Assumptions

We are analyzing this game based on the assumptions that apply at early week events similar to the play level of Minnesota (pretty low… actually really low). As the weeks progress, and in other regions, the level of play will likely be higher so adjust your design decisions accordingly.

Terminology

Scaler – Scores onto Scale.
Switcher – Scores on Switch.
Climber - Climbs the Scale at the end of the match
Vaulter - Fills the vault
Home Switch- Near Switch, your alliance
Away Switch - Far Switch, opponent Switch
Landfill - the 10 cubes located next to the Switch.

Cycle Time Assumptions

When coming to an understanding how this game will play, we made some assumptions on cycle times. Here is what we came up with.

A	B	C	D	E	F	G	H
Action	Time	extra time if failed	Percentage success	Average time	Time Low	Time High	Total Match Time
Elevator to top	4	0	1	4	4	4	135
Elevator to bottom	3	0	1	3	3	3	
find/intake cube	2	2	0.75	2.5	2	4	
Line up for climb	4	0	1	4	4	4	
drive from feeder to swich	3	0	1	3	3	3	
drve from feeder to scale	5	0	1	5	5	5	
drive from landfill to center feeder	2	3	1	2	2	5	
lineup, place cube	4	10	0.8	6	4	14	
Extra Defense	0	0	1	0	0	0	
			Gameplans				
Action	**Predicted Time**	**High Time**	**Low Time**		**Average total time**	**Cycles per match**	
			Cycle from landfill to scale				
find/intake cube	2.5	4	2	Ave Cycle Time ->	18.5	7.3	
drve from feeder to scale	5	5	5	Slowest Cycle->	28	4.8	
lineup, place cube	6	14	4	Fastest Cycle->	16	8.4	
drve from feeder to scale	5	5	5				
			Cycle to switch from landfill				
drive from feeder to swich	3	3	3	Ave Cycle Time ->	10	13.5	
lineup, place cube	6	14	4	Slowest Cycle->	18	7.5	
drive from feeder to swich	3	3	3	Fastest Cycle->	8	16.9	
			Cycle Opp switch from feeder				
find/intake cube	2.5	4	2	Ave Cycle Time ->	11.5	11.7	
drve from feeder to scale	5	5	5	Slowest Cycle->	21	6.4	
lineup, place cube	6	14	4	Fastest Cycle->	9	15.0	
			Cycle vault from landfill				
find/intake cube	2.5	4	2	Ave Cycle Time ->	10.5	12.9	
drive from landfill to center feeder	2	5	2	Slowest Cycle->	23	5.9	
lineup, place cube	6	14	4	Fastest Cycle->	8	16.9	

We know its small. Please open the link and edit the sheet for yourself! See it here

Our prediction is Scalers should be able to do just over 7 cycles getting cubes from the landfill, Home Switchers can expect 13 cycles, and away Switchers should do over 12 cycles. This doesn't take into account the extra difficulty added by driving 50 feet away. We predict this will cause a speed decrease of about a third, leading to 9 cycles a match on the away Switch. Actually fitting this many cubes onto a Scale or Switch is something teams should test.

This information doesn't matter a ton, seeing as this game is all about having more cubes than the opponent, but It is interesting insight.

Qualification Seating Capabilities

1st -4th seed at regional

- Climb regularly
- Maintain control of home Switch
- Auto scoring
- Will probably be one of the best Scalers.

5th-8th seed at regional

- Maintain home Switch most of match
- May have Scale capability, not necessity
- Will be able to climb

Win champs

- Do everything very well
- Do one thing better than literally anyone else that could be on the field. For instance, if you can climb 100 percent of the time while also carrying all of your alliance partners, there is a high chance that you will get picked at worlds even if you are only mediocre at other things.
- Be 254 every third year

Top Picks at a Regional

- Hard to predict
- Depends on the robot and prefered strategy of 1st seeded alliance…
- At Minnesota events the top pick won't be the best team (because most Minnesota teams generally don't know how to scout…)
- Likely to be the best robot at their chosen game objective
- Likely to be one of the best climbers
- Potentially the top pick because you can help alliance members climb
- Possibly picked for some other defining attribute that the top seed desires

2nd Pick at a Regional

- The 2nd pick at a regional will likely not have a scaling capability and will be specialized to do defense/Switching/vaulting
- Climbing will be the biggest separating factor between teams that get picked and teams that don't get picked

Alliance Structures:

1 Scaler, 2 Switchers

- Likely very common
- If you each do your job better than the person on the other side you will win
- One robot for each scoring location, if your Switch is locked up, 3rd robot could play defense, play power-ups, or help with opp. Scale

<u>2 Scalers, one Switcher</u>

- Ignore far Switch, control home Switch and overpower on Scale
- If you control Scale, you have a high likelihood of winning given you can have some control over your own Switch

<u>No Scalers, 3 Switchers</u>

- 2 dedicated to far Switch, must be able to stack 2 cubes high on far Switch
- 1 dedicated to home Switch
- In case of complete control, have a Switcher run vault cycle

