



Tableau for Robotics: Storing Data

DATA STORAGE

Having good data is the foundation for good analysis, but data is useless unless it provides meaningful insights. This whitepaper focuses on providing a good foundation for future analysis by creating a solid, structured database to enter scouting information once it's gathered.

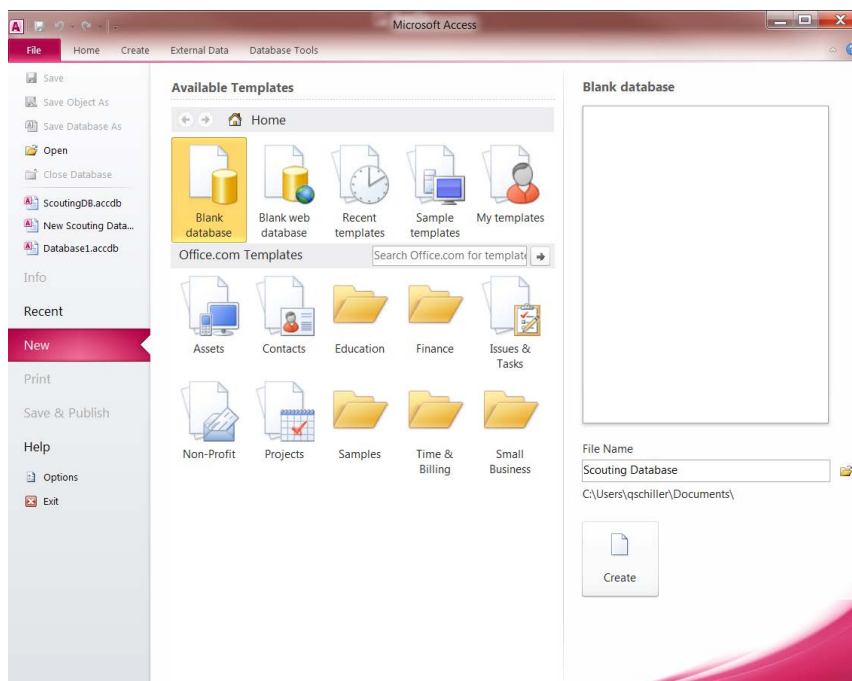
Going back to our end goal - we want to understand what teams are most effective, where they play from, and how to adapt our strategies to win as much as possible. To do this, it is important to store your data in as raw of a form as possible. This allows you to later combine records and summarize them however you want. One common mistake is to aggregate results - or in other words, sum up the total shots, misses, and targets a bot had in a match. By keeping our information as disaggregated as possible, we can compute the score of the robot from that data, in addition to other metrics like accuracy, shots on goal, and preferred target.

In this whitepaper, we will go over two of the best ways to store scouting data in a raw and error-free way, which will let us best analyze our information later.

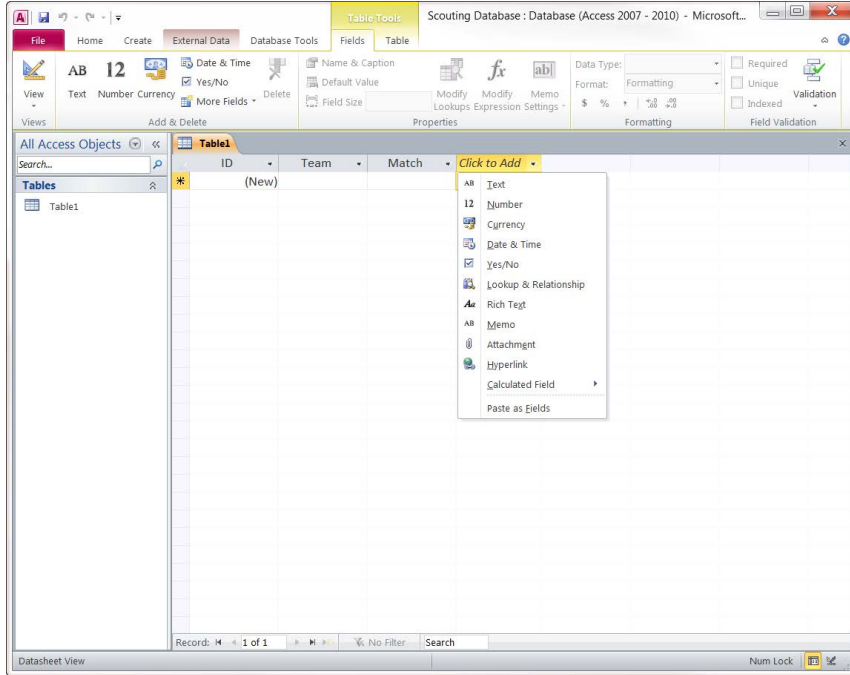
USING ACCESS

For a combination of ease of use and power, Microsoft Access is a good solution for data entry and storage. While there are more powerful or easier systems for data entry, Access offers a good balance of the two. This is not to say that other methods are less legitimate - many teams use Excel for data entry and storage quite well- but Access is prefilled with easy-to-use tools to lower errors and speed entry. To make things even better, in the previous two whitepapers, you have already done most of the outlining it takes to build an Access table.

