Date	Location	Start Time	End Time	Week #
September 8, 2018 September 9, 2018	Huntsville High School AvaLAN Wireless AvaLAN Wireless	11:00 am 2:30 p.m. 12:00 pm	2:00 pm 4:30 p.m. 4:00 pm	1
Meeting Goals: Brainstorming				
Team Members in Attendance:				
Ian, Megan, Brooklynn, Kye, Jalynn, Joel				

Brainstorming

Brainstorming is a process that generally consists of the following steps:

1. **Generate Ideas**: Often a meeting conducted with simple rules:
   - There are three defined roles:
     Faciliator - Sets a specific goal/topic, keeps the team on topic, asks "what else" a lot.
     Scribe - Records all ideas.
     Everyone Else - Shares their ideas in an orderly fashion dictated by the Facilitator.
   - **NO** criticism, debate, or critical remarks are allowed. Questions for clarification are OK.
   - No idea is dumb. Wild ideas are encouraged. Adding to ideas is OK.
   - Emphasis is on generating as many ideas as possible.
2. **Evaluate / Edit / Prioritize Ideas**:
   - Generally a second group discussion that refines, combines, and prioritizes the ideas generated during step #1.
   - No idea is dumb, but they may be combined with others or assigned a low priority.
3. **Implement Ideas**: Act on the highest priority ideas agreed to in step #2.

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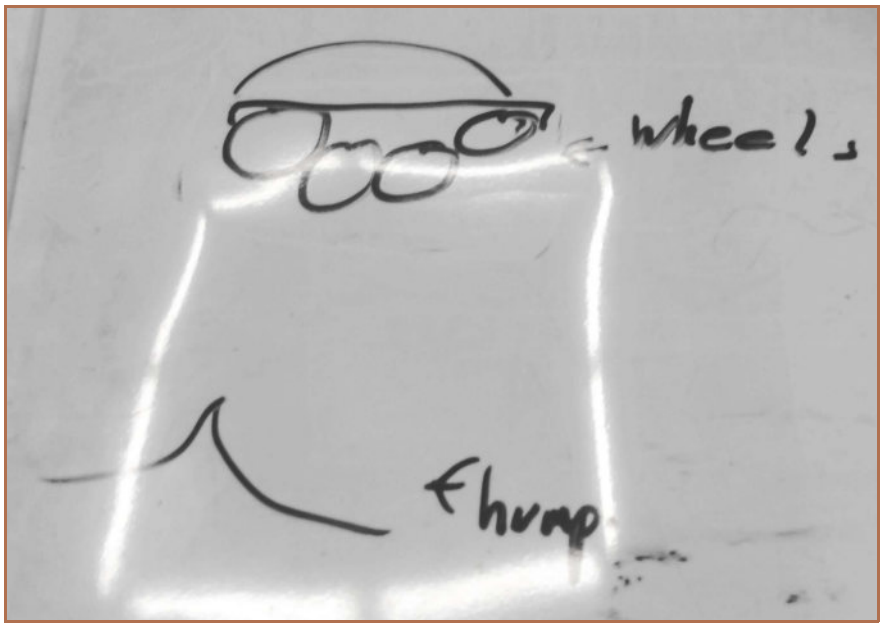
Tasks	Reflections
Megan's General Summary	On Saturday September 8th after kickoff, we headed back to our meeting place to get some more brainstorming in. We went around the room and listened to everyone's ideas, which lead to some discussion about different subsystems and possible designs. One of the first things we all agreed on was the fact that we should avoid driving into the crater at all costs. Not only would it take up a lot of time, but the mecanum drive train which we'd modeled in the summer wouldn't be able to go over the walls. We talked about possibly using a six wheel drive train, which would be more likely to make it over the wall, however we all agreed we should focus on making an arm with some kind of collector on the end of it that could extend to the crater and pick up the elements. Many different designs were brought up to accomplish this. We could have a sweeper on the end of the arm that would pick up the minerals and store them into some kind of hopper, we could use a claw, or we could use a scoop of some sort. As for how we would score the minerals, we discussed several options. Some of them included having a scoop on the front of the arm, and then having the arm lift over the robot and into the cargo, or we could use the sweeper to put the minerals into a hopper, and then transfer them into a bucket into the robot, which would then lift and deposit them into the cargo. Another thing we discussed was the team marker. We figured building a whole subsystem devoted to it wouldn't be necessary, as we could pre-load it into whatever scoring mechanism we decided on, and during autonomous, we could place it into the depot.
Ian's Initial Assessment	130 point from autonomous and end game (80 in autonomous and 50 in end game) teleop: 5 points per block = 13 runs of 2 blocks to equal autonomous/end game. This works out to 9 seconds per cycle. He believes autonomous and end game are more important than teleop.

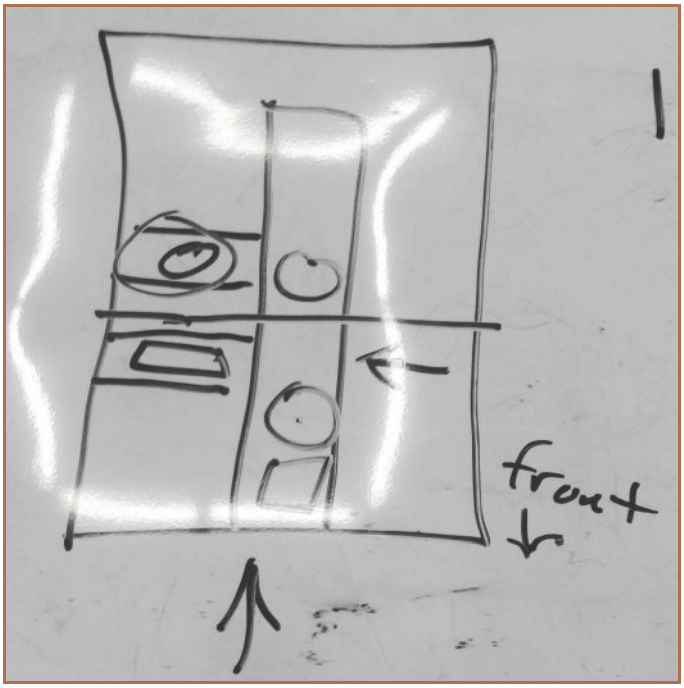
Brainstorming Round 1	Kye, Jalynn & Brooklynn: Scoop with a lid that would turn around. Arm that could reach into crater up to top of cargo hold Ian: Extracting intake to avoid going into crater. Front of robot being intake on slides to pick up balls or cubes. Problem = no longer technically in crater, how many can you pick up? (Forum question?) Megan: Agrees with Ian, avoid crater. Conveyor belt so that balls can from scoop with cut-outs for blocks to sort. Brooklynn: Slider arm for hanging. Drive into hook. Retract slider to hook robot. Joel: Make a sorter, two sections, cube in one. When you have 2, raise cube slot-diverter cube tunnel, ball tunnel. Dedicated lifts. Bins side by side. Both look like mailboxes (Cascade Effect). Floor of robot tilted? Ryan: Single multi-purpose arm intake. Starts level, scoop, drive back with hook, load with winch, flat arm, scoop on end. John: Sweeper scoop, dump into hopper. Sort with slots only wide enough for balls. Sideways hook, let robot down, strafe out. Triangle at end, latching mechanism. Slight lip on linear slide. No hanging from lift, it will sag. Rigid arm attached to robot that won't sag. 2 plates with spring in between.
Brainstorming Round 2	Kye: capturing drawings Ian: Filtering elements in the intake, gate or something so all you don't take what you don't need in the crater. Cascade Effect-style lift with hopper. Lift hopper, drop into Cargo Hold. Balls will fall easier than blocks. Brooklynn: build an arm to push gold block (use open cv or vuforia instead of color sensor?). Robot needs to move accurately enough to choose the gold block.

