The Story:

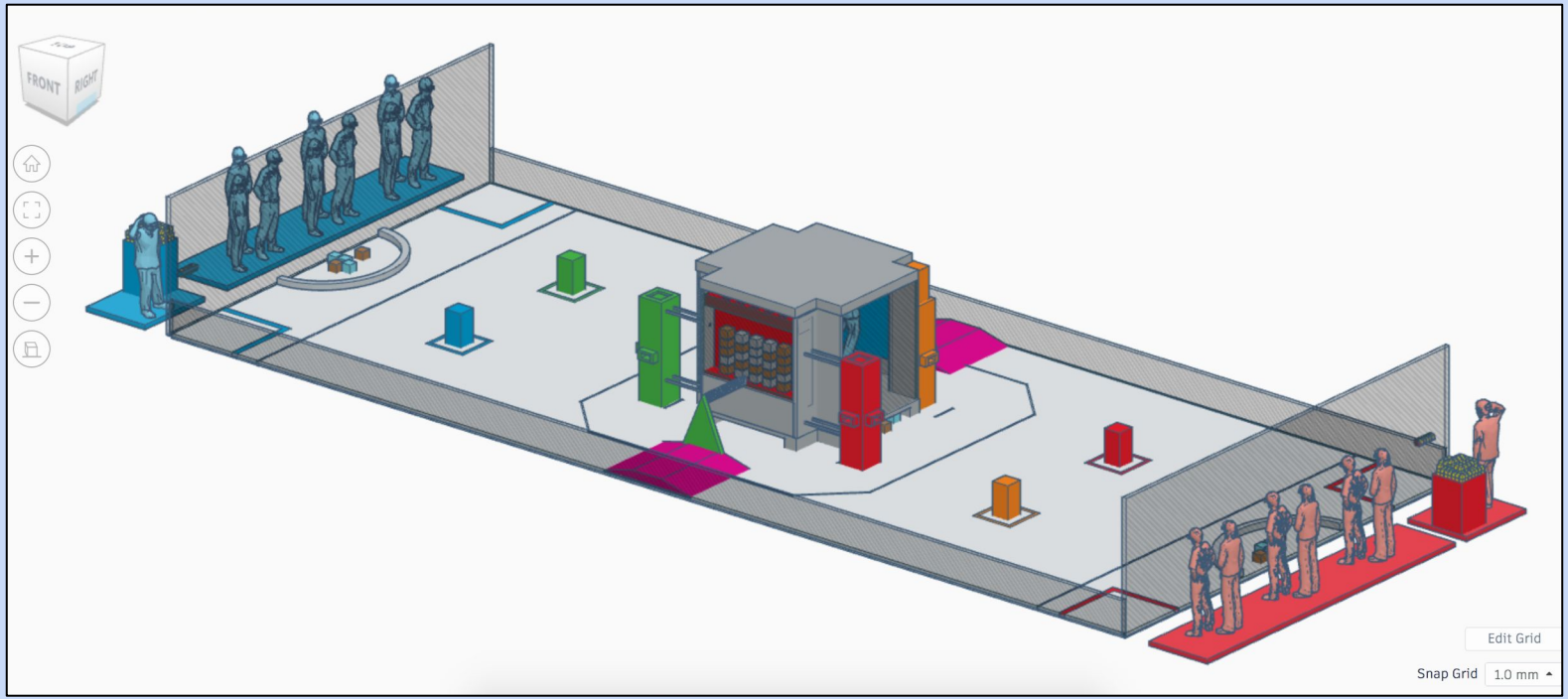
"The relationship between the four pillars became fractured and separated, each division: Science, Technology, Engineering, and Mathematics, neglected the need for cooperation and unity. Everything they tried to do or create was dysfunctional and nothing seemed to work quite right. The four were no longer balanced, with no hope of reuniting. *Until*, two brave alliances of Scientists, Technicians, Engineers, and Mathematicians decided to step up and reunite the four pillars of knowledge. Which alliance will be the first to restore balance and unity to *FIRSTlandia*? Good luck teams, and welcome to...

FIRST® ReUnited!"

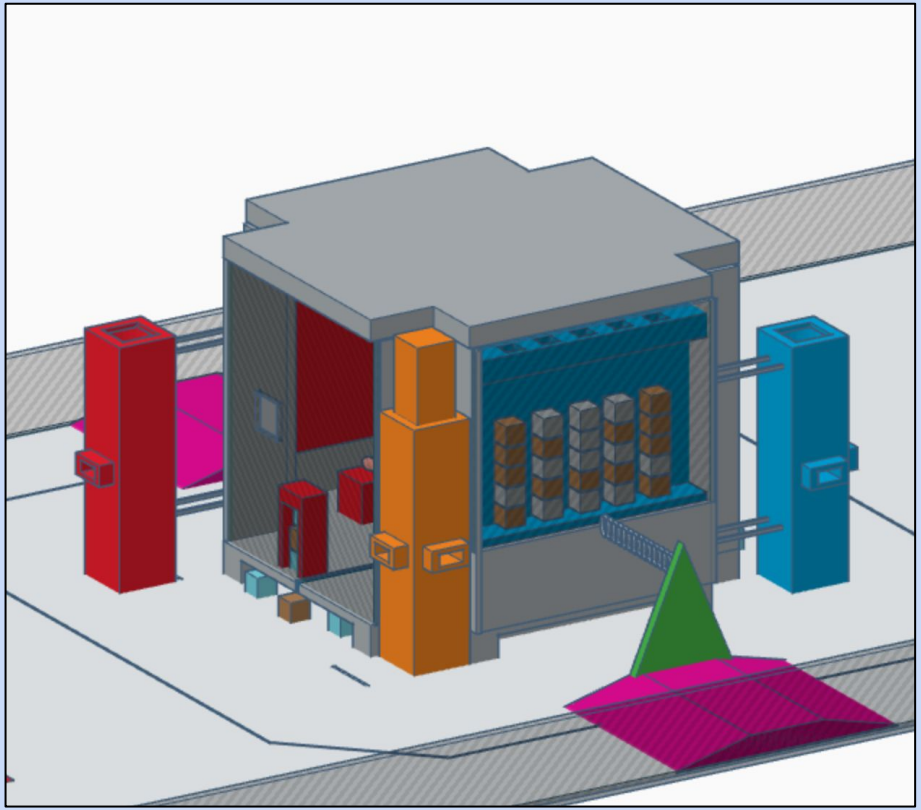
FIRST ReUnited!

Designed by FRC Team 3568, the Linden RoboEagles

2021 FRC At-Home: Game Design Challenge



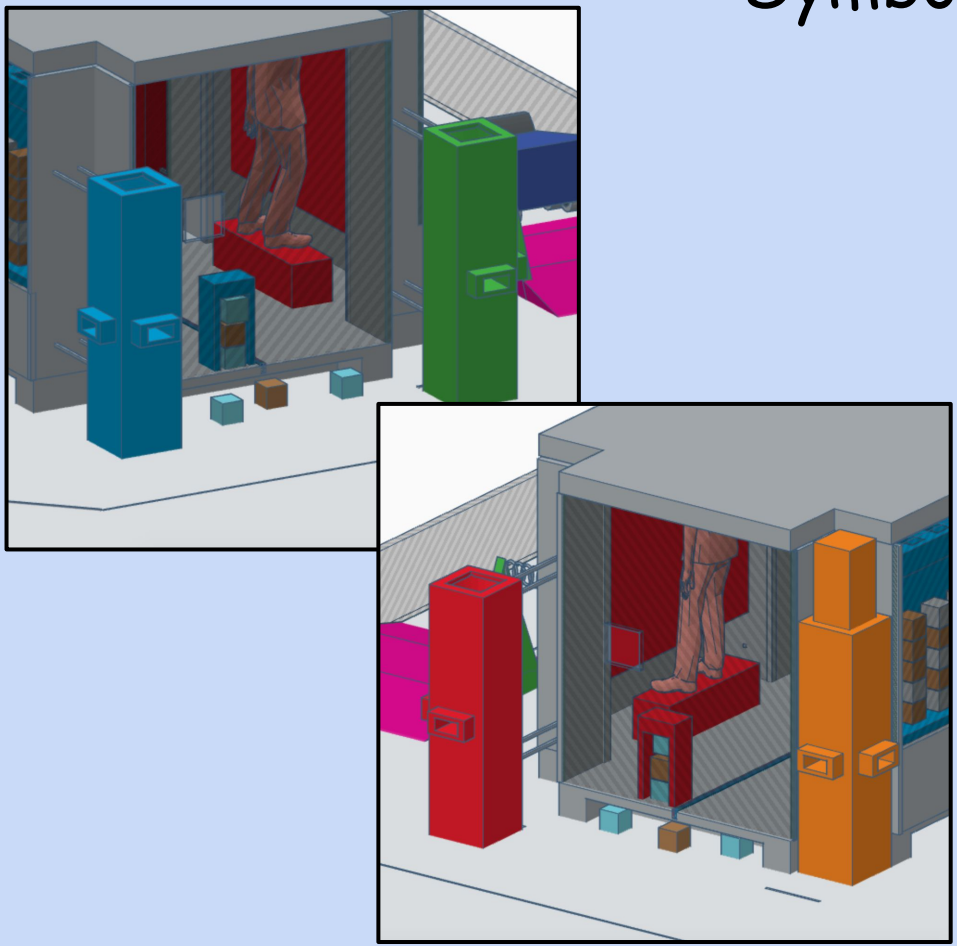
Symbolism:



