

LESSON 2

Drive Trains

THE PURPOSE OF DRIVE TRAINS

PROVIDES MOBILITY FOR THE ROBOT

If you can't drive, you can't play the game

- Push + pull objects and robots
- Move around the field
- Move over/around obstacles
- Enhances or aids in the abilities of speed, agility, and pushing force

DIFFERENT TYPES OF WHEELS

- “Traction” Wheels

- Standard wheels with varying amounts of traction, strength and weight
 - Kit of Parts (KOP)
 - AndyMark (AM) or VEX Pro
 - Pneumatic
 - air filled tire
 - super defense
 - really big and really strong
 - Slick
 - Custom

KOP



Pneumatic



DIFFERENT TYPES OF WHEELS

- Omni
 - rollers are attached around the wheel
 - perpendicular to axis of rotation
 - can move in both x and y axis
- Mecanum
 - rollers are attached at an angle
 - but attach on a 45 degree angle
 - allows robot to strafe

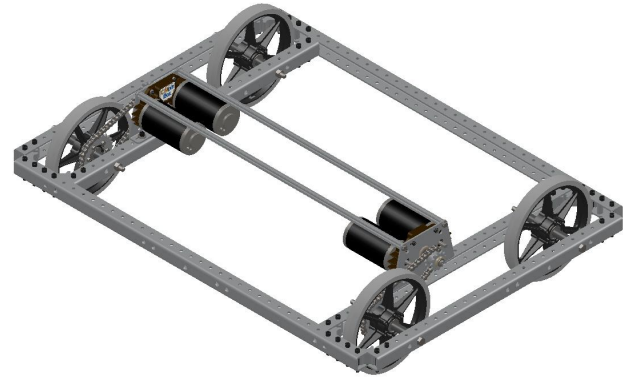
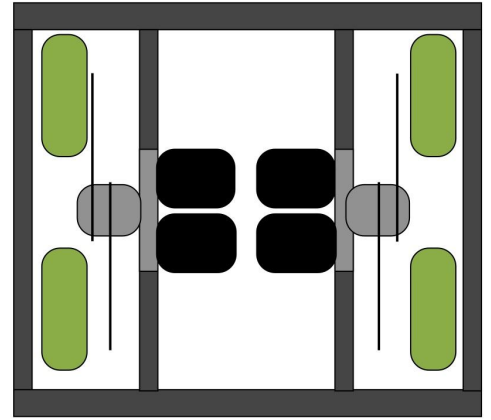


DIFFERENT TYPES OF DRIVE TRAIN

- Tank Drive
 - 4-wheel
 - 6-wheel
 - 8-wheel
- Slide
- Mecanum
- Swerve
- Slide
- Crab
- *Nona (variant of Slide)
- *Butterfly (<http://www.teamneutrino.org/seasons/ultimate-ascent/robot/butterfly/>)

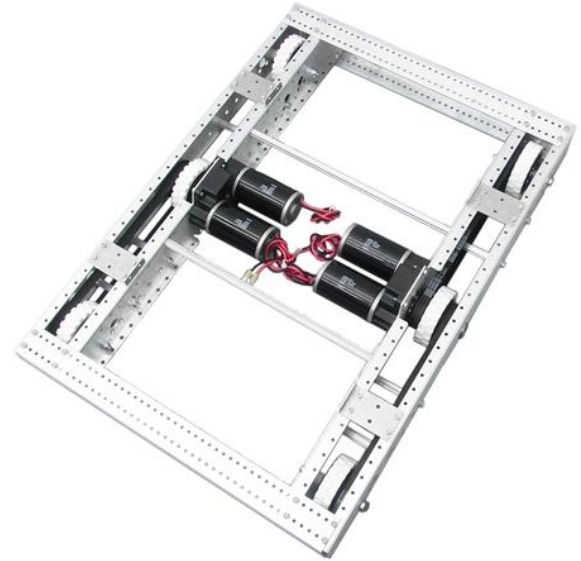
TANK DRIVE (4-WHEEL)

- Simple construction
- 2 wheels on each side of chassis
 - connected to gearbox
 - left and right sides are driven independently
- Pros
 - easy to build
 - potential for high speed
- Cons
 - hard to maneuver
 - greater maneuverability if there are 2 omni wheels in front or back



