SPARTAN ROBOTICS

FRC 971

Technical Documentation 2019

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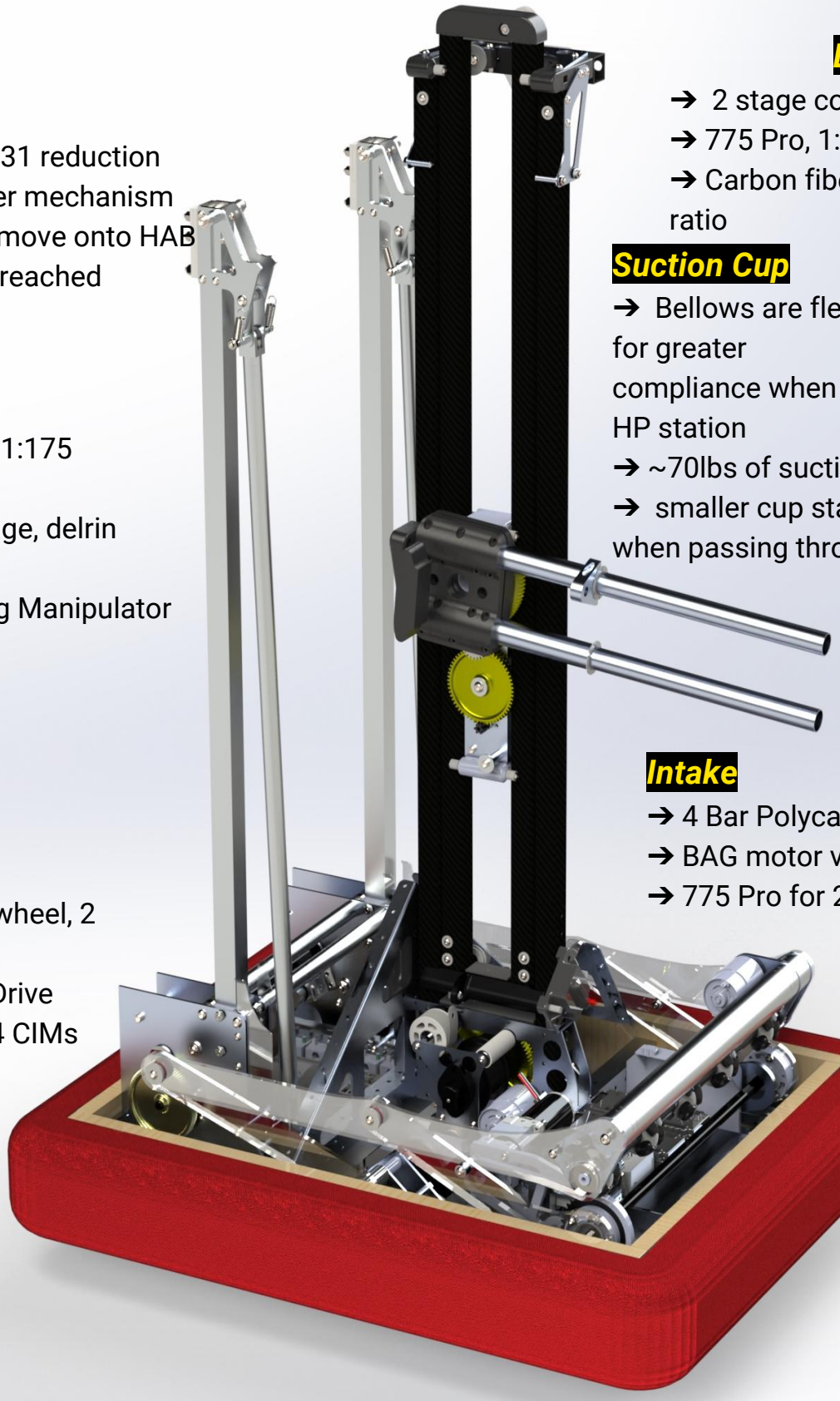
971 Robot Overview



Stilts

➔775 Pro 1:31 reduction
➔Over center mechanism
➔passively move onto HAB After height reached

Wrist

➔BAG Motor, 1:175 reduction
➔ Onyx Carriage, delrin bearings
➔ Telescoping Manipulator

Drivetrain

➔ 4 Colson wheel, 2 tread
wheel tank Drive
➔ 16.4 ft/s 4 CIMs

Elevator

➔ 2 stage continuous rigged
➔ 775 Pro, 1:10.25 reduction
➔ Carbon fiber, optimized I/d ratio

Suction Cup

➔ Bellows are flexible and allow for greater
compliance when loading from the HP station
➔ ~70lbs of suction
➔ smaller cup stabilize hatch panel when passing through

Intake

➔ 4 Bar Polycarb
➔ BAG motor versaplanetary
➔ 775 Pro for 2 in Omnis

Pump

➔ 775 pro on a OTS pump

Robot Function Objectives

During Kickoff we determined that in a cycle dominant game with no protected zones we would need to be as small & fast as possible to avoid defense. We thus set about designing a robot which could do the following as quickly as possible while being small light, and resistant to defensive effort.

