6024

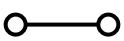
MARCH 2018
ISSUE No.: 01 FREE

GAME & ALLIANCE

MARCH, 2018
FREE FOR CIRCULATION IN FRC

Strategy is thinking about a choice and choosing to stick with your thinking. Hope is not a Strategy and Strategy without Process is little more than wish list.

“A vision without a strategy remains an illusion.”



(LEE BOLMAN)

CONTENTS

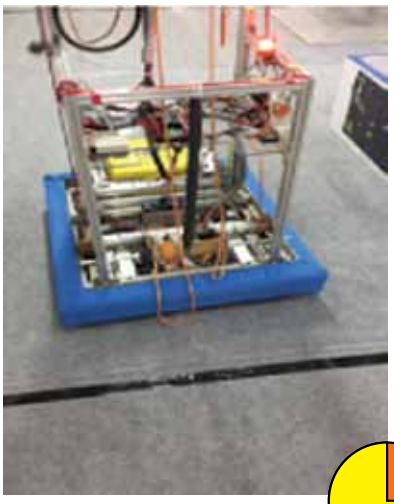
Introduction

A team without strategy is like a ship without a sail.

What is a ship without a sail? The same way, a team is nothing without strategy. Sails help a ship move forward, overcome obstacles, and without a sail, the ship would sink, or would be a sitting target for pirates. The same way, a team without strategy is potentially useless, and will not be able to sail forward in the competition. Strategy plays an important role in this years challenge. The introduction of power ups has taken strategy to another level. It is essential for all teams to maintain a well thought out strategy, to progress in this competition.