Brainstorming Round 2 (continued)	Megan: Likes Ian's and Ryan's ideas. Would like to use Mecanum wheels. Need to avoid the crater. Marker Ideas: Maximum 4x4x8 inches, Minimum 3x3x4 inches. Cube, Robot, Weeble, Robot Weeble. Does it need to stand. Is weight counted as part of robot weight (no). Needs to fit in/on robot. Joel: Hook to drop team marker. Curved piece on top, bottom piece connected to servo, just drops. Ian: Intake on slides. Refinement to Ryan's scoop, need to work without dead zones - having 2 counter rolling linear slides, brush blocks, hold in hopper. Sweeper out horizontally over walls of craters. Retract and convey pieces in hopper, putting wheel on slide to support, spring on it for suspension, lock into pogo wheel. Don't want arm to top. How would hopper sort blocks and balls - always blocks or always balls? John: Ian needs to put everyone on Discord. On Discord, ask questions - any questions. John can answer and/or point to videos. Kye: Have something push under robot instead of winch. Platform that lifts the robot like a jack. Ian: Should I pursue designing 6 wheel drive train or wait to see how Mecanum wheel drive train works? Joel: Arm needs to slant down to get into crater? Concerns on level arm, how does it get elements? Randy: Would Mecanum still be maneuverable with arm extended or does the arm need to be retracted? – driver compensation? – weight to counter balance? – software

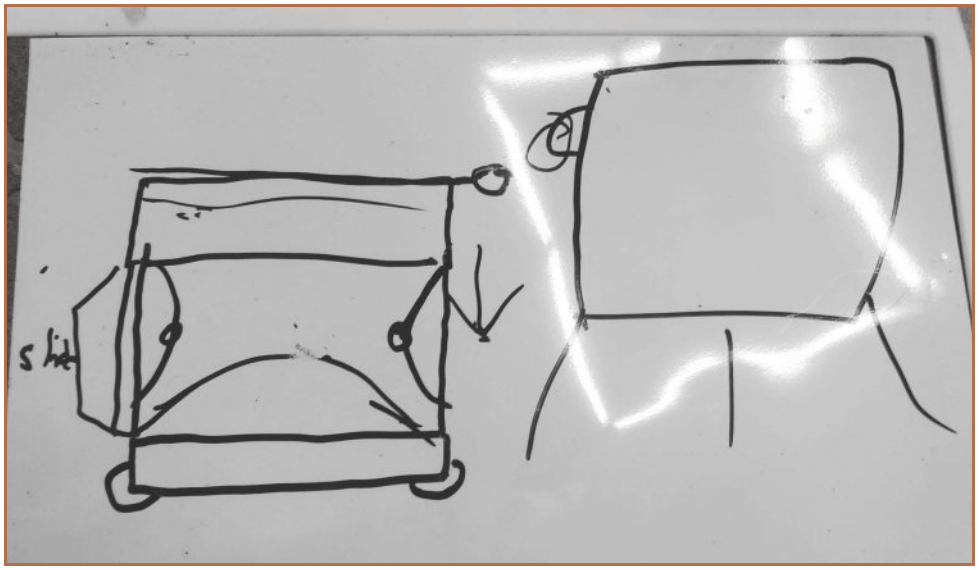


Joel: These wheels would be placed as a tank drive (with no caterpillars) so that we could get into the crater.

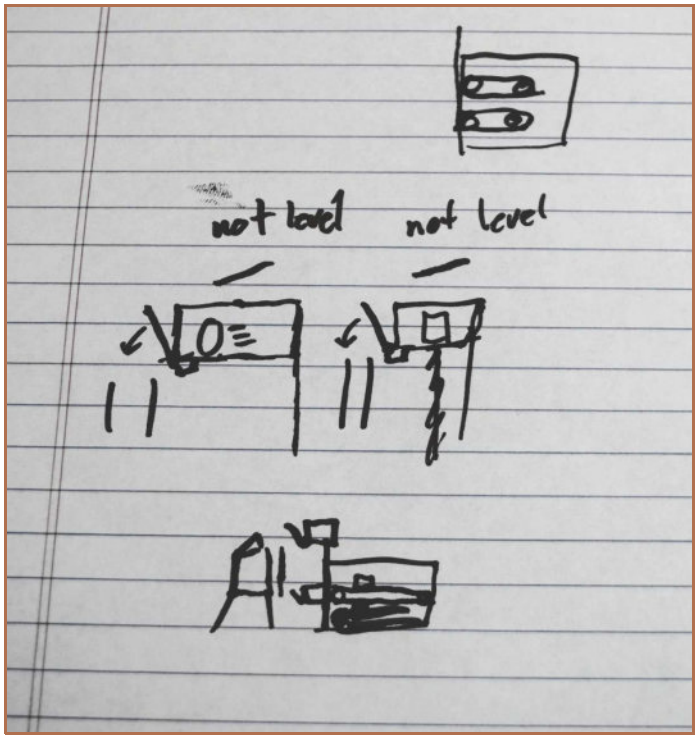
Joel: The middle line is a vertical gate. The idea was that a color sensor would scan the color of the sphere or cube and would only open the gate f or spheres and the cubes would stay behind, and they would be pushed into the dumper. A conveyor would move the cubes and spheres.