Critical Thoughts/Questions

- Can you effectively do all of the things that you want to do? If you can't put up half of the capabilities of the top teams, don't focus on that functionality
- How well will you be able to see across the field?
- Can 3 Switchers win in elims?
- Will a Scaler always rank first?
- Each combination of alliances can beat any other if each robot beats their opp. Counterpart.
- Which side do we want to collect cubes? and what side do we want to score them?
- How many cubes can reasonably fit on the Switches before another level of cubes is needed?
- Top ~15% of teams at a regional should focus on Scale
- Everyone will try to Scale. Everyone will try to climb.a majority of them probably will not work.
- If you don't think scaling is reasonable, focus on being a great Switcher
- How important is climbing? Ask 330 Beachbots

What you should do?

This section is very dependant on the capabilities of your team. How much time do you think it would take you to make a working prototype of what you want to do…. Take that time, multiply it by 2.5. That is a reasonable amount of time to have a flawless prototype. Then add about half of that total time to make a final product. Is this less than 6 weeks? Does this give you enough time to accomplish your other goals. The real problem that most teams have is that they underestimate the challenge and overestimate their resources.

-Rookie and small resource teams: focus on the things that require minimum moving parts to emphasize simplicity and what things you might have to troubleshoot. Things for putting game pieces on the Scale are probably not for you. If you can effectively put game pieces into the Switch, it would be more beneficial to your alliance than having an ineffective mechanism that focuses on the Scale

-Medium resource teams: Think about how effective your team will work. If you focus all your resources effectively, you will probably be able to make a decent Scaler or a very good Switch

mechanism. Also look at climbing. Even if you cannot pick up other robots, it will be good if you can make sure that you can climb 100 percent of the time.
-Large resource teams: Why are you here? You do not need this. If you are not successful with this amount of resources, you need to rethink your build strategy. Try focusing on how to make your robot as efficient as possible.

Design tips

-Ratchet for climber - let the ratchet take the strain of carrying a second robot, gear your climber to lift your robot, once off the ground your ratchet will take the weight of your alliance partners.
-How important is it to score the game piece if you cannot intake it?
    -Maximize the effective width of your intake- think about how wide you need your intake to be? When the cubes are on their side they are only 11 inches wide.
-Build where you can stack multiple levels of cubes on the platforms

Power Ups

Powerup	Value	Value per Cube
Levitate	30(climb) + 15(vault)	15pts/cube
Force: Lvl 1	10pts + 5(Scale)	15pts/cube
Lvl 2	10pts + 10(deny Scale)+10(vault)	15pts/cube
Lvl 3	20 points + Deny Scale (10) + 15 vault	15pts/cube
Boost: Lvl 1 (Switch)	10 points + 5 vault	15pts/cube
Lvl 2 (Scale)	10 points + 10 vault	10pts/cube
Lvl 3(Both)	20 + 15 vault	11.6pts/cube

<u>When to use boost:</u>

- At level one, when you are in control of your home Switch, the one brick boost is worth using.
- At the beginning of teleop, bring one power-up block to the vault and immediately use the boost while you own your home Switch. This allows you to gain an early lead and apply pressure throughout the rest of the match for the other alliance to catch up.
- Boost levels 2 and 3 do not seem as valuable or useful over the course of the match. The reason for this is you do not know how much time that you will guarantee either the Switch or the Scale.

- If you are already ahead, the extra blocks needed for levels 2 and 3 will be better utilized either in the force or the levitate or guaranteeing owning the Switches/Scales that you already have.

When to use levitate:

- If you do not have three climbers, it is worth using
- Guaranteeing the rank point if you have 2 reliable climbers
- Hit in the last couple of seconds

When to use force:

- Level 1 is useless. If you cannot control your home Switch, you will not win the game
- Level 2 is the most useful per block used. This takes the “neutral” Switch that can give the most points. If you are in a position in which the other team has control of the Switch, the level 2 force will help to conquer the deficit/ break the tie/ or extend your lead
- Level 3… See level 1

Overloading

What it is: Overloading is a strategy used to intimidatly your opponent by filling your home Switch with many cubes (7+) early in the match. The hope is to get the opponent alliance to give up on attacking your Switch. When the opponent has given up hope on attacking your Switch you are freed up heavier pressure on their Switch and/or Scale.

How to execute: Focus most/all of your alliance effort until you have built up a sizable lead. At ~45 seconds or 6-8 cubes you should pull all your efforts into attacking the enemy Switch. The goal is to force them back and come play defense.

Defense

Body-on-Body: get between them and their target, avoid null zones, execute friction pins, be aware of opponent dropped cubes.
Offense: Offense is the best defense. Smother them with scoring. Any cube you score they need to match.

First Mover Advantage

Not all cubes were created equal. The position of cubes on the Scale and Switches. The further out on the Scale a cube is placed, the more it will affect its balance. In the field tour video of the Switch you can see 3 cubes being beat by 2 when they were positioned further out.