Division of the Game

THE GAME IS DIVIDED INTO 3 SECTIONS



AUTONOMOUS
15 SECONDS

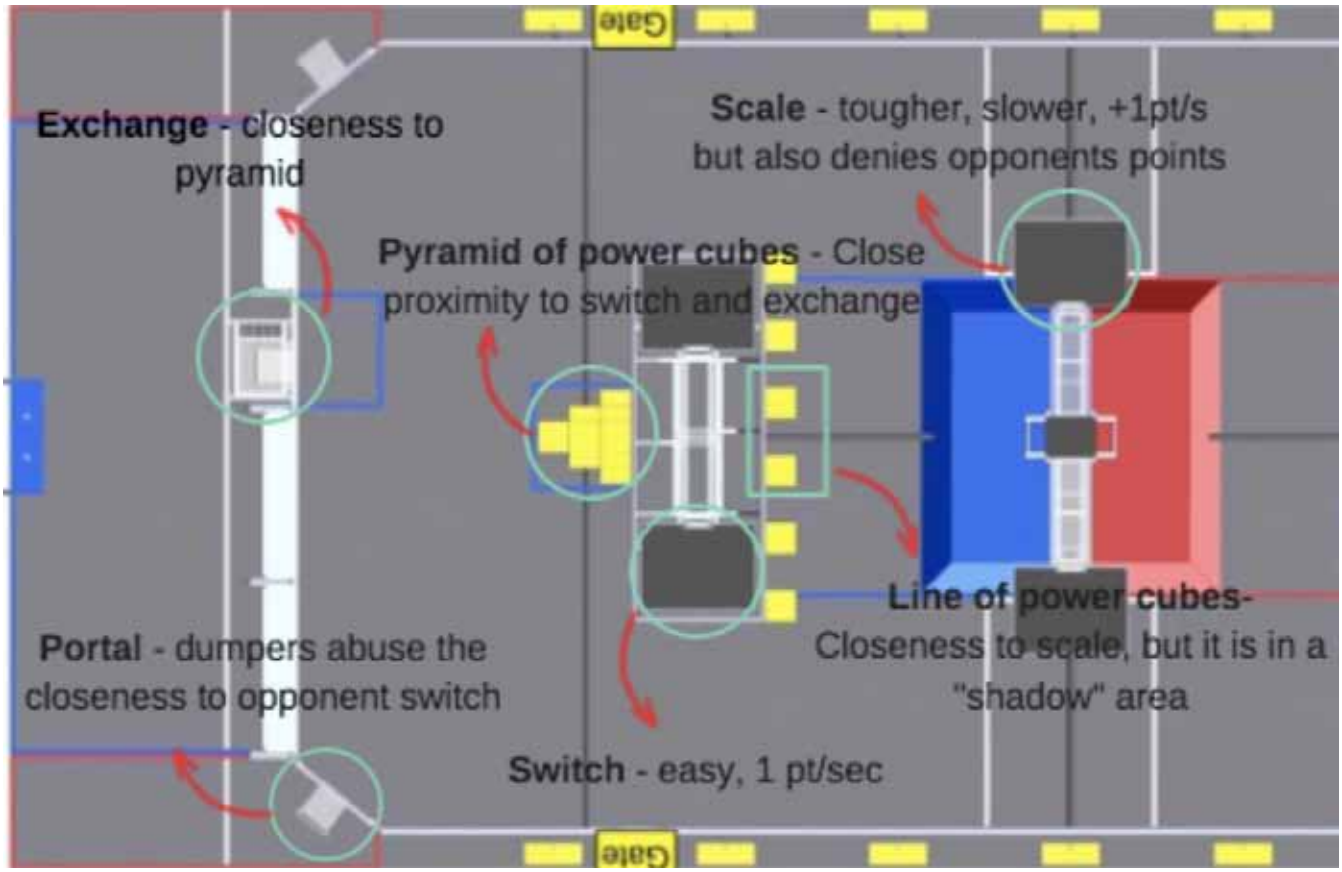
TELE-OP
1 MINUTE 45 SECONDS

END GAME
30 SECONDS

Field Mapping

What is mapping

Just like a ships captain needs to know his bearings, the drive team will be required to know the strategic advantages of the different locations of the objects.



Division of Possible Allied Robots According to Ability

BEGINNER

AMATEUR

EXPERT

To make our strategy compatible with every possible robot team R-Factor can be allied with, we divided our possible allies into 3 categories: Beginner, Amateurs and Experts.

This allows us to evaluate every possible condition, and use the same set of rules to adhere to the alliance. This also allows us to concentrate on different conditions individually.

These divisions are made by evaluating the ability of the robot to complete the different tasks: Placing in the Exchange, Switch and Scale.

This was how we divided the robots into their possible categories:

Task	Beginners	Amateurs	Experts
Tele-OP	Can place a block into the exchange zone	Can place a block on the switch	Can place a block on the scale
Autonomous	Can also cross the auto line in autonomous mode	Can place a block on the switch in autonomous mode	Can place a block on the scale in autonomous mode
End-Game	Cannot Climb	Cannot Climb	Can Climb

Autonomous Strategy

To get the ship out to sea, sails play a vital role. The same way, strategy plays a vital role in autonomous as it is pre-decided.

Objectives

There are 3 tasks to tackle during the autonomous period. They are:

Auto Line	You gain 5 points for crossing the line
Scale	If you own the scale you earn 2 + 2/sec
Switch	If you own the switch you earn 2 + 2/sec

Autonomous Challenge

If all 3 robots of an alliance have crossed the auto line, and the alliance has ownership of the switch, then the alliance gains 1RP.

Gaining the RP is our goal, as 1 RP is worth 1/4th the match. Thus, we make sure that we are going to earn this RP, and base our autonomous strategy on this primary objective.

Strategy

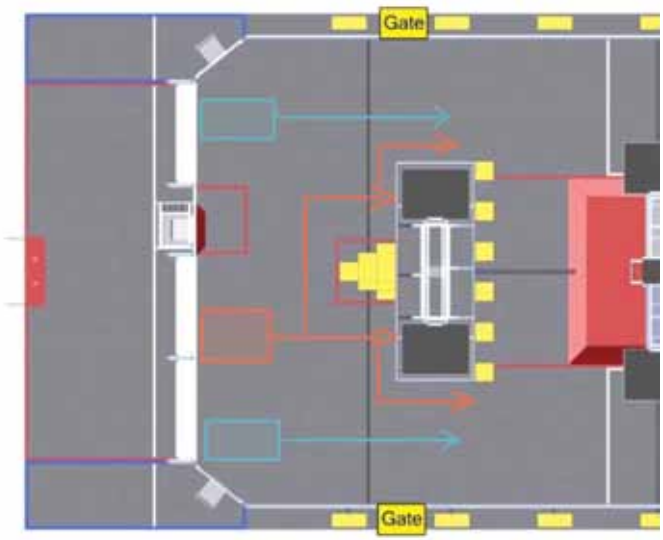
Every ship uses an arrangement of sails for different voyages, to achieve quick or steady speeds, so that the ship can complete its journey. The same way strategy helps a team figure out the best method of earning points.