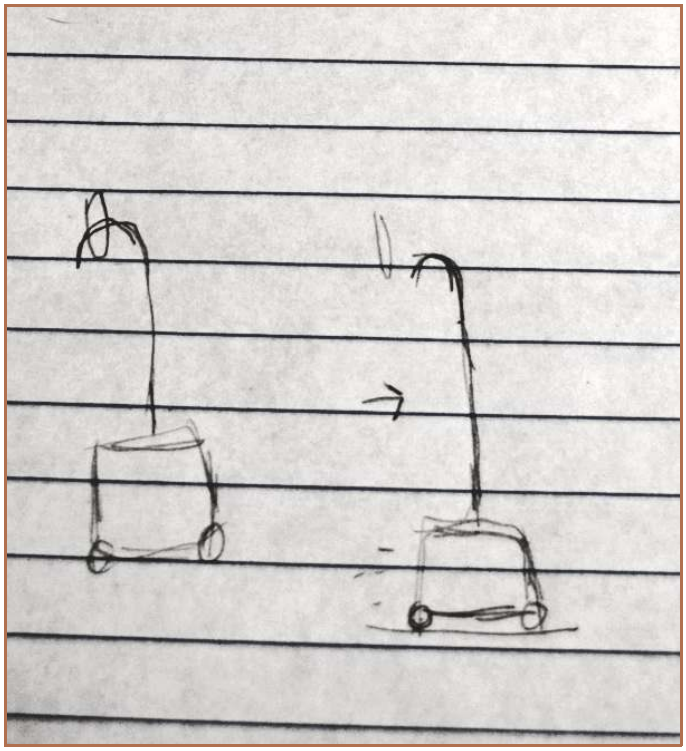
Joel: This idea was to hook onto the lander, and the back piece would give it support so it will not break.



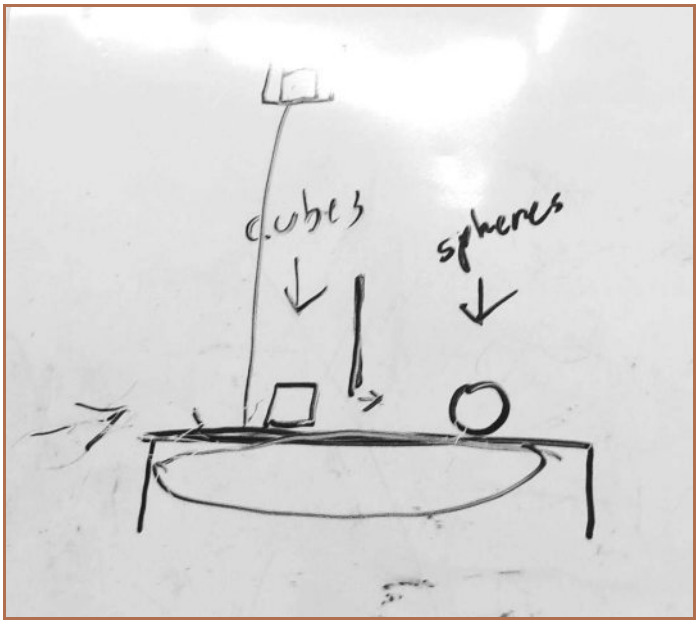
Joel: Make a sorter, two sections, cube in one. When you have 2, raise cube slot-diverter cube tunnel, ball tunnel. Dedicated lifts. Bins side by side. Both look like mailboxes (Cascade Effect). Floor of bins tilted to allow cubes and balls to slide out.

