1/10/2020 - Very preliminary. This is the bones of the robot systems.

1/28/20- More details, editing systems

This is a review of the robot’s systems and subsystems. It is used to capture the states and actions of the systems. As well as the inputs and outputs needed to accomplish control.

**The Game**

There is a 30” hole centered 8’ high, outer port, with a 12” hole, inner port, centered on the outer port but 2’-6” farther back. There is a color wheel on the side that should be rotated twice during the match. For the end game there is a rocker bar, Shield Generator Switch, 4’-6” to 6’-6” off the ground to lift on with the goal to balance the arm.

Power Cells, 6” balls, are collected from a loading station on one end or from the floor and delivered, shot, into the outer or inner ports on the other end. Only 5 balls can be held by the robot.

**Hardware**

There are 8 assemblies, subsystems: Drive, Snorfler, Revolver, Turret with CV targeting, Shooter, Wheel of fortune, Climb.

The **Drive** system is a 8 wheel tank drive system. It is controlled by the joysticks most of the time. When retrieving and delivering power cells. May be Reversible by button press.

* (2) TalonSRX - CAN bus
* (2) Talon Encoders
* (6) VictorSPX- slaves to follow front talon controllers
* (3) Joysticks - Standard Driver Station
* (1) Possibly USB Camera- chasing yellow balls, low priority for now

The **Snorfler** retrieves and delivers the balls, power cells, into the robot. When a joystick button is pressed the Snorfler assembly lowers, motor spins to sucks in the ball(s), an intermediate arm extends and 2 sets of loader wheels spin inward. If Revolver is full then the snorfler and intermediate wheels spin outwards. When the the joystick button is released, the snorfler and spinning wheels are stopped and the whole assembly is returned to a stored position.

* (2) Motor Controller - Spin Snorfler and intermediate wheels
* (2) Pneumatic Actuator - Lower/Raise Snorfler and intermediate Arm
* (1) Possibly Banner Sensor

The **Revolver** stores up to five balls and indexes how many balls are currently in the Revolver. If full, it will not allow any balls in, and be ready to empty.

* (3) Motor Controllers
  + (1) TalonSRX with encoder for rotating the chambers of the revolver
  + (2) Kicker motors- come up to speed, then feed balls into the turret
* (1-2?) Banner Sensors- Used for indexing and keeping track of how many balls are in the chamber
* (1) Mag sensor- one revolution on the motor is one index
* (1)pneumatic arm- bumps up for spinners to feed the

~~The ball~~ **~~Indexer~~** ~~holds only 5 balls then delivers them one at a time to the lifter.~~

* ~~(2) TalonSRX~~
* ~~(2) Banner Sensors~~

~~The ball~~ **~~Injector~~** ~~readies the balls for vertical injection into the center of the shooter.~~

* ~~(2) TalonSRX~~
* ~~(2) Banner Sensors~~

The **Turret** positions the shooter at the target. It can be done manually with a joystick or automatic targeting with a button press through the Limelight. The rotation is limited to 270 degrees, +/- 135 degrees.

* (1) Motor Controller
* (1) 3 turn Potentiometer
* (2) Limit Switches
* (1) Limelight

The **Shooter** is used to “shoot” the ball at the target. The launch angle will be fixed. The launch velocity may need to vary based on distance to target.

* (1) TalonSRX
* (1) Wheel encoder

The **Wheel of Fortune** rotates the color wheel twice during the game.

* (1) TalonSRX
* (2) Pneumatic Actuator
* (1) Color Sensor (Might be able to reuse a vision camera)

The **Climb** is used to lift onto the Shield Generator switch. TBD main mechanisms still (1/28)

* (1) Pneumatic solenoid with 2 actuator -position the left & right climber bars up
* (2) TalonSRX - retract cables to lift robo & balance the switch.