R-Factor is shown by Orange,
Beginners by Blue,
Amateurs by Green,
Experts by Grey,

Beginners - Beginners

Assuming both alliance teams are Beginners;

- Team R Factor will proceed to assume ownership of the switch
- The Beginners will cross the auto line



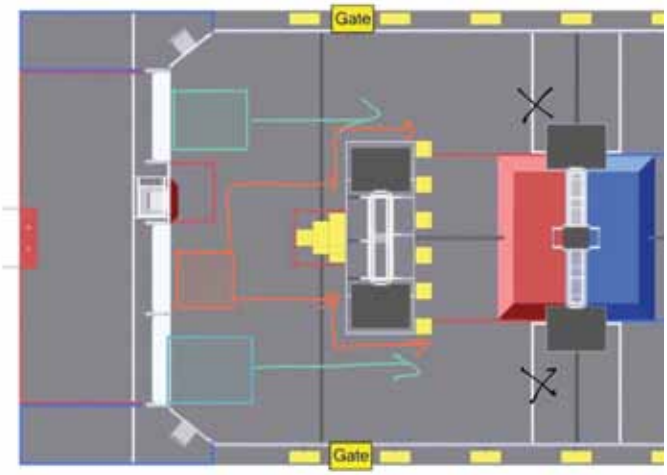
Autonomous Strategy

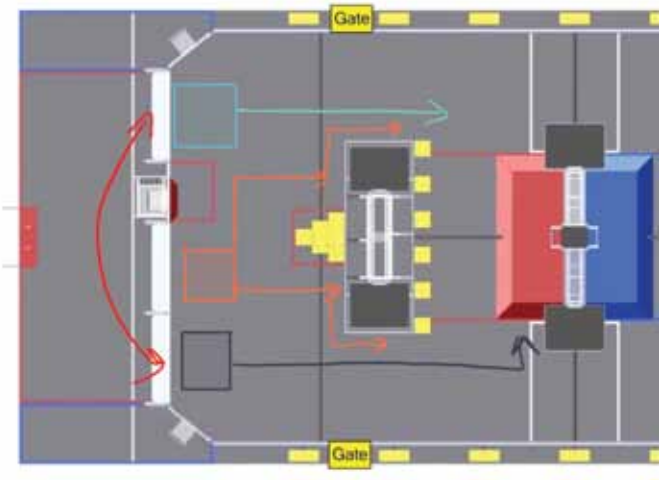
Beginners - Amateurs

- R Factor will then proceed to assume ownership of the switch;
- The other two teams will cross the auto line;

Thus, the ranking point will be obtained as the criterias (autonomous) are satisfied;

This should gain us the 1 RP.





Beginners - Experts

- R Factor will take possession of the switch.
- The expert will take possession of the scale.
- The Beginner will cross the auto line.

We will also gain an RP.

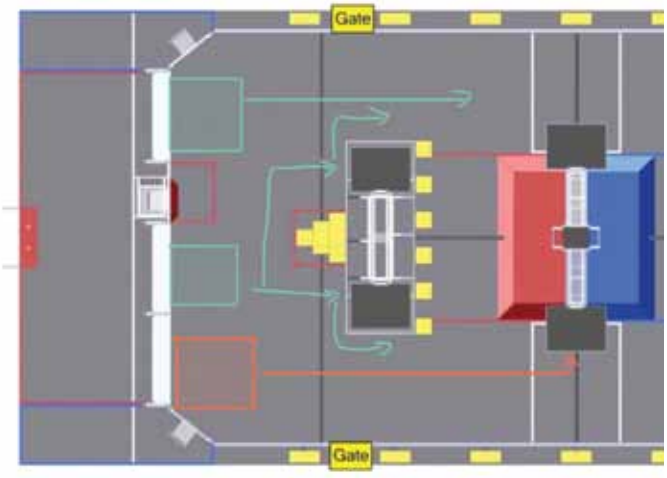
This strategy will gain the alliance a ranking point as well as a distinct advantage in the Tele OP period, because the scale would probably be in our possession along with the switch.

Amateurs - Amateurs

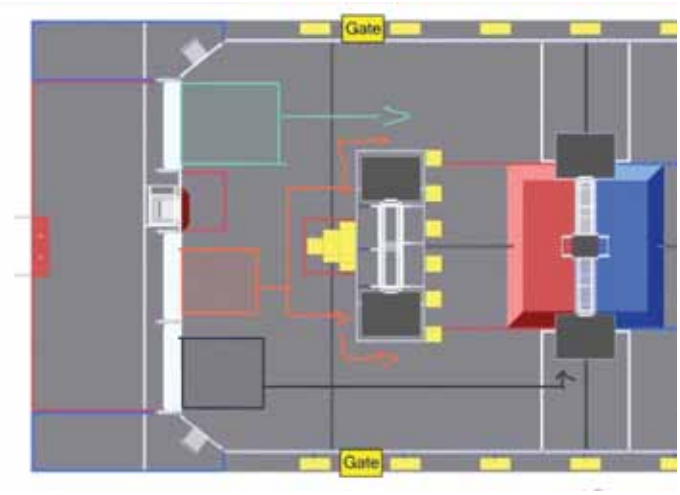
- Team R factor will proceed to assume ownership of the scale.
- One ameteur will attack the switch.
- The other one will cross the line.

