

Introduction to FRC Strategy:



The 1511 Structure



*Part of a series based on 'Effective FIRST
Strategies for Design and Competition' compiled
by Karthik Kanagasabapathy -- FRC 1114.*



Two Starting Thoughts

- This presentation is just an introductory look at what the Strategy Subteam is responsible for
 - Much of what you see today will be explored in-depth in future weeks
 - If I speed through something you don't understand, feel free to stop me and ask any and all questions

- 70% of this presentation is plagiarized
 - “The father of FRC strategy” Karthik Kanagasabapathy, FRC 1114
 - Global Competition Manager, IFI Canada Inc.

Carol Engelbrecht

1511 Strategy

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Questions

- 5 Years of FIRST Experience
- Electrical Mentor: 2011 - 2015
- Strategy Mentor: 2014 - 2017
- Systems Engineer, Viewpoint Systems, Rochester, NY
 - Past: Electrical Engineer, Harris Corp
- Patronus: Mountain Lion



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Josh Goodman

- 12 Years of FIRST Experience
- PHS Class of 2009
 - Scouting Captain: 2006
 - Student Drive Team Coach: 2007-2009
 - Mentor Drive Team Coach: 2012
- Design Strategy Mentor: 2010- 2017
- Strategy and Drive Team Mentor:
 - 2011, 2012, 2016, 2017
- Controls Engineer, Branson Ultrasonics, Honeoye Falls, NY
- Game Announcer for Finger Lakes and Tech Valley Regionals



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The 1511 Strategy Team

- The Strategy Structure has remained relatively unchanged in 12 years.
 - Very real world and.....it works!
- The Strategy Team's responsibilities fluctuate throughout the season and are integral to the team as a whole:
 - Analyze the game to create design restraints and priorities
 - Understanding of what it takes to be successful in each game
 - This includes how the game changes throughout the season!
 - Stinger (2012), Ramp (2015)
 - Create a system of support so the robot will operate as close to 100% efficiency as possible and each match is executed to give the team the highest chance of winning an event.



The 1511 Strategy Team

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- The strategy team is an ever-improving system
 - **YOU** are a representative of this team now
 - This requires a lot of decision-making that the team relies on
 - Not every decision made will be the right one -- LEARN!
 - Making the right call is super rewarding!
- Every decision should be backed with documentation
 - “Guesswork” is the achilles heel of any strategy team
 - Both design & match strategies have many unknowns -- we need to prepare for these!
- You have only one goal on this subteam now:
 - **Win. Your. Events.**



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Build Season Strategy

Guiding the Robot Design Process





Robot Design Strategy

- Most everyone's primary goal after kickoff is to design a cool robot
 - This leads to very strong feelings for particular mechanisms before a strategy is picked
 - To actively set a plan for a successful robot, biases must be left at the door
- Very hard to go through the build process without a concrete aim
 - Don't let any other objective get in the way of your main objective: winning your events.
- It is our job to thoroughly examine and analyze the FRC Game Manual to calculate the game strategy we need to execute
 - Everything hinges on this: from initial robot concept to tiny design constraints.

Analyzing The Game

- Read the manual! At least twice on Saturday!
 - This includes watching the video field tours
- Start with the Tournament Section -- understand the ranking system well
 - e.g. win-loss-tie, qual score (2015), coopertition points
- Examine every possible way to score points, no matter how obscure
 - “Litter Treaty” (2015), Laps (2008)
- Examine every possible way to prevent your opponents from scoring
 - Recycle Cans (2015), Safe Zones (2012)
- Examine every possible way to lose points
 - Penalties, Stacks tipping over (2015)
- Only when this is complete and well documented can we start to consider potential strategies!



Cost-Benefit Analysis

- For each task, you must compare the difficulty of an accomplishment to the reward for doing so.
 - Scaling vs Shooting (2016)
 - This is where the strategic value vs. coolness factor decision often pops up
 - 2015 Landfill loading vs human loading
- The best tasks to perform are those which are relatively easy, yet provide big points
- Denying your opponents 10 points is just as good as scoring 10 points (in a win/loss scenario)
 - 2003 knocking down stacks



Strategic Prioritization

- Now you can create two separate lists that are ordered and weighted by your strategic analysis:
 - Desired robot qualities
 - Robot pushing power, arm speed, center of gravity
 - Desired robot functionality
 - The things you want your robot to do
 - Shoot balls, climb bars, drive over obstacles
- Now when you merge these lists, your strategic priority becomes clear and you are able to decide on a drive system and robot functionality.
- Ideally this is all done the first weekend!