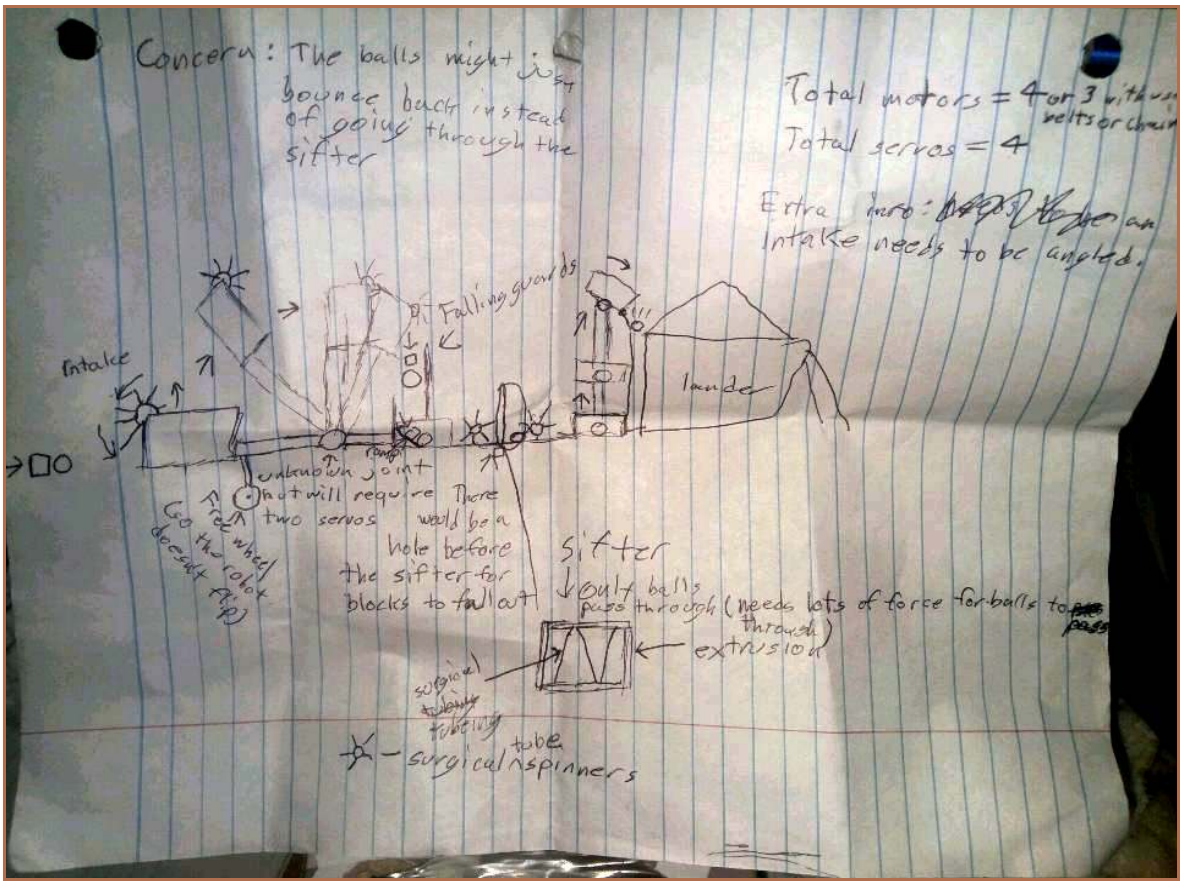


Joel: Hook to drop team marker. Curved piece on top, bottom piece connected to servo, just drops.

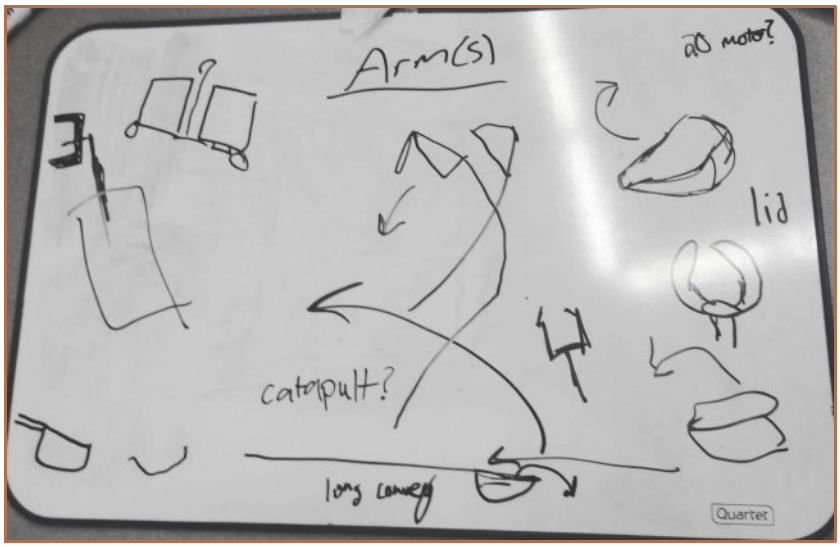


Joel: Color sensors would allow balls to pass then a finger would push both into a hopper that would lie into the lander. A conveyor belt moves all of this.

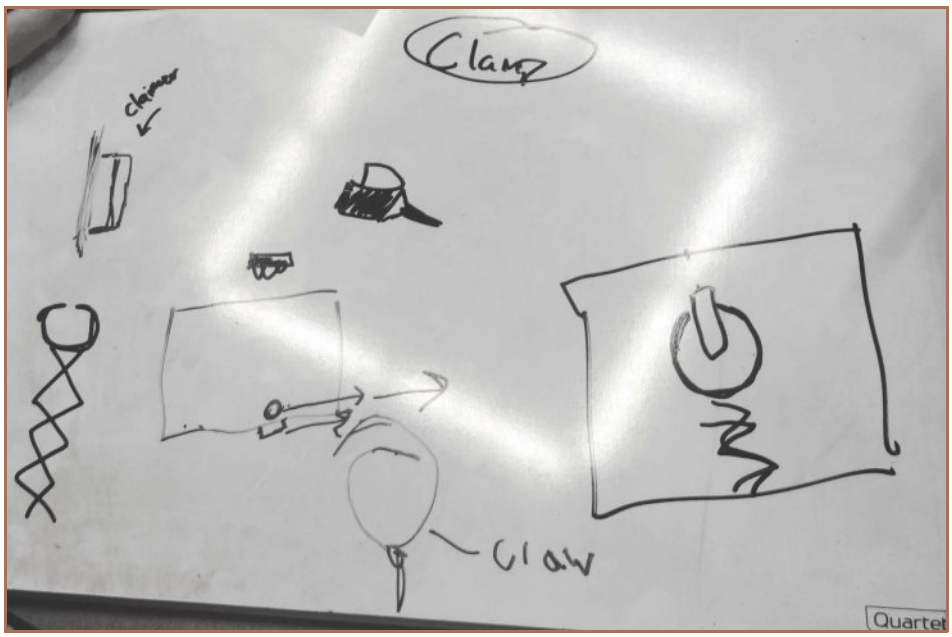




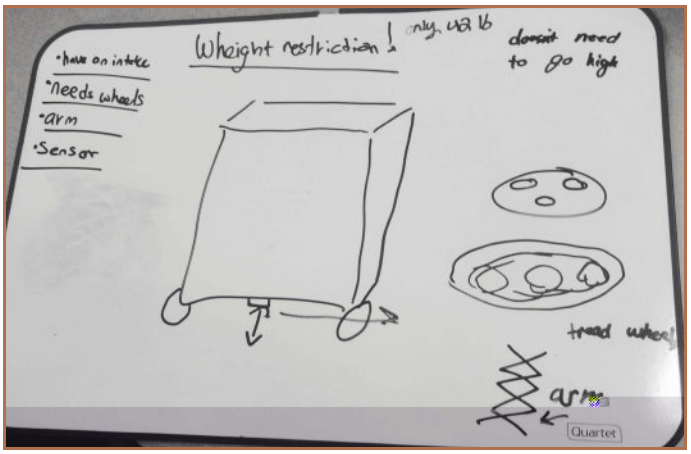
Joel: A tube intake would take in balls and blocks then bend to 100° to dump them onto a ramp then slide into another tube intake and would shoot the balls through the tube sifter, then another tube spinner, then into a hopper which would carry them up to the lander. Blocks will fall out of the bottom since they cannot go through the sifter.



Brooklynn, Jalynn, & Kye: This was mostly ideas for an arm to move the gold and silver to the lander. The catapult idea was that it picked up the gold or silver to "catapult" it to the goal.

