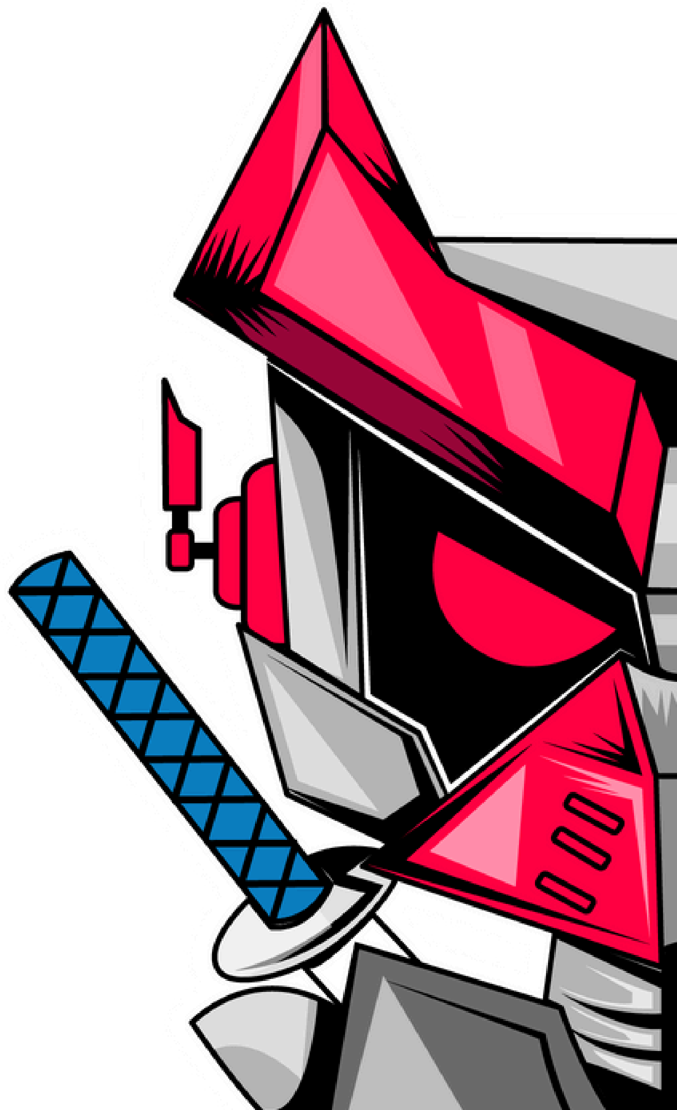
25915

BLADE
FORCE



TECHNO VILLE

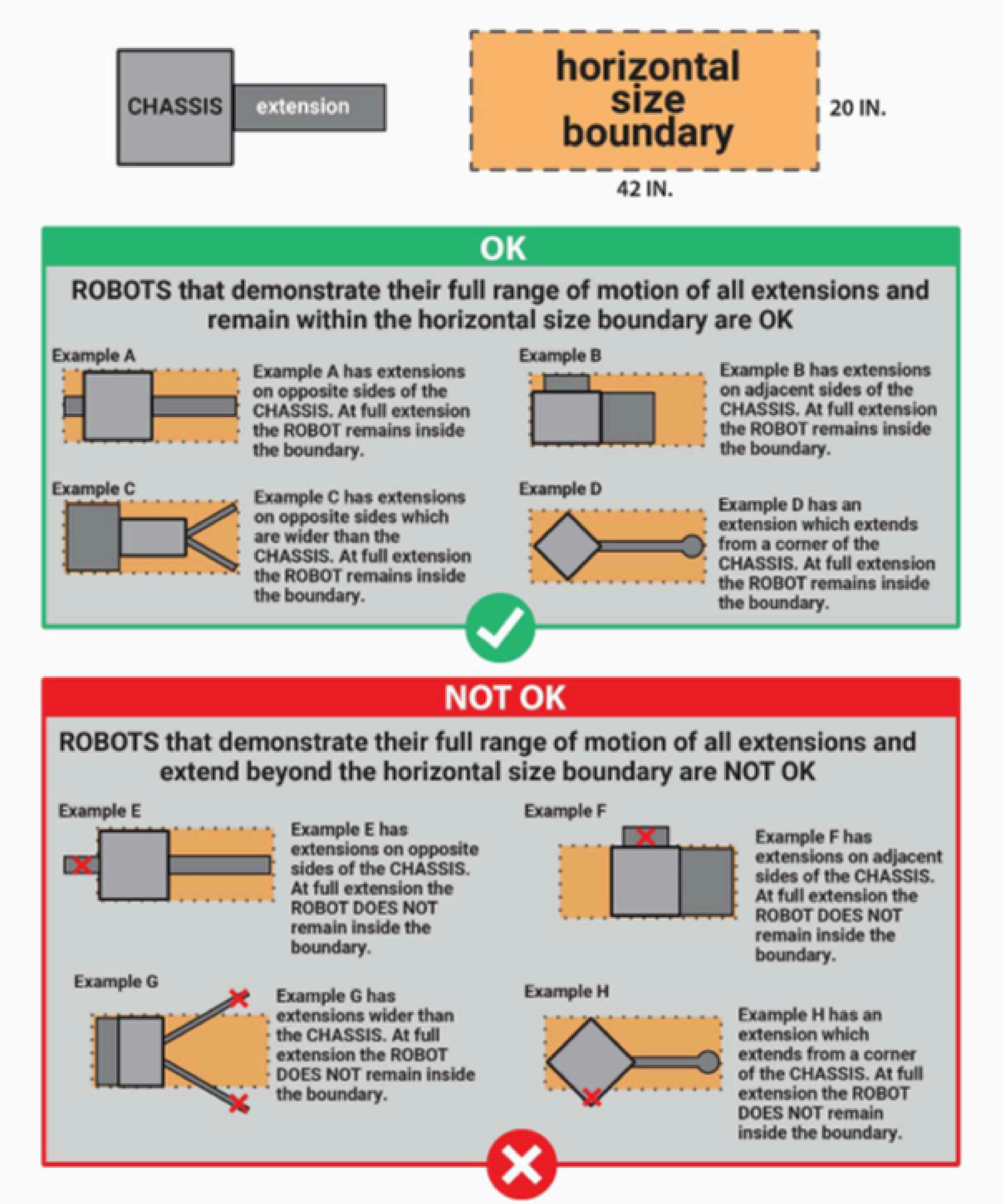
FIRST TECH CHALLENGE
12 – 18 AÑOS
INTRODUCCION

The rule numbering method indicates the section, subsection, and position of the rule within that subsection. The letter indicates the section in which the rule is published.

- I for Section 3 Competition Eligibility and Inspection (I)
- E for Section 5 Event Rules (E)
- A for Section 6 Awards (A)
- G for Section 11 Game Rules (G)
- R for Section 12 ROBOT Construction Rules (R)
- T for Section 13 Tournament (T)
- L for Section 14 League Play Tournaments (L)
- C for Section 15 FIRST Championship (C)

DIMENSIONES

REV Hub Not Included



DIMENSIONES

Figure 12-2: Expansion Limit Examples

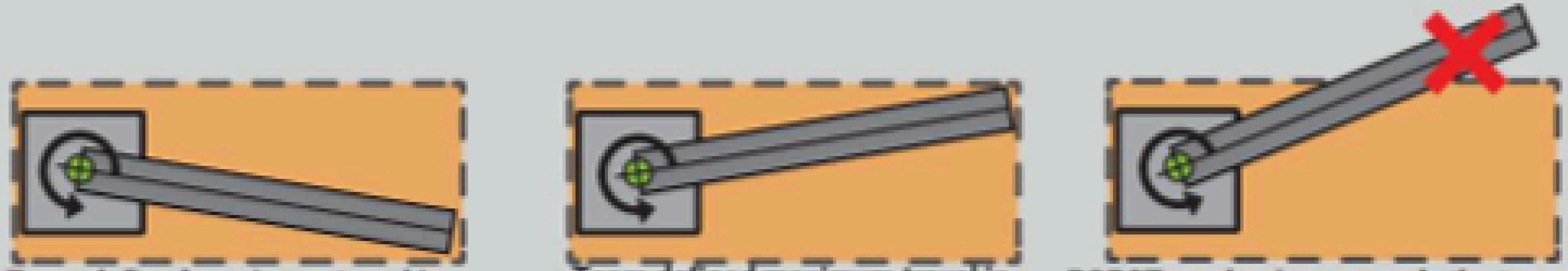
CAUTION

ROBOTS with mechanisms that move relative to the CHASSIS should be careful to keep within the horizontal size boundary.