The Keystone:

- The central principle on which all knowledge depends on
- The Pillars of Knowledge, the Chain, and the Building Blocks of Knowledge are all brought here

Symbolism:

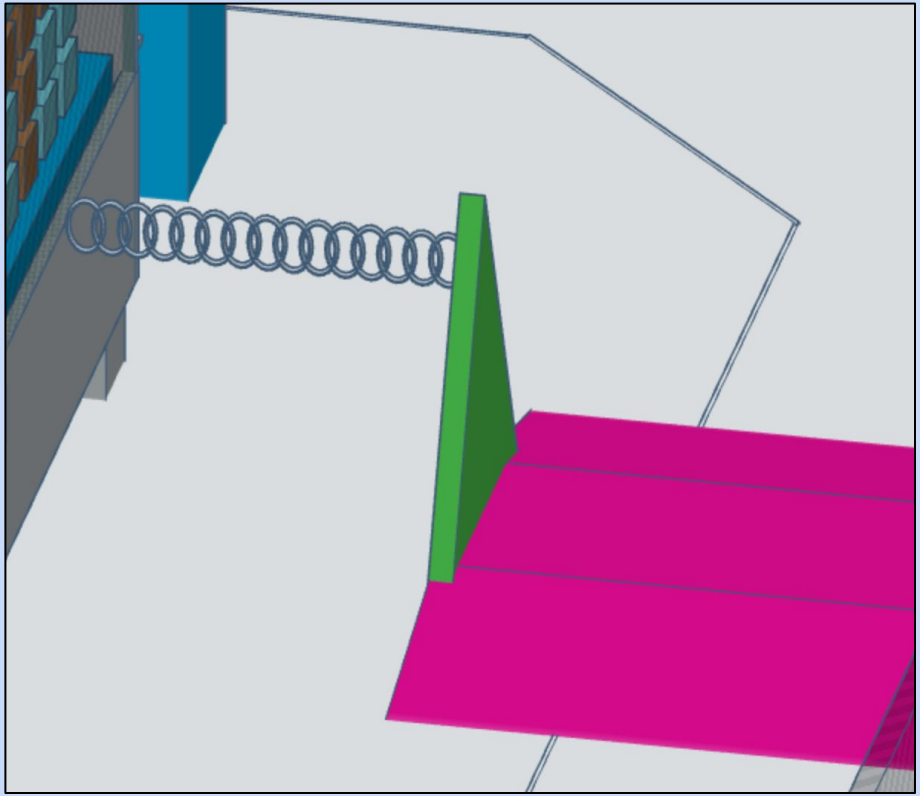


The Pillars of Knowledge:

- Each Pillar represents a branch of **STEM**
- Connected to the Keystone by linear slide
- Nuggets of Knowledge are scored into the pillars' high and low ports to fill the Pillars of Knowledge
- 8 levels of 10 cubes (1.14 lbs)

See our "Description of Game Elements" for more details.

Symbolism:

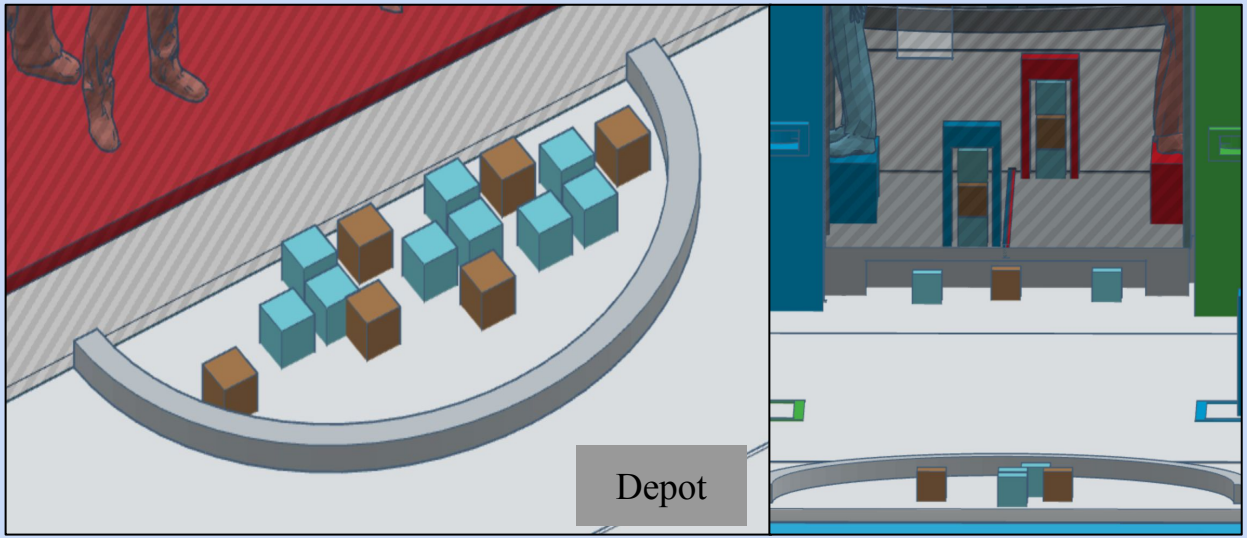


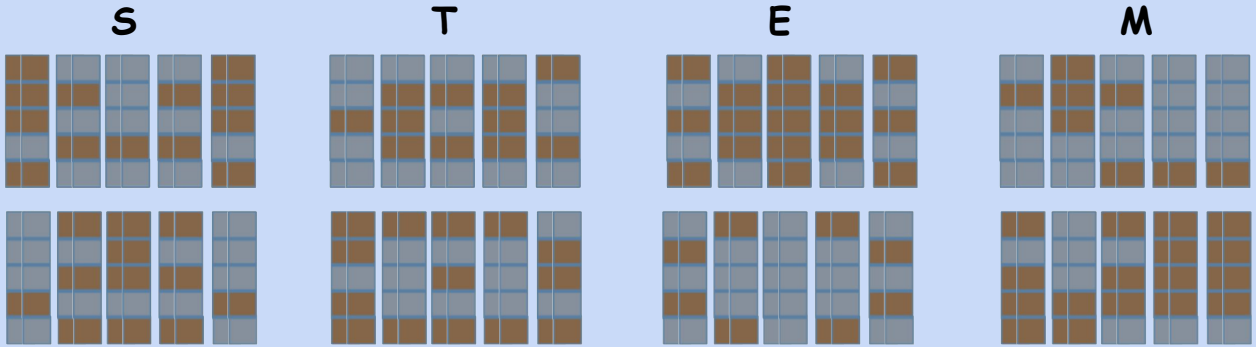
The Chain:

- Symbolizes the connection between STEM and the real world

See our "Description of Chain Element" for more details.

Symbolism:

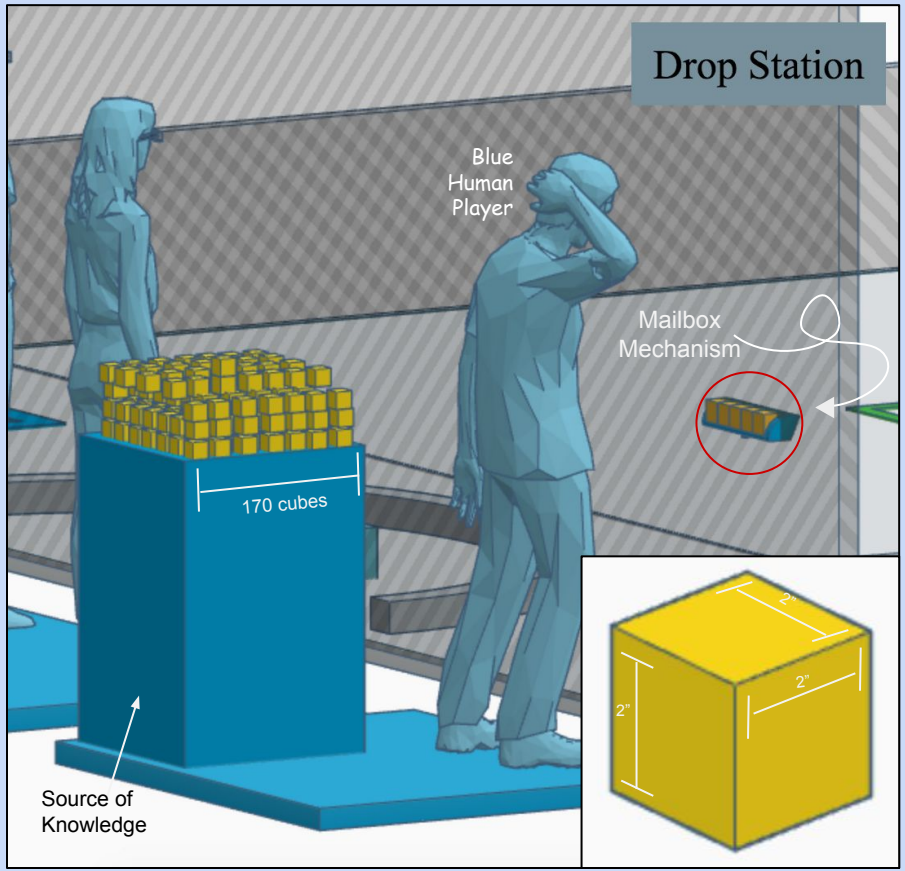




The Building Blocks of Knowledge:

