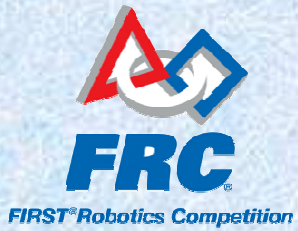
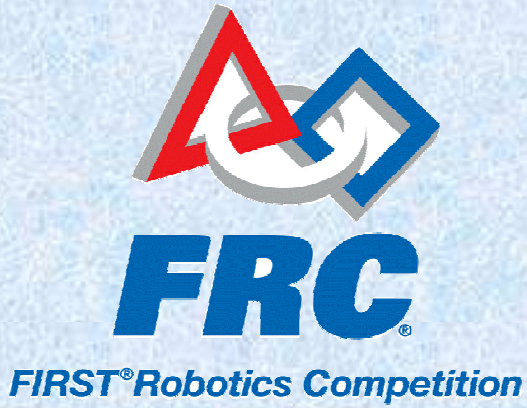




FRC Steering

Ralph Lambert, FRC 1094

rivercityrobots@hotmail.com

636-542-0533

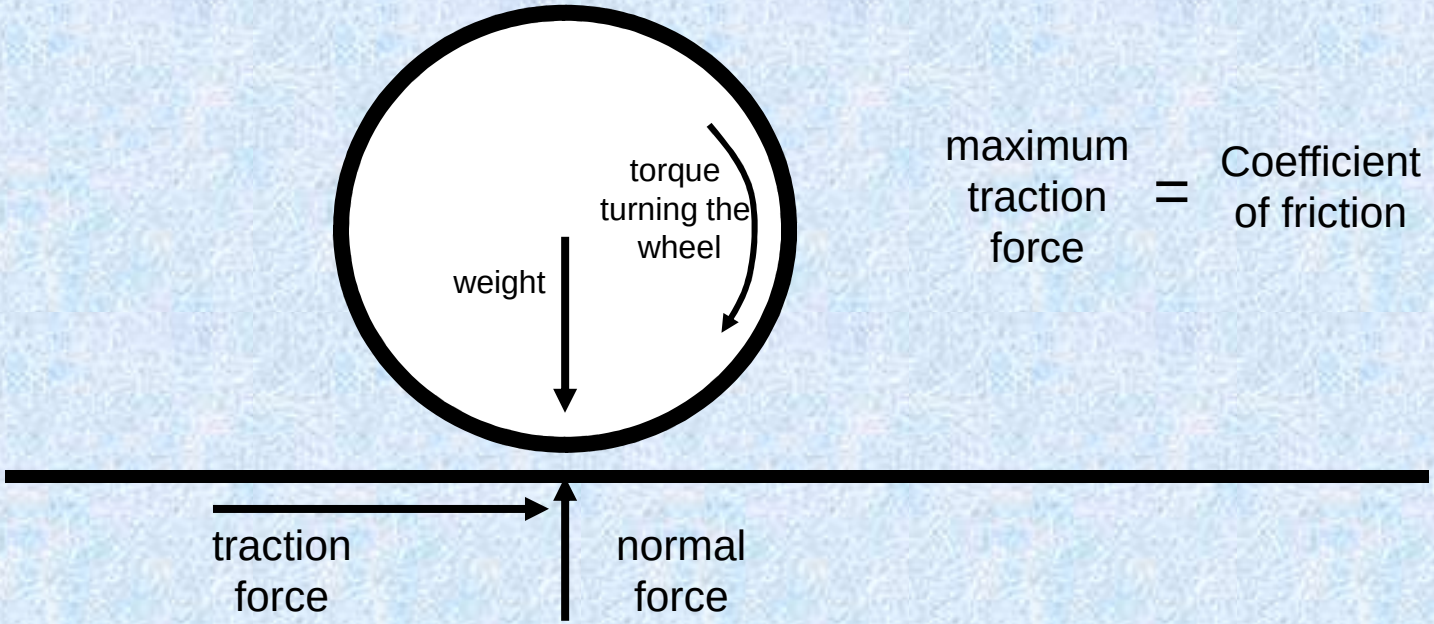
Steering - Considerations

- Pushing Force
- Position Holding
- Driving Straight
- Accurate Turning
- Axis of Rotation
- Degrees of Freedom
- Maintainability
- Complexity
- Risk
- Weight
- Cost
- Field Terrain
- Ease of Control
  - Controls Laws and Controllers