Example I - "Turret Mechanism"

ROBOTS with an arm on a pivot that rotates in the horizontal plane may violate this rule if the arm rotation extends the mechanism beyond the horizontal size boundary even if the overall size of the robot could still fit within a 42 x 20 in. box. ROBOTS with mechanisms capable of horizontal rotation should ensure rotation is restricted to remain inside the boundary defined during inspection at all times during MATCH play.

Position A | **Position B** | **Position C**



Position A: Team defined maximum travel in clockwise direction as viewed from top

Position B: Team defined maximum travel in counter-clockwise direction as viewed from top

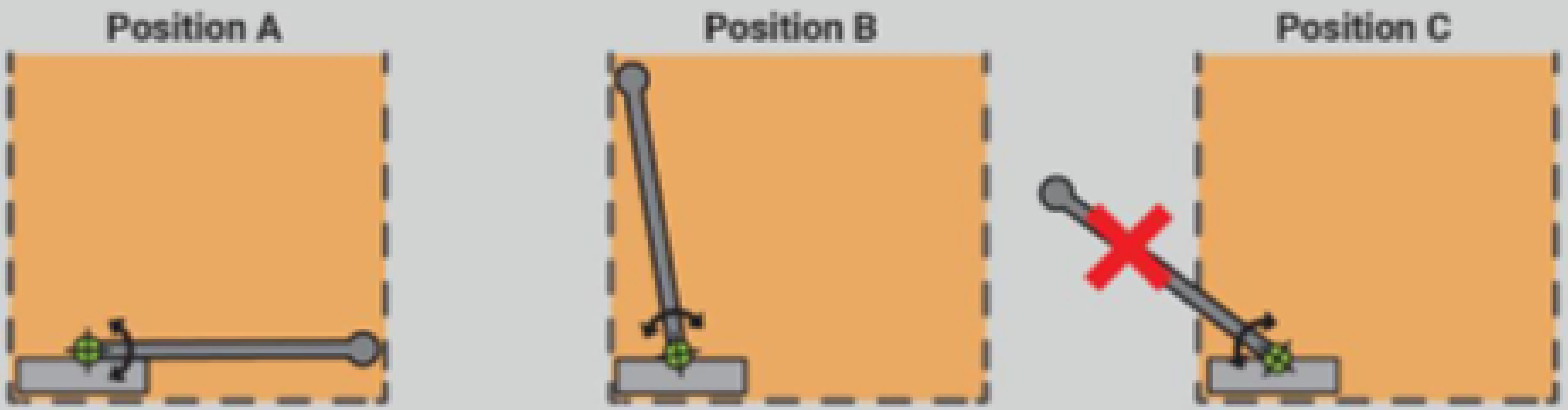
Position C: ROBOT mechanism exceeds the team defined maximum allowable travel and extends outside the boundary. The boundary does not move with the mechanism therefore this would be a violation.

DIMENSIONES

violation.

Example J - "Pivot Arm Mechanism"

ROBOTS with an arm on a pivot that rotates in the vertical plane may violate this rule if the arm rotation extends the mechanism beyond the horizontal size boundary even if the overall size of the robot could still fit within a 42 x 20 in. box. ROBOTS with mechanisms capable of vertical rotation should ensure rotation is restricted to remain inside the boundary defined during inspection at all times during MATCH play.



Team defined maximum travel in clockwise direction as viewed from side

Team defined maximum travel in counter-clockwise direction as viewed from side

ROBOT mechanism exceeds the team defined maximum allowable travel and extends outside the boundary. The boundary does not move with the mechanism therefore this would be a violation.

Materiales

Many rules in this section reference Commercial-Off-The-Shelf (COTS) items.

R306 *COTS MECHANISMS have limits. COTS MAJOR MECHANISMS (as defined in [I###]) purposefully designed to complete a game task are prohibited.

Allowed exceptions to this rule are:

A. COTS drive chassis, provided none of the individual parts violate any other rules

R307 *COTS should be single DoF. COTS COMPONENTS and MECHANISMS must not exceed a single degree of mechanical freedom (DoF). Examples of allowed COTS single degree of freedom MECHANISMS and COMPONENTS are as follows:

Allowed exceptions to this rule are:

H. ratcheting devices (wrenches, bearings, etc.),
I. Holonomic wheels (omni or mecanum), and
J. dead-wheel odometry kits

Prohibidos:

- Materiales de origen animal
- Vidrio (materiales frágiles)
- Electroimanes
- Materiales que puedan esparcirse
- Fluidos a presión

Permisiones y Restricciones

12.5 Motors & Actuators

R501 ***Allowable motors.** The only allowed motor actuators are:

Table 12-1: Motor allowances

Motor Name	Part Numbers Available	Notes
AndyMark NeveRest 12V DC	am-3104, am-3104b	
AndyMark NeveRest Hex 12V DC	am-3104c	
goBILDA Yellow Jacket 520x Series 12V DC	5201-0002-0026, etc.	5201, 5202, 5203, and 5204 series
Modern Robotics / MATRIX 12V DC	5000-0002-0001	
REV Robotics HD Hex 12V DC	REV-41-1291	
REV Robotics Core Hex 12V DC	REV-41-1300	
Studica Robotics Maverick 12V DC	75001	
TETRIX MAX 12V DC	739530, 39530	Discontinued
TETRIX MAX TorqueNADO 12V DC	W44260	
VEX EDR 393	276-2177	Counts as a servo for R503
Factory installed vibration and autofocus motors resident in COTS computing devices (e.g., rumble motor in a smartphone); can only be used as part of the device and cannot be removed and/or repurposed. These motors do not count toward the limit in R503.		
Motors integral to a COTS sensor (e.g., LIDAR, scanning sonar), provided the device is not modified except to facilitate mounting. These motors do not count toward the limit in R503.		

R503 ***ROBOTS are limited to a total of 8 motors and 12 servos.** A ROBOT may not have more than 8 motors and 12 servos from the allowable actuator lists per R501 and R502 for all MECHANISMS used in all configurations, with the following exceptions:

R504 ***Do not modify actuators unless explicitly allowed.** The integral mechanical and electrical system of any motor or servo must not be modified. Motors and servos used on the ROBOT shall not be modified in any way, except as follows:

R704 ***Use only legal Android smartphone devices.** Android smartphone devices, if used, must minimally be running the Android 7 (Nougat) operating system. The following table lists the legal Android smartphones:

Table 12-10: Legal Android Smartphones

Phone	Notes
Motorola Moto G4 Play	Sometimes noted as "4th Generation"
Motorola Moto G5	
Motorola Moto G5 Plus	
Motorola Moto E4	USA versions only, includes SKUs XT1765, XT1765PP, XT1766, and XT1767
Motorola Moto E5	XT1920
Motorola Moto E5 Play	XT1921

