

Crawley, Henry

10/12/2019

Identifying Constraints

In this document I will be going over how and what we identified for our constraints. It is important to know what the “Engineering Design Process” is before reading everything that will be discussed during this document.

The Engineering Design Process is something well established and known to members of VEX Statix. It is something that all Foy H. Moody High School Citgo Innovation Academy students are required to know their freshman year of high school.

What is a constraint?

-a limitation or restriction.

There are 9 Categories we identified our constraints in:

1. Game Rules
2. Outreach
3. Marketing
4. Robot
5. Cadding
6. Programming
7. Awards
8. Engineering Notebook
9. Fundraising/Budget

Game Rules:

For the game rules we thought it was important that everybody goes over and reads the important parts of the game that we can find.

Some things to look out for are the basic rules for the game such as:

- **Robot Constraints**

This could be things such as Size, Weight, Motor Limit, etc.

- **Penalties**

Make sure to identify beforehand some things that could penalize you during the game. Knowing this, you can call out certain things that refs. Might not have noticed and could benefit you.

- **Point System**

Outreach:

Outreach is a big aspect when it comes to Robotics. Spreading the opportunities that STEM has to offer is what makes you look good to professionals. It opens opportunities to many young minds in your community and can get people to join your team!

Here are the things we identified within Outreach:

(Most of the things that will be discussed in this section can also be found on our website in the outreach page.)

-Planning

We need to make sure to always plan and talk to people in our community to see if we can schedule a time and place we can go to present what we do in robotics. Planning allows us to be as active around our community as possible. Visiting local libraries or watching the news allows you to become aware of STEM-related events throughout your community, allowing you to reach many people within your area.

-Being Involved

Following STEM-related pages on social media can help you stay up-to-date. Conferences are often great places to showcase the world of STEM to everyone involved. Get in touch with middle schools, high schools, organizations, etc. so you can reach as many people as possible about STEM. Many schools will be glad to have you encourage students to partake in this field of study for their future.

-Scouting

By making a scouting sheet we can gather information on other teams based off of many factors, such as:

- What type of systems they incorporated into their robot.
- What things they discussed in their engineering notebook.
- How well their robot works competition day.
- What processes they went through to develop their robot.

For scouting what you can do is make a google form of what things you want to identify.

-Presentation Skills

When presenting you want to make sure you look as professional as you can be. A way you can do this is by going over and improving your presentation skills.

1. Remember what you're going to say - Going over the slides multiple times beforehand allows you to completely understand what you're going to talk about, while also allowing you to be more prepared.
2. Make eye contact - When presenting, be sure to make eye contact with whoever you are speaking to.
3. Deep breaths and pauses - It's always good to take deep breaths. It's okay to pause for a minute to catch your breath as it'll help you calm down.
4. No slang or awkward speech - Refrain from using slang such as "uhh" or "umm" as it often takes the audience's attention off of you, as well as shows your nervousness.

If you want to learn more about how you can improve your presentation skills, I have cited a website you can look over. This goes over mainly everything you need to take into consideration when presenting.

<https://www.wordstream.com/blog/ws/2014/11/19/how-to-improve-presentation-skills>

Marketing

Having good marketing is something that will help you get yourself out there in your community! It can benefit you in many ways and helps you look very professional.

-Getting in Contact

We like to make sure we get in contact with at least 2 professional engineerings and talk to them about what our goal is and how we plan on accomplishing it.

When contacting professional Engineers, here are some things you can talk about:

- Who you are
- What your goal is
- What you are apart of
- How you plan on meeting your goal
- Some things you are having trouble with
- Methods to get to your goal
- Anything else you want to include

-Social Media

Make. Social. Media. Pages.

By making social media pages, you can let other people know what you are doing and how you are doing it. We recommend to have at least 2 social media pages

Somethings you can use are:

- Twitter
- Facebook
- Instagram
- Snapchat

It gives people a way to contact you and your team if they ever need to do.