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Competition Season Strategy

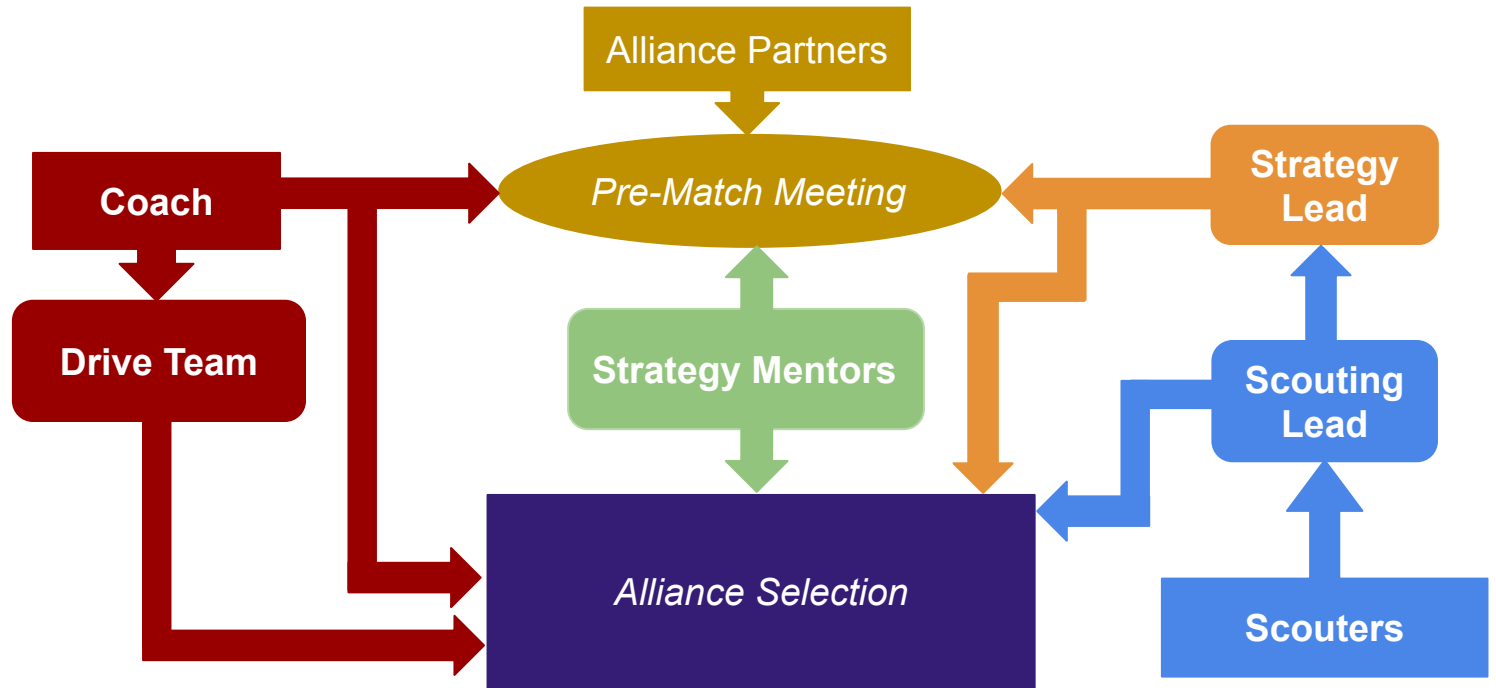
Driving Robots, Choosing Partners, Winning Events



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Competition Strategy Flowchart

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Competition Strategy Roles

- **Scouters:** The backbone of the strategy team and the main source of information. Acquires team and robot data from pit questionnaires and match data. Watches and collects everything. Kind of like the NSA.
- **Scouting Lead:** In charge of organizing both the scouts and the scouting data. The data is compiled into one database and controlled by the Scouting Lead and Strategy Lead.
- **Strategy Lead:** The main analyst and overseer of the strategic process at events. Works with the Scouting Lead to research compiled information and conveys important facts about the next match to the coach and pre-match team.
- **Coach:** The Coach works with the Strategy Lead before a match starts to discuss the scouting data in order to form a basic match strategy. During the match, the Coach will be the one to call any audibles to this strategy.