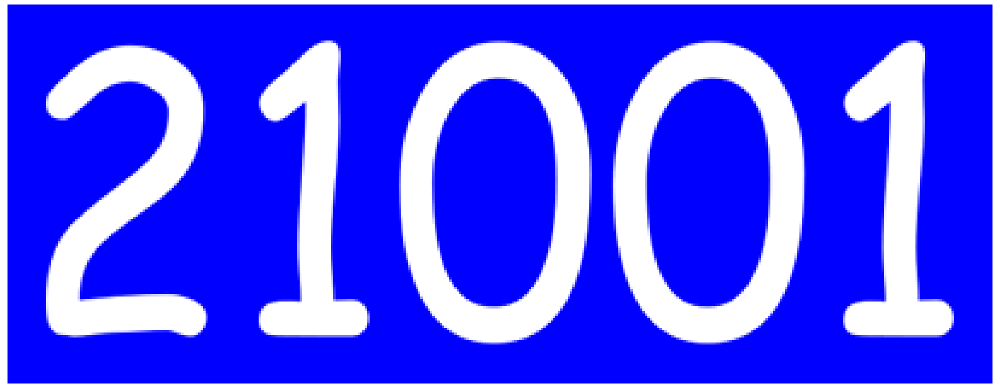
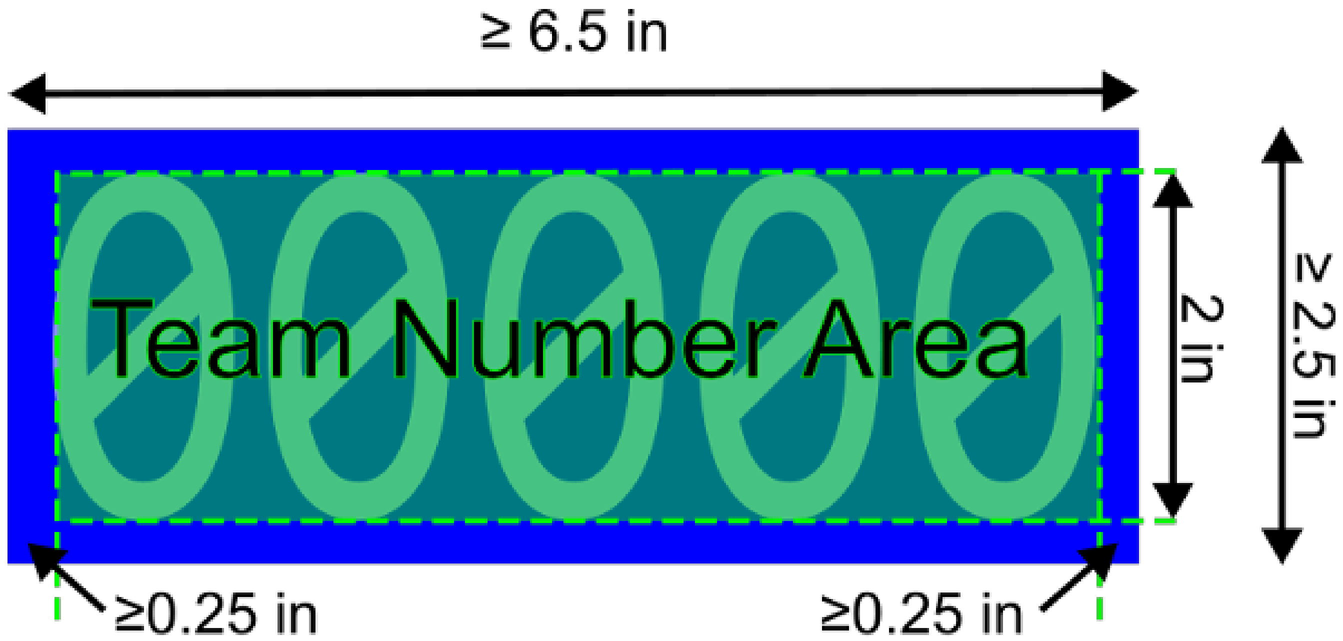
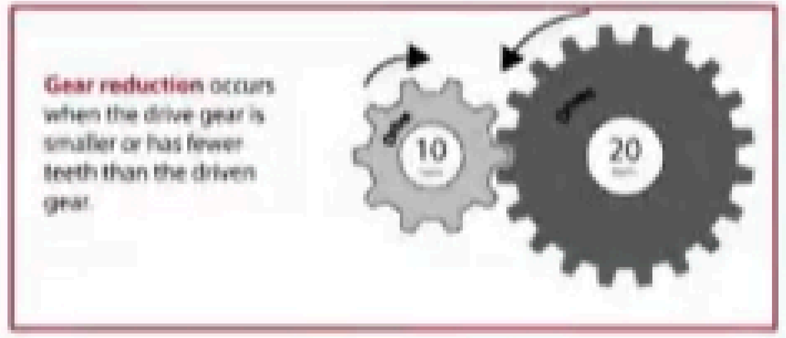


Figure 12-7: Team number orientation examples for team 1355 playing on the blue ALLIANCE

Figure 12-3: Team Number ROBOT SIGN Sizing

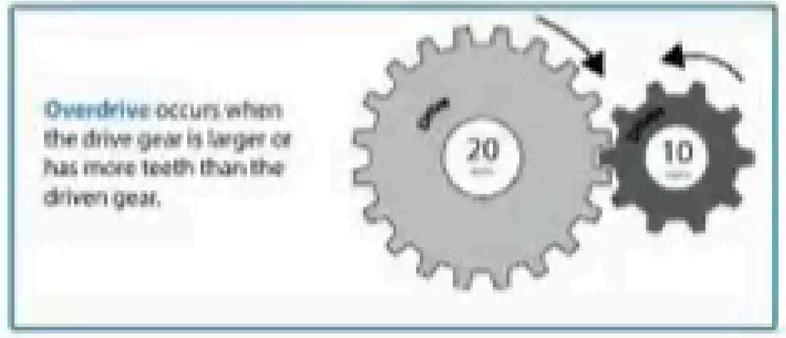


Reducciones



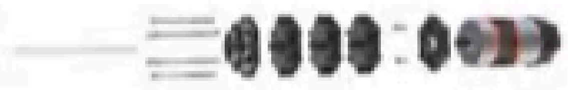
↑ Torque
↓ Velocidad

2:1



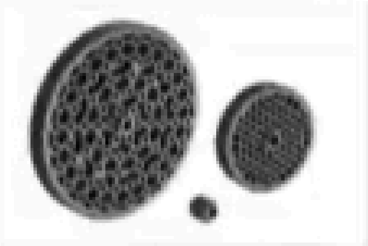
↓ Torque
↑ Velocidad

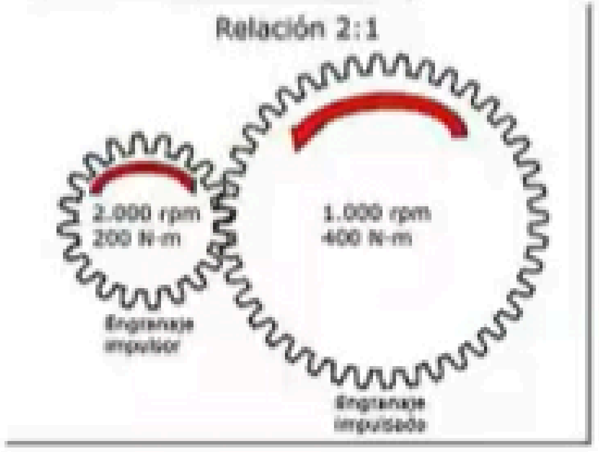
1:2



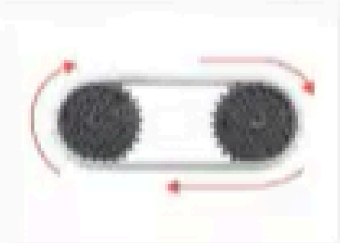
Rotaciones de entrada : rotaciones de salida