Thus, the ranking point will be obtained.

This strategy will gain the alliance a ranking point as well as a distinct advantage in the TeleOP period, because the scale would probably be in our possession along with the switch.



Autonomous Strategy



Amateurs - **Experts**

- R Factor will assume ownership of the switch.
- The Expert team will assume ownership of the scale.
- The amateur team will cross the auto-line.

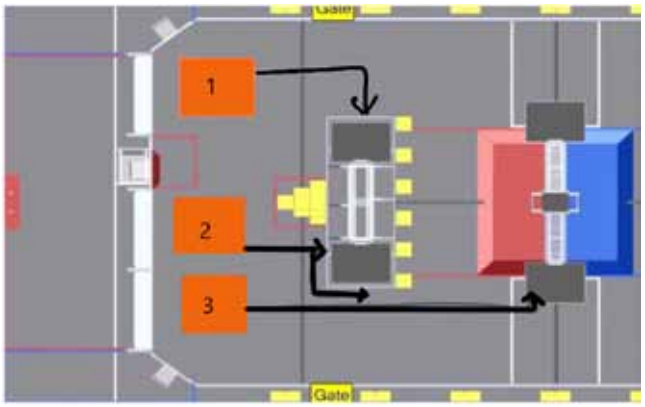
Thus, the ranking point will be obtained.

This strategy will gain the alliance a ranking point as well as a distinct advantage in the TeleOP period, because the scale would probably be in our possession along with the switch.

Experts - **Experts**

- R-Factor will cross the auto-line.
- One expert will attack the scale.
- The other expert will attack the switch.

This strategy will gain the alliance a ranking point as well as a distinct advantage in the Tele OP period, because the scale would probably be in our possession along with the switch.



Tele-OP Strategy

Tele-OP Strategy

When the ship sails out to sea, sails are essential for the ship, not only to complete its voyage, but to survive at sea. The same way strategy keeps a team active and useful to an alliance in a game, and helps the team boost efficiency.

Keeping in mind the sources of points, we learnt that we should try to keep both the switch and scale in our possession, to maximize points. We should also prioritize the switch over the scale, as the switch denies the opportunity to the opponents of gaining points. Thus, in order of priority, the tasks are:

- **Scale:** It unbalances the game by 2pts/s
- **Switch:** It gives you 1pt/s
- **Vault:** It gives you 5 points per block
- **Opponents Switch:** Denies the opponent 1pt/s

Thus, using the same conditions as before, this is how the robots will be allocated for the start of the match: (30 seconds)

Beginners - Amateurs

- The amateurs will try to get hold of the switch.
- The Beginners go to get the 6 blocks into the exchange.
- This leaves team R-Factor the duty to attack and gain dominance of the scale.

Beginners - Experts

- The Expert and R-Factor will both attack the scale, it being the first priority.
- The Beginner team will in that time try to put blocks into the exchange, in order to get the power-ups activated.
- The switch will be in our favour already due to the autonomous place, and as it is far away from the opponents robots, they will take some time to reach there, in case they want to deactivate it.

Amateurs - Amateurs

- R-Factor will target the scale.
- After placing one block in the vault for the boost, the amateurs will then both try to get a 3-4 block advantage on the switch, before targeting the vault again to gain more power-ups.

Tele-OP Strategy

Amateurs - **Experts**

- The expert and R-Factor will both target the scale as it is the first priority.
- During this time, the Amateur will first get 1 block into the vault for the boost, and then he will proceed to gain dominance of the switch.

Experts - **Experts**

- One expert and R-Factor will both target the scale as it is the first priority.
- The other team will first get 1 block into the vault for the boost, and then he will proceed to gain dominance of the switch.
- All 3 robots don't target the scale, although it is first priority, as there will be a huge crowd in that local area, leading to diminishing returns and lesser points per robot.

Dumper Robot

During our primary scouting, we saw that many Beginners had a "dumper robot", one which abused the closeness of the portal to the opponents switch. In case we ever have to team up with these robots, our primary goal will remain to take over the scale, but we will also not bother about our switch, as when we deny all the points from the opponents, (switch is dumped on and scale is conquered by us), only owning the scale will gain us the points needed for the victory.