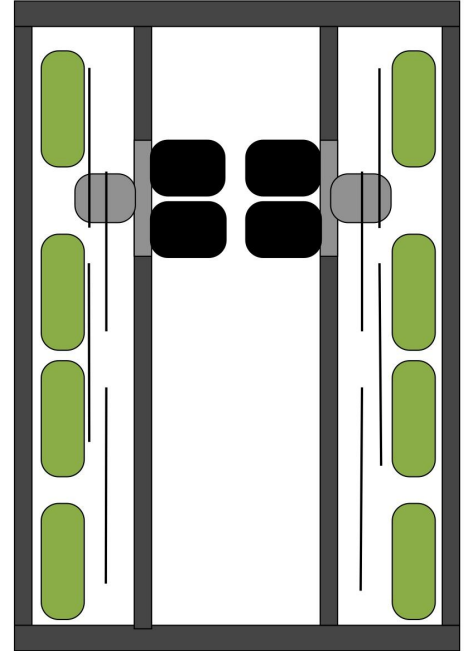
TANK DRIVE (6-WHEEL)

- Similar to 4-wheel
- 3 wheels on each side
- May have a dropped center wheel
 - reduces turn radius and friction
- PROS
 - potential for full pushing force
 - easier to turn
- CONS
 - heavy
 - may lead to problems when climbing obstacles



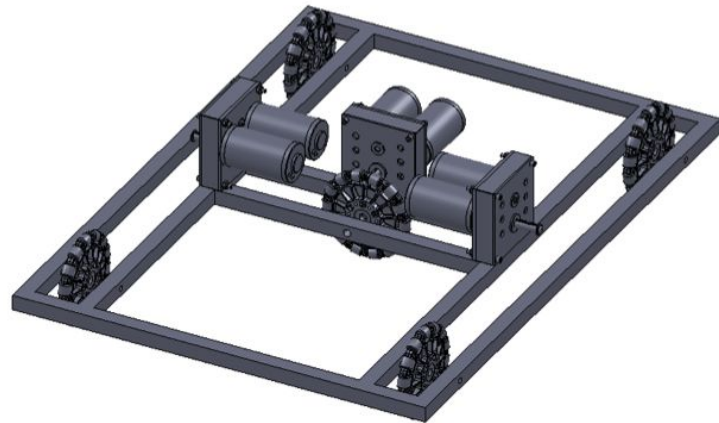
TANK DRIVE (8-WHEEL)

- Made for climbing
- 4 wheels on each side
- Usually uses traction wheels
- Pros
 - able to travel across objects and field elements
 - high pushing capability
- Cons
 - very heavy
 - longer to build



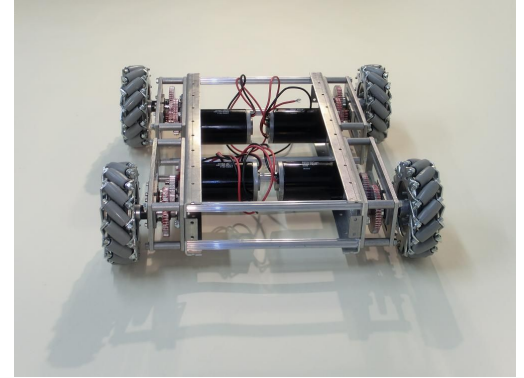
SLIDE

- Similar to tank drive
 - an extra wheel(s) perpendicular to the rest
- *MUST use omni wheels
- Pros
 - easy/cheap to build + design
 - agile
- Cons
 - no potential for high pushing force
 - extra wheel(s), motor(s), and gearbox(es) are necessary for robot to move sideways



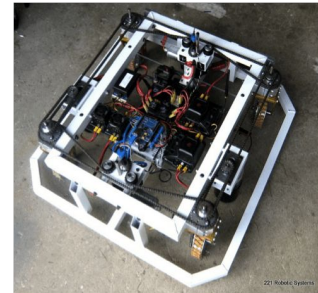
MECANUM

- Each wheel must be driven independently
- Must use 4 mecanum wheels
- Strengths:
 - Fairly easy to design and build
 - Agile
- Weaknesses:
 - No potential for high pushing force
 - Challenging to program and learn to drive well
 - Requires extra gearboxes
 - Wheels are \$\$\$



SWERVE

- Wheels modules rotate on the vertical axis to control direction
- Typically 4 traction wheels
- Strengths:
 - Potential for high speed and/or pushing force
 - Agile
- Weaknesses:
 - Very complex and expensive to design, build and program
 - Extra motors required to be able to rotate robot frame
- Different Steering:
 - Four modules steered together = crab drive
 - Front modules steered together, back modules steered together
 - Right modules steered together, left modules steered together



SOURCES

- <http://www.simbotics.org/resources/mobility/drivetrain-selection>
- <http://www.simbotics.org/resources/mobility/omnidirectional-drive>
- <http://curriculum.vexrobotics.com/curriculum/drivetrain-design/drivetrain-terminology>