

DON'T DOUBT THE SCOUT

The subliminal and often-neglected key to FRC success.

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WHO AM I?

- Member of Ctrl-Z 4096 for 6 years
- Scouting Captain
- Programming and Data Analytics fanatic

WHAT IS SCOUTING?

- Understanding the abilities of other teams
- Subjective, Objective or both.

WHY SCOUT?

- Informed decision making.
 - Match Strategy
- Dynamic Strategies.
- Analytical thinking.
- Real-world experience of using data.

COLLECTION

PRE-DESIGN

- Design starts Day One.
 - Keep notes of strategies discussed, their pros/cons, and possible implementations

OBJECTIVE DATA

- Split the game up into its basic actions
- List the details that can be collected

FIRST STEAMWORKS

Shoot

Mode
Level
Amount
Accuracy
Location
Rate

Gear

Mode
Location
Result
Speed

Feed

Fuel	Gear
Location	Location
Amount	Accuracy
Accuracy	Speed
Speed	

Climb

Speed
Touchpad

Don't overscout!!!

SUBJECTIVE DATA

- Depends on experiences of individual scouts.
- Quantitative
 - Easier to analyze, but more restrictive
 - Can be normalized
- Qualitative
 - Harder to analyze, but less restrictive

PIT DATA

- Things you can't see from match data:
 - Drivetrain
- Strategies you might want
 - Cheesecake
 - Ground Feeder
- Be careful of what you ask.

PAPER SCOUTING

- Cheap and Easy
- Harder to Analyze
- If implementing a paper scouting system:
 - Keep an entire team's data on one page
 - Keep collection limited
 - Aggregate whenever possible
 - Keep it organized!!

Team Number: _____

COUNT ON IT

Autonomous (circle all that apply):

Cross White Line?

Score High?

Score Low?

Place Gear?

Teleoperated:

Fuel (Circle one):

Didn't Shoot

Weak

Medium

Strong

Gears:

Gears Placed: _____

Gears Dropped: _____

Climbing (Circle one):

No Attempt

Failed Attempt

Successful Attempt

Team Number:

Match Number:

Field Setup	1	2	3	4	5
Class: Defense	Low Bar				

Auto Table	Cross					Score		Spy Bot? Yes No		
Attempt	Low	A	B	C	D	Low	High			
Succeed	Low	A	B	C	D	Low	High			

Acquire	# Boulders	Scoring		Attempt	Score
HP		Low Goal			
Neutral		High Batter			
Forward		High Ctyd			

Crossing	Cross	Assists	Stuck
Low Bar			
Position 2			
Position 3			
Position 4			
Position 5			

Playing Defense	# Instances	Endgame	Challenge	Scale
Broadside		Attempt		
Pin		Succeed		
Strafe		> 20 Sec		
Blocked Shot				

Fouls	Tech Fouls

[illegible]

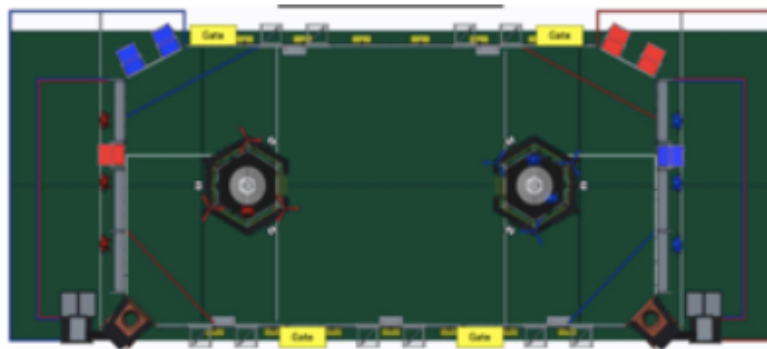
Autonomous Notes

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Tele-operated Notes

Preferred strategy:

Balls / Gear / Ball + gear



Pit Scouting Data

Wheel Type:

#Wheels:

Drive train:

#CIMS:

Weight:

Preload Gear Y/N

Climbable Y/N

Floor Intake

Y/N

#Gear Cycles:

#Balls Holdable:

Receive & Deliver Gear Y/N

Human player / Floor pick up

Shooting

Low Goal / High Goal / No

Additional Notes

Friday night

Qual Average: ____

OPR: ____

Rank: ____

PAPER + ELECTRONIC

- Easy to collect, Easy to analyze, but requires data entry.
- Allows more data IF data entry and analysis happens in real time
- If implementing a hybrid system:
 - Try to make data entry and analysis quick and easy.
 - Keep analysis dynamic and visual.