Engranajes

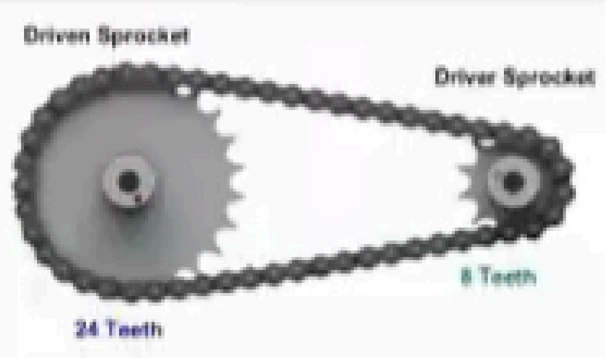




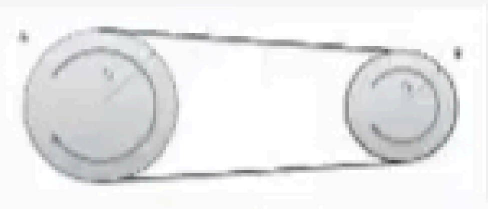
Cadena



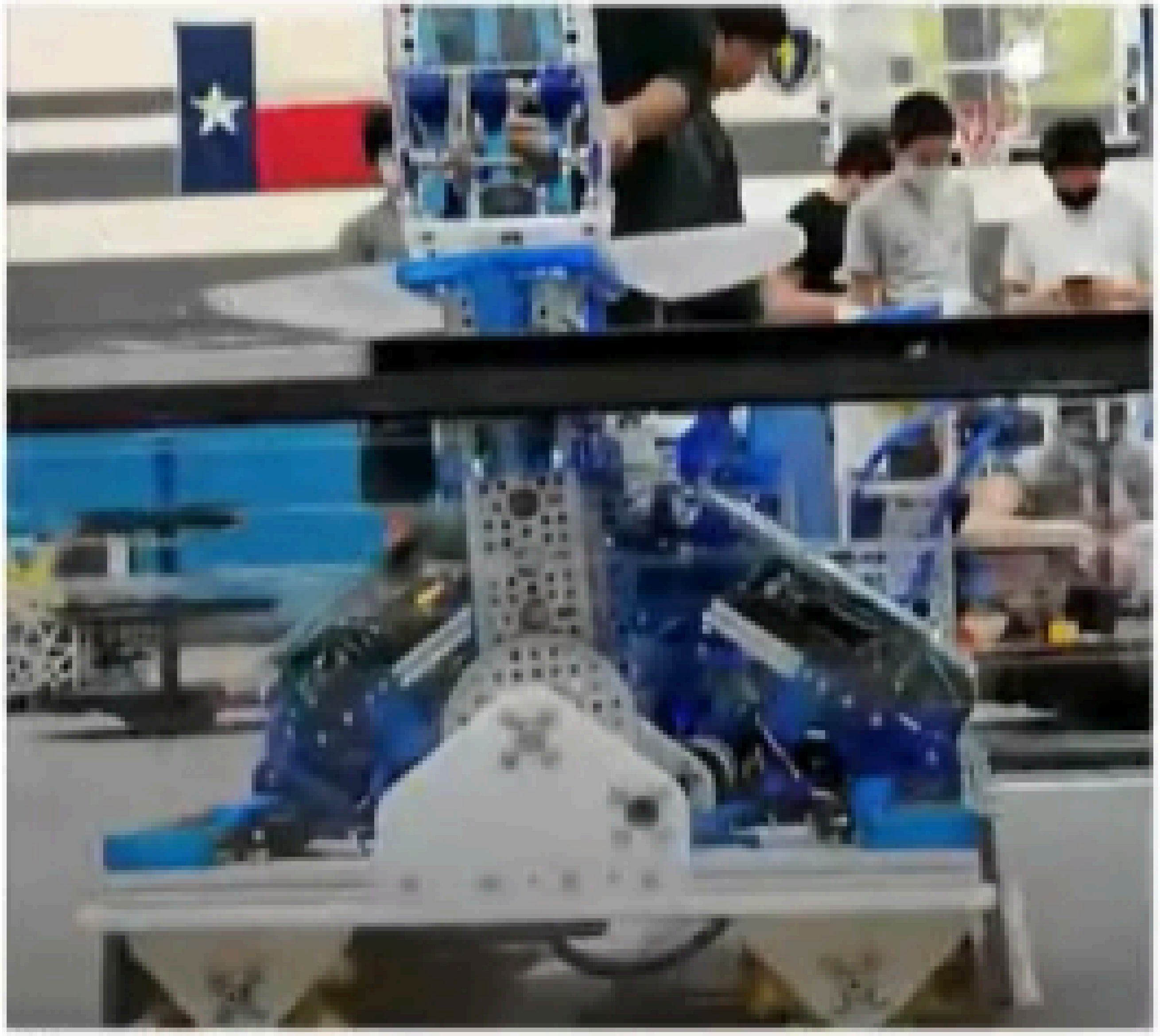
3:1



Banda



Articulaciones



Tipos de chasis

Tanque

Tracción ↑
Velocidad ↑
Simplicidad ↑
Omnidireccional ✘
Económico ✔

Mecanum

Tracción ↓
Velocidad ↑
Simplicidad ↑
Omnidireccional ✔
Costoso ✘

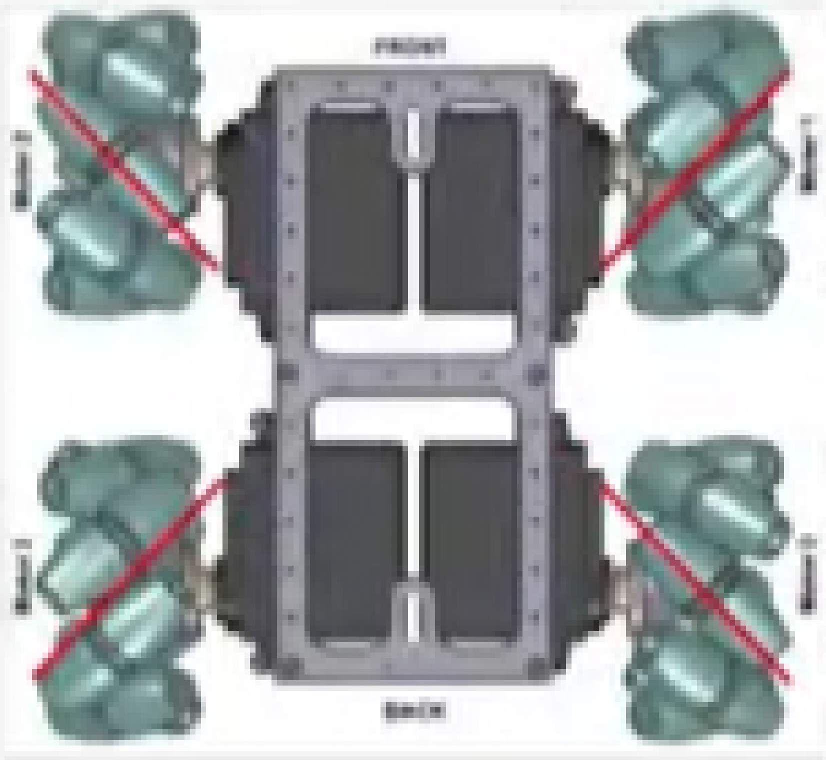
Xdrive

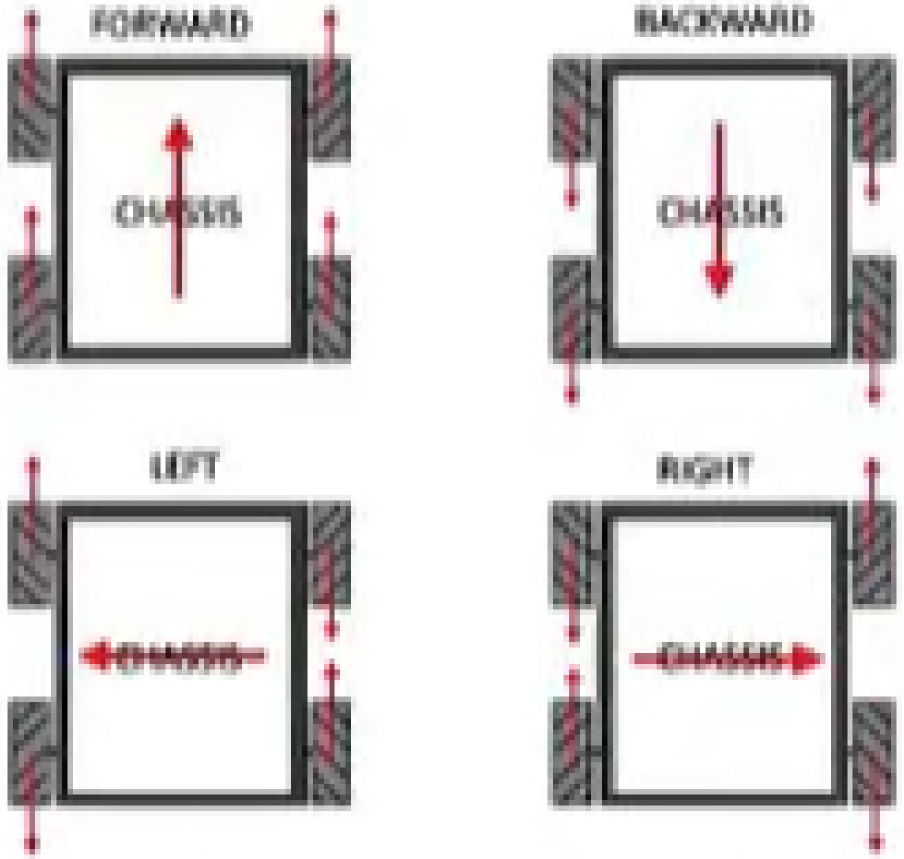
Tracción ↓
Velocidad ↓
Simplicidad -
Omnidireccional ✔
Económico ✔