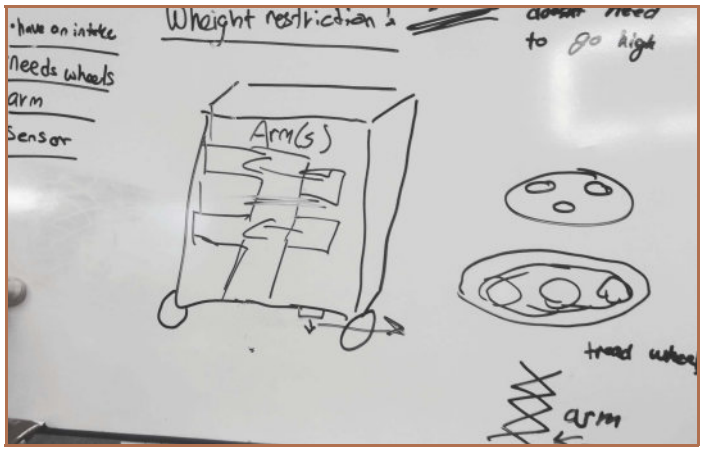


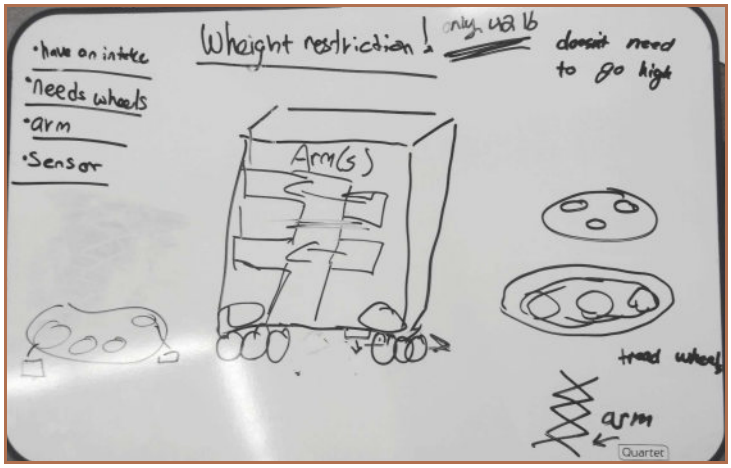
Brooklynn, Jalynn, & Kye: These were possible latching ideas for hanging off the lander. The square with arrows was a possible arm to push the gold off the mark. It's similar to the jewel arm from last year.



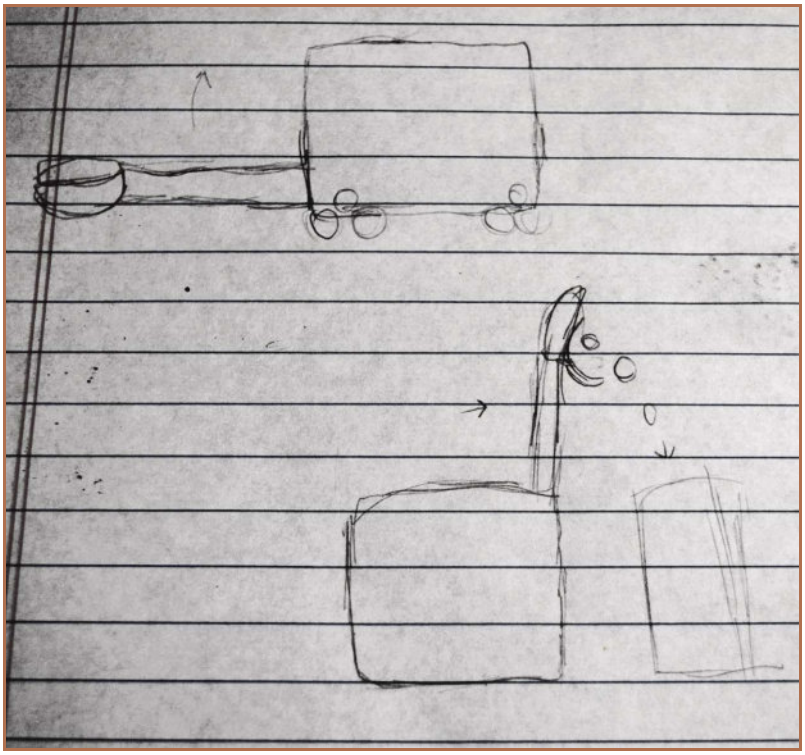
Brooklynn, Jalynn, & Kye: #1 - middle block push and bot lifter, right tread wheels, bottom right arm.

Brooklynn, Jalynn, & Kye: #2 - inside robot arms that push blocks or balls out.