Robot Steering Factors

- Wheel Types
- Tread Types (Coefficient of Friction, μ)
- Number of Wheels
- Mounting Options
  - Orientation
  - Fixed vs Moveable

Pushing (Traction) Force



maximum traction force = Coefficient of friction X Normal Force (Weight)

Coefficient of Friction (COF, μ)

- Interaction of Playing Surface & Wheel Tread
  - Material - Soft or Sticky vs Hard or Slick
  - Shape – Smooth or Rough

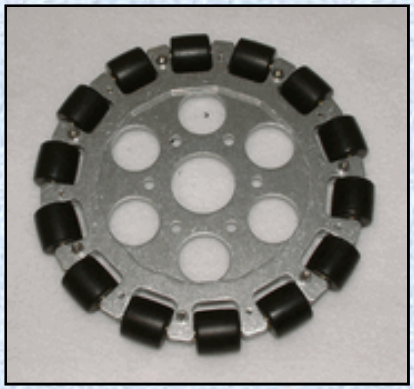
Wheel/Tread Types

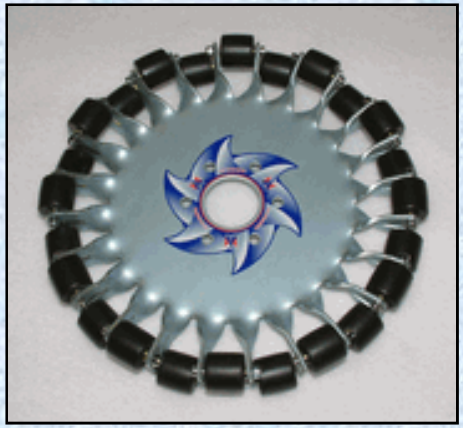
- High Traction
- Slick
- Casters
- Omni-Wheels
- Mecanum
- Tank Treads