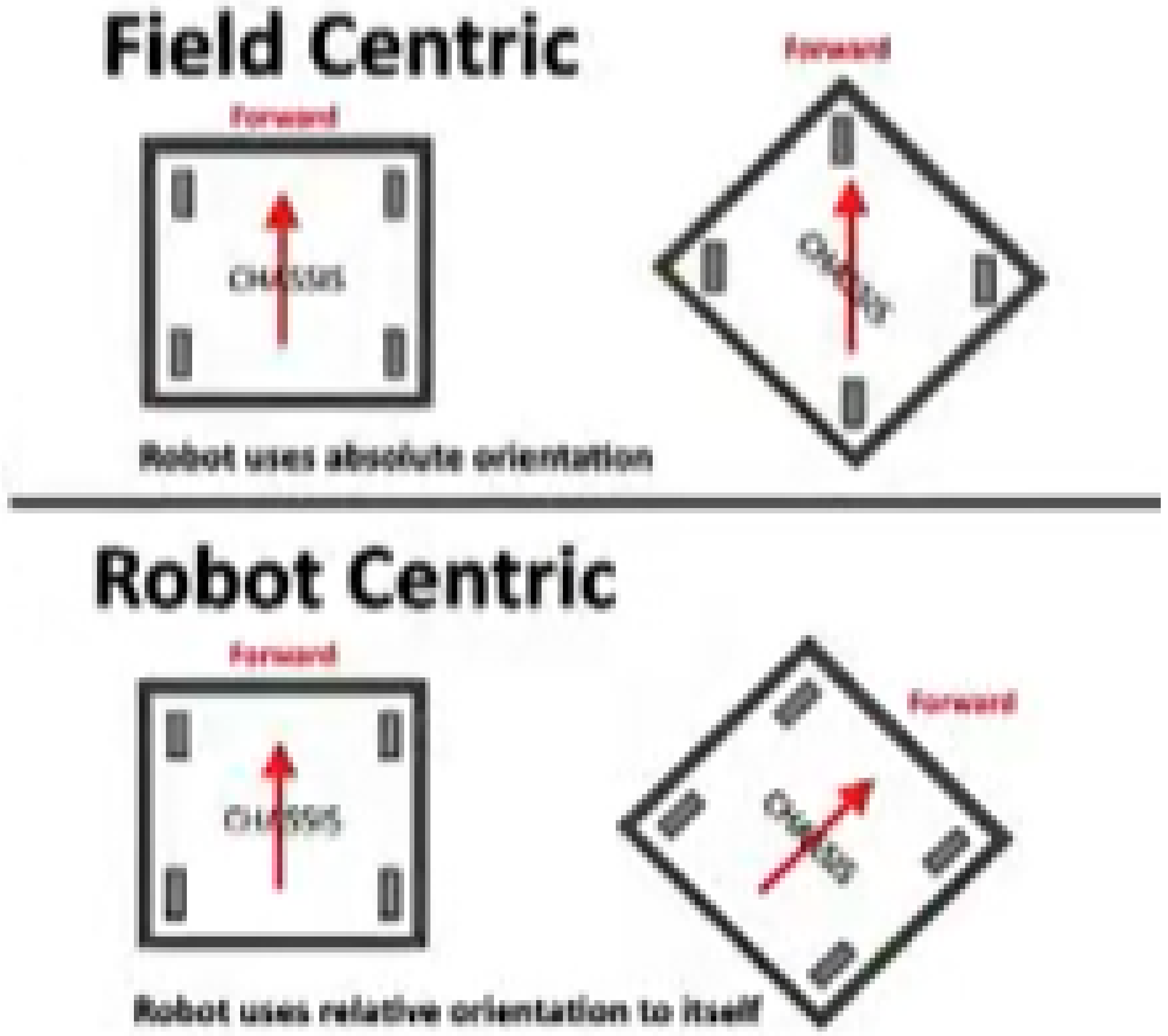
Swerve

Tracción ↑
Velocidad ↑
Simplicidad ↓
Omnidireccional ✔
Muy costoso ✘✘

Mecanum

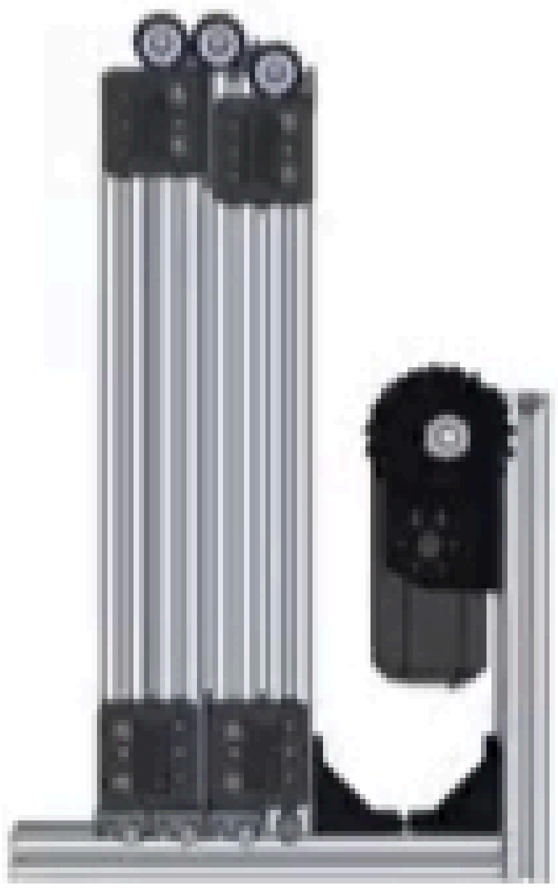

FRONT
BACK

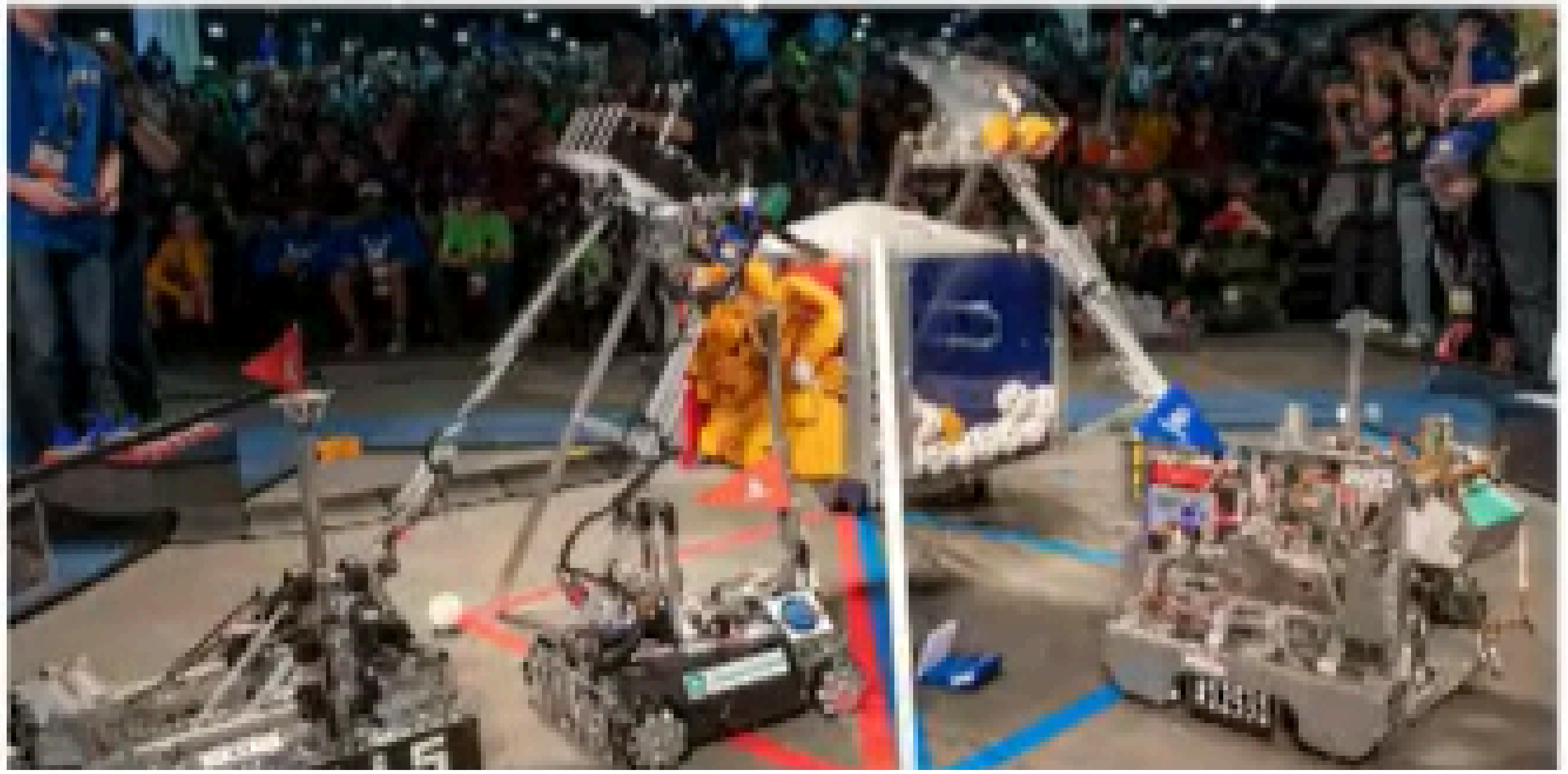

FORWARD
CHASSIS
BACKWARD
CHASSIS
LEFT
CHASSIS
RIGHT
CHASSIS


Field Centric
Forward
CHASSIS
Forward
CHASSIS
Robot uses absolute orientation
Robot Centric
Forward
CHASSIS
Forward
CHASSIS
Robot uses relative orientation to itself

Actuadores lineales

Movimiento rotacional → Movimiento lineal

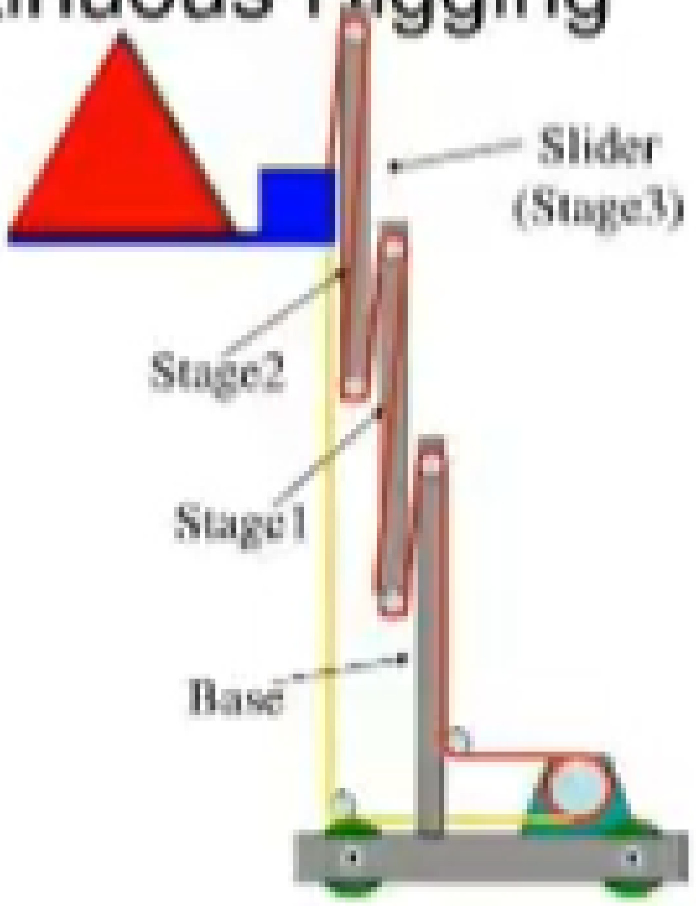




Encordado

Extension: Continuous Rigging