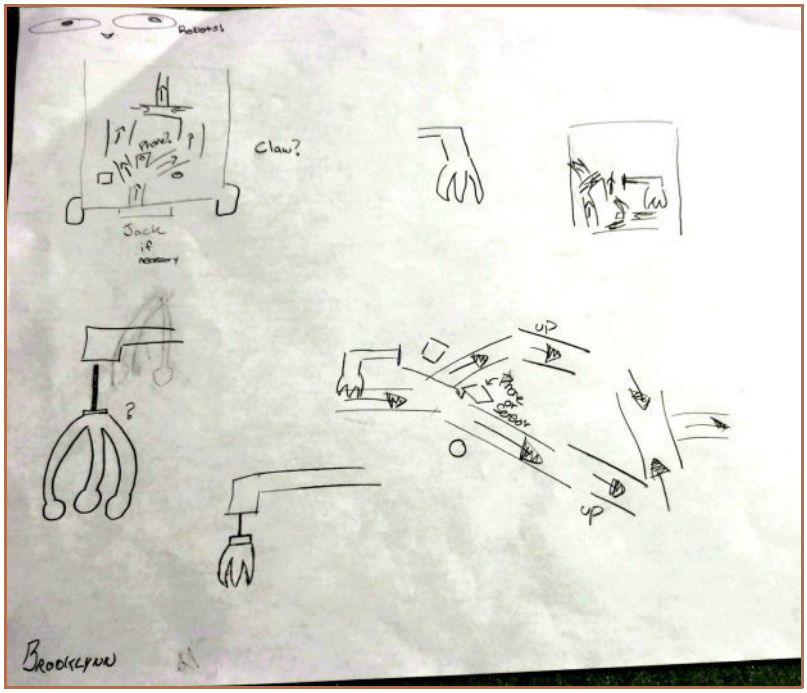


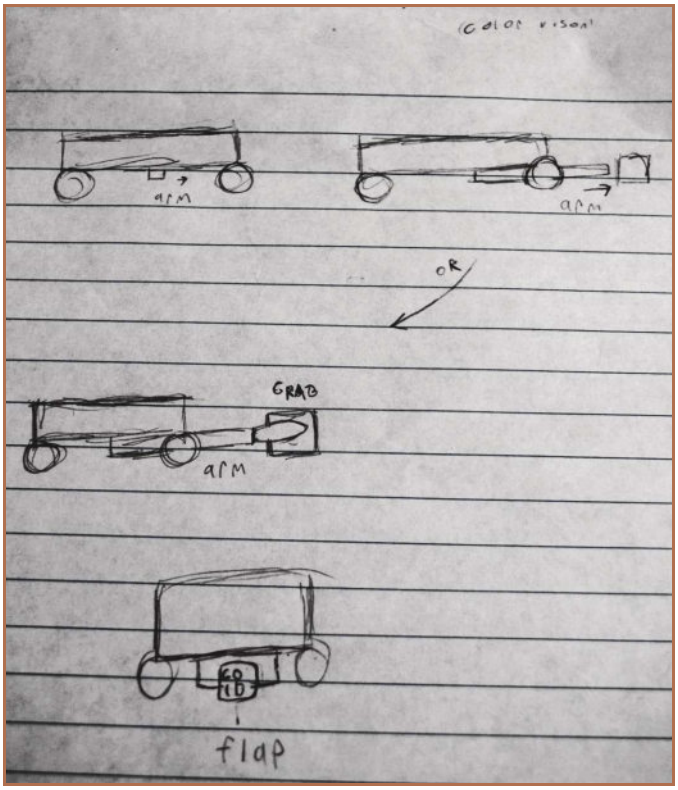
Brooklynn, Jalynn, & Kye: #3



Brooklynn, Jalynn & Kye: Scoop with a lid that would turn around. Arm that could reach into crater up to top of cargo hold.

Brooklynn: I was thinking about a possible way to not use too many motors on one thing. A simple arm/claw for something that only has to pick up max of 2 gold/silver. The inside of the robot was a possible way to separate the gold from the silver then it goes to the top of the robot and from there, to the goal.





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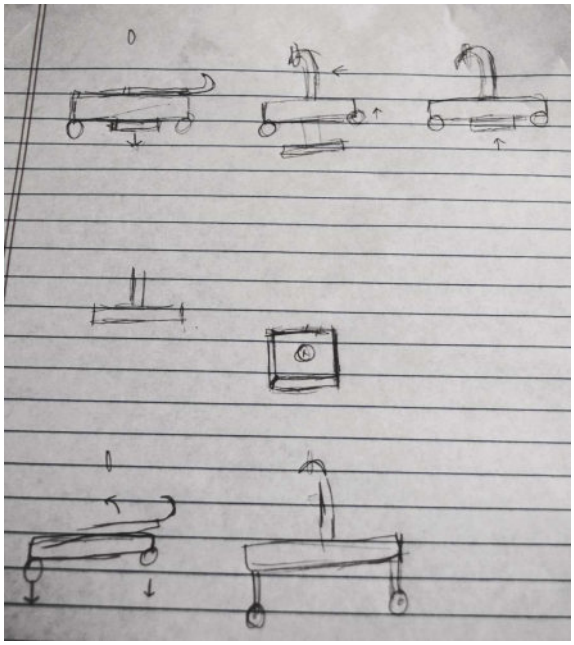
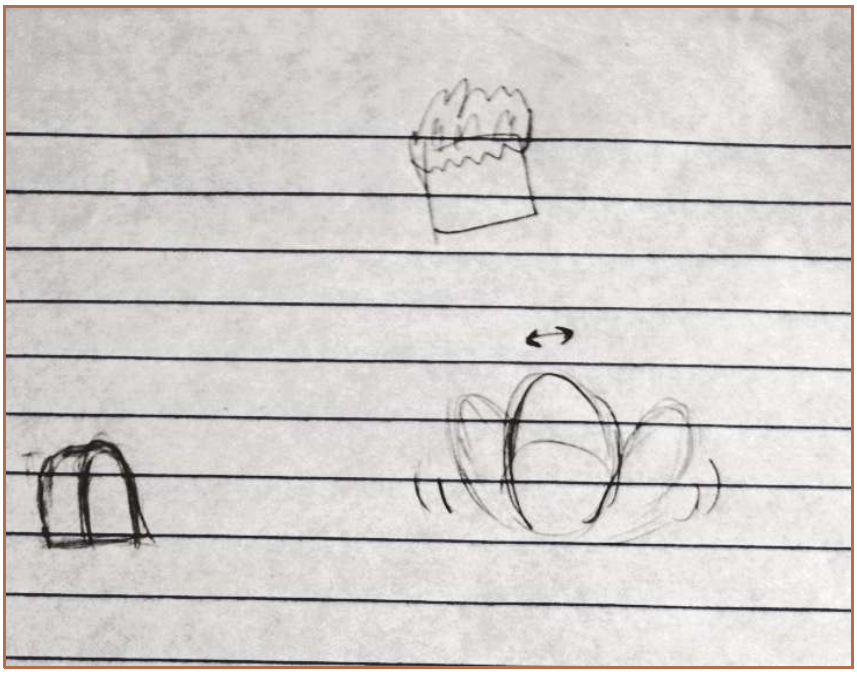
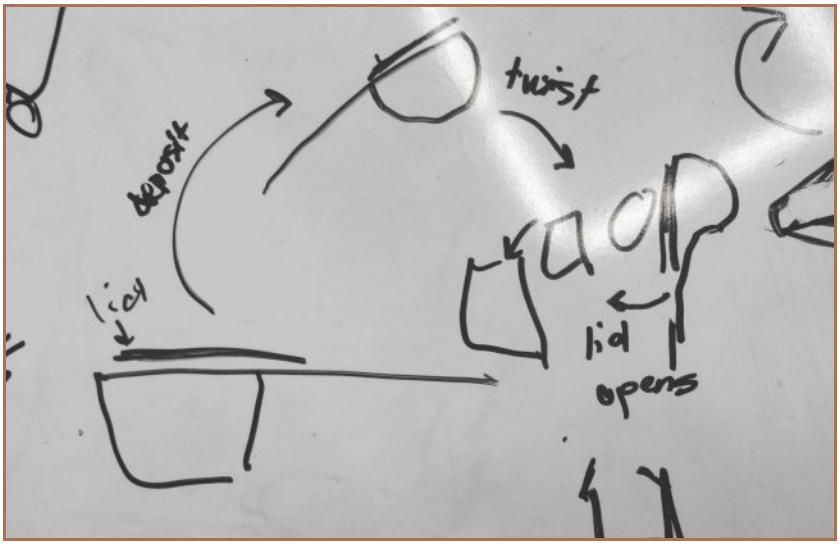
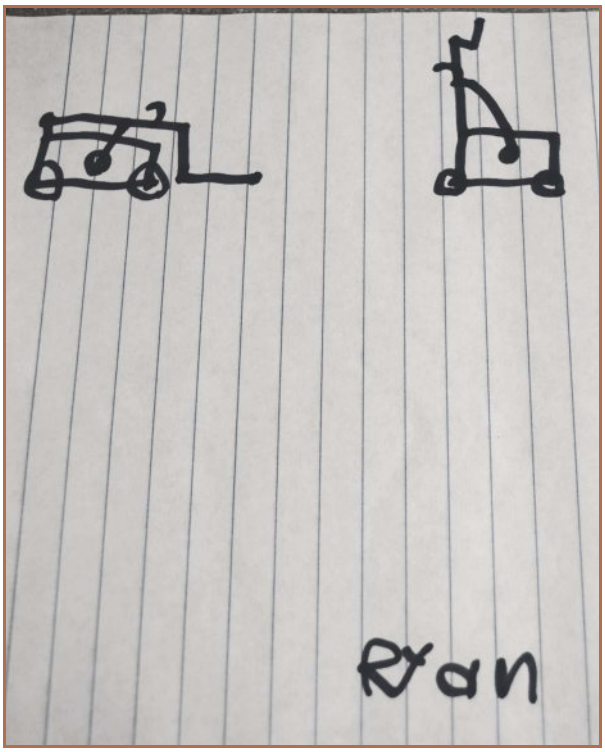