AndyMark Wheels

Plaction

AndyMark Omniwheels





AndyMark Mecanum

Kornylak Wheels

Transwheel®

Omniwheel

Mini-Wheel®

Palletflo®

Pallet Flow

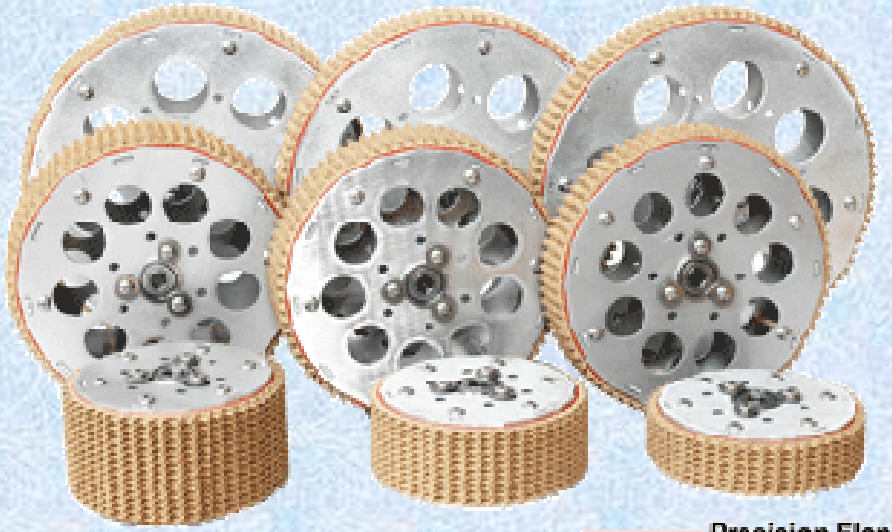
Superwheel®

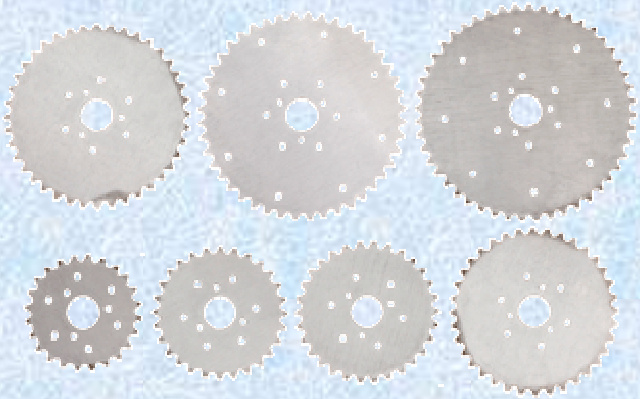
6" Mecanum Wheel

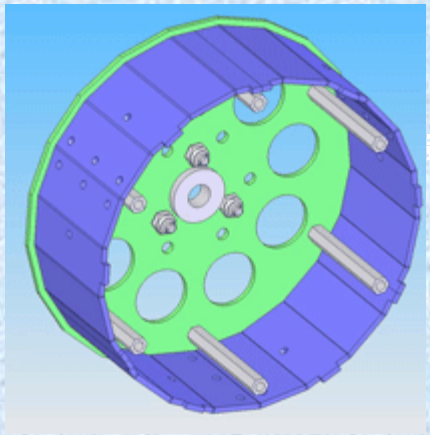
Rotacaster

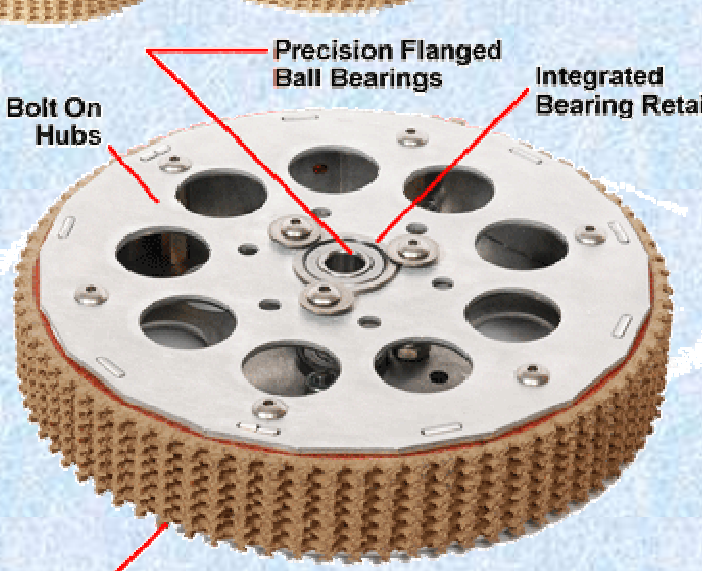
Heavy-Duty Mecanum Wheel

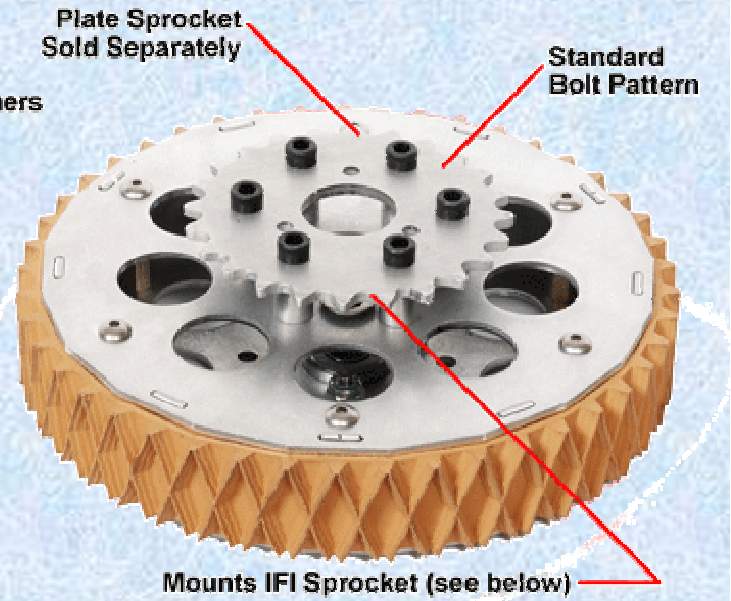
Vexrobotics.com/FRC
Robot Traction Wheels





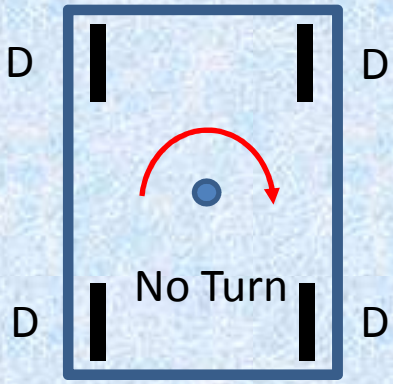