Info		Defense		Offense			Points			Ranks		P.Rating
Team #	Match #	Driving	Defense	Shooting	Climbing	Feeder	Auto Pts	Teleop Pts	Avg Pts	Def. Rank	Off. Rank	
71	Totals	6.36	3.73	5.09	6.82	4.36	59	46	164	10.09	25.27	9
101	Totals	4.82	5.09	6.00	5.45	4.73	54	37	145	9.91	23.18	7
111	Totals	4.73	7.18	6.55	5.91	5.09	53	34	140	11.91	23.55	6
648	Totals	5.18	5.36	7.18	4.64	5.45	31	55	117	10.55	21.27	4
677	Totals	5.18	6.27	5.73	6.18	5.00	56	39	151	11.45	23.91	7
1091	Totals	5.18	4.00	6.00	6.27	4.55	57	50	164	9.18	25.82	9
1625	Totals	5.27	5.36	6.09	6.91	4.91	31	52	114	10.64	21.91	4
1675	Totals	5.09	5.64	5.45	5.82	5.27	42	38	122	10.73	20.55	4
1739	Totals	6.36	6.36	5.91	5.27	5.64	31	30	92	12.73	17.82	1
1781	Totals	4.45	4.91	6.18	6.27	4.36	34	59	127	9.36	21.82	5
1850	Totals	6.00	5.73	6.18	5.82	4.73	43	53	139	11.73	22.73	6
2010	Totals	6.09	4.64	4.36	5.82	5.09	53	57	163	10.73	24.27	9
2022	Totals	6.45	5.73	6.09	4.55	5.45	41	34	116	12.18	20.09	4
2039	Totals	5.91	4.73	5.09	6.09	5.00	56	35	147	10.64	23.18	7
2115	Totals	6.09	4.82	5.73	7.64	4.55	51	39	141	10.91	23.91	6
2136	Totals	4.45	4.91	6.00	4.91	4.91	54	59	167	9.36	24.82	9
2151	Totals	6.64	5.36	5.73	4.36	5.27	43	41	127	12.00	20.36	5
2194	Totals	5.91	5.36	6.00	4.82	5.64	57	44	158	11.27	24.45	8
2338	Totals	5.27	6.27	5.91	6.36	4.36	42	33	117	11.55	20.64	4
2358	Totals	4.91	5.09	5.27	6.45	4.73	40	45	125	10.00	21.45	5
2432	Totals	5.27	5.82	5.55	4.55	5.09	33	40	106	11.09	18.18	3
2451	Totals	5.91	4.55	4.73	7.18	5.45	47	41	135	10.45	23.36	6
2512	Totals	3.36	7.27	5.45	5.45	5.00	37	58	132	10.64	20.91	5
2704	Totals	6.55	4.82	5.09	5.36	4.55	44	33	121	11.36	19.00	4
2709	Totals	5.73	4.45	6.09	4.64	4.91	48	57	153	10.18	23.64	8

Defense Bots



FULLY ELECTRONIC

- Easy to scout, Easy to analyze (if done well) but can pose logistical issues.
- ThunderScout, GearScout, FIRES, Wildrank, many more
- If implementing an electronic system:
 - Try to make data entry easy for the scouter. Prioritize the UI
 - Make analysis dynamic and visual
 - Create fail-safes – things happen.
 - Plan out logistics well beforehand

DEMO!

ANALYSIS

MATCH STRATEGY

- Extent of match strategy depends on the game
- Offense, Defense or Both?
 - Make scenarios: worst case, average case, best case
 - How close will this match be?
- What may the opposing alliance strategy be?
 - Plan for all scenarios based on their abilities.
- Look through everything!

OFFENSIVE

- What needs to happen for a win?
- Which opposing teams, if any, might pursue defense?
- How close will the match be? How much risk should be taken?

DEFENSIVE

- How much do the opponents need to be limited for a win?
- Which teams are the most susceptible? Which teams need to be limited most?
- What is the best way to slow a team down?

