



# Drive Trains

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# What this presentation is and is not

## Is

- A guide to picking a competitive drive train for any FTC game
- A general overview of the drive train options FTC teams have

## Is not

- A primer on the physics of drive trains
- A guide to the specifics of building a drive train
- A guide to picking a drive train for FIRST Res-Q
- A guide to esoteric/unused drive trains

# What is a Drive Train and Why do I Care?

- Drive Train
  - The subsystem of the robot dedicated to moving around the game field
- Drive trains are essential for accomplishing nearly any task in a robotics game
- This year: Potentially your ticket to winning a tournament
- Drive trains are like IT



# The Goal of a Drive Train

To get you where you need to be,  
when you need to be there

# Key Goals for a Drive Train

1. Reliability
2. Build Speed
3. Game-specific goals
  - Get from point A to point B in X seconds(any year)
  - Be able to push a goal up the ramp (2014-15)
  - Don't get pushed while placing tubes (2012-13)
  - Get to the (low, mid, high) level of the mountain (2015-16)



# Drive Train Principles

Vocabulary, Simple Math, and a combinatorial explosion of options

# Parts of a Drive Train

The background of the slide features a decorative graphic of interlocking gears. There are four gears visible, rendered in two shades of red: a darker red and a lighter red. The gears are positioned on the left side of the slide, with some overlapping each other. The overall background is a solid dark red color.

- Frame
- Contact (wheels, treads, etc)
- Motors
- Power Transfer (the classical definition of drive train)
- Sensors



# Frame

- Purpose
  - To hold the drive train together
  - Connect to the rest of the robot
- Lots of options
  - Materials
  - Techniques



# Frame: Material Options

- Tetrix/Matrix Kit
  - What almost all teams have
  - Very nice for low-resource (money or experience) teams
  - Overpriced, limiting
- Raw Materials
  - Can be aluminum, plastic (NEVER ACRYLIC), wood
  - Good for advanced teams
  - Materials are cheaper, machining is not
- Most teams use a mix of these

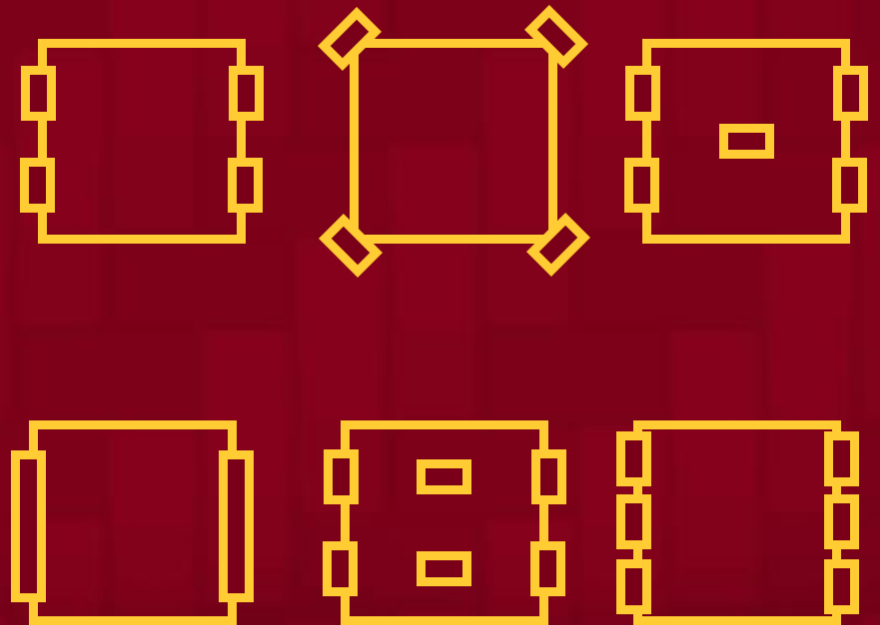
# Frame: Techniques

- Standard (see PushBot)
- Sheet/Standoff
  - FTC 5943
- Tube/Channel
  - Mini-6
- Flat Sheet
  - FTC 6699 (2013-14)
- Finger Sheet
  - FRC 4183

# Contact

- What actually applies force against the ground to cause your robot to move
- Types:
  - Normal wheels
  - Omni wheels
  - Mecanum wheels
  - Treads (in a variety of patterns)
  - Straandbeest (not really)

Arrangement:



# Motors

- Technically you have several options
  - In reality you have one
- NeverRest 40 (for skid)
  - NeverRest 20 for omnis
- They effectively don't burn out
- They include an encoder
- Only use DC/other if you don't have space

# Power Transfer



- Belts

- More efficient than chain
- Requires precision/tensioning
- Can also be used as treads
- Good when you know what you want

- Chains

- More flexible than belts
- Works nicely with kit
- #25 is most common
- Good for prototyping

- Gears

- Most efficient
- Works nicely with kit
- Good for drive trains

- Direct Drive

- Most common
- Please don't!
- Motors are technically designed for it
- Very rough on heavy robots



# Contact Info

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# Driving Time!

Also questions