- Create the foundation of knowledge by placing them under the Keystone
- Stored in the **Cache** to symbolize knowledge that is retained
- Create **STEM**'s Runes in order to restore STEM's knowledge to *FIRST*Landia

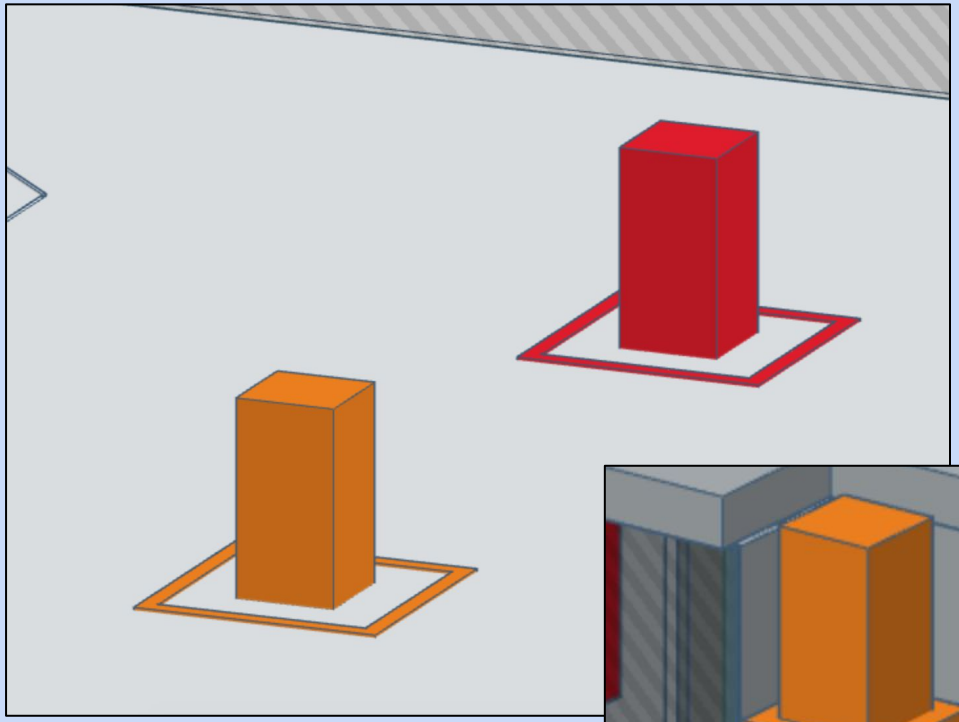
Symbolism:

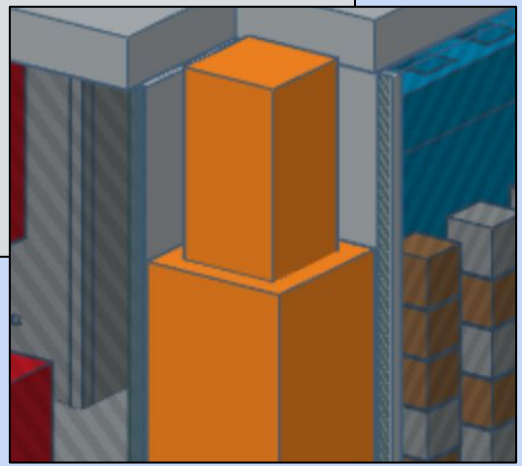


The Nuggets of Knowledge:

- Symbolize **Knowledge** itself
  - Are stored in the **Source of Knowledge**
- Human Players **share their knowledge** with the Robots in order to help ReUnite **STEM** using their **Mailbox mechanism**
- Scored into the Pillar's high and low port to fuel STEM

Symbolism:





The Capstone:

- The last thing needed to ReUnite *FIRST*Landia
- Seals in the Knowledge that was restored to the Pillars
- **Capstone Rule**: Alliances can score each others' Capstones under certain conditions

Game Walkthrough:

Autonomous: 15 Seconds

1. Move forward off the Initiation Line
2. Move Pillars to the Keystone
3. Score Building Blocks in a predetermined spot under the Keystone
4. Park Fully behind the Initiation Line

TeleOp: 2 minutes, 30 seconds (including Endgame)

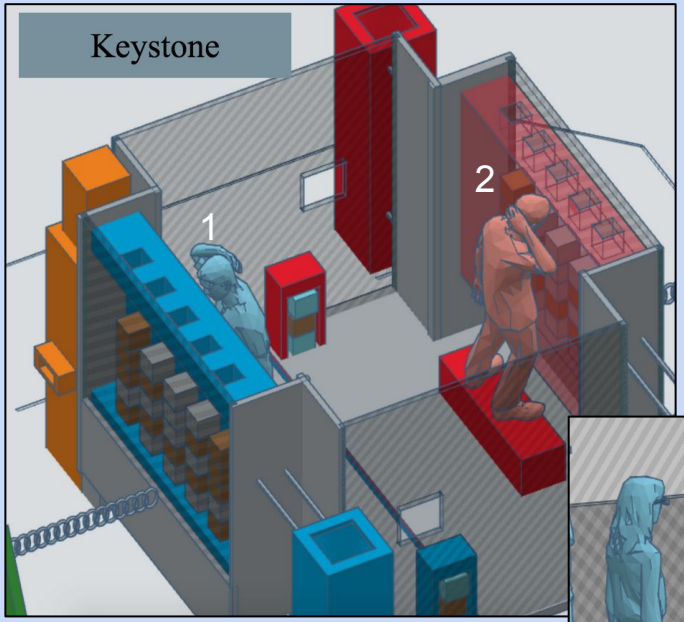
1. Score Building Blocks in the Grid to complete Runes (located in the Keystone)
2. Score Nuggets into the Pillars

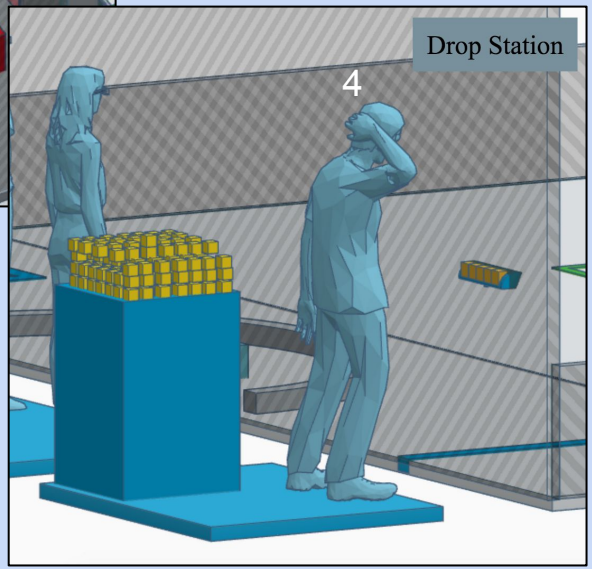
Endgame: last 30 seconds of TeleOp

1. Place Capstone on top of the Pillars
2. Parking

Refer to our "Description of Robot Actions" for more in-depth descriptions.