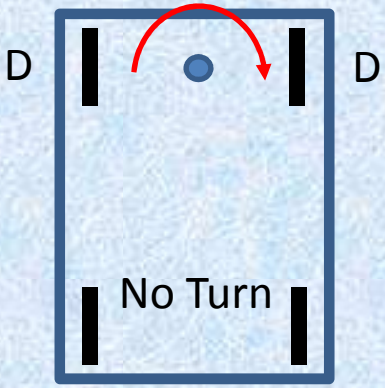


Skyway Wheels

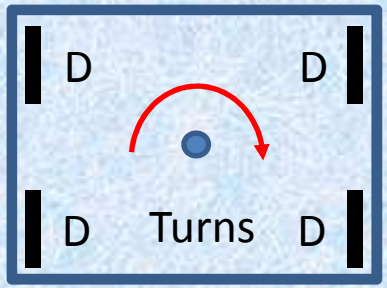
Turning with Simple 4Wheel System

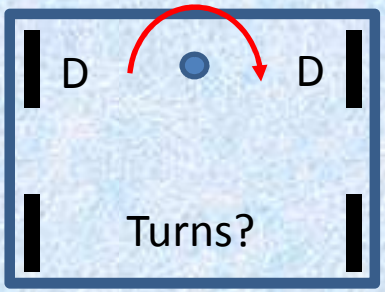


4 Wheel Drive



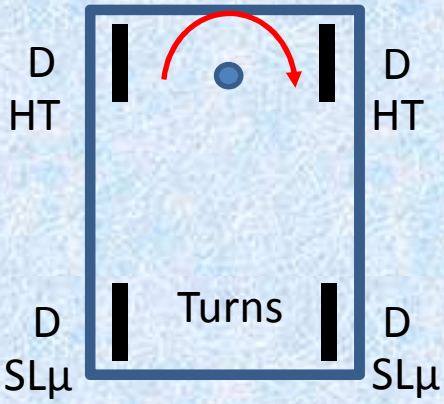
2 Wheel Drive



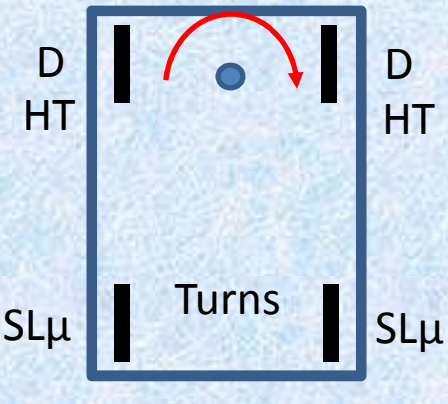


- Four Fixed High Traction (High μ)Wheels
- Symmetrical Wheel Motion for Forward and Back
- Differential Wheel Motion for Turns
- Ability to Turn Depends on Torque Created by Wheels Rotating Longitudinally vs Sliding Laterally