Megan: Marker Ideas - Maximum 4x4x8 inches, Minimum 3x3x4 inches. Cube, Robot, Weeble, Robot Weeble. Does it need to stand. Is weight counted as part of robot weight (no). Needs to fit in/on robot.

John: Sweeper scoop, dump into hopper. Sort with slots only wide enough for balls? Sideways hook, let robot down, strafe out. Triangle at end, latching mechanism. Slight lip on linear slide. No hanging from lift, it will sag. Rigid arm attached to robot that won't sag. 2 plates with spring in between.





Ryan: Single multi-purpose arm intake. Starts level, scoop, drive back with hook, load with winch, flat arm, scoop on end.

Brainstorming Summary
Rover Ruckus / 2018-2019 Season
Week 2 – 14 Sept 2018 – Revision 1

Summary of Ideas Collected

Drive Train:

- Mecanum drive is our going-in position—Nearly complete and maneuverability is key.
- Concern: Mecanum can get hung up on crater walls. Must experiment with parking in autonomous.
- Idea: Jack/foot under the robot may help with climbing over the crater wall.

Landing/Latching:

- Idea: Latching mechanism can be a simple hook with a tab to prevent sliding out.
- Idea: Latching mechanism should lock in place when weight is applied.
- Idea: Robot could be raised/lowered by a winch.
- Idea: Robot could be allowed to drop for landing. (Note: 4 inch drop)
- Idea: Could share motors to raise/lower: Use a PTO or transmission
- Idea: Robot could be raised by a jack/foot underneath.

Summary of Ideas Collected
(continued)

- Idea: Use a ratchet or latch to hold the robot weight while hanging. Prevents slipping.
- (Rev 1) Idea: The latch hook could be designed so that as it is raised over the bottom of the lander support bracket, two spring loaded levers would pivot downward and over the bottom surface of the bracket (similar to a carabiner). Once withing the bracket, the springs would close the levers and lock the hook into place so that the weight of the robot would be supported. If the robot weight was removed and the latch hook pushed upward again, the spring loaded levers would again open around the top surface of the lander support bracket, thus freeing the hook and allowing the robot to drive away. In addition, a magnet positioned on the latch hook support mechanism could be used to 'sense' the position of the lander support bracket and help pull the mechanism into place and guide the latch hook over the lander support bracket.

Summary of Ideas Collected
(continued)

Arms:

- Idea: Separate telescoping horizontal arm and vertical lift. Horizontal arm extends a collector, retracts with minerals. Transfers minerals to hopper on vertical lift. Lift raises and dumps minerals into cargo hold.
- Idea: Single telescoping arm that pivots up. End of arm would be a dual purpose collector/dumper. No transfer mechanism required.
- Idea: Use an extendable wheel on a leg to support the horizontal arm and prevent tipping over.
- Idea: Motor(s) that raise lift/pivot single arm could also drive lift mechanism.
- Idea: Two telescoping arms long enough to reach from crater to cargo hold. Would provide continuous path to move elements.
- Idea: Vertical lift might be a combination of drawer slides and extrusions. Drawer slides are heavier/stronger/capabible of supporting more weight. Independant stringing should make the upper/lighter extrusions move very quickly.
- Idea: Consider using GT2 belts instead of fishing line or kevlar string to string the lifts. Will not stretch.

Summary of Ideas Collected
(continued)

- Concern: With horizontal arm extended, the center of gravity shifts and mecanum drive handles differently. Handle either through driver practice, shifting counterbalence weight, or software mixing.

Dispenser

- Idea: Allow hopper to tip right/left rather than down. More flexability during dumping.

Summary of Ideas Collected
(continued)

Collector:

- Idea: Ability to sort gold from silver particles. Use light sensor and servos. Driver control selects which is kept.
- Idea: Collector could be a tubing-based sweeper.
- Idea: Collector could be a scoop which lifts minerals into a bin.
- Idea: Collector could be a servo-driven 3 or 4 finger claw that fit over minerals and lifts them into a bin.
- Idea: Put collector on a horizontal arm and extend into the crater. Do not drive into crater. Arm/collector should reach into corners.
- (Rev 1) Idea: Do the sorting in the body of the robot as part of the transfer mechanism between the horizontal and the vertical arms.
- (Rev 1) Idea: Similar to last year's robot, use 3 pair of soft conformal wheels arranged one after another to pull elements off the floor and onto a guide, raising them onto either a belt (which would run the length of the horizontal arm) or into a hopper. If using a belt, elements could be sorted and rejected during the trip down the arm.

