







## Holonomic, Non-holonomic and Redundant Robots

- Holonomic:
  - The number of controllable DOF (CDOF) is equal to total number of DOF (TDOF).
  - i.e. CDOF = TDOF
  - Non-holonomic:
  - CDOF < TDOF</p>
  - Most robots are non-holonomic
- Redundant:
  - CDOF > TDOF
  - More than one way to move the parts
- What about these?
  - Elevators, cars, airplanes, human arms

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## Function of gears

- What can gears do?
  - Change planes of rotation
  - Transfer motion
  - Increase/decrease speed (i.e., gearing up and gearing down)

ex: a car engine revs at 6000rpm, without gearing, a 27  $^{\prime\prime}$  tire will be moving at about 480mph.

- Increase/decrease power Torque
- Change direction. Idler gear only changes directions, does not affect the gear ratio (speed)

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