Rest of the match

This strategy only gives us a hard and fast strategy for the first few seconds of the tele-op period, as after this, the robot positions will be too random to make a pre-made strategy on. Thus, we make a dynamic strategy, which can be implemented on the spot. This will the objectives with their priority.

1) Try to gain dominance of the scale
   - This gives you +1 point per second and reduces the points the opponents can gain by 1 point per second, as they cannot gain points from the scale when you own it.
2) Try to gain dominance of the switch
   - This only gives you one point per second.
3) Try to get blocks into the exchange to gain the levitate power-up
   - The blocks individually give you 5 points, but it takes more than 5 seconds to put the block inside, so it gives you less points than the switch also.

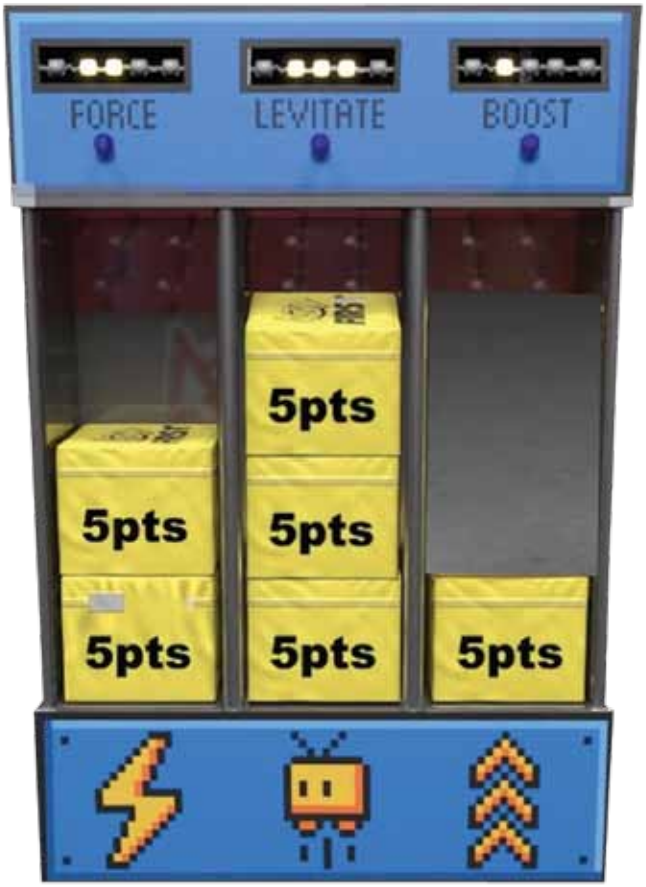
Tele-OP Strategy

Vault Strategy

The vault contains a bunch of power ups that can give you a huge advantage in the match, if played at the correct time. This is similar to excess defence ammunition, money, on a ship that can give the sailors a great advantage if put to use properly.

There are 3 power ups accessible through the vault: Force, Boost and Levitate.

Looking at the timings R-Factor and Team 6813 Pangea, we saw that on average, the teams could place a total of 3-4 blocks into the vault, while also focusing on both the switch and scale. This leads to a total of 4-6 blocks per alliance. (3 teams)



Boost

We will allocate the first block into the boost, and this block will be deposited at the start

- The boost will be used early, as the way to **maximize the boost points is to have control over boosted object during the period**.
- The best guarantee we have of this is that we will have the ownership of our switch at the start of the match for the first few seconds, if the tele-op goes perfectly.
- Thus this gives us the highest reward with the lowest risk.

Tele-OP Strategy

Force

The next 1-2 cubes will go into force.

Level 1: The main objective of using the level 1 power-up is to counter dumper robots, so even though we don't own the switch, we can still score points from there.