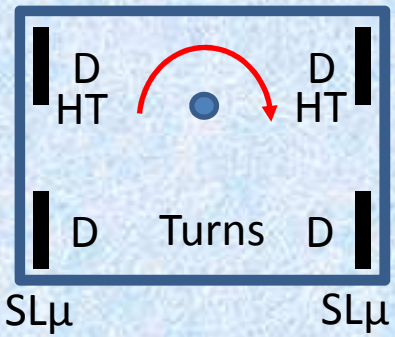
Turning with Simple 4Wheel System

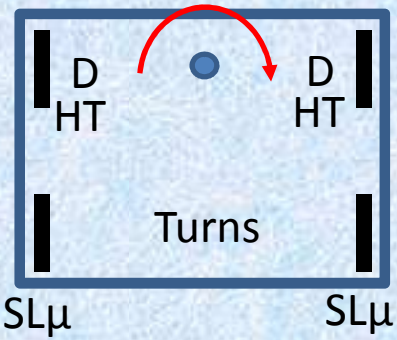


4 Wheel Drive



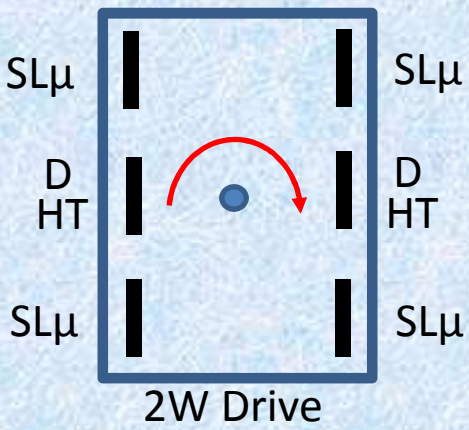
2 Wheel Drive

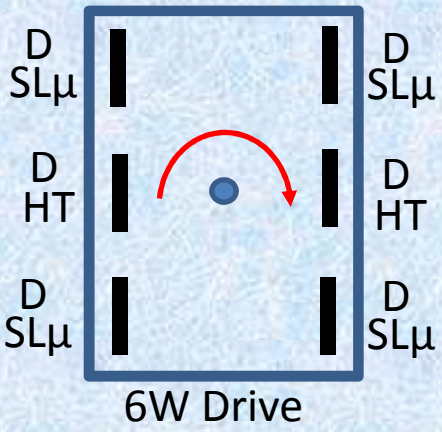


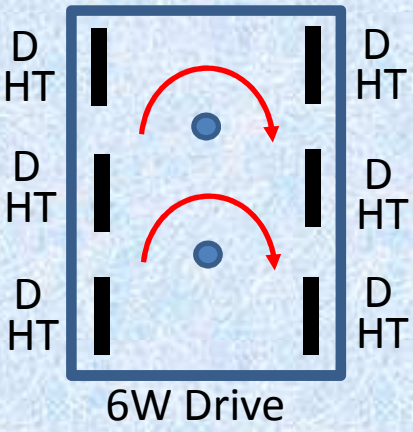


- Two Fixed High Traction (HT) Wheels & Two Wheels with Small Lateral μ (SLμ)
- Symmetrical Wheel Motion for Forward and Back
- Differential Wheel Motion for Turns
- Ability to Turn Depends on Torque Created by Wheels Rotating Longitudinally vs Sliding Laterally

