Scouting

My first time scouting was at Cow Town Throw Down of my freshman year. At that time, our team's scouting system consisted of just a pen and paper, and it was hard to keep all the information organized. Over winter break, David Runneals emailed me 3929's scouting system, and I used that as an example to create the system Team Neutrino used in 2013.

There are many reasons to scout. The most obvious reason is to gain information about each team so you can make a good decision about who you want on your alliance for the elimination matches. Sometimes the drive team also likes to look at the data and have match breakdowns before each match so they know what the other teams will do.

I HIGHLY recommend going to watch Simbotics' scouting seminar right now. Karthik Kanagasabapathy does a really nice job of explaining everything you need to know about scouting. What I've done here, then, is described things with a lot more application for 3928. (If you're reading this and you're from another team, keep in mind that our system won't work for every team, but Mr. Kanagasabapathy talks about a lot of things that are generally applicable for everyone.)

Simbotics' Scouting Seminar: https://www.youtube.com/watch?v=l8syuYnXfJg

Prescouting

This is a way to get a little background information on teams before going to competitions. Historically, Team Neutrino has not done a whole lot of prescouting, since we've been able to get sufficient (and accurate) data at the competitions themselves. It is still a good idea, however, to watch some matches before your first competition using the live video streams available on the Blue Alliance to get a feel for how the game is played that year.

In 2015, we had a scouting practice session a couple weeks before our first competition. We used this to train members interested in being on the scouting sub-team in using the new cards. Here was the schedule for that day:

1. Start 10:00am
2. Watch Simbotics' scouting seminar
    1. how will scouting work for us?
3. go over cards
4. practice pit scouting with partners

5. Watch live video stream of week 2 playoff matches and practice scouting using cards

6. Watch prerecorded week 1 matches (some easy, medium, hard), and have scouting test.

7. Takeshi's scouting app

8. Done at 3:00ish

The data that we collected during the live video stream wasn't used for anything except to gauge how good everyone was at scouting.

If you actually want to do good prescouting, you can research the teams attending your next competition using Chief Delphi, the Blue Alliance, and individual teams' websites.

Creating the Scouting Card

To create the scouting card, I start by rewatching the game animation and brainstorming what aspects of a robot would be worth tracking for that year. In 2014, for example, I split up the quantitative data into autonomous and tele-operated modes, and then kept the fouls and total points scored from the 2013 card. I tried to keep the number of columns as small as possible to maximize the size of each box and minimize the complication of finding your spot on the card. In 2015, that resulted in the card being a little complicated to fill out, but because we had the scouting practice session that year, it worked out okay. It's a good idea to plan on using tally marks for stats you'll be writing down during the match, mainly things related to scoring points. Here's a list of things you want to make sure you include (from Simbotics' Seminar):

- Match score
- Points scored by the individual team
- Scoring attempts and failures (important for getting an accuracy percentage)
- Penalties
- Starting position
- General strategies and tendencies
- Drivers and human players

After I have an idea of what I want to look for, I make a copy of the previous years' quantitative data table (Excel spreadsheet) and make the changes. Then, I take a screenshot of the table. I then make a copy of the previous years' actual scouting card, right-click on the data table, and select "Change picture." I locate the screenshot I just took and put it in the new card.

That's pretty much it for the quantitative side. For the qualitative side, I update the pit scouting table for the new year. The top four rows (wheel type, #CIMs, weight, etc.) stay the same from year to year. After that, you put in rows for tasks you think that robots might be able to do. For 2015, that was abbreviated questions like (Can your robot pick up totes?, can your robot handle litter?, etc.). You want to be as specific with these questions as you can, yet also fit a lot into a small space. Sometimes that requires some creative thinking, like in 2015 with the table.

You also need to update the field diagram. Depending on the simplicity of the field, it might be easier to create your own diagram using Illustrator, snip the diagram off of the game manual, or find one online or on Chief Delphi.

There are also boxes for autonomous notes and tele-operated notes. Basically, you can write the teams' strategy for these two periods in the boxes. If they have more than one strategy they can do, indicate that with bullet points or something. When you're creating the card, you don't have to edit much here.

When the rough draft of the card is done, send it to the drive team and me for comments and suggestions. Alumni are always happy to help, too!

When the final version of the card is done, find the page for your next upcoming competition on the Blue Alliance. Print out a card per team, put the team number in the box on the front side of the cards (and the top right hand corner of the back side), and put the team name right on top of the box.

Pit Scouting

As soon as you enter the competition venue, send one person to get a paper copy of the pit map (or take a picture of one if that isn't available) and tell them to meet you up in the stands. Have the rest of the scout team who is not needed in the pit follow you to the bleachers to claim a good spot. Then, put the deck of cards in the same order as if you snaked around the pits.

