

Innovators Predictive AnalYTics Scouting System (IPA)

F.I.R.S.T provides a game each year that offers teams a diverse landscape of design goals and play strategies. First and foremost, teams must build a robot, under time constraints which, in their view, best accomplishes the game. Teams must evaluate the game's various elements and prioritize their goals in order to focus their efforts. Only a handful of teams (I won't mention any team numbers here but we all probably know who they are) build a robot which reliably and consistently executes all of the elements of the game. Given the complexity of the game, even the best teams realize having a sound strategy to maximize each alliance member's strength complements good robot design. Good strategy relies on good information.

Our scouting goal is to develop match strategies to affect future outcomes. We accomplish this by collecting, analyzing, and presenting data to our drive team in real-time. Our scouting strategy has evolved over the years. At first we did pit scouting, collecting lots of information about the robots and the team's strategies and capabilities. We compiled all the information into a spreadsheet and tried to categorize the teams. It was a huge failure. There were two realizations that we discovered from that effort... 1. The technical aspects of a robot do not win matches. A great drive team can overcome operating an average robot. 2. Teams will tell you during pit scouting, their design and strategies (drive fast, climb the best, shoot accurately, etc.) which turn out to be optimistic projections under the stress of actual match play. "No plan survives contact with the enemy" (Helmuth Carl Bernard Graf von Moltke). Because of these factors we focused our efforts on observing individual teams during match play.

Our team's scouting approach goes beyond match prediction (we have OPR and CCWM for that) and assists with gameplay strategy decisions. For those of you interested in this type of scouting watch the movie "Moneyball" (again). We wanted to evaluate our collected information and alter our behavior to change the "predicted" outcome. In the business world this is called Business Intelligence (or BI). The whole idea behind BI is to evaluate history and trends and determine what variables affect certain patterns. By altering the variables you can alter the outcome...if you can measure and control the variables. The key is "WHAT" to scout. Our team has had many a discussion over what data to collect. The rule of thumb is: "Can the data collected equate to points or more importantly a win".

Let's look at a classic example that we are all posed with... as an alliance should we all play offense or should one team play defense. The simple answer is...it depends. Equate this dilemma into how it affects points. If the team in question is able to create a moderate 12 points during teleop play then you would need to subtract this from your offense score if they focus on defense. The REAL question is can they defend more than the 12 points they would have produced. If the answer is no, then it will be pointless to take away your scoring potential.

So, what does the Innovators system do? It is a real-time data collection system that consolidates information into a dashboard for the drive team. Our scouts watch a single robot and log every event that happens – both the “what happened” and “where did it happen”. The web based application records the location of the events and the time the events took place. This helps us correlate the data against the other scouter’s information. You will see we log all the shots made and missed, fouls, breakdowns, defense play, pyramid climbing information (climb locations and climb speed), and a place for scouts to record any other observations through a notes field. We chose to deploy the data collection via tablets as this removes the whole paper/data entry aspect of the process. This year’s tablet scouting data collection application looks like the following:

FRC 2013 Scouting - RobM - Test

19

3138 [B1]

2481 [B2]

829 [B3]

217 [R1]

51 [R2]

469 [R3]