ALLIANCE SELECTIONS

- Create pick-lists ranking team by action

ALLIANCE SELECTIONS

- If alliance captain:
 - Predict opposing alliances
 - Determine your strategy
 - Filter teams to create picklist
 - Keep cooperation in mind.
 - Don't rely solely on numbers!
- If first pick:
 - Analyze strengths and weaknesses of captains
 - Help captain in achieving their strategy

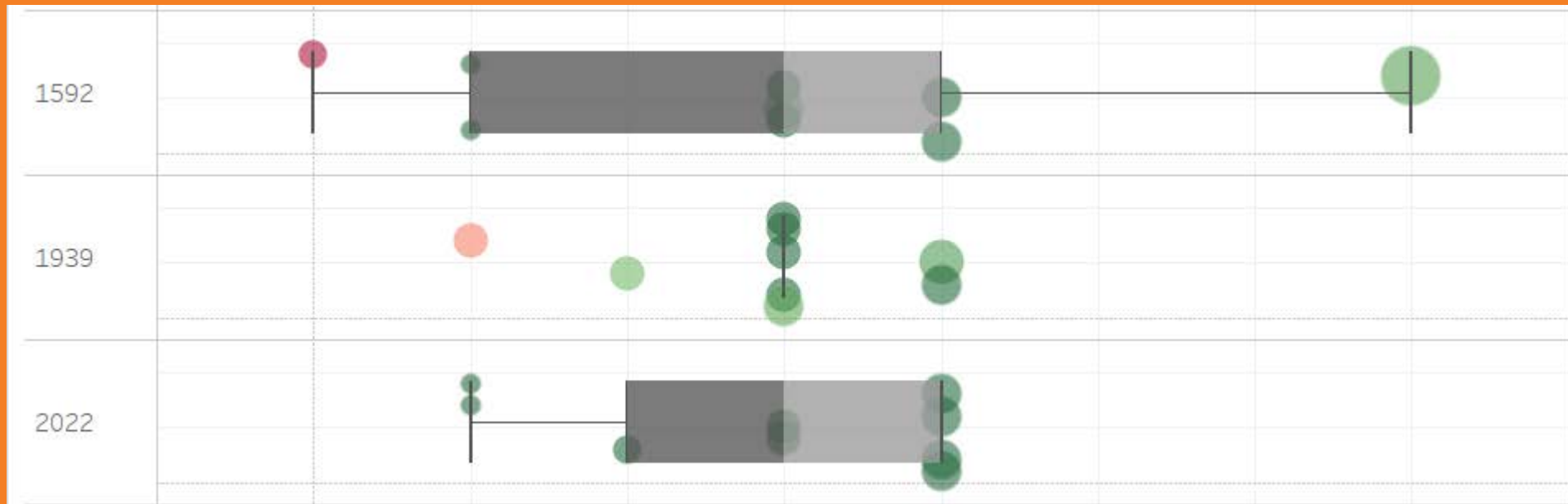
Keep lists general! Don't limit yourself.

ANALYTICS IMPLEMENTATIONS

- Paper: Good for overviews, but hard to answer very specific questions
- Electronic: If done right, can make it easy to drill deep.

A FEW TIPS

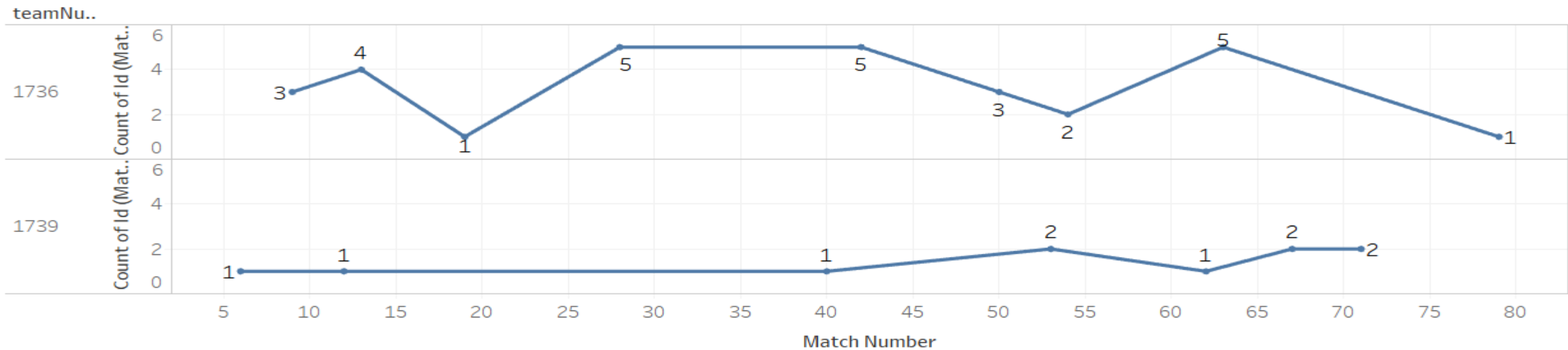
- Don't just use averages!
 - A team's performance can't just be summed up with one number. Include min, max, median and IQR.