- Score on all Levels of the rocket quickly enough to be able to solo the rocket under light defense.
- Be able to pickup hatch panels from the human player station, and cargo from the human player station or the carpet.
- Intake & Score both game-pieces from either side of the robot(Testing and simulation revealed that a pass through mechanism shortened cycle times considerably)
- Climb to level 3 with ~10s left in the match, with the possibility of fitting another robot on HAB 3
- Complete a Rocket Solo during qualifications with light or poor defense

Subsystems

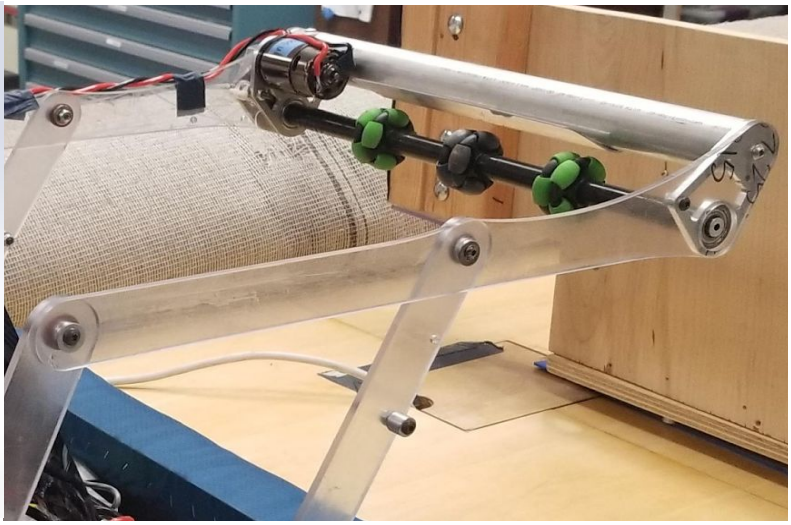
Elevator

In designing the elevator the main considerations were speed and low CG, in order to facilitate fast vision assisted scoring in both the Sandstorm and Teleoperated periods.

- 2 stage continuous rigged
- Carbon Fiber
- Powered by 775 pro: 1:10.25 Reduction
- 7lbs
- Complete extension in < 0.5s
- Offset from the center of the robot to allow for the wrist to swing past
- 3D printed Pulleys, dyneema rigging