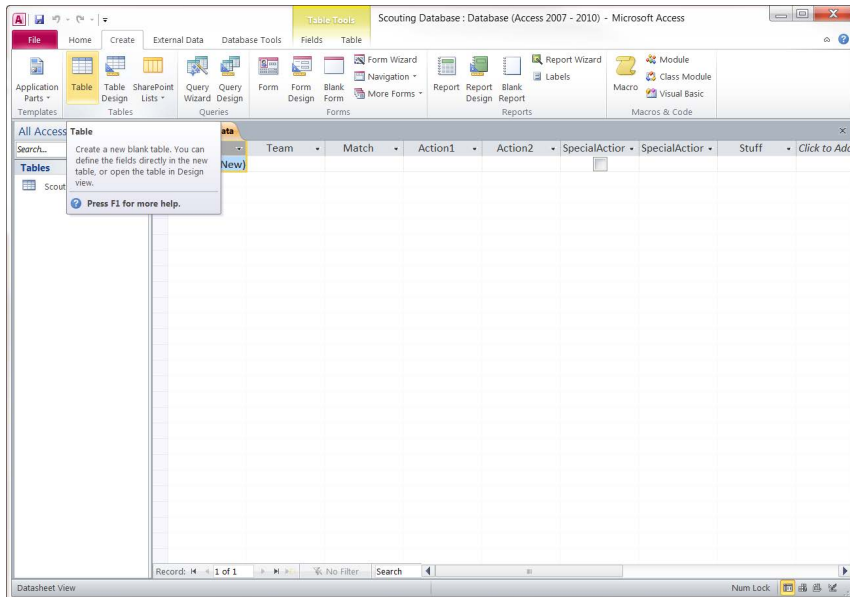
We are going to be building a blank desktop database. When you open up Access, this is already the default option selected. Name your database in the corner and click create.



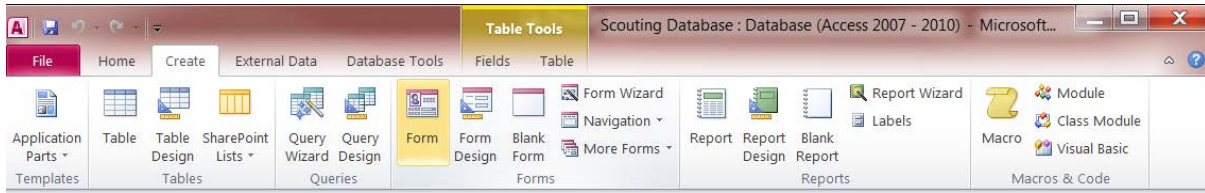
Once we create our database, we are going to be building out the table will hold our data in. Once again, the original table we have been working on in the first few whitepapers is going to help us set up the columns. In Access, each column is named and set to a specific data type. Because we have already classified each field into a data type, we can just copy them into Access, with one column for each field.



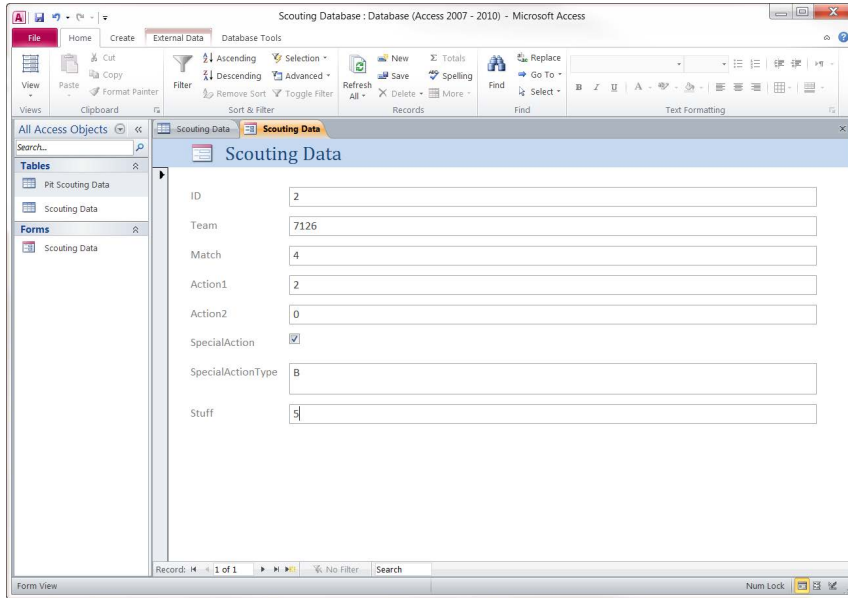
Because each column will only accept the type of data you set, the table already has basic error checking built in. When you have completed the table for your match scouting data, create a new table for your pit scouting data and repeat the process of creating a column for each field.