Split the scouts into groups of two and make sure each group has a camera/phone camera and a cell phone. Exchange phone numbers with everyone so you can call them if they're taking too long. Hand a clipboard, a stack of cards, and a pencil to each group. Remind everyone how to fill out the cards, and TO TAKE PICTURES OF ROBOTS THEY SCOUT! (get a nice view of robot and make sure team number is in the picture. This can be accomplished by putting the corner of the robot card in the frame of your camera. This is important because you want to be accurate with the data and get good pictures! When everyone gets back, sort the cards numerically and put them back in the box.

To pit scout, you need to take each card to its team's pit and fill out the back side (the non-colored side). Ask the team questions about the items on the back, such

as what kind of drive train they have, what their autonomous strategy is, and where they shoot disks from. Note: some team members won't know all of the information, such as how tall their robot is in inches. That's okay. Just keep asking people until you get an answer.

Match Scouting

It is a good idea to have at least 6-8 team members scouting in the stands during qualification matches, however, you might be able to manage with less at off-season events.

Before the match starts, one scout will pass out the six cards to six scouts (one for each scout, including himself/herself). The scouts will then fill in anything they can prior to the match starting (i.e. alliance color, match number, playing pieces preloaded, etc.). They could also add descriptive details about the robot to make it easier to recognize the next time like "has purple spot" or "neon yellow."

During the match, each scout will pay full attention to the robot on their card (even if you think it won't do anything the whole match). Follow the directions for that year's card that you created. When it makes sense, use tally marks. If something sticks out about the robot, write it in the additional comments space on the back. Things that might go there (I'm using 2013 as an example): good D-bot, awesome driver control, 6 runs-wow!, climb and dunk, tippy...fell over!, blocks teammates, doesn't know rules, etc.

After the match is over, the scout with the box collects all of the cards and sorts them numerically back into the box. Then they get out the next set of cards, and you repeat the process for all of the qualification matches on Friday.

You do not need to scout any more of the qualification matches using the method described above if you don't want to on Saturday morning. Your time would be better spent looking for specific things, such as "Team so-and-so is a good cycler, but can they be used as a defensive bot?" and so on. *Note: every team with a good driver can be turned into a team with a good defensive bot.* You may also want to do more pit scouting to clean up some of your data, such as, "I know team so-and-so has a tank drive, but how many CIMs do they have?"

One last thing: in 2015, we tried adding another aspect we called "alliance scouting," where basically we had a scout for each alliance. They would write down what strategy the alliance used during that match, and how effective it seemed to be. In hindsight, this idea wasn't the greatest (especially because we used up almost 200 index cards!), and so I'm thinking of abandoning this for future years.

The Scouting Meeting

Invite the scouting team, the drive team, and "anyone who's watched matches in an analytical way" as Mr. Kanagasabapathy says. The goal for the data you collected is to use it to make the rough draft for your pick list. DO NOT SKIP THE SCOUTING MEETING! (We tried it at IRI in 2013. It doesn't work!)

Entering data can be done modeled off of other competitions' internet failure spreadsheets. It will basically look like a bunch of scouting cards all strung together end to end. You will use this spreadsheet and programs from former competitions to predict the final rankings.

Note defining characteristics of each robot. I like to color code using the sticky-tabs included in the box. Things to categorize by (using 2013 as an example; these aren't necessarily in a specific order):

1. Top all-around bot
2. Top offensive disk/scorer
3. Top defensive
4. 30-point climb
5. Full-court shooter (effective)
6. floor pick-up

Predict the outcome of alliance selection and highly-ranked teams' strategies for alliance selection. This is the fun part! Start by putting the predicted top 8 ranked teams in a row. Then predict you are team #1. Who would you pick to be on your alliance? This will depend on several factors. If team #1 picked, say, team #4, team #4 becomes a part of alliance #1 and all the other robots below 4 move up in rankings (e. g. #5 becomes #4, etc.). Next, go to team #2. Who are they going to pick? Continue in this manner until there are 8 alliances of two teams each. Now you are going to go in reverse order. Alliance #8 will pick another robot. Then Alliance #7 picks another robot, and so on until all the alliances have 3 robots total. The reason you want to go through this is to see where you think Team Neutrino will end up among the other teams, as well as gain a feel for the process of alliance selection (for any new members).

Come up with your rough draft of your ordered list of teams. Knowing what information you have based on the teams you marked earlier with the colored tabs, you can now come up with a list of 24 teams you may want to choose, plus 3-6 extras so you have a buffer. It is a good idea to split your list into categories

according the traits above (or make multiple lists), and mark any that you want to pay special attention to.