Summary of Ideas Collected
(continued)

Team Marker:

- Idea: Make the marker self-right like a weeble.
- Idea: Make the marker look like outreach robots with a weeble base.
- Idea: Use a servo-driven latch on the robot body. Autononous drives into the depot and simply drops the marker.
- Idea: Marker is placed in the collector. Autonomous extends the horizontal arm over the minerals into the depot, then drops the marker. Prevents the robot from driving into and bumping the minerals.

Proposed Subsystems

Robot Hardware:

- Drive Train
- Horizontal/Vertical Arms
- Collector/Dispenser
- Landing/Latching Mechanism
- Marker Dispenser

Robot Software:

- Driver Control
- Autonomous
- Peripheral Control

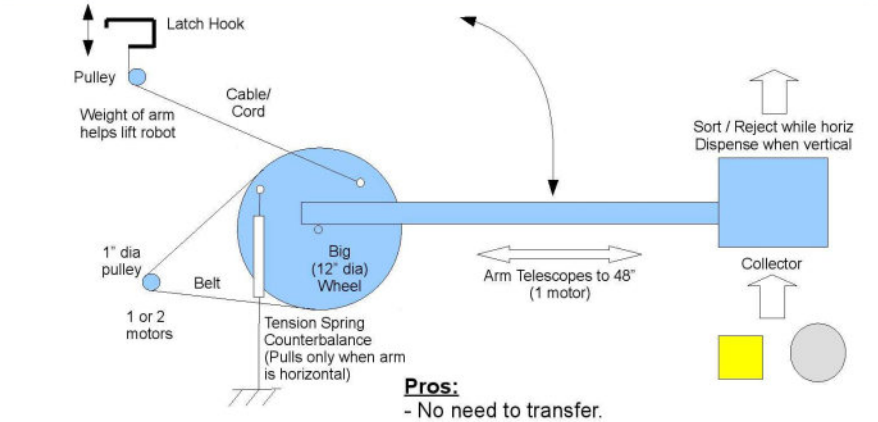
Everything Else:

- Engineering Notebook
- Social Media
- Display Boards
- Pit Design
- Scouting Prep

Open Questions / POPs Required

- Drive Train: 95% sure of mecanum. BUT: Can it park on the crater without getting stuck?
- Collector: Sweeper or Scoop or Claw? Concerns: Motor availability, weight, ability to lift elements into the bin reliabily and quickly.
- Arms: One or Two?
  - Pros for one: No transfer needed, potentially faster, potentially lighter.
  - Pros for two: Reliability.
  - If two, positive transfer of minerals from collector to dispenser can be very tricky.
- How does marker dispensor work?
- How to power robot landing/latching?
- Reliable hook mechanism for releasing from and latching onto lander?
- Autonomous considerations:
  - How to find/distinguish between mineral samples?
  - Drive to depot OR reach into it to deliver marker?

Possibility...



Pros:
- No need to transfer.
- Does Triple Duty (Saves weight).
- Uses maximum of 3 motors.

Cons:
- If it breaks, we're done.

Motor / Servo Budget

	Motors (8 Total)	Servos (12 Total)
Drive Train	4	0
Horizontal Arm	1?	0
Vertical Arm	2?	0
Single Arm	3?	0
Robot Landing/Latching	0? 1? 2?	1 (ratchet)
Collector	1?	2? 3? 4?
Dispenser	0	2?
Marker Release	0	0? 1?
Transfer Collector to Dispenser	0	0? 1? 2? 3?
Camera Swivel	0	1?

Scoring

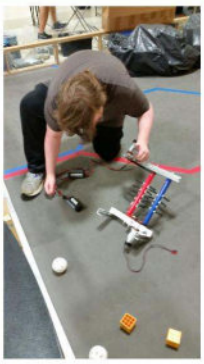
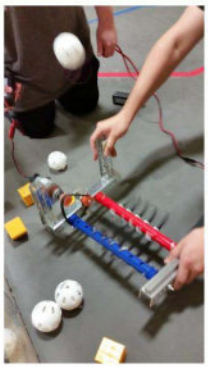
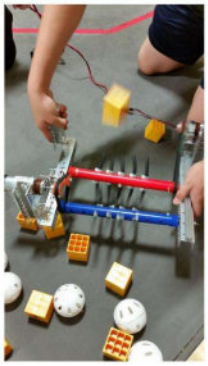
- How to score 1 point by 1 October?
  - Bulldoze samples into Depot (2pts each)
- Progression of Scoring Abilities?
  - Autonomous:
    1) Landing
    2) Sample
    3) Drop Marker
    4) Park
  - Endgame: Latch onto Lander
  - Mineral Collection and Deposit into Cargo Hold

Expectations

- When a POP is completed:
  - Need **Pictures** for the Engineering Notebook
  - Need a brief write-up of what was learned (also for Engineering Notebook)
  - Need to **share** results with everyone else on the team.
- Decisions:
  - Discuss with majority of teammates and get agreement.
  - COMMUNICATE: Write up the decision for the Engineering Notebook.
  - COMMUNICATE: Please make sure that the Coaches & Mentors know!
- (rev 1) Design Reviews:
  - Done after design is complete but before prototype construction begins.
  - Informal and short: Show the team what you're thinking about building.
  - Show design work, POP results, models, flowcharts, sketches, CAD drawings, whatever.
  - Major input into the Engineering Notebook.

Example of POP Input

- Pictures:

- Date: 9 September 2018
- Who: Ian, Joel, and John
- Purpose: Show if sweeper made of contra-rotating neoprene tubing can grab and lift both blocks and balls.
- What was done: Put together simple sweeper. Powered by 2 motors (20's). Manually ran over minerals on floor at height of about 4 inches.
- Conclusion: It can!

Conclusion

- LOTS of GREAT Ideas!
- LOTS of Open Questions.
- Few definite decisions (OK at this point).

- PLEASE remember to Communicate:
  - We are a TEAM.
  - Communications can double as Engineering Notebook Input.