A full table is only slightly better than an Excel sheet for entering data--until we build the entry form. When you have completed both tables, go to the create tab and let Access build an entry form for you.



When it is done, it should look like the picture below. Remember to also make an entry form for your pit scouting data.



In a full form, you can push enter to move from one field to another, and pushing enter after a full form automatically starts a new one. Entering data in the form will automatically copy to the table and the whole database will save after every sheet is entered. For a more in-depth step-by-step introduction to Access, check out the video tutorial at <http://www.tableausoftware.com/first-robotics/access>.

USING EXCEL

If your team chooses to use Excel for data collection, here are two best practices for holding data in Excel.

Best Practice 1: Leave no blank spaces

In Excel, try to fit data into as small of an area as possible. Some people put blank rows or columns as spacers in an effort to make the formatting more visually appealing, but this is to be avoided. Whenever possible, remove those columns and replace blank cells with zeros. As a strict rule, the top row needs to contain your column headers. Examples of poorly formatted data are shown below.

Team	Match	Action1	Action2	Action3
9854	1	1	2	3
8975	1	4	3	4
9056	1	3	8	2

Has a lot of spaces

Scouting Sheet				
Team	Match	Action1	Action2	Action3
9854	1	1	2	3
8975	1	4	3	4
9056	1	3	8	2

Has a title row

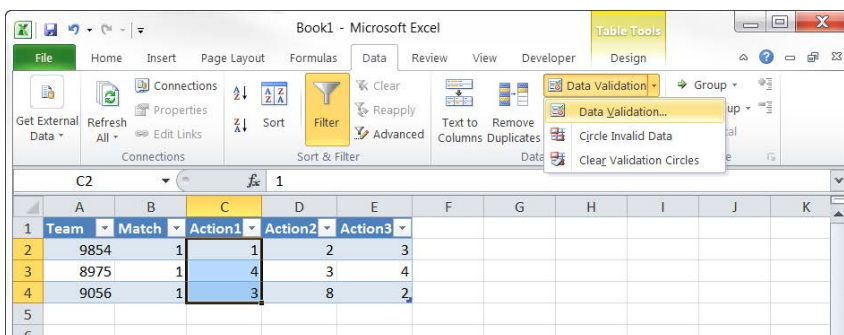
Team	Match	Action1	Action2	Action3
9854	1		2	3
8975		4	3	4
9056	1	3	8	

Has blank cells

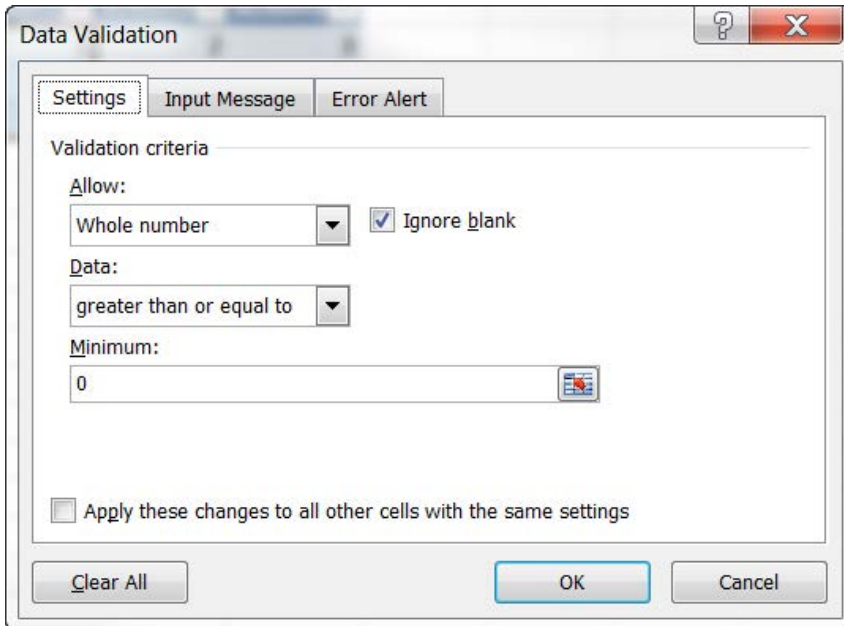
Best Practice 2: Use data validation

In Access, when we set a column to a specific data type, we limited the type of data that could be entered into it. This reduces errors and ensures cleaner data, and can be emulated in Excel with data validation.

If your data is in an Excel table, highlight at least two cells in the same column. Then, go to the data tab and select data validation.



For each field type you can set up the validation a little differently. In fields that are counts, for example, you would want to only allow data larger than 0 as a valid data source.



By setting the validation to a list, you can validate short list and Yes/No (boolean) field types. Even better, a cell with a list validation will autocomplete.

NEXT STEPS: ANALYZE YOUR DATA

At this point, you are ready to get insights out of your data. You already know what you are going to scout for, how you are going to collect it, and how you are going to store that data. Additionally, you have already organized everything in a way that prepares you optimally to ask questions about your robot, others teams, and how to properly play against them.