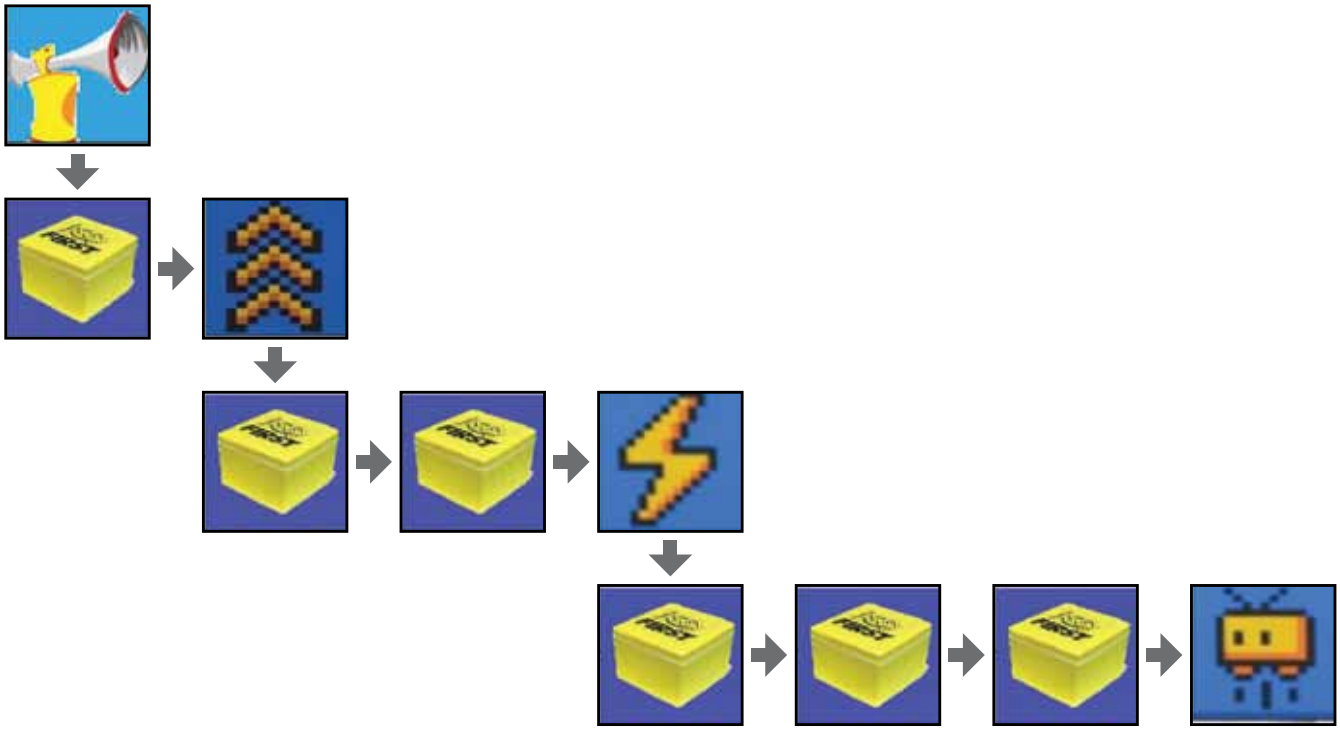
Level 2: The scale is the most important source of points in the game. Thus, during closer game where there is a lot of competition for the scale dominance, we will use the level 2 power-up instead, to win the scale battle for that time period. This will also ensure that the robot has enough time to reset, and rescan the field to find its next target.

Level 3: This is not considered, as it is a waste of a block, as at one time we will have either the switch or the scale in our favour, and if not we will already be in a huge loss.

Levitate

- This is a high risk-high reward power-up, as it gives you the most points per block placed (15 per block), but need 3 blocks.
- This makes it the last powerup we target, but also the most important, as it gives any robot a free lift up to face the boss,
- Thus, the last few blocks are placed here, so that you can make sure to gain those extra end game points, and have a chance at getting the FACE THE BOSS RP, which is virtually impossible without this ability.

Timeline of usage



End Game Strategy

End Game Strategy

For a ship, the fag end of the voyage is the most important part of it, as anything could go drastically wrong. Strategy plays an important role in this phase, as efficiency and a good plan can help you gain a huge advantage.

Levitate

Levitate, as we have discussed earlier, is the most risky power-up but has the most benefit for a team. It gives the team a sum of 45 points, and also reduces the amount of robots needed to climb the rung by 1, in order to achieve the RP for FACING THE BOSS.

This powerup in our eyes is a must for 2 reasons:

- Due to the size of the rung (13") it feels like it will be impossible for 3 robots to climb up and FACE THE BOSS for the RP, so one robot should get the lift up. It is also unlikely that there will be 2 robots in our team capable of climbing.
- The levitate power up also gives us the most amount of points per block ratio (15 points per block) and we will, for sure, deposit 3 blocks into the vault. Thus we will get the highest amount of points from this "investment" of blocks into the vault.

Strategy

The strategy for attacking this section of the game is simple: Secure the most points possible. Thus, we always attempt the levitate power-up, as it guarantees us 45 points.

Attempting the Climb:

- We will approach the scale at the start of the end game, leaving us with a 20 second window to achieve the climb.
- This is divided into 7 seconds for aligning and hooking up, and the remaining 12 seconds for winching our robot up.
- One other robot will have to finish in the SCALING AREA, for the 5 points and the other robot will finish anywhere on the field as he is being levitated to the top.