Scouting

- Has a bad reputation for some reason despite being the most important part of the strategic process.
 - Without the data, there is no strategy -- guesswork!
 - Makes matches your team isn't in not boring anymore!
- This is *the* data the team will use for many different situations:
 - Predict your opponent's strategy before you play against them
 - Confirm or reject your alliance partners' claims on what they can *actually* accomplish during a match.
 - Essential for alliance selections
 - Especially for the right second-round pick

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Pit Scouting

- Gives you a chance to ask **objective** questions to every team in the competition directly.
 - Don't ask the same questions your match scouters will give you
 - e.g. *How many years of experience do your drivers have, do you have a student or mentor coach, what kind of drivetrain do you have, can you pick up off the ground, can you go under the low bar, etc (2016)*
- Take pictures of **every** robot
 - Get at least three views of the robot with the team number in it
- This should be started and finished on Thursday
- If a specific robot's mechanism interests you -- go off script!
Pits are a great opportunity to learn new techniques and ideas!



Match Scouting

- The objective is to compile all the **quantifiable data** from a match so that, at any given time, we know every single action that every team has or has not done in the competition so far.
 - This needs to be done for **every** match -- both practice and qualifications!
- This means that each match requires one scouter to observe one robot
 - Six scouters every match plus the scouting lead!
- Examples of what to look for (2016):
 - Scoring attempts and failures
 - Penalties
 - Autonomous modes and starting positions
 - How many goals scored and where
 - Which defenses were crossed
 - Did they climb/how fast?



Alliance Selection Pick List

- Based on history, we can infer alliances are here to stay
 - 2005-2016: 3 team alliances
 - Top 8 teams draft their tournament alliance after Qualification Matches
- Need to be prepared to choose the best alliance if your team is in a position
- Impossible to accomplish without good scouting data
- Preliminary pick list is created Friday night by a group composed of key roles of the strategy subteam
 - The list is refined and tweaked over the course of the competition on Saturday by 1 or 2 strategy/scouting leaders.



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- Good strategy and scouting can allow a mediocre robot to win the majority of its matches
 - 1511 (2007)
- Good strategy and a good robot are *almost* unbeatable together
 - 1511 (2008, 2010)

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Pre-Competition

- First and foremost: analyze and evaluate your robot's abilities
 - BE HONEST. Don't over or under-estimate
 - How good are your drivers? How much practice have they had?
- Create a playbook
 - A "lookup table" of possible match strategies that can be run
 - Factor in different robot combinations both with and against you - HUGE number of permutations
- Pre-scout your competitors
 - Has anyone put out photos or videos of their robot?
 - What do they say they are capable of doing
 - Previous competition match videos
 - Take release videos with a grain of salt



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Pre-Match

- Every match requires a plan and strategy to be formulated with your alliance partners
 - You MUST leave this meeting with everyone on the same page - otherwise CHAOS
- This plan should outline what each robot will do and what each team is responsible for in the entire match
- Each plan should include contingencies
- Winning the match is the first priority, everything else comes second



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During the Match

- You must be able to make on the fly decisions
- Never lose sight of the main goal - winning the match
- If you fall behind, don't panic, calmly re-evaluate and come up with a new plan
- Leave it all on the field
 - Don't be afraid of damaging the robot
- After the match
 - Discuss what went right and wrong
 - Add new/discard old strategies based on what is working and what isn't
 - Adapt to your competition!



The Playoff Rounds

- You now have two (or three) static partners for the remainder of the tournament
 - This makes creating strategies easier!
 - ...It also makes creating defensive strategies against you easier
- New strategies need to continuously be created for both the current round you're playing in as well as potential matchups in future rounds
 - This is often times “all hands on deck” for the strategy team to create a system of support for our alliance
- In higher level play, there sometimes becomes a need to alter a team's robot design to better suit the synergy of the alliance. This is grey area, especially if a team is reluctant to do so.
 - Informally known as “cheesecaking”
 - Nets (2016), Grabbers (2015)



Final Thoughts

- Become a master of the rulebook
- Always have your strategy focused on winning events
- Always have your robot design focused on your strategy
- **Good, consistent, scouting** is the easiest way to make your team more successful
- Be curious. Talk to other teams.
 - Learn from their designs and strategies
- If it ever stops being fun, take a break and come back to it
 - Don't burn yourself out
 - Approach all strategy discussions with Gracious Professionalism both within the team and with other teams



Questions

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