Defended

Top

Collided

Left

> Auto <

Right

Teleop

Pyramid

Side

Miss

Pass

Pickups

Sgl Feed

Dbl Feed

Floor

Fouls

Foul

Technical Foul

Climbing

Defense

217

51

469

Cards

Yellow

Red

Notes

Submit Notes

Start Climb

Z 1

Z 2

Z 3

00:00

00:00

00:00

Never Moved

Partial Breakdown

Intermittent Breakdown

Collision

Tipped Over

Fell Off Pyramid

No Show

> Face <

Corner

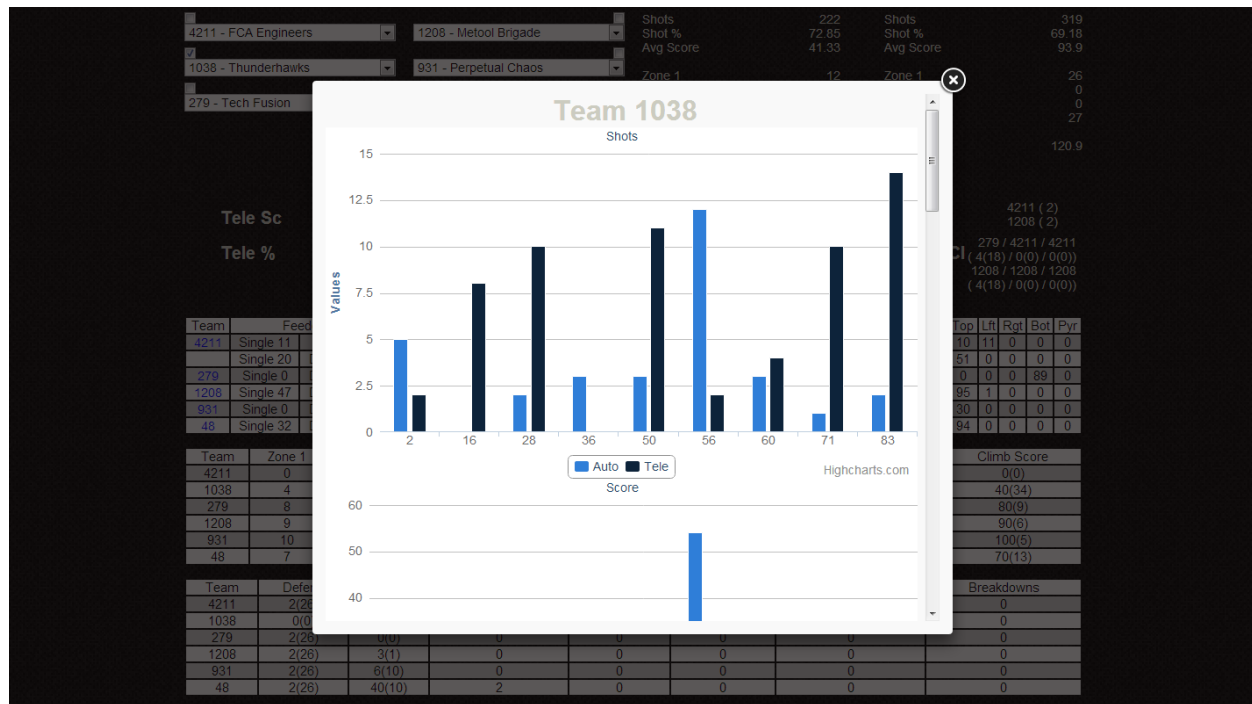
> Outside <

Inside

Where the real power comes in, however, is presenting the data back to the drive team in a form that lets them make intelligent, informed strategy decisions based on the real-time statistics collected. The drive team dashboard shows where each of the teams shoot from (a heat map if you will), scoring potential by alliance, top performers in various categories (the At a Glance section), and individual team statistics. All of the numbers in parenthesis are the current rankings for that category. The items with 2 columns are showing Autonomous and teleop statistics.



Selecting one of the teams will drill into the individual match numbers to evaluate trending. We have found this very useful to see if teams are improving (or getting worse).



Lastly, one of the most difficult challenges is when your team is in the position of making the “top 8”. Congratulations, you are one of the top 8 alliances...panic...who should you pick? Even those teams that collect lots of useful data have difficulty boiling it down to what teams are best suited to play with our team. Generally speaking, most teams spend Friday night coming up with a preliminary picking order after pouring over all of the data collected during the course of the day. This is a good start but A LOT happens that second day and there is very little time between the last match and alliance selection process. We have written a simple web application that will allow the alliance captain to view a number of attributes and assign weights to each of them based on what type of strengths they are looking for. The application will find the top 6 teams based on combination of the desired weighted attributes. This is an area we will be expanding considerably moving forward.

In closing, by no means was this to expose and throw stones at all the great methods out there today. Many of you have wonderful systems out there and we at team 3138 (Innovators Robotics) wanted to share what works for us. Happy Scouting!!

Rob Miller

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