Turning with Simple 6Wheel System

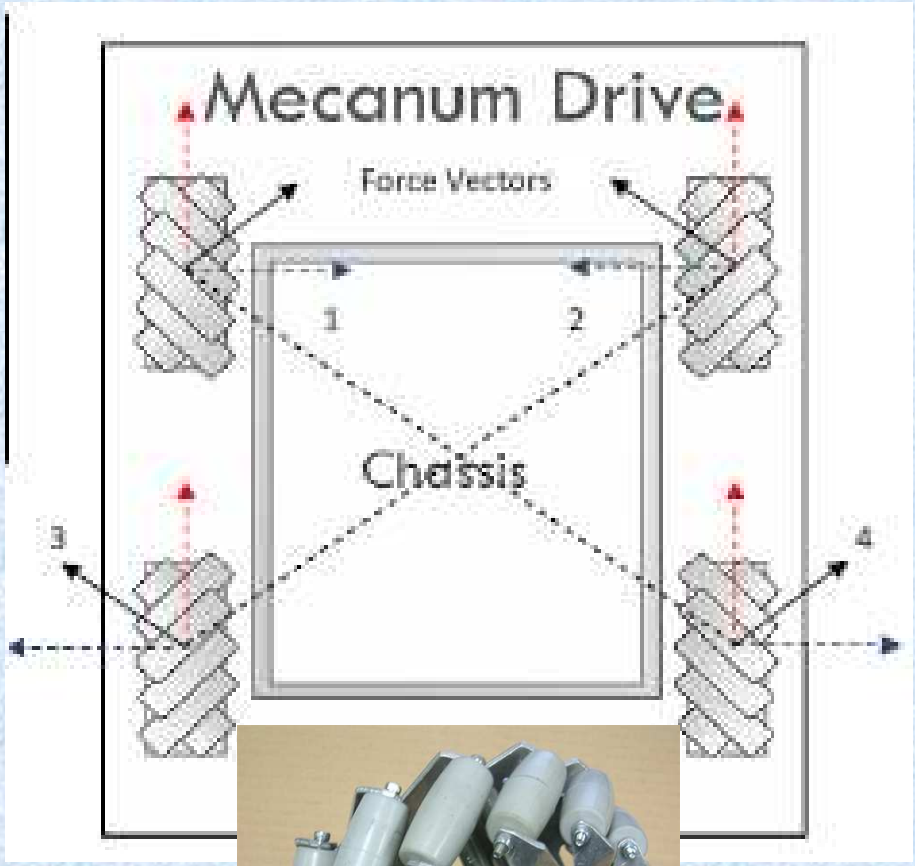






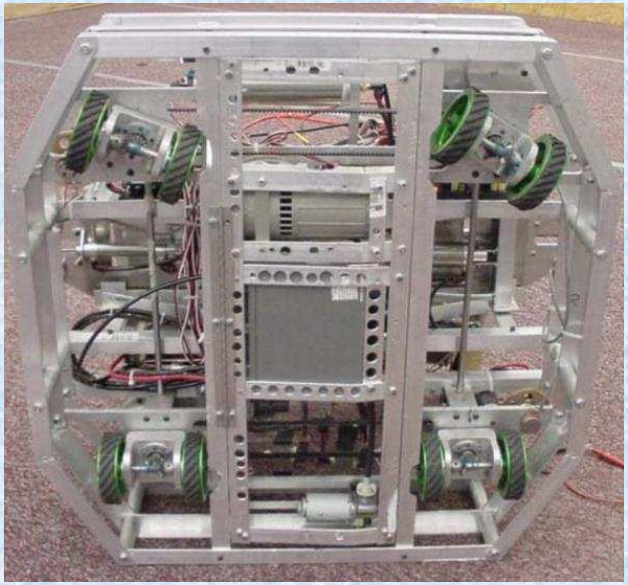
- Center HT Wheels ≈1/8” Lower Than Corner Wheels
- Can Use SLμ or HT Wheel on Corners
- Wheel Base for Turning Shortened
- Differential Wheel Motion for Turns

