



2016-2017 4-H Exploding Bacon

Motion Overview

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- » Options for making motion
- » Translating motion
- » Changing motion
- » How gearboxes work
- » Planetary gearboxes
- » Pistons
- » Controlling motion
- » Next time
- » Your turn

Options for making motion

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- » Motors
 - » Rotational motion
 - » Electrically powered
- » Pistons
 - » Usually linear motion
 - » Air powered

Types of Motors

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- » 775's
 - » More power and speed
 - » Burn out more easily
- » 550's
 - » Similar to 775s but lighter and weaker
- » AM 9015
 - » Easy to burn out and weaker than 550 by a little bit
- » CIM
 - » LOTS OF POWER
 - » Hard to burn out
 - » Drive train motors
- » BAG motors
 - » Weaker than others but hard to burn out
- » Mini CIM motor
 - » 2/3 the size, weight, and power of a CIM motor

See VexPro's motor guide for more information.

Translating Motion

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- » Chain
 - » Comes off of sprockets
 - » Very strong
 - » Heavy
 - » Customizable lengths, but slacks and stretches
- » Belt
 - » Comes off of pulleys
 - » Slightly weaker
 - » Light
 - » Preselected lengths, but doesn't stretch much
 - » Can buy to desired length
 - » Will need new belt if length changes
- » Gears
 - » Heavy
 - » Good for small spaces

Changing motion

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- » Gearboxes
 - » Change RPM and torque of motor outputs
 - » Normal gearboxes
 - » Planetary gearboxes
- » Rack and pinion
 - » Can turn rotational motion into linear motion
- » Elevator runs
 - » Use a motor to wind in a spool and raise an elevator
 - » Connect a chain to a carriage on an elevator

How Gearboxes Work

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- » Meshing gears of different sizes will change speed and torque
- » The higher the speed the lower the torque
- » Normal gearboxes are more flat than long
 - » Drive gearboxes
 - » Occasional other uses
- » Planetary gearboxes
 - » Longer
 - » More versatile gearings

Planetary Gearboxes

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- » How they work
- » Calculating the ratio
 - » 3:1 means 3 times slower
 - » Multiple numbers in stages
 - » Combined stages of a 3:1 and a 10:1 is 30 times slower
- » Versa Planetary Gearboxes
 - » Most used gearboxes in FRC
 - » Very versatile
 - » Can use 2-1 input stage
- » Commonly used for just about everything that isn't driving

Pistons

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- » Spring loaded
 - » Automatically return to their home position when there's not air pushing on them
 - » Low force one way, normal the other way
 - » Rarely useful
- » Dual action
 - » Fully powered both ways
 - » More power pushing than pulling

Controlling and Measuring Motion

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- » Motor controllers
 - » Act as a floodgate for power to the motors
 - » Some motor controllers are better for some applications
- » Solenoids
 - » Control air flow
 - » All on or all off
- » Encoders
 - » Measure rotation
 - » Measure in clicks
- » Touch sensors
 - » A switch
 - » Can say "When this gets hit stop moving"
 - » Magnet sensors are similar but don't touch
- » Potentiometers
 - » Measure rotation
 - » Can only spin a certain number of rotations

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Your turn

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- » Select subsystems
- » Investigate motion
- » Pick possible motors, gearboxes, and pistons for mechanisms