball, TETRAX Speed Controller is not allowed in the game and the Tetrax AA battery holder isn’t allowed. A super lube is used only for the robot to get less friction.

### 4.2 Game Rules and Mission

## 5. Safety

### 5.1 General Safety

For general safety, wear eye protection when operating, assisting any power operated machine or tool. Students should wear goggles at all times when working with the robot or machines. All tools should be in proper working condition, before using dangerous tools, such as power drills, sanders, jig saws, or any other dangerous mechanical tools. Please keep your hair up in a ponytail while working near or with the robot. No horseplay near the robot for safety. These rules are made for your safety! An example of how not to wear your goggles is shown on the left hand side.





## 5.2 Working Area

The Working Area is very important when working on projects. You need to make sure that everything is safe that everything is safe to work in before you start working. After using tools put them back to prevent any hazardous things from happening. Make sure to have no food, or drinks by the working area. Always clean up after your mess like picking up trash. Always remember to unplug electrical tools to prevent anyone from tripping over wires. Our working area is in a little hallway. We as a team strive to keep our working area clean and a safe environment to work in. We always clean our area so that everything is safe to work in.





### **5.3 Electrical Mechanical Safety**

Safety is first, so before we do anything, we check our tools to see if they are working, we make sure all connections are secure, and that we have eye and ear protection. We always use gloves when working with wires (hot or not) because we don't want to be shocked.

## **6. NXT Mind Storm, Servos, Motors and Sensors set up process**

### **6.1 DC Motors**

We used two Hitch 12v DC motors for the wheels and mounted them below the frame. We also used two NXT DC encoded motors for the arm so we can tell it where to be and how far to turn every time to get the batons.

### **6.2 Servo**

We used two Hitch servos for the front arm, which just pushes the arm down to let us get on the bridge since we can't get over the "mountain". We used servos because we just have to tell it a position and it will instantly turn to that.

### **6.3 NXT Brain**

We used a standard NXT Brain to control our robot. We used both NXT-G and Robot C to program it to talk with the controller and become autonomous. In the autonomous part, we just set up a macro to do it for us.

## **7. Programming**

### **7.1 NXT-G**



At first, we decided to use NXT-G to program the NXT to function with our robot, but once we got to the practice day, the robot wouldn't work with the LOGITEC controller at all. So, after talking with the programmers, they showed us Robot C, which is a straight Hex-code/script editor.

## 7.2 Robot C

We used Robot C to generate the C-code needed to control our robot, but really we wrote a small program with NXT-G, and then edited it using Robot C to make it function with the LOGITEC controllers needed to control it in the competition.

## 8. Robot Testing

### 8.1 Robot testing at Education and Training Center

We didn't have time to build a crash course to test our robot, so we only had one chance to really test what our robot could do. That was practice day, and our robot didn't perform at all. After we got the controller issue fixed, we still couldn't get over the "Mountain" and, the judges said if we used our idea to drag the trailer around, it would be possession (which is against the rules) and we would lose points.

### 8.2 Redesigning Robot

After what happened at the practice, we decided on two things. One, reinforce the arm and find a way to get over that "mountain". So, we wrote a program that used the full force of the motors, plus we used some of the NXT Lego pieces to reinforce the arm. We also needed a better program, but that was easy now that we know how to use Robot C.

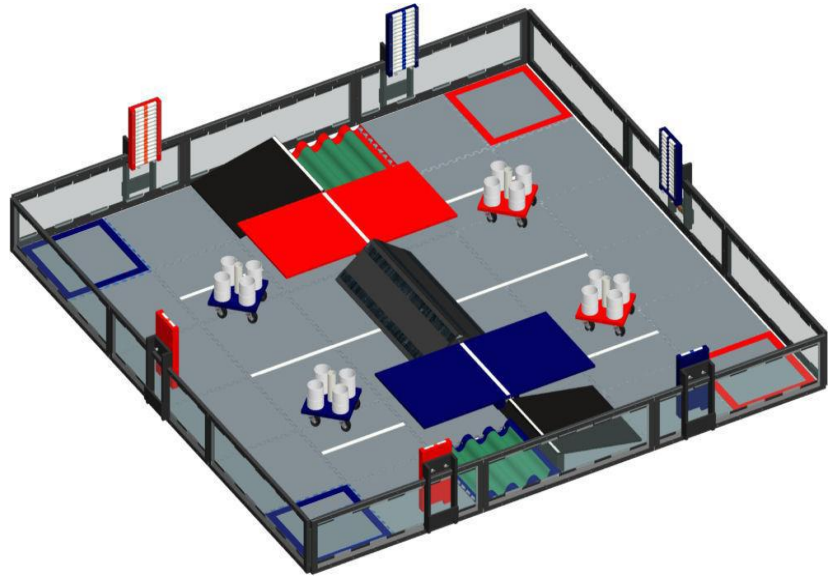


## 9. Game Scoring Strategy



## 9.1 Autonomous Period

We will just go over the bridge and then score the five pre-loaded baton into a trailer. After that, we will go across the field and just let the baton go on the floor, that way we still get points, but don't have to waste the time getting them into the trailers.



## 9.2 Joystick and End Game

For the joystick time, we will dock the trailer to our robot and spin the arm to gain baton points. But, we will get as many as we can from the other side of the field to double our points. In the End Game period, we will dock the trailer and balance it on the bridge to gain the 15 points, and we will also out ally to balance with us to gain those point too.

## 10. Coach's Observation

The FTC competition is the best way to motivate students in math, science, technology and especially engineering. I have never seen such a great event to cover such a wide variety of educational fields. During our short 6 weeks period my students have learned tons of things. They have worked with electrical device and components to make their robot run. They have learned mechanical engineering skills to connecting wheels. They learned the graphic design process by sketching a robot model in design programs such as AutoCAD and SketchUp. They learned how to make an engineering

**I forgot my tiredness when I saw my students' enthusiasm in Robotics. After 42 days**

**The students built a robot with their own hands. That was a biggest award that they have gotten! Finally, I believe these students are ready to go NOT only to Robotics competition, but also to go the college. What a promising future!**



design process by preparing an “Engineering Notebook”. They learned math science and geometry fractions by measuring robot components. They have learned computer engineering by using software programs to run their robot. They learned how to solve problems by reading instructions. Finally, they learned HOW TO ACT AS A REAL ENGINEER by participating in FTC Robotics competition. I met with my Robotics students almost every day after school. As well as Robotics, they had school responsibilities. The students have all A’s in their class. If they have lower grades, they can’t join the robotics team. As a result, they really worked hard academically and at the Robotics job. Right after school (at 3 pm.) they stayed in library to do their homework until Robotics practice started (5pm.) Usually practice was from 5-7 pm and sometimes until midnight students stayed with me to get their done.

**Rahman Rasulzada**

SST –CC Coach /teacher

## 11. Team Work and Sportsmanship

We can show good sports man ship by not booing the other teams by the importance of evaluations by being fair, being honest, and not cheating. Show how one another work. If another team wins we congratulate them on their win and say things like “good job”, “nice work”, and “glad that you won”. We can also show sports man ship by being kind to one another. And that’s how we can show good sportsmanship.



School of Science and Technology Robotics Team