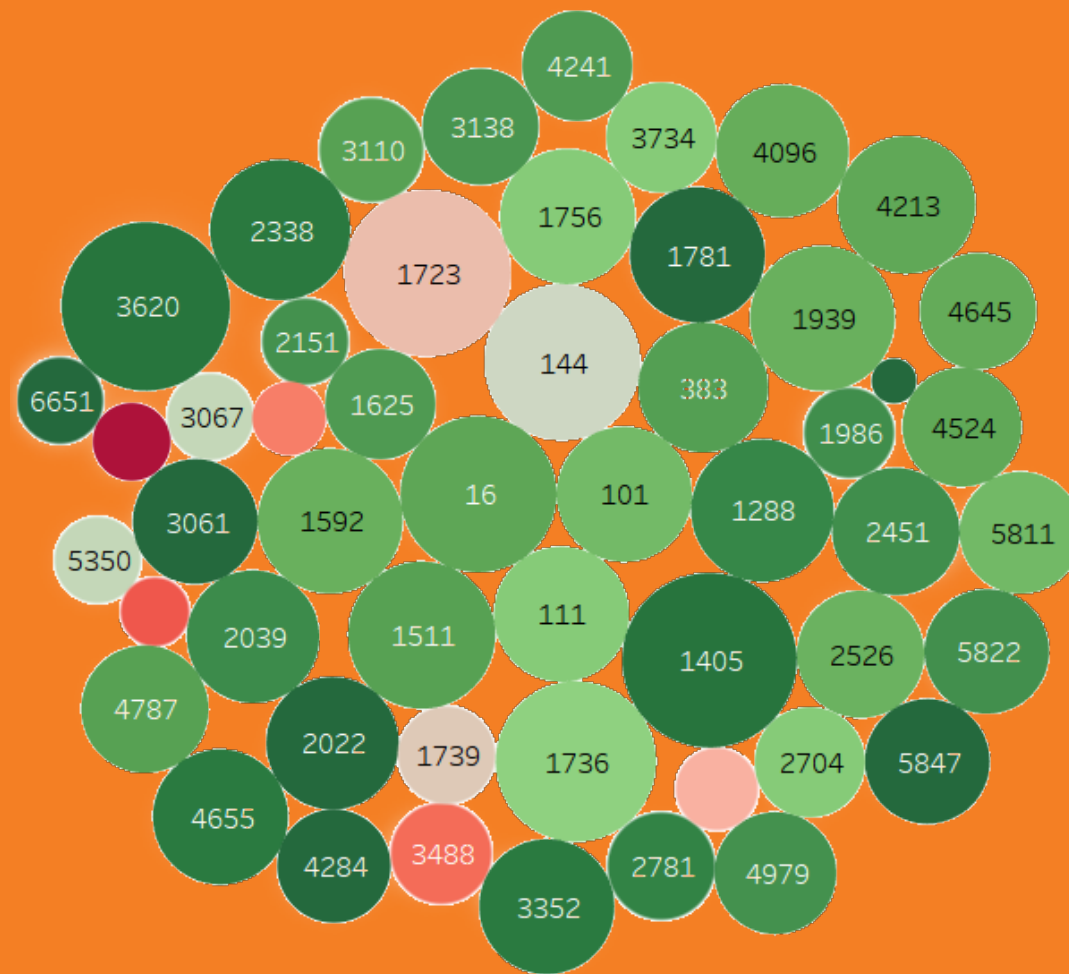
A FEW TIPS

- Track performance over time
 - If a team experiences massive damage, the medians might be an inaccurate representation.

Gears over Time



TABLEAU



THANK YOU!

Ctrl-Z FRC

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