Alliance Selections

If you are chosen to go down to alliance selection, good luck!! You will do fine. Make sure you bring: safety glasses, the scouting box, a team list, your ordered list of 24 (or 32) teams, and a pencil. If you are seeded/ranked 1-8, you will go onto the field with the other highly ranked teams. If you are ranked 9 or more, you will stand in a line around the field. The announcer will explain how alliance selection works to the audience, and then seed #1 will choose their first team. If you are chosen, congratulations! A good thing to say is "Team 3928 Team Neutrino graciously accepts." Then everyone moves up and team #2 chooses. If you are alliance captain, refer to your list to choose. Make sure you are crossing teams off of your list as they become alliance captains or are selected. When alliance selection is over, if you are on an alliance, the alliance captain may want to hold a strategy meeting over lunch. Pat yourself on the back; the hard part is over!

Managing the scouting sub-team

If you are chosen to be the Scouting Manager (or "lead scout"), congratulations; this is a pretty important roll! Most of the things you'll need to do are described above, but I have some more tips and tricks.

How to pick your scouts

Hopefully, Team Neutrino will continue to be large enough to have a good-sized scouting team. As the Scouting Manager, you can choose who will be on the scouting team. You need to eliminate the drive team since they'll be really busy and have "tunnel vision" anyway, but don't count anyone else out yet. You can include mentors, but let students have priority.

You need 7-8 members on your scouting team during regional events. You'll need yourself (duh) plus five other primary scouts, and a couple backups if possible so people can take breaks. You also need someone to be in charge of the scouting box (this needs to not be you; see "Tip for Match Scouting" below) and someone to input data onto the octopus/scouting database if you want to use that.

Once I knew who the drive team, pit crew, and Chairman's presenters were, I always just emailed the entire team and asked people to apply. In hindsight, this wasn't the best way to do it… because then scouting is seen as something you do if you don't get to do anything else, and not something that you need some of your best team members, your best tacticians, working on. You might want to consider having a scouting practice day to assess how well interested members scout, a scouting test, or something like that so you can minimize bias. I'd like to keep the

number of match scouts as low as possible, so you have less people knowing a lot more, as opposed to more people having less firsthand analyses about each team.

Make it fun!

Scouting is treated as a punishment on some teams, believe it or not. That is no way to incentivize people to work hard and care about what they are doing. As Mr. Kanagasabapathy says in his seminar on scouting, inaccurate data is actually worse than having no data at all! So… how can you make scouting a fun experience for all involved? I started by getting mini neon-colored clipboards and fun pencils. In 2015, we thought about bringing stickers so everyone could personalize their own clipboards, but we ended up not doing that because that would've been too many clipboards to carry; maybe that idea will work out in the future? Mr. Kanagasabapathy suggests creating some sort of gambling game to incentivize scouts to really pay attention to which teams are good and what they're good at (Watch the full seminar for a great description of "SimBucks!"). Remember to keep the atmosphere fun, and don't force anyone to be on the scouting sub-team that doesn't want to be.

Tip for match scouting

When you're match scouting, you (lead scout) should be sitting right next to the scout with the box. I suggest actually having a parent holding the box and sorting cards, because this person won't have time to actually watch matches and get any first-hand data or make first-hand analyses. This person should hand the cards to you for the upcoming match, and you should have first pick for either a robot you haven't scouted before or a robot that isn't especially good or not-so-good. Your goal is to be able to summarize what each robot does at the end of Friday's matches (a daunting task, I know!), and the middle-ranked robots are the ones you want to know the most about. It's easy to know who the top five ranked robots are, and who the teams are that really don't do much, but the real challenge comes in when you're trying to order, say, teams that are ranked 10-30. This will pay back later during the second round of alliance selections.

That being said, you do want to know what the top ranked teams do and are good at, but there comes a point where you don't gain any information from watching them again (a great example of this would be WAVE Robotics in 2015).

After you've picked your card, share the stack with the next best scout (or best analyst, etc.) so he/she can also develop that list of summaries. Then, pass out the rest of the cards. See below for a suggested "seating chart."

3456B
21XCB

1=Scouting Co-Manager
2=Scouting Co-Manager
3436=rest of scouts
X=Scouting box
C=Scouting database, if applicable
B=Backup scouts

Research other teams' methods

Although Team Neutrino's method is pretty good (if I do say so myself), there are some even better methods out there! Asking other FRC teams how they scout might just give you some ideas on how to improve our methods.

Get involved with team strategy

One of my biggest regrets is not being more involved with creating and helping to implement our match strategies. Because you'll end up knowing the most about all the teams at any competition you attend, it's important that you can see how any other team could potentially fit into our strategies. In order to be able to do that, you need to be thoroughly involved with creating 3928's strategies from kickoff, or at least know them really well after they're all developed.

Never skip the scouting meeting!

Just don't do it. It can make you really uneasy the next day, especially if your ranking starts to go up!