Human Players:

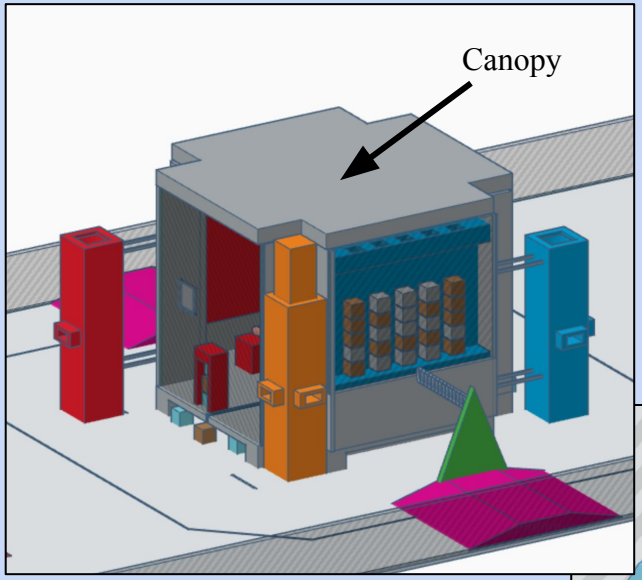


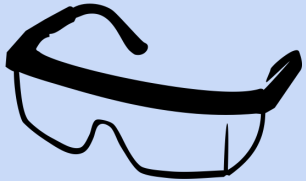


- Total of 4 Human Players
  - 2 in the Keystone
  - 2 in the Drop Stations

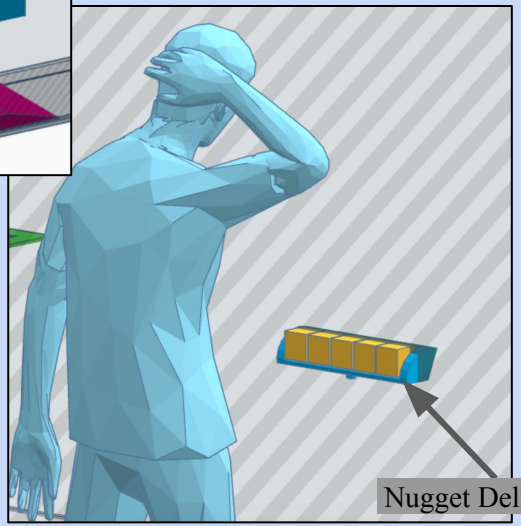
+ {One in Red Drivers' Station
  One in Blue Drivers' Station}

Human Players' Safety:





"Always wear your safety glasses!"



The Canopy:

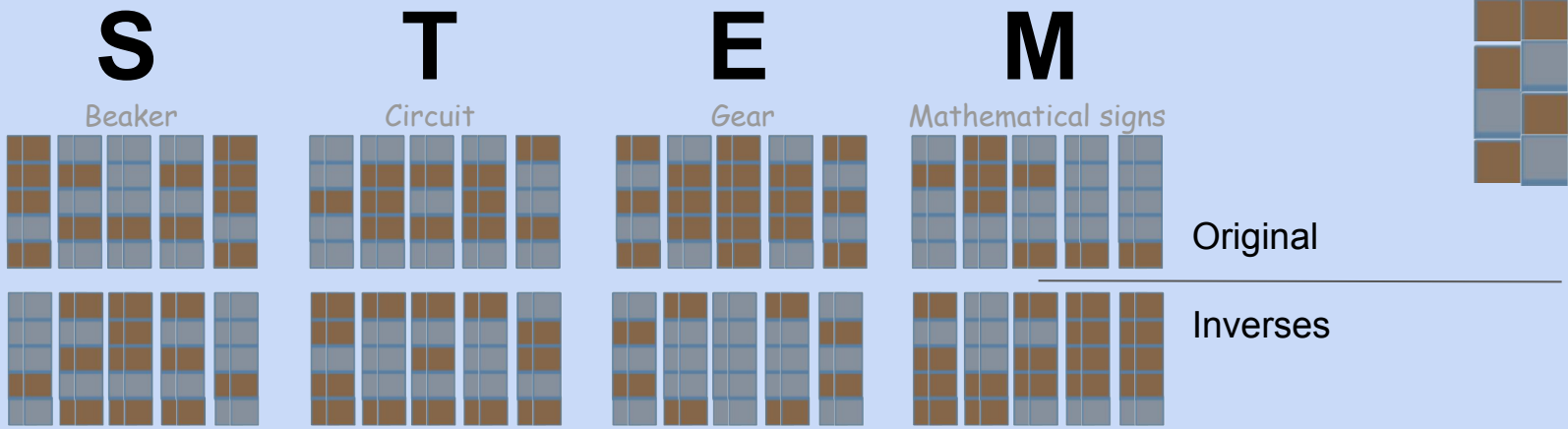
- Serves to keep stray Nuggets from falling into the Keystone
- Keeps Human Players safe

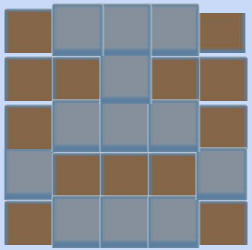
The Nugget Delivery System:

- Prevents Human Players from reaching directly into the field
- Also prevents them from violating a rule that the Human Players cannot *directly* interact with the robots.

Balance Elements:

- Pillars of Knowledge:
  - Each alliance belongs to two pillars -- *Symmetrical and Even*
  - If a team finishes with their two Pillars within the same of eight levels, they earn bonus points
- Neutral field is visually balanced (symmetrical)
- Runes are balanced
  - Example on next slide

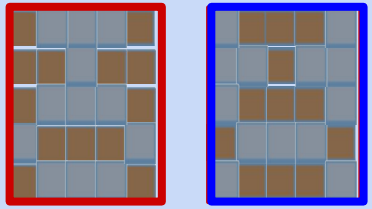




Balance Elements - Example:

EX:

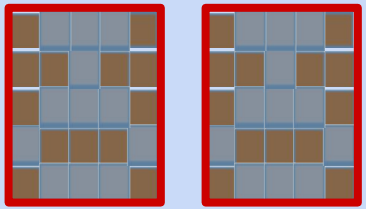
If Blue creates the Original pattern while Red creates its Inverse



-- Opposites balance

~~Or~~

If *both* Blue and Red creates either the Original or Inverse



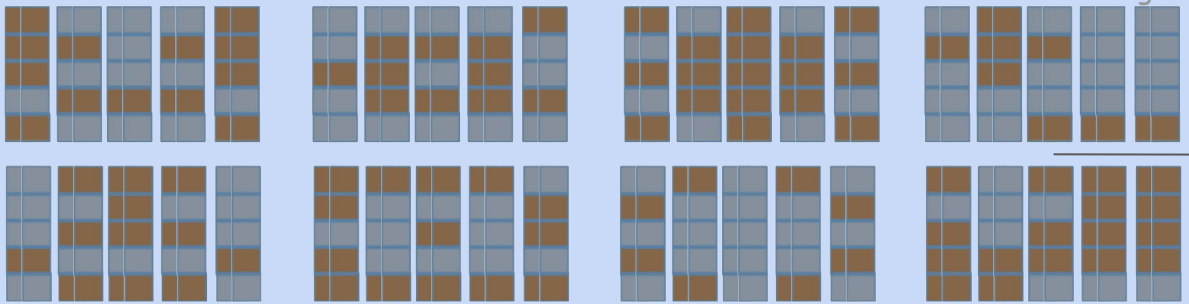
-- Symmetrical balance

S Beaker

T Circuit

E Gear

M Mathematical signs



Original

Inverses

Coopertition® Elements:

In this game, we wanted to put more focus on Coopertition®, while still keeping the fun, competitive experience that *FIRST*® always brings. There are many aspects that encourage teams and alliances to work together in *FIRST*® ReUnited!:

1.) Alliances can score each other's Capstones per the **Capstone Rule**

2.) Alliances work together to earn a ranking point by completing the Runes

3.) The field is all neutral, with the exceptions of Alliance specific Parking spots, Drop Stations and Drop Zones. This allows for robots on opposing Alliances to work together during Endgame

4.) Teams work together to reunite all of the Pillars and restore *FIRST*Landia.

Ford
Go Further

Thank you for your time!