Structure 1/28/20

1. Drive
   1. Tank Teleop
      1. Left Axis to Left Master Talon, all other Victors are slaves to it
      2. Right Axis to Right Master Talon, all other Victors are slaves to it
         1. Try implement velocity drive vs percent drive
      3. Invert each speed controller on some button press
   2. Tank Ball Chaser
      1. using Camera to control sides, move forward still on axis
   3. Auto Magic Function to be called during Auto
2. Snorfler
   1. State 0 - Default
      1. Arm up
      2. Spinner off
   2. State 1 - Snorfle
      1. Arm down
      2. Spinner on
   3. State 2- Reverse Snorfle when Revolver is full
      1. Reverse spinner
3. Revolver
   1. State 0- Receiving
      1. Accepting, every ball in fills an index and moves the chamber over
   2. State 1- Full
      1. Snorflers set to rejecting, no movement until asked to unload
   3. State 2- Unload
      1. Spin unloading wheels to speed, bring up pneumatic bumper, spin the chamber
4. Turret
   1. State 0 - Off and centered on robot (forward), return to center?
   2. State 1 - Uses gyro to point towards target end, 20 degree deadband
   3. State 2 - Locate and hold on target on button hold
5. Shooter
   1. State 0 - Off
   2. State 1 - Maintain RPM setpoint
      1. Initiated by button press
6. WoF- sort of TBD
   1. State 0 - Default
      1. Arm in/up
      2. Spinner off
   2. State 1 - Spin wheel
      1. Arm down
      2. Spin wheel for rotations, most likely time based or manual
   3. State 2 - Spin Wheel 2
      1. Arm down
      2. Spin wheel until color match, color sensor
7. Climb TBD

**Software Structure:**

1. Drive system - Differential Drive
   1. State 0 - Default, commands come from joysticks
      1. Tank drive
      2. Left JS to left wheels
      3. Right JS to right wheels
   2. State 1 - Autonomous
      1. Tank?
      2. Commands from a list of possible starting locations and secondary ball pickups
   3. State 2 - Ball Chaser
      1. Initiated by button press during teleop
      2. Arcade
      3. Forward/Backward by JS
      4. Left/Right by Vision Camera targeting
2. Snorfler
   1. State 0 - Default
      1. Arm up
      2. Spinner off
   2. State 1 - Snorfle
      1. Arm down
      2. Spinner on
3. Ball Indexer
   1. State 0 - All off
   2. State 1 - Receive balls from snorfler
      1. Initiated when snorfler is on or ball in holding bin
      2. If ball in slot 1, index forward
      3. ?
   3. State 2 - Deliver balls to injector
      1. Initiated when injector requests ball, no ball and running.
      2. Turn on ball pusher
      3. Rotator when new ball is detected in injector
4. Ball Injector
   1. State 0 - Off
   2. State 1 - Advance ball
      1. Initiated when shooter is up to speed or/and button push
      2. ??
5. Turret
   1. State 0 - Off and centered on robot (forward)
   2. State 1 - Uses gyro to point towards target end, 20 degree deadband
   3. State 2 - Locate and hold on target
6. Shooter
   1. State 0 - Off
   2. State 1 - Maintain RPM setpoint
      1. Initiated by button press
      2. ?
7. WoF
   1. State 0 - Default
      1. Arm in/up
      2. Spinner off
   2. State 1 - Spin wheel
      1. Arm down
      2. Spin wheel until color match
   3. State 2 - Spin Wheel 2
      1. Arm down
      2. Spin wheel until color match
8. Lifter
   1. State 0 - Default
      1. Left/Right down
   2. State 1 - Raise arms to max
      1. Initiate by button press
   3. State 2 - Lower both to hook on to arm
      1. Initiate by button press
   4. State 3 - Raise both to hook on to arm
      1. Initiate by button press
   5. State 4 - Lower Left only
      1. Initiate by button press
   6. State 5 - Raise Left only
      1. Initiate by button press
   7. State 6 - Lower Right only
      1. Initiate by button press
   8. State 6 - Raise Right only
      1. Initiate by button press
   9. State 7 - Once hooked on arm, auto level by raising left or right
      1. Initiated by button press