Subsystems

Intake

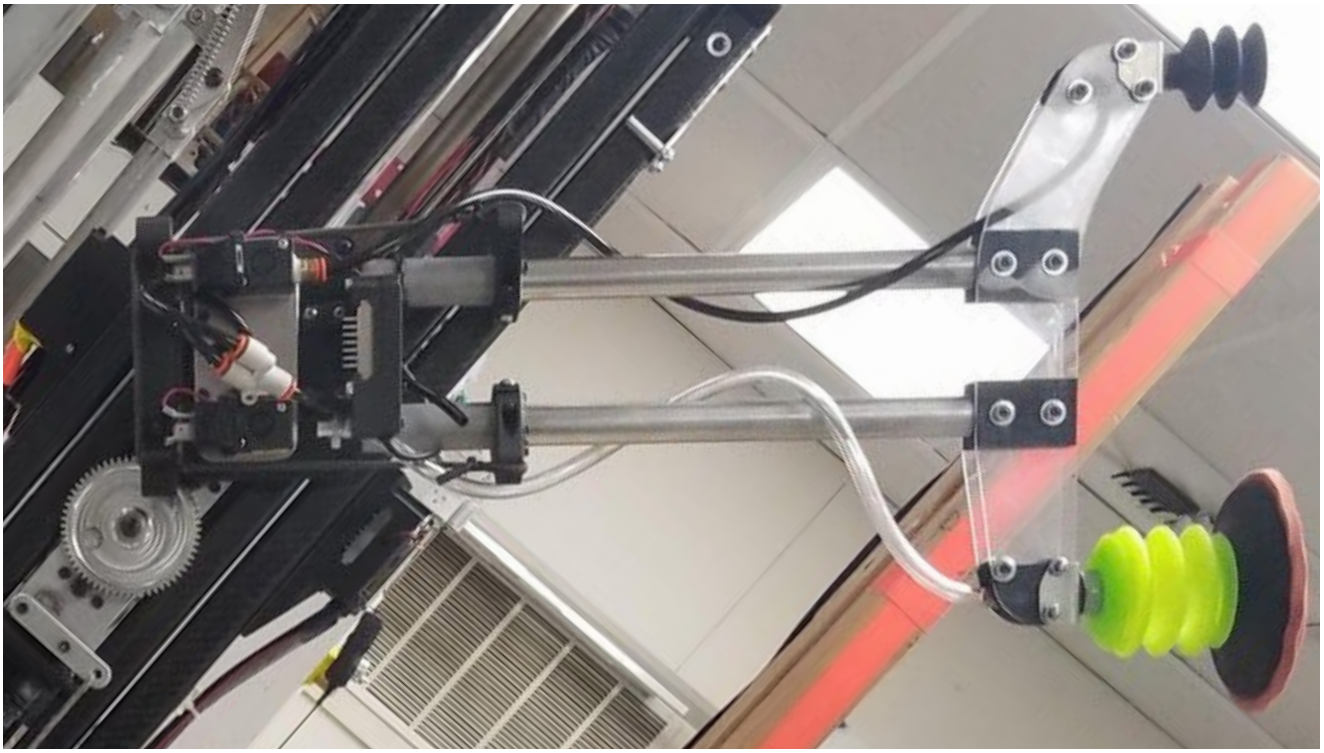


The Intake was added when it became clear that the suction cup would not pick up cargo from the depot effectively.

- 4 Bar linkage, Polycarbonate for longevity
- BAG Motor with a versaplanetary for the 4 Bar
- 2 inch AndyMark omni wheels to allow for easy centering
- 775 pro for rollers, current limited to prevent catastrophic stalls.

Subsystems

Carriage/Wrist

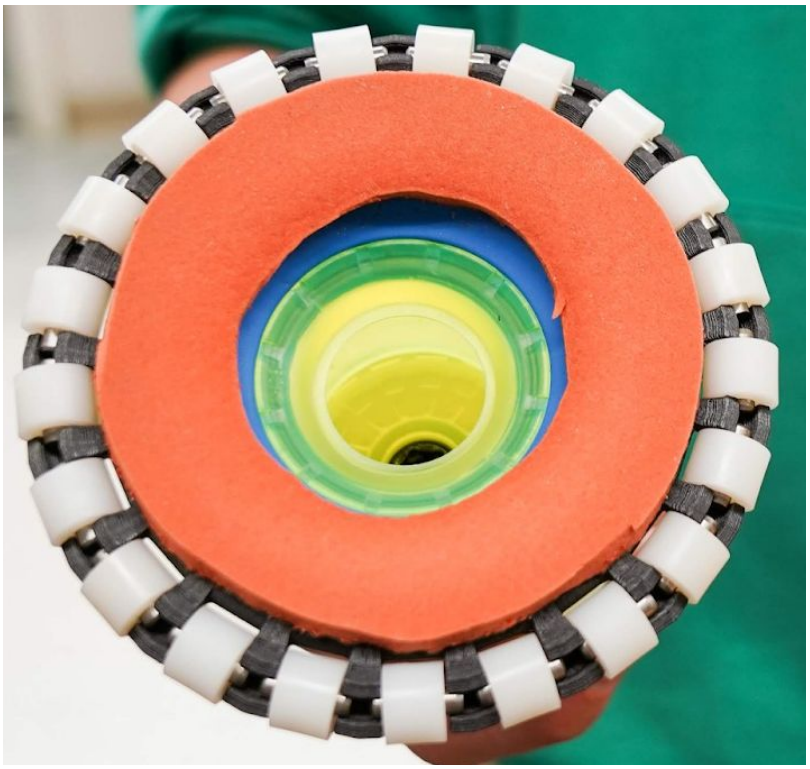


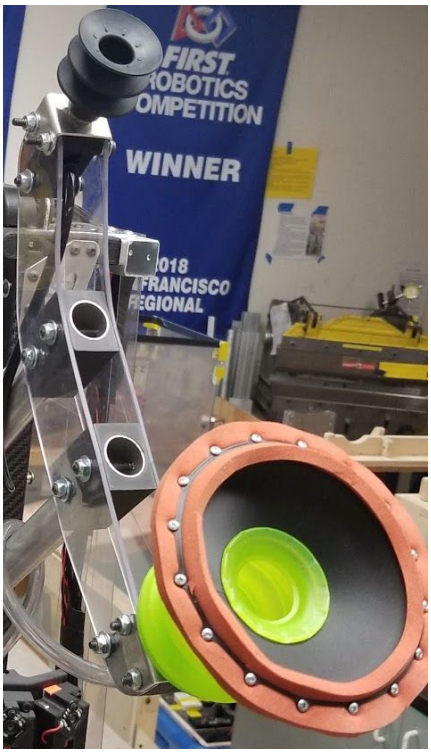
The Wrist and Carriage were designed to move the wrist fast enough not to slow down the elevator, and be as light to lower CG