FCA FOUNDATION

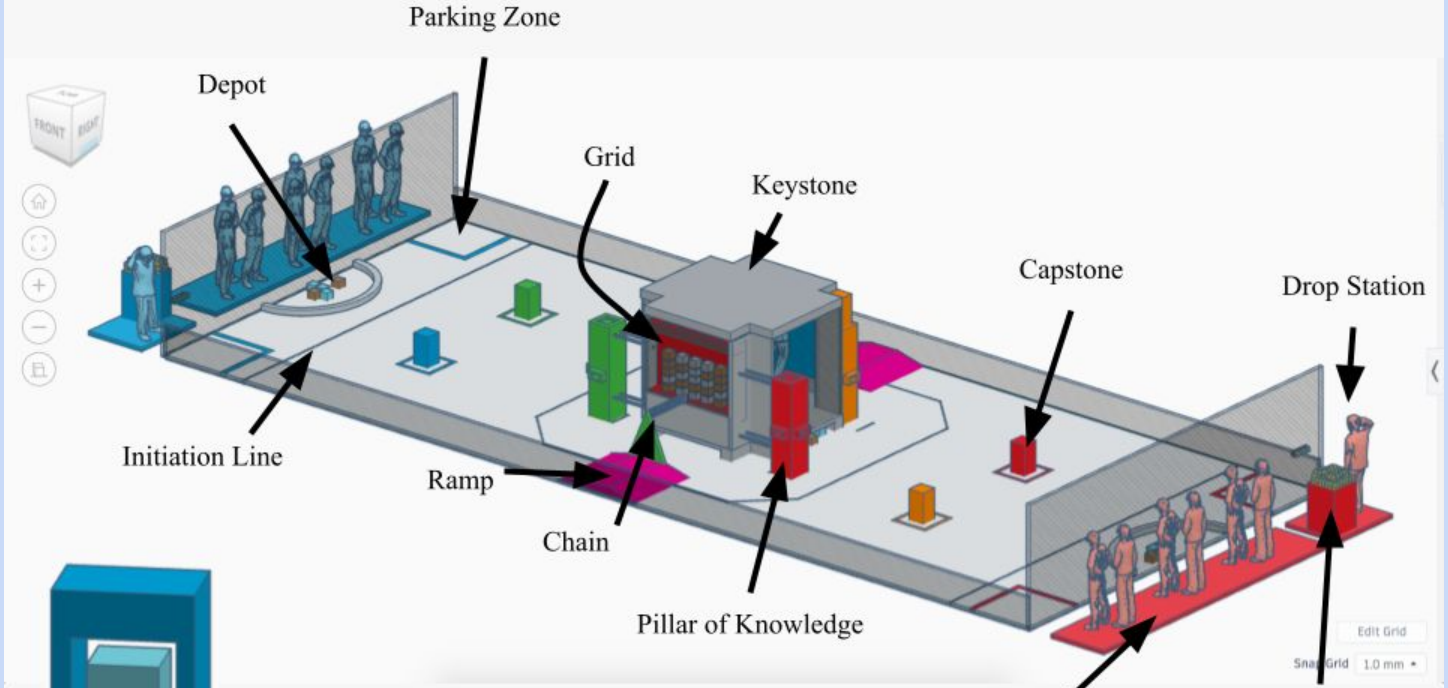
Do you have any questions for us?

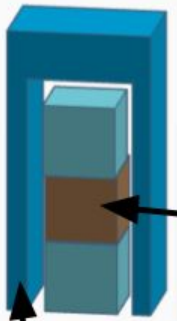
GENISYS CREDIT UNION

Check us out at lindenrobotics.weebly.com
Facebook: @RoboEagles

MICHIGAN Department of Education

FIRST® ReUnited! Field Model





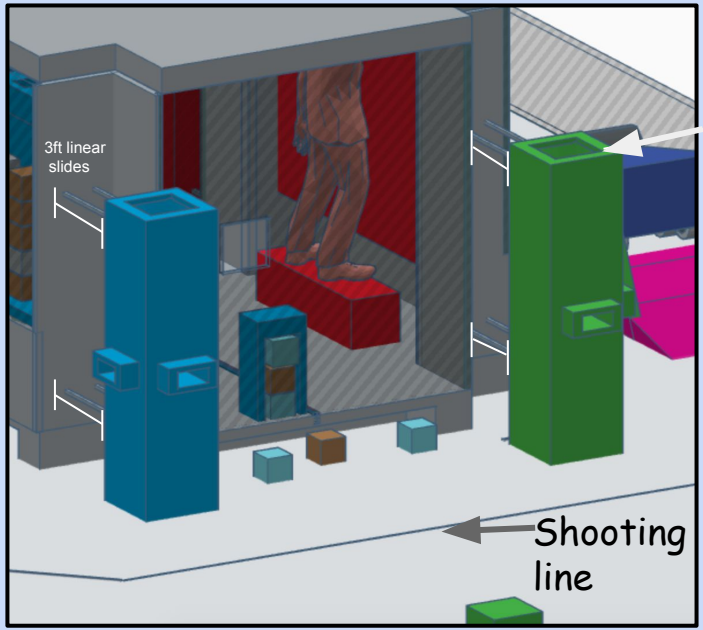
Building Block of Knowledge

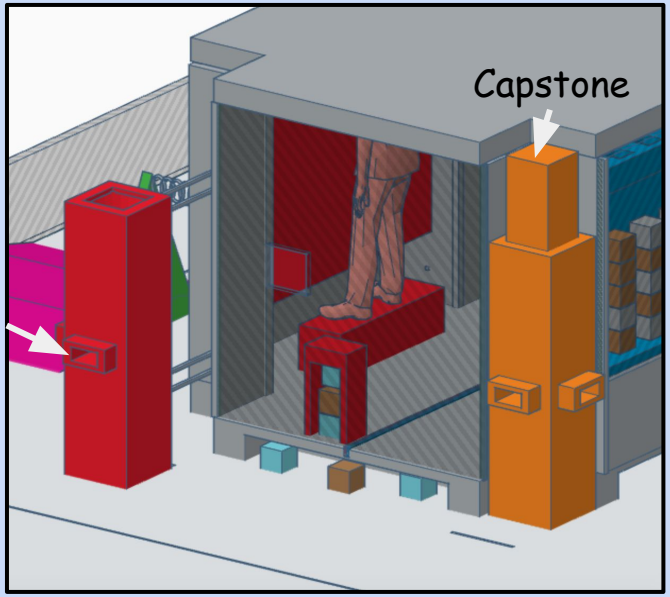
Cache
(located inside Keystone)

Nugget of Knowledge

Pillars' Anatomy:

Blue Alliance Side





Red Alliance Side

Due to Pillars' movement, robots

cannot score during Autonomous

Pillars' Smart-Scoring:

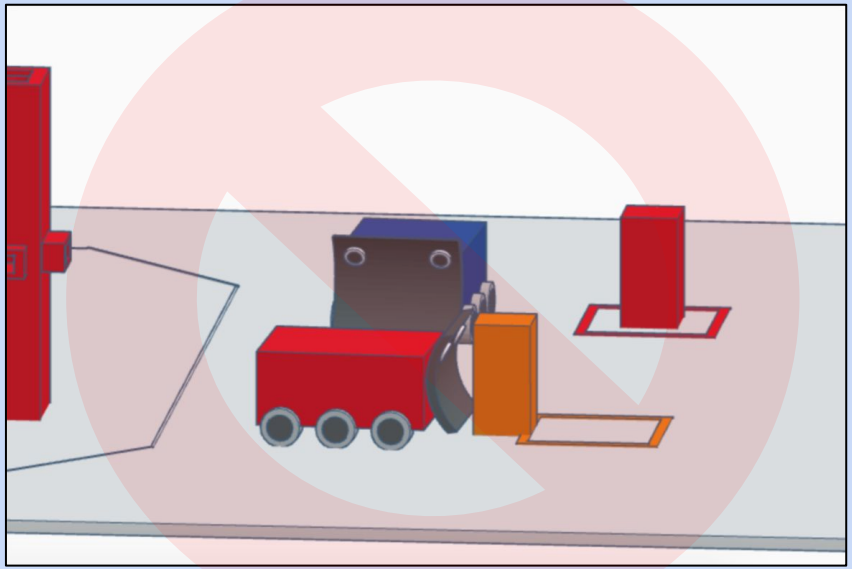
Smart-scoring features:

- Measures Nuggets by weight
  - Scale in their bases
  - The Pillars are measuring the Nuggets to determine when a level has been met -> side row lights
    - 8 levels in each Pillar
    - 1 level = 10 Nuggets/1.14lbs.

- Visual feedback:
  - Rim lights: Indicate connections to Keystone
  - Side row of lights: Indicates an alliance has reached one of the 8 levels

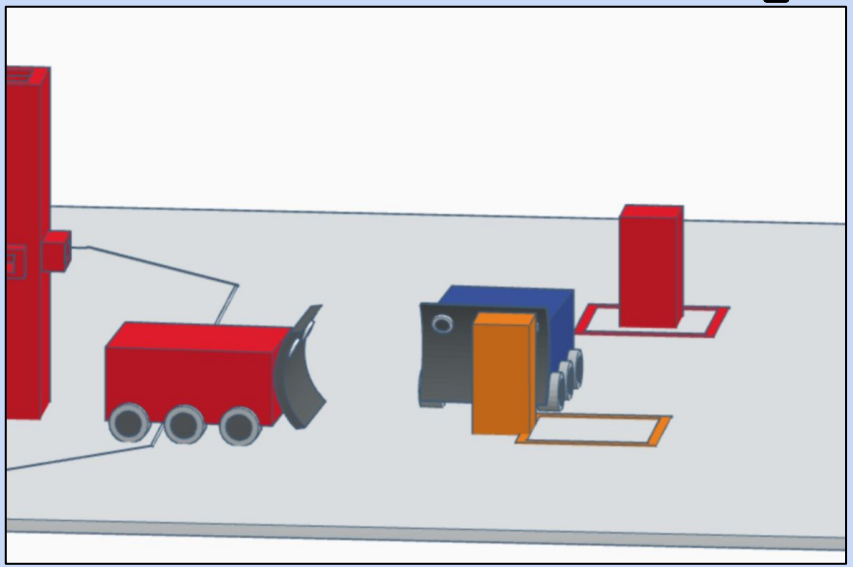
The Capstone Rule (*Endgame Only*):