Alliance

Using the same analogy between the sails of a ship and strategy, having a powerful alliance is like sailing alongside a fleet of powerful ships. During the time of an attack, ships are strongest when they have good coordination with the other ships in their alliance to overcome it. If you do not have a good relationship with other teams in your alliance, or you do not have an efficient plan of action that can cope with all possible scenarios of well equipped teams or Beginner teams in your alliance, you will lose the match.

If a ship is in need of equipment or expertise, more efficient ships help it to whatever extent they can. This is similar to the Gracious Professionalism aspect of FRC, that states that teams should help each other, despite the fact that they are competing.

Communication with Other Teams

Communication with other teams

Why to communicate:

- Communication with other teams increases us being aware of the robots and the mechanisms.
- Communication is important as we have a mere idea of a team's strategy and progress.
- Occasionally we need to ask advice from experienced teams. Other times we help teams by giving a few ideas and helping them with programming. It is a great opportunity to contact with teams from across the globe.
- We also mainly communicate to keep Gracious Professionalism with other teams.

Scouting Strategy

We have divided our scouting process into 2 main divisions. They are:

A. Primary Data Collection

B. Secondary Data Collection - Divided into 2 more parts
   - Observation
   - Visual Alliance Observation

C. Primary Data Collection - Communication and Rating

Communication

- This data is collected pre-season by contacting teams which will participate in Southern Pacific Regionals and Southern Cross Regionals.
- We gather information by communicating with teams via social media like Instagram, Twitter, Facebook, G-Mail and via their websites.
- We have been successful in having Skype calls too with teams.
- Evidently, FRC is "just not about robot" but also strategy and what more.
- We have contacted Team 3008, 6083, 7050 and many more.

We contacted many teams, mainly 3008 and 7050:

We helped Team 3008 and we too learnt that they made CAD Models before making their main robot. They also made different cad models and then they compared it. We realised that they made their own parts. It was very cool. While contacting with Team 7050 we Google Translated it into Arabic and communicated. It was very appalling the fact although they were a Beginner Team they had done amazing. Their robot was working perfect and evidently they had come a long way.

Rating System

Why do we need to rate teams?

We need to rate the teams in our regional to get to know their strengths and weaknesses.

This will help us differentiate the stronger teams from the weaker teams. This will be helpful to us as we will have ideas about other teams before the competition, and thus will help us to locate our possible competitors and friends, and will give the "competition day scouting team" an easier day at work.

Our rating system is based on trying to find the most balanced team. So our rating system is made to give the highest rating to the team which is the best in all the categories of the robot game.

One of the things we had to take into consideration was that the data on the blue Alliance website included the total score of the alliance and not individual teams..

This is how the math works:

- We divided the game Into its four sections: Autonomous, Rotor, Touchpad and Pressure.
- We then found the regional averages for all the sections, to keep a baseline for comparing.
- We dance scaled down all the points by dividing the team score by the average regional score. If the score was higher than 1, then the teams were better than average, and if the score was lower than 1, then the team was worse than average.
- Then we assigned **exponential** weights to each and every category. Rotor was 1.1, Touchpad was 1.2, Autonomous was 1.3 and Pressure was 1.4. These rates were determined by trial and error, and also by the difficulties of the challenge itself.
- The total score is just the sum of these four components together.

The use of exponential weights is justified by:

The weight is used as the exponent, so if someone had a scaled score of 1.2 at the rotor, his rotor weighted score is:

1.2^1.1 = 1.22

Exponential weights on a number less than 1 will decrease the number:

Eg. 0.5^2 = 0.25

This means that if a team is under average, then it will have a reduced score in that section. Because the weights are exponential, there is a higher penalty on teams much below the average. This benefits the team who is above/at average.

Exponential weights on a number greater than 1 will increase the number:

Eg. 2^2 = 4

This means that if a team is above average, then it will have gain a great boost to its score.

Because the weights are exponential, there is a higher gift to teams much above the average. This benefits the team who is very good at tasks.

Communication with Other Teams

This is the table showing the first 20 teams and their weighted scores:

Ranking	Team	Auto	Rotor	Touchpad	Pressure	Total
1	4613	1.56	1.02	1.5	14.56	18.63
2	3132	1.44	1.05	1.4	3.49	7.38
3	5985	2.08	1.13	1.6	0.98	5.78
4	6061	1.48	1	1.7	1.37	5.54
5	6579	1.61	1.24	1.6	0.39	4.83
6	1772	1.17	1.27	1.7	0.61	4.75
7	4253	1.35	1.18	1.5	0.31	4.35
8	4817	1.44	1.14	1.02	0.74	4.34
9	5331	1.19	1.16	1.3	0.62	4.28
10	4537	0.67	1.11	1.91	0.59	4.28
11	6035	0.75	0.76	0.48	2.25	4.25
12	4739	1.1	0.98	0.92	1.1	4.1
13	5593	0.81	0.98	1.4	0.78	3.97
14	4774	1.2	1.02	0.74	0.85	3.81
15	5983	1	0.96	0.92	0.61	3.49
16	6522	1.11	0.98	0.83	0.35	3.27
17	6204	0.83	0.91	0.92	0.59	3.25
18	6062	0.79	0.94	0.92	0.59	3.24
19	6523	1	0.92	0.48	0.64	3.05
20	5893	0.72	0.98	0.65	0.64	2.99