- 3D printed carriage, delrin bearings
- Powered by BAG motor
- Telescoping aluminum tubes, spring loaded to enhance seal when intaking
- Dead Axel Wrist
- Solenoids on the wrist allow for faster unseat times

Subsystems

Suction Cup





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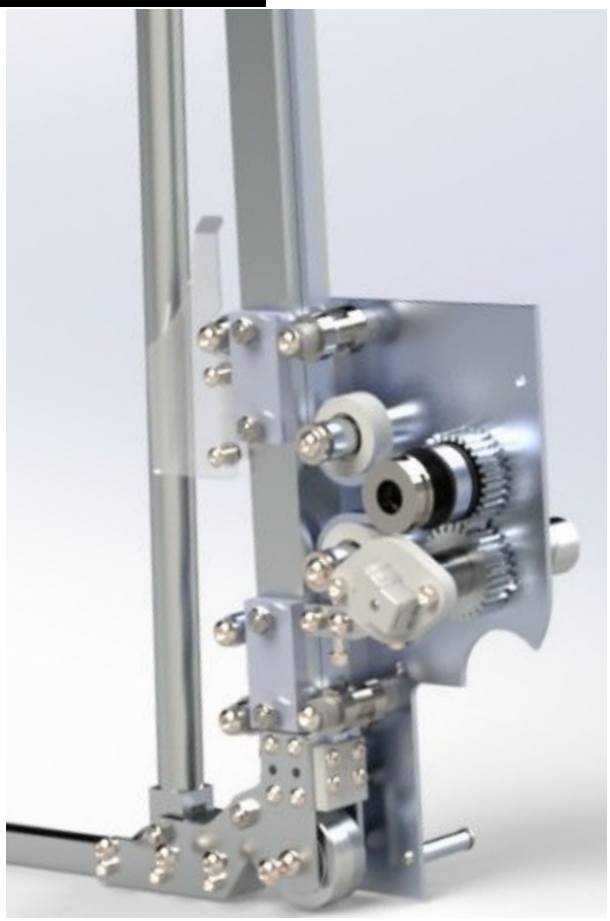
Subsystems

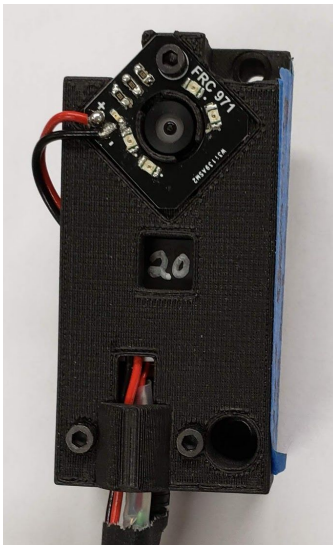
Stilts

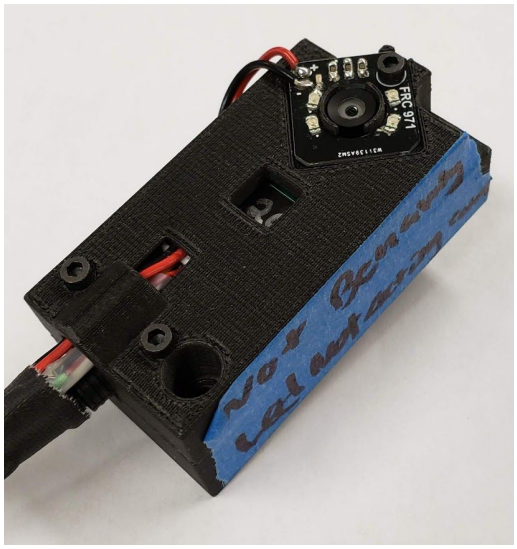


- Powered by 1 775 Pro 1:31 reduction
- Over center spring mechanism keep's the feet in place until the stilts reach the top
- "Ankles" break and robot moves onto HAB 3
- Wheels on 1 way bearings prevent slipping, roll robot onto the platform
- Stilts retract and we drive onto the platform

Subsystems

Cameras(x5)





- Jevois Smart Machine Camera, Quad Core onboard processor
- Custom infrared emitters
- Heatsink
- 90 degree FOV
- Computes distance, heading, and skew of targets