Movement with Mecanum Wheel System

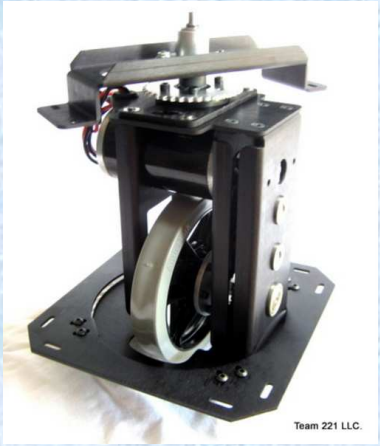


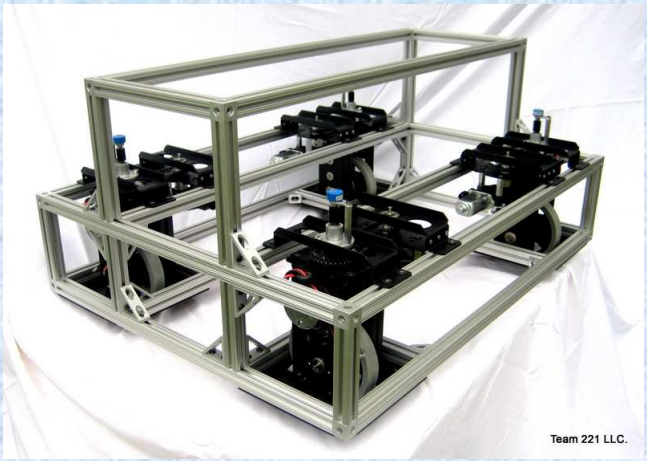
- Wheel Have Rollers Mounted at 45 Deg Angle
- Wheels Are Independently Driven
- Can Drive Straight, Rotate, Move Laterally and Any Combination Thereof
- Traction Reduced

Swerve/Crab Drive

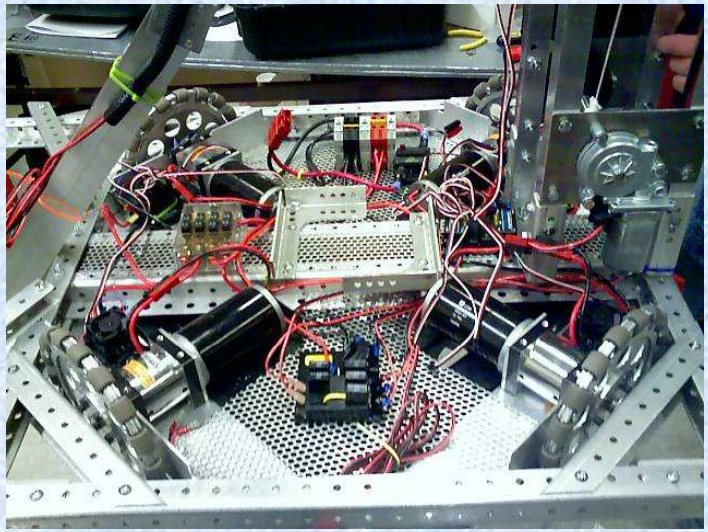


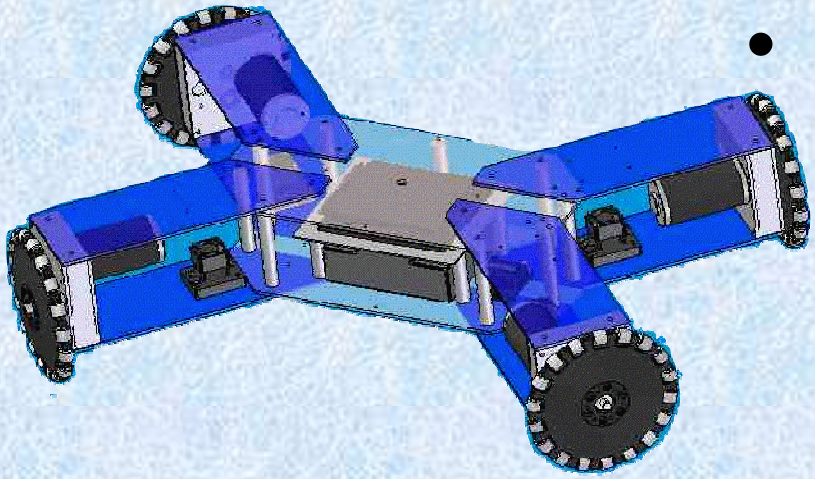
- Angle and Speed of Each Wheel Controllable
- Can Move in Any Direction Independent of Chassis Orientation
- High Traction