Communication with Other Teams

Secondary Data Collection

1) **Communicative Observation -** This observation will be done during the practise days in Australia by talking with them in the pits during scouting rounds.

Step 1	• On the scouting day, the scouters split up into teams of 2
Step 2	• The scouters go around to those teams, and ask them question about their bot
Step 3	• The scouters then input this data into a google form, which collects all the data and creates a database
Step 4	• Then the team can collectively analyse, sort and conduct queries on this data

2) **Visual Alliance Observation -** This observation will be done during the practise days and the main days when the team's robot is running on the maze and notes.

Step 1	• The alliance team is split into 2 groups of 6 and given 24 matches to scout
Step 2	• Each team member observes 1 teams actions in the match
Step 3	• These are uploaded into an app, which collects all this data
Step 4	• The team can sort this by team, to see a teams performance and also by match to see the results by match

Roles and Responsibilities

Drive Team

Our drive team consists of four members tasked with controlling the robot and coordinating with alliance teams during the matches. Although a single controller could have been sufficient to operate the robot, we divided the roles according to our strengths in order to make controlling the robot smoother. We have three roles on our drive team:

- Primary Robot Controller - Rahesh Saraf
  The primary controller is tasked with driving the robot around. Driving is the main operation of the robot and requires speed and agility, two qualities that Rahesh possesses. Having been our driver for the last two competitions, he is comfortable with operating the controls and gets our robot where it has to be as quickly as possible.
- Secondary Robot Controller - Riyaan Bakhda
  The secondary robot controller is tasked with operating all the mechanisms on the robot, such as the collecting arms and the cube delivery. The secondary controller has to work in perfect tandem with the primary controller to reduce costly delays and inefficiencies in robot operation. The secondary robot controller also has to set up and debug problems with the robot or control system and take find quick solutions in the spur of the moment.
- Robot Tactician - Adhyyan Sekhsaria
  The aim of the robot tactician is to coordinate with other alliances so that not only our team, but the whole alliance, knows what the others are doing and there is no miscommunication between them. Adhyyan relays information to and from alliances and along with the other alliance tacticians takes calls on what the three robots should collectively do at a certain point during the match. Additionally, he will decide what the robot does at every point in time and how to power cubes are being used to get power-ups and maximise the chance of winning.
- Robot Technician - Uchit Shriyan and Hitansh Doshi
  The robot technician will gauge the field conditions and appropriately suggest the placement of the robot, working with the tactician. He will assist the tactician in effective communication with our alliance partners so that we go into every game with a sound and complete strategy. His expertise in electronics will allow us to make sure no last-minute adjustments go south. If the robot malfunctions, the robot technician can collaborate with the FTAs to get the robot back in working conditions before the game begins.

Alliance Strategy Team

- Alliance Strategist - Krish Mehta
  Alliance Strategist leaves no stone unturned when it comes to the team's progression in the rounds. Making strategies comfortable to all teams in the alliance is the key and the Alliance Strategist has to look at each situation from all the 3 team's contexts. Our alliance strategist has already communicated with teams from all across the globe and has already spoken to the teams and discussed mutual problems, and is hence aware of the challenges he might face at the competition. Furthermore, he has designed the scouting system to be implemented at the competition.
- Alliance Scout - Vatsin Suchak
  The alliance scout expertly judges the strength and weaknesses of each team so as to be aware of both the opposition and partners. He advises the drive team as to which strategy to adopt after analysing the data accumulated over the practice and league matches. Along with the alliance strategist, the scout's role is to communicate with other teams at the competition so that, come playoff time, we are prepared to select the teams whose robots best complement ours if the opportunity presents itself.

Game & Alliance Team Members

Aarav Parekh

Armaan sheth

Krish Mehta

Mahir Shah

Nandish

Nandish Khandhan

Shiv Kampani

Tanay Nistala

Vansh Diora

Vyom Shah

NOTES

“A vision without a strategy remains an illusion.”

(LEE BOLMAN)