** Red Alliance Side **



Blue Alliance **CAN NOT** take Red Alliance's Capstone

- Since the Red Robot is touching their Capstone, the Blue Robot may not touch it

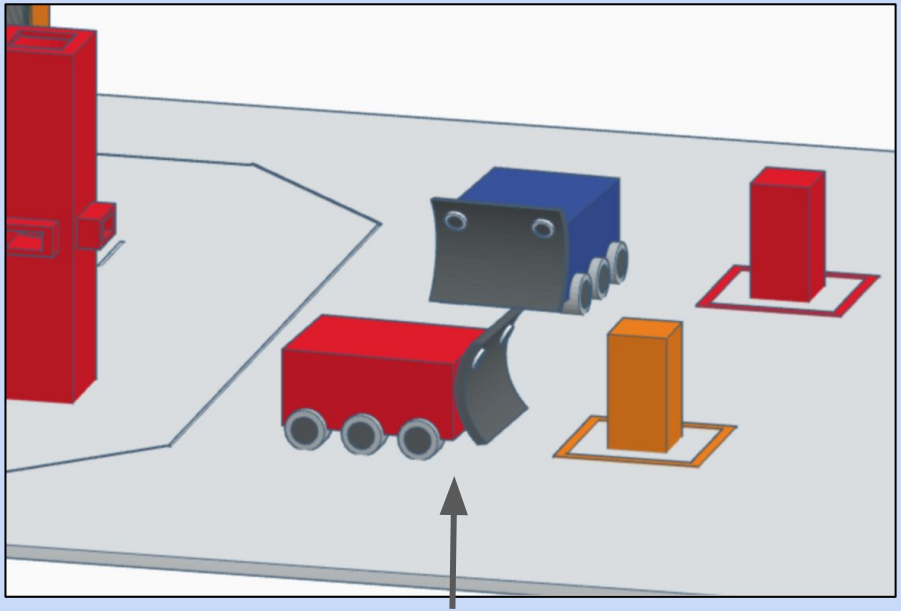


Blue Alliance CAN take Red Alliance's Capstone

- Since the Red Robot is not touching their Capstone AND it is outside of the imaginary infinite vertical plane created by the Capstone Border, the Blue Robot can take it!

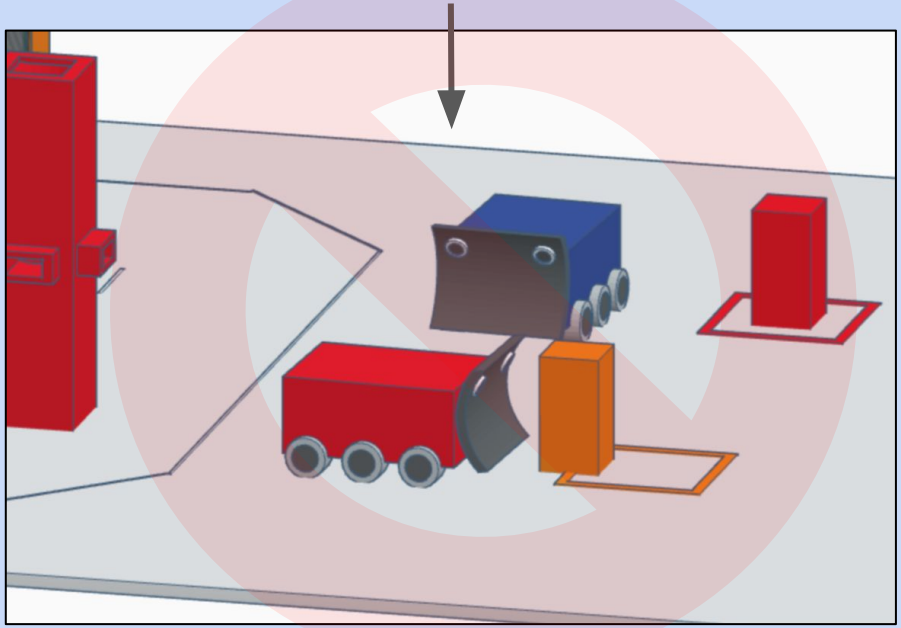
The Capstone Rule (*Auto and TeleOp*):

** Red Alliance Side **



Capstone is INSIDE of the designated border.
OKAY!

Capstone is OUTSIDE of the designated border.
NOT OKAY! The team now has to make an effort to move it back.



The Capstone Rules Summary:

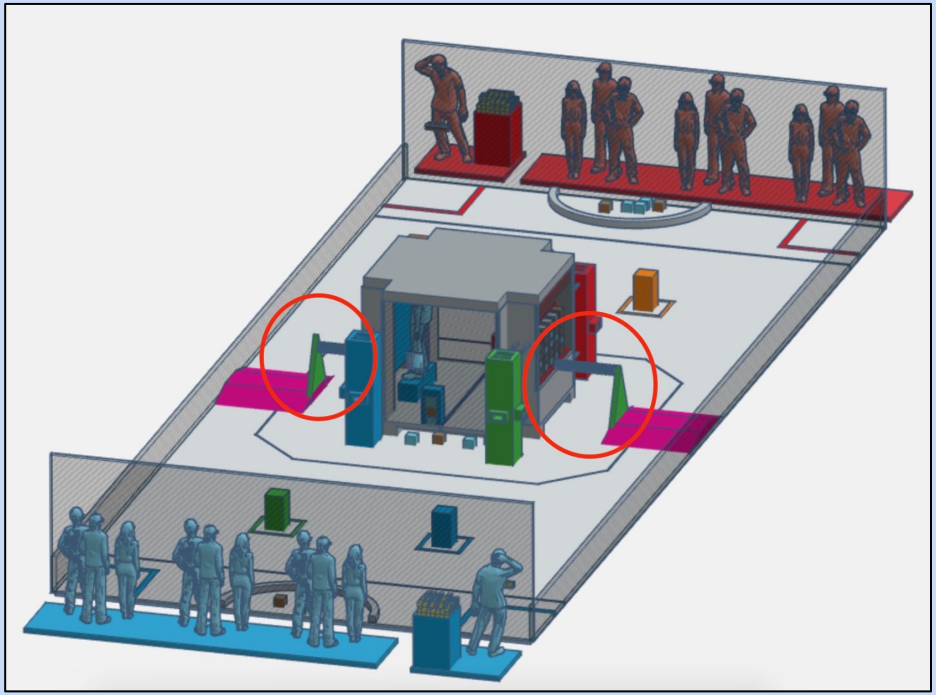
During Autonomous and TeleOp:

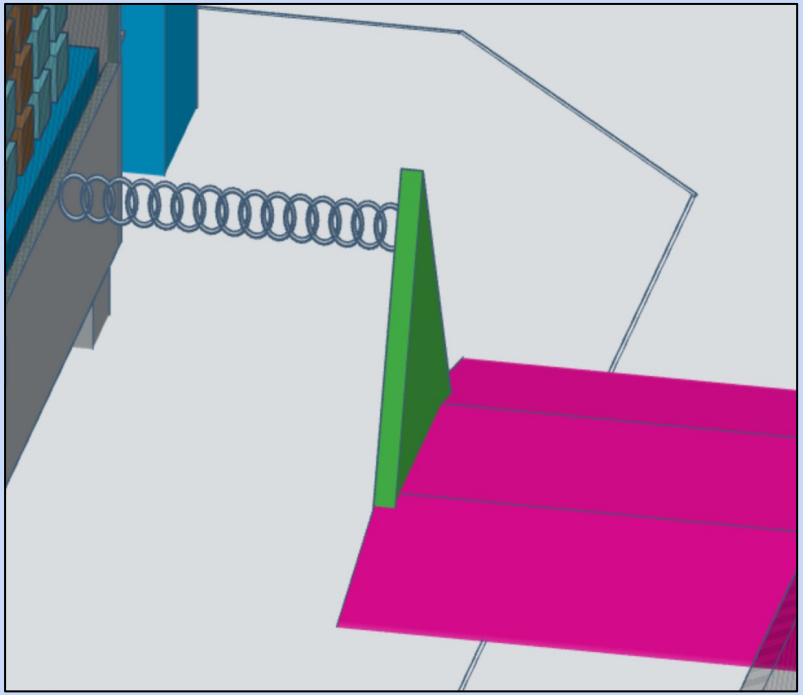
- The Capstone **may not** exit the infinite vertical plane created by the Capstone Border.
  - If it does exit the infinite vertical plane, Robots must make an effort to replace it inside of the Border\
- The opposing Alliance **may not** move the Capstone out of the infinite vertical plane
  - If they do, they will be awarded a penalty
  - It is the Alliance whose Capstone was removed that is responsible for replacing it inside of the border