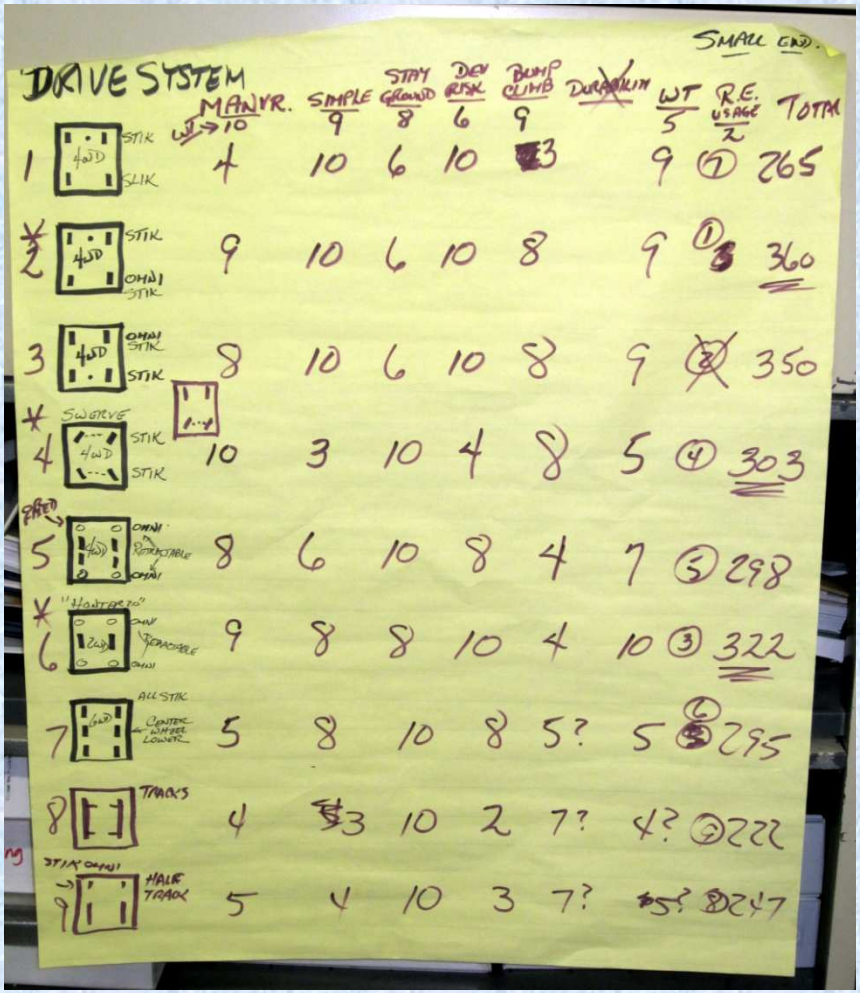
Holonomic Drive





- Four High Traction Omni Wheels Mounted Orthogonally on Chassis
- Each Wheel Independently Driven
- Can Move in Any Direction Independent of Chassis Orientation

Objectively Evaluate Alternatives Designs



- Weighted Objective Table, Evaluation Matrix, Rubric
- List Design Options
- List Evaluation Criteria
- Assign Weights to Criteria
- Estimate Score for Each Element in Matrix
- Calculate Weighted Score