-Website

Making a website is not something that you need, but something that does look very professional and can help you get many awards. As you can see we have made a website. We included a website as one of our constraints mainly to give back to other people who want to be more involved to STEM. We also did this to give professional Engineers something to look at when we get in contact with them.

You can use basically our entire website as a source and a reference to look back on if you want to try and challenge yourself to make your own website. ;)

Robot:

The robot is the main part of your entire VEX/FTC Career, you can as good as a website and Engineering notebook as you want, but if your robot isn't good, than did you really do any of what you did right?

When working on your Robot, it's going to be an entire Design Process separate from your main Design Process.

For the robot, here are some constraints we identified:

- **Parts limit.**

Knowing what parts you have is something crucial so you don't have to waste money on something that you already have. Knowing this also gives you a heads up on what you will need to buy if you don't already have it. Take inventory, and identify all the parts you have before you start to build.
- **Building Knowledge.**
 1. Knowing your limits on what you know how to build will come in handy when you try to make more complex structures and systems.
 2. Research and look online on what you need to learn how to build and develop before you start to do it.
 3. Some examples of this can be: Linear slides, Scissor Lifts, Sprockets and Chains, Pulleys and etc.

-Identifying your components needed.

Take some time and identify all the systems or components you need to incorporate into your robot.

For example, in this year's game we believe we will need some sort of lifting mechanism, and an intake to hold blocks to a certain limit.

Once you know what you need, you can then make decision matrices on each component depending on how you want to score each of them. (We will also be discussing how we make our decision matrices on another doc.)

-Physics & Mathematics

By incorporating both of these, it will not only make you look like you know what you're doing, it will make you know what you're doing!

Some constraints we have placed on ourselves incorporating this are:

- Finding out how much power is needed to move the weight of our robot
- How fast we can move under the circumstances of weight.
- How much power is needed to move our lift up and down with ease while also being able to lift our intake with ease.
- If our lift designs can be proven to follow these constraints listed

These are just some things we have identified.

Along with all of this, it will help you and save you the time of testing something beforehand by just doing the math on it, and seeing if it passes that before you start to test.

-Decision Matrix

A decision matrix is a list of values in rows and columns that allows an analyst to systematically identify, analyze, and rate the performance of relationships between sets of values and information.

We will be using this to analyze every part of our robot. Some things you could use this for could be:

- Finalizing intake ideas
- Finalizing Drive train ideas
- Finalizing Wheels

And etc.

I will add a google drive to show what decision matrices we have made.

Cadding

The ability to know how to CAD will be very handy and I think is a very crucial part and necessary when being in robotics.

What is CAD?

Computer-aided design is the use of computers to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing.

The software we mainly use to CAD our parts is Autodesk Inventor 2018.

The constraints we have listed when it comes to cadding are:

- Using CAD to identify and visual our robot parts and our robot before we start to build

Doing this will save you the time of redoing your robot each time it doesn't work.

- **Animating**

When presenting to judges and scouters, it is very useful to make an animation of what your robot will be able to do instead of JUST explaining verbally.

You can search up on youtube how to animate and identify software you can use to animate your robot.

Programming

Programming, an essential part when it comes to robotics. Knowing how, what, and when you need to program is something very crucial.

The constraints we added for programming are:

- **An AI**

Making an AI is something that we have as a team want to do not only to make us look cool, but also help us out during our Driver-Controlled period.

Some ways we want to do this is by

1. making an assistive stacking mechanism

Making an AI is not as easy as it sounds though, it is very complex.

- **Autonomous**

1. Our autonomous has to be able to stack at least 4 blocks before the time ends
2. Must be consistent
3. Must incorporate at least 2 sensors
4. Programming difficulty must be something we can handle
5. Must follow all guidelines and game rules

- **Driving Practice**

We included this because it is something that has not been valued for the past couple of years. Our drivers should be familiar with their robot and should know how to operate it like an expert.

We want to do this by incorporating Driving Practice.

Awards