- Cable moves at the same speed for up and down
- Intermediate sections sometimes jam
- Low cable tension
- More complex cable routing
- The final stage moves up first and down last

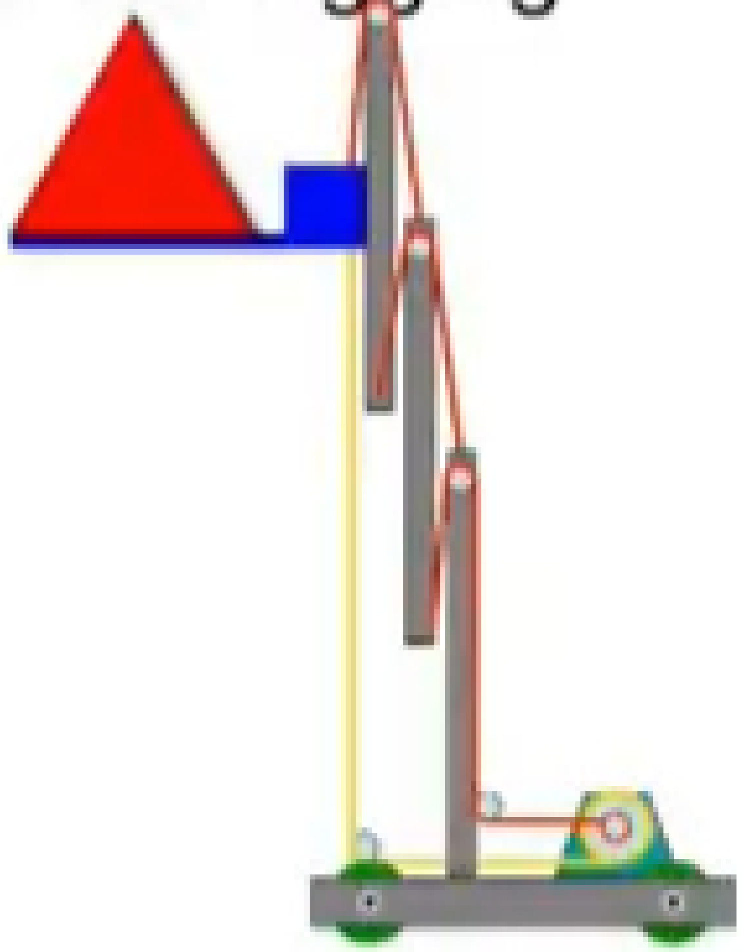


J.M. Gabrielse

Extension: Cascade Rigging

- Up-going and Down-going Cables Have Different Speeds
- Different Cable Speeds Can be Handled with Different Drum Diameters or Multiple Pulleys
- Intermediate Sections Don't Jam
- Much More Tension on the lower stage cables
  - Needs lower gearing to deal with higher forces

- I do not prefer this one!