During Endgame:

- The Capstone **may** exit the infinite vertical plane created by the Capstone Border.
- The opposing Alliance **may not** have greater-than momentary control of the Capstone unless:
  - It is outside of the infinite vertical plane created by the Capstone Border
  - Another Robot is not touching it

The Chain Element:

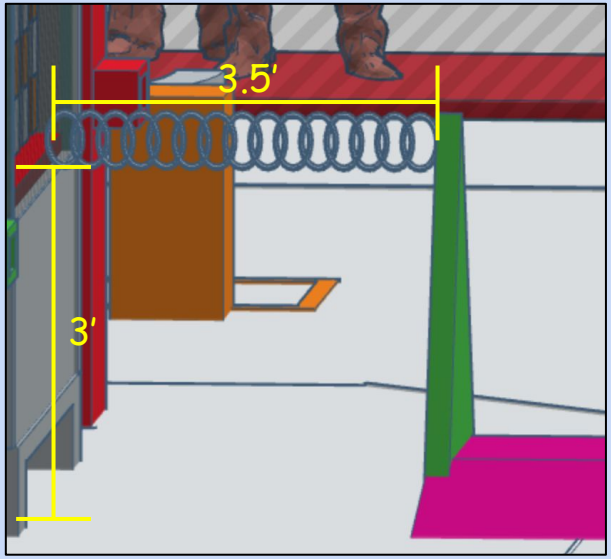


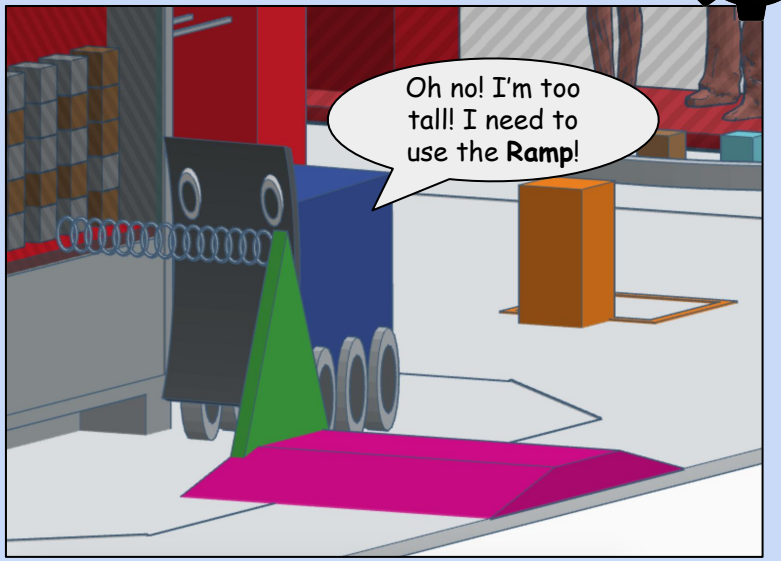


Where is it Located?

- Located in the central-outside edges of the field, attached with a triangle-shaped panel on either side of the Keystone

The Chain Element:





Dimensions:

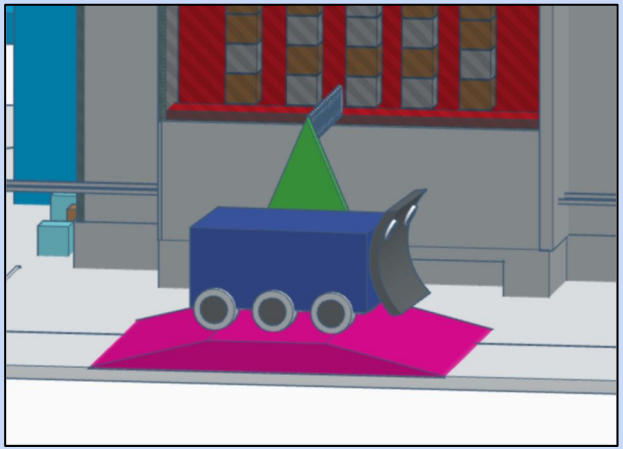
- 3.5' long
- Secured 3' high off of the field floor
- The Chain would be made of the same materials as the one provided in the 2021 Kit of Parts

Purpose:

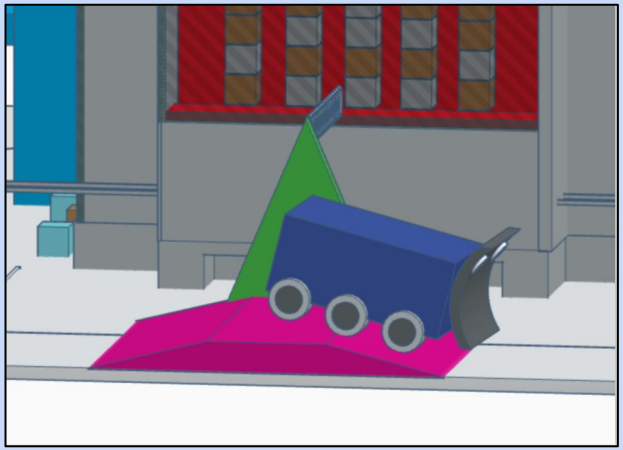
- Teams need to maneuver underneath the chain or around it via the **Ramp**
- This serves to encourage teams to think more about their height limitations, as well as what wheels teams choose to use

Parking:

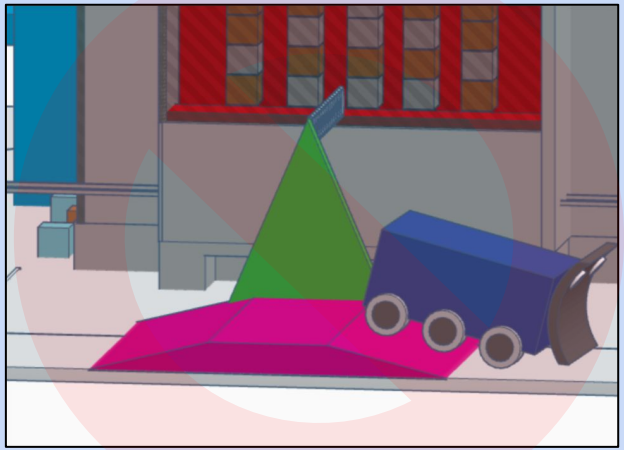
All wheels on the Chassis must be fully on the Ramp when the Match ends



Parked

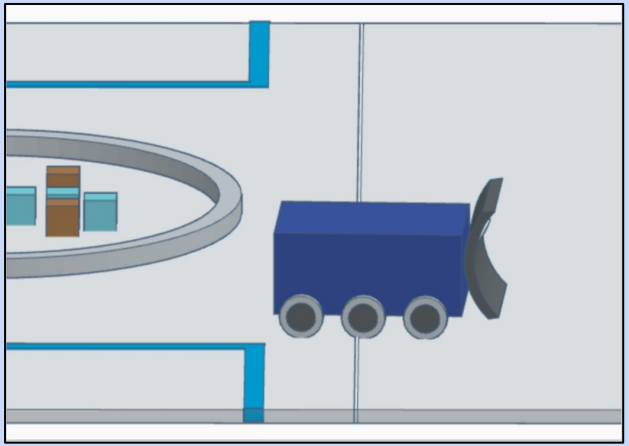


Parked



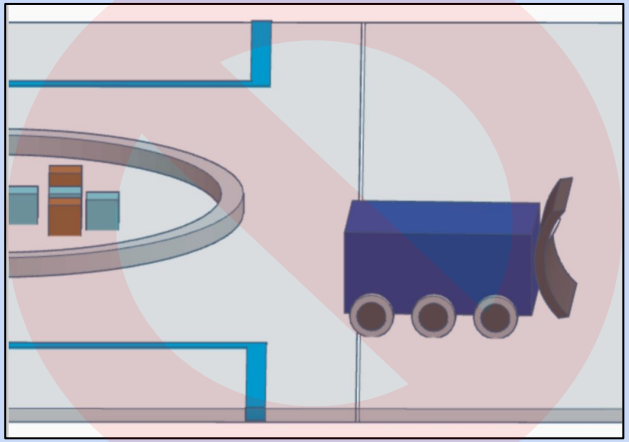
Not Parked

Initiation Line (*Driving Off*):