J.M. Gabrielse

Figure 9-10: BASKETS

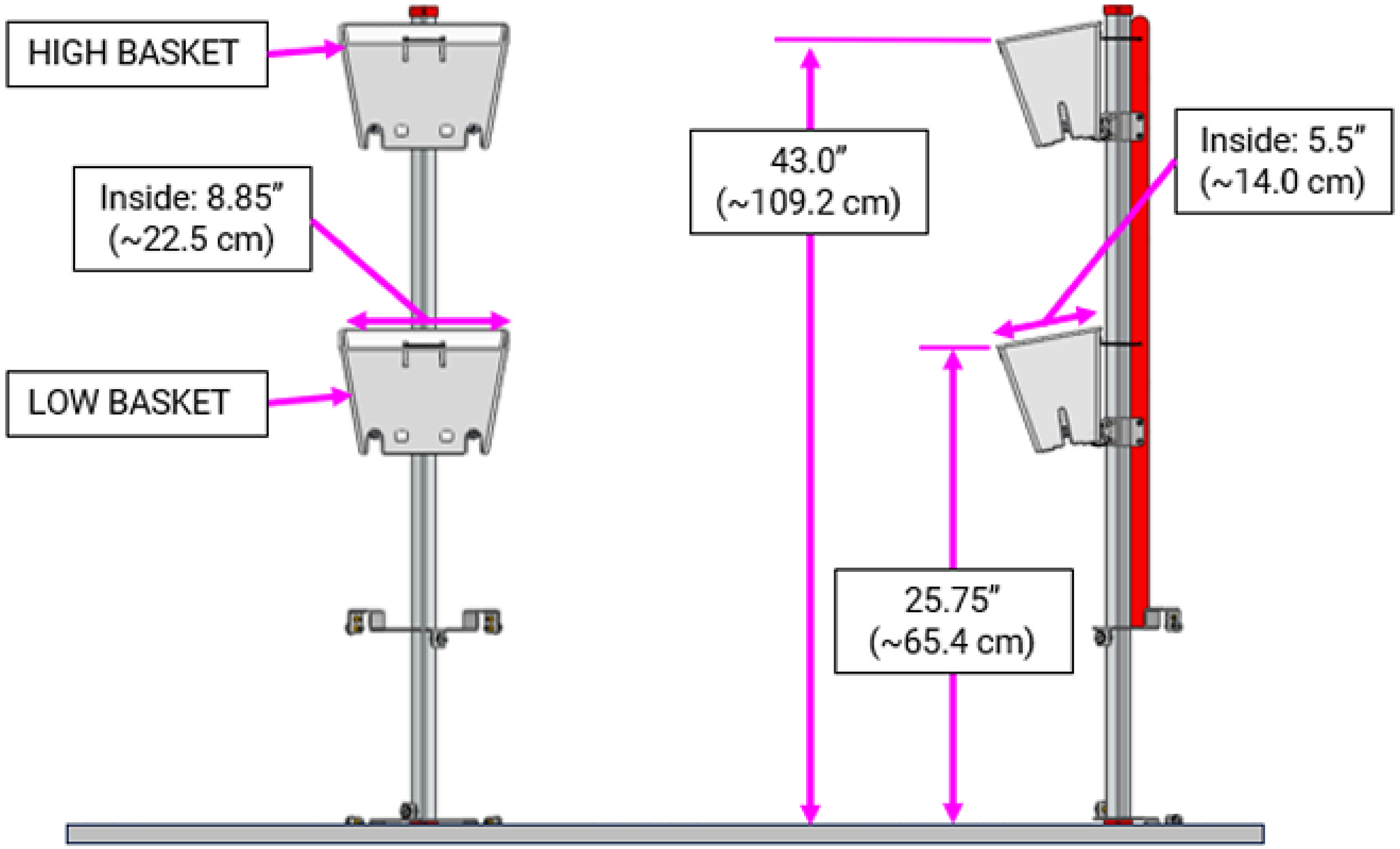


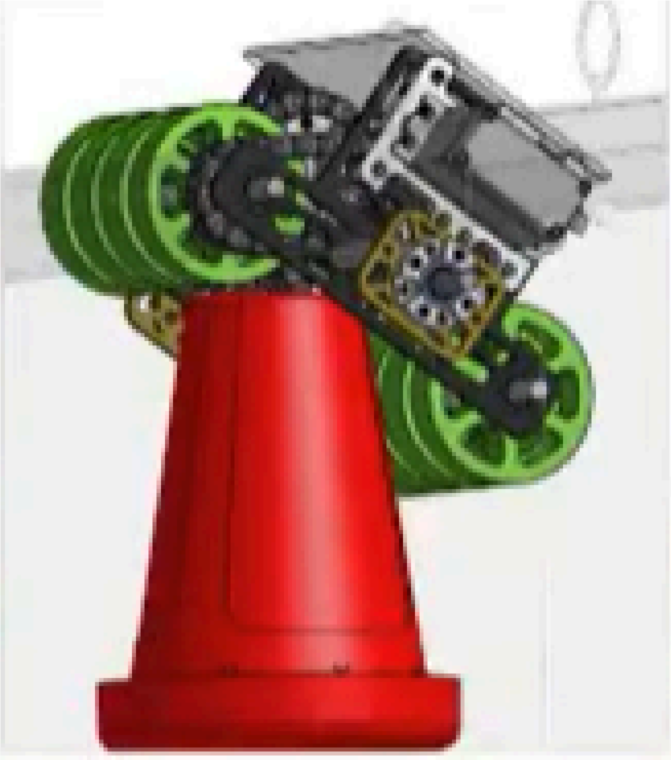
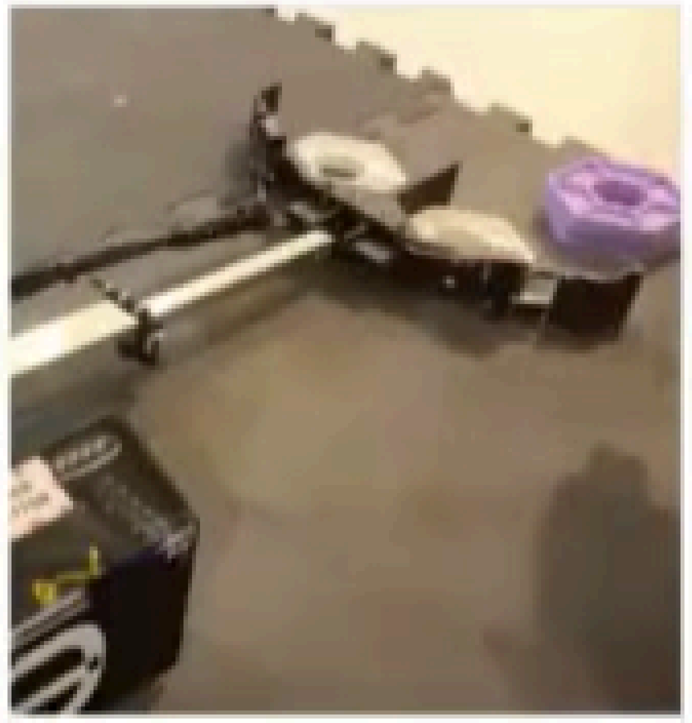
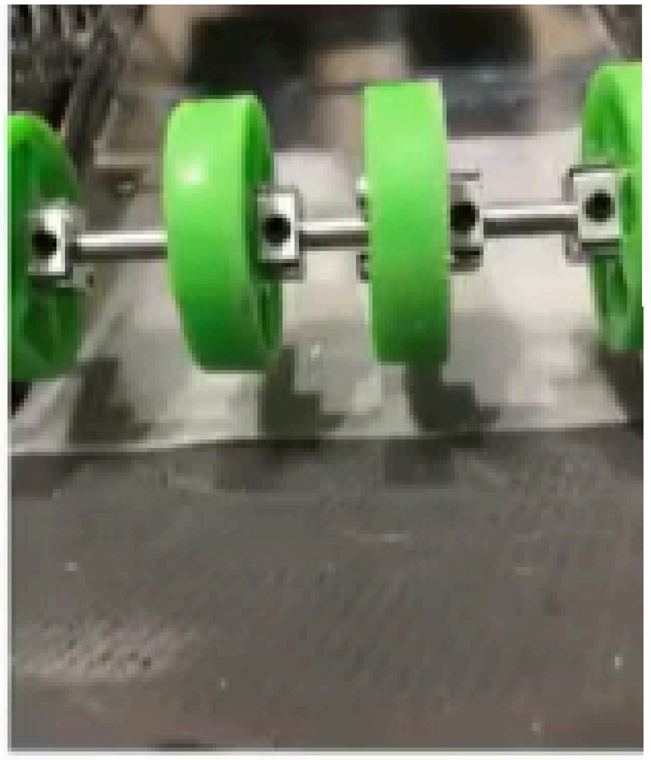
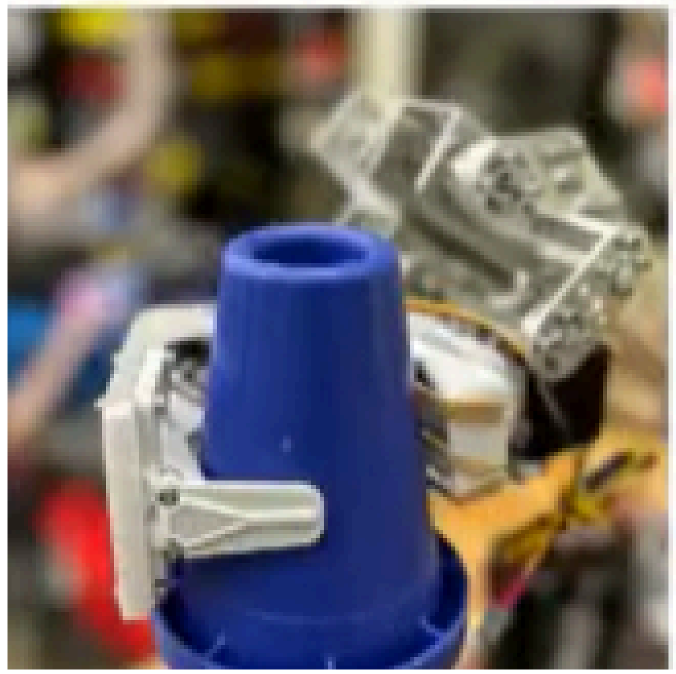
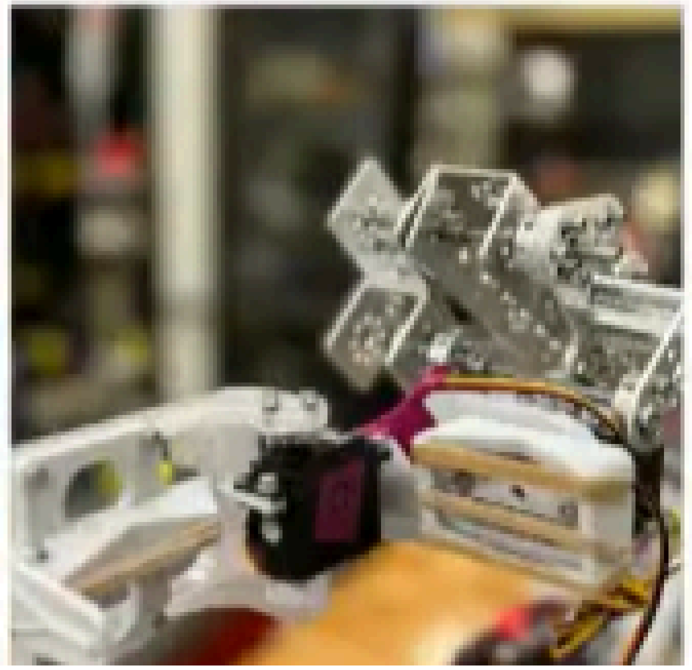
Figure 9-11: BASKET Dimensions

Servos

✓Modo angular: Movimiento a posiciones determinadas con precisión

✓Modo continuo: rotación continua sin control de posición

* Usar solo para aplicaciones de poca fuerza


Formas de intake

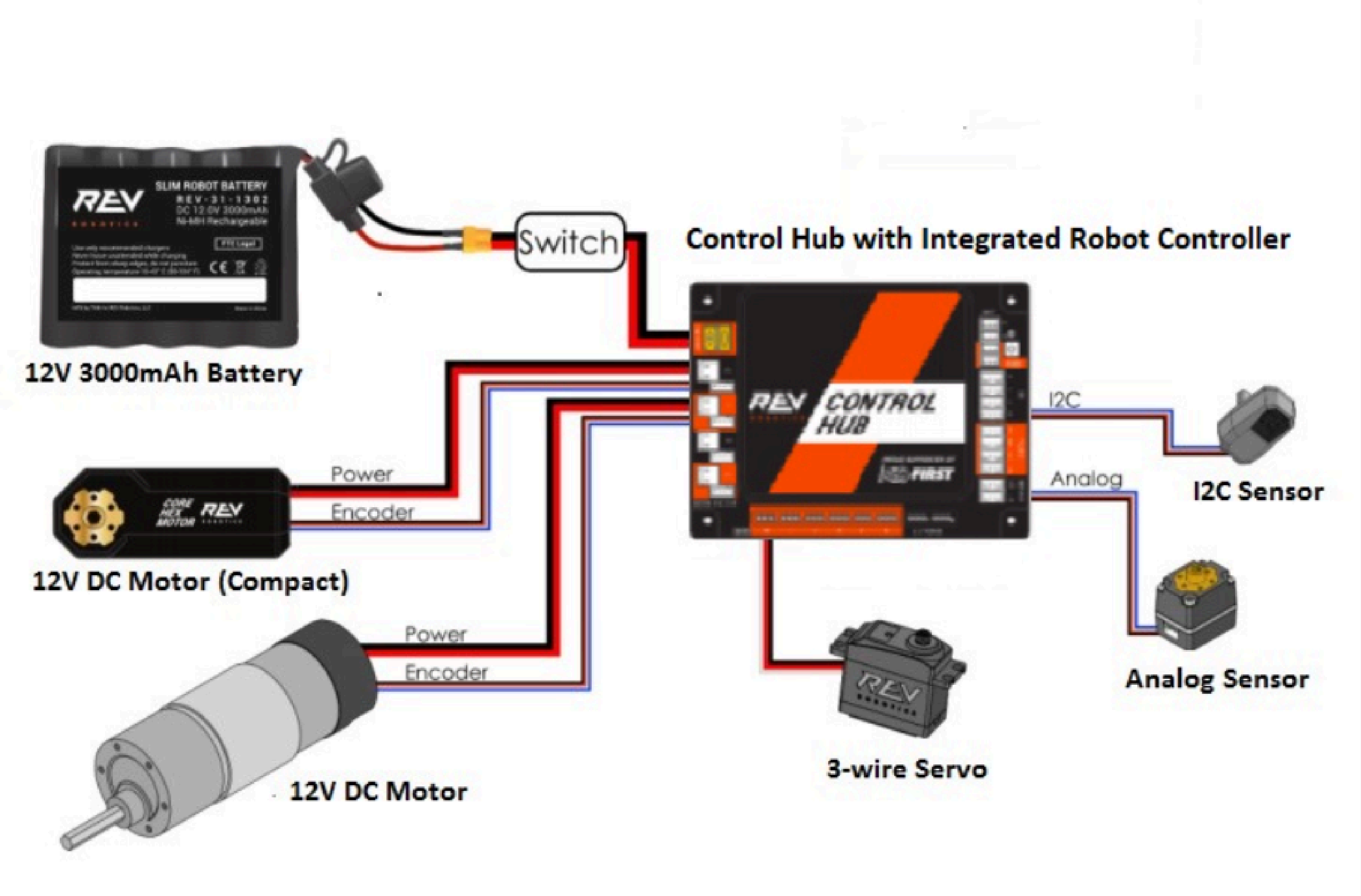
- Factores:
- Cantidad de piezas
- Velocidad
- Simplicidad (cantidad de movimientos)
- Fiabilidad
- Robustez

AUTO vs. TELEOP

A *FIRST* Tech Challenge match has an AUTO phase and a TELEOP phase. In the AUTO phase of a match the robot operates without any human input or control. In the TELEOP phase, the robot can receive input from up to two human drivers.

Point-to-Point Control System

FIRST Tech Challenge uses Android devices to control its robots. During a competition, each team has two Android devices.



REV Robotics Control Hub

The REV Robotics Control Hub is an integrated version of the Robot Controller. It combines an Android device built into the same case as a REV Robotics Expansion Hub.