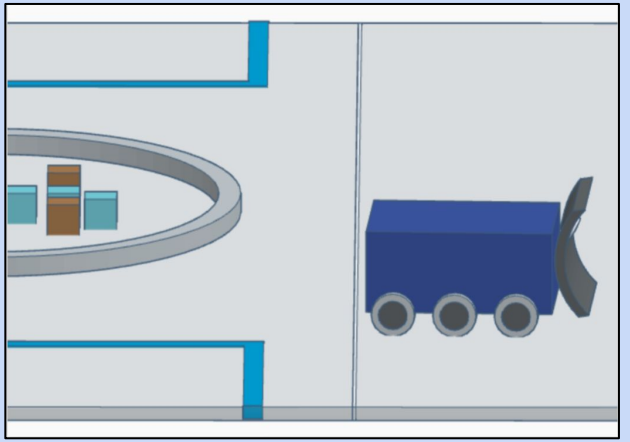
Starting Position:

- Robot must be crossing the imaginary infinite vertical plane created by the Initiation Line



Driving Off:

- This image is NOT off of the line and will not be awarded any points
- The back end of the Robot is still crossing the imaginary infinite vertical plane created by the Initiation Line

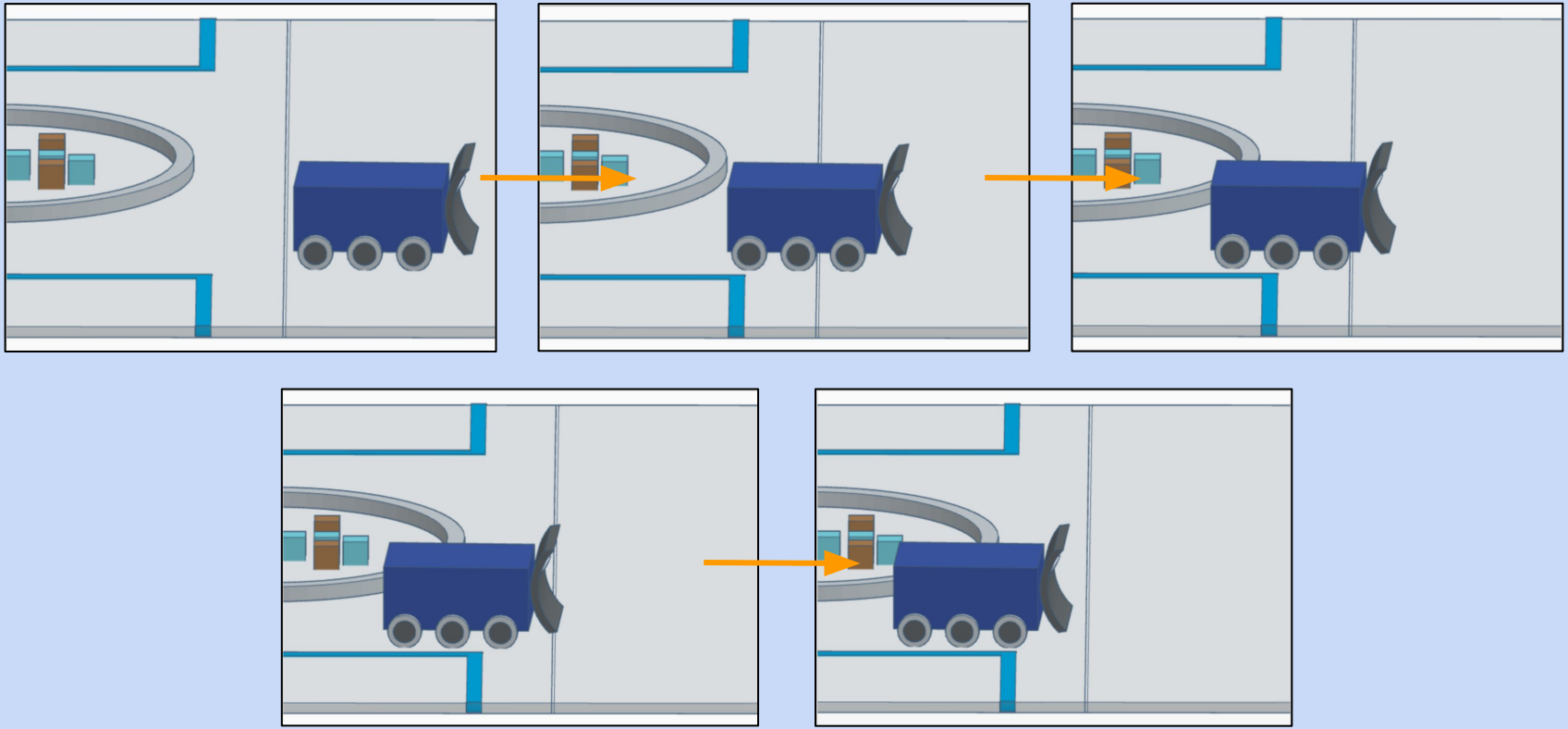


Exiting the Plane:

- This image IS off of the line and will be awarded points
- All parts of the Robot have exited the imaginary infinite vertical plane created by the Initiation Line

Initiation Line (*Driving Behind*):

In order to gain points for driving behind the line, Robots must first drive forward off the line

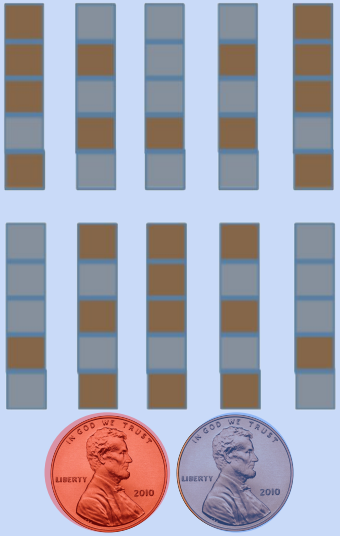


Randomizing Patterns:

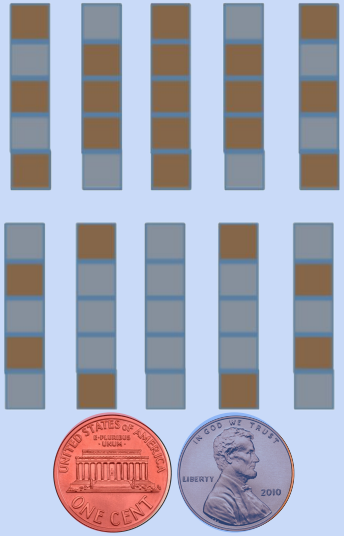
- Two coins are flipped before the match to Randomize between four sets of patterns
- HPs know the pattern before entering the field but are still unable to review or cheat.

Ex: One red and one blue coin are flipped in animation

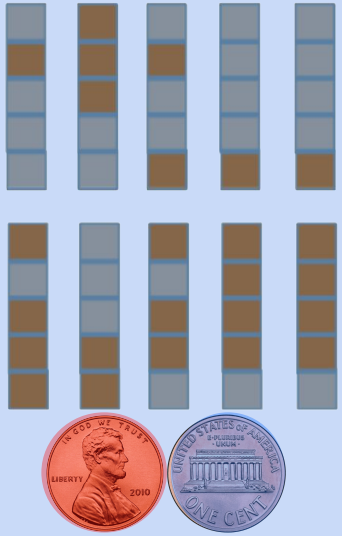
Science: HH



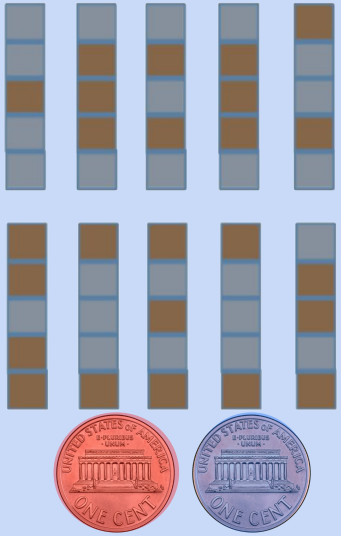
Engineering: TH



Mathematics: HT



Technology: TT



Scoring:

Autonomous: 15 Seconds

Drive forward off Initiation Line -- 5pts
Disrupt Pillar ---------- 6pts
Connect Pillar ---------- 15pts
Foam Block (matched) ---------- 4pts/block
Foam Block (mismatched) ---------- 10pts/block
Park Behind Initiation Line --------- 5pts

TeleOp: 2 minutes, 30 seconds (including Endgame)

High Port ---------- 3pts/cube
Low Port ---------- 1pt/cube
Per Filled Level ---------- 10pts
Foam Block delivered to Keystone -- 4pts/Block
Completed Rune ---------- 20pts

Endgame: last 30 seconds of TeleOp

Matching Capstone --------- 30pts
Mismatched Capstone ------ 20pts
Waffle Cubes (Low Port) ---- 1pt
Foam Blocks ---------- 4pts
Park in Corner ---------- 5pts
Park on Ramp ---------- 8pts

Balanced Levels in Pillars --- 28pts

Ford
Go Further

Thank you for your time!

FCA FOUNDATION

Do you have more any questions for us?

GENISYS CREDIT UNION

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MICHIGAN Department of Education

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