Digital Notebook

Thursday, January 19, 2023 3:29 PM

Team
40458F

Team Captain: Quinn
Drivers: Danny, Walker | Coder: Quinn
Builders: Levi , Danny, Quinn, Walker

Due to Short Notice, many pages are photos of our physical notebook, we apologize for this inconvenience, if you need help reading the photos, please feel free to ask us for help.
Many Thanks, the team members of 40458F

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Key:
Important to driving
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Code

Up until the first code section was written in paper notebook, we apologize for the poor quality, if you need any help understanding the writing, please feel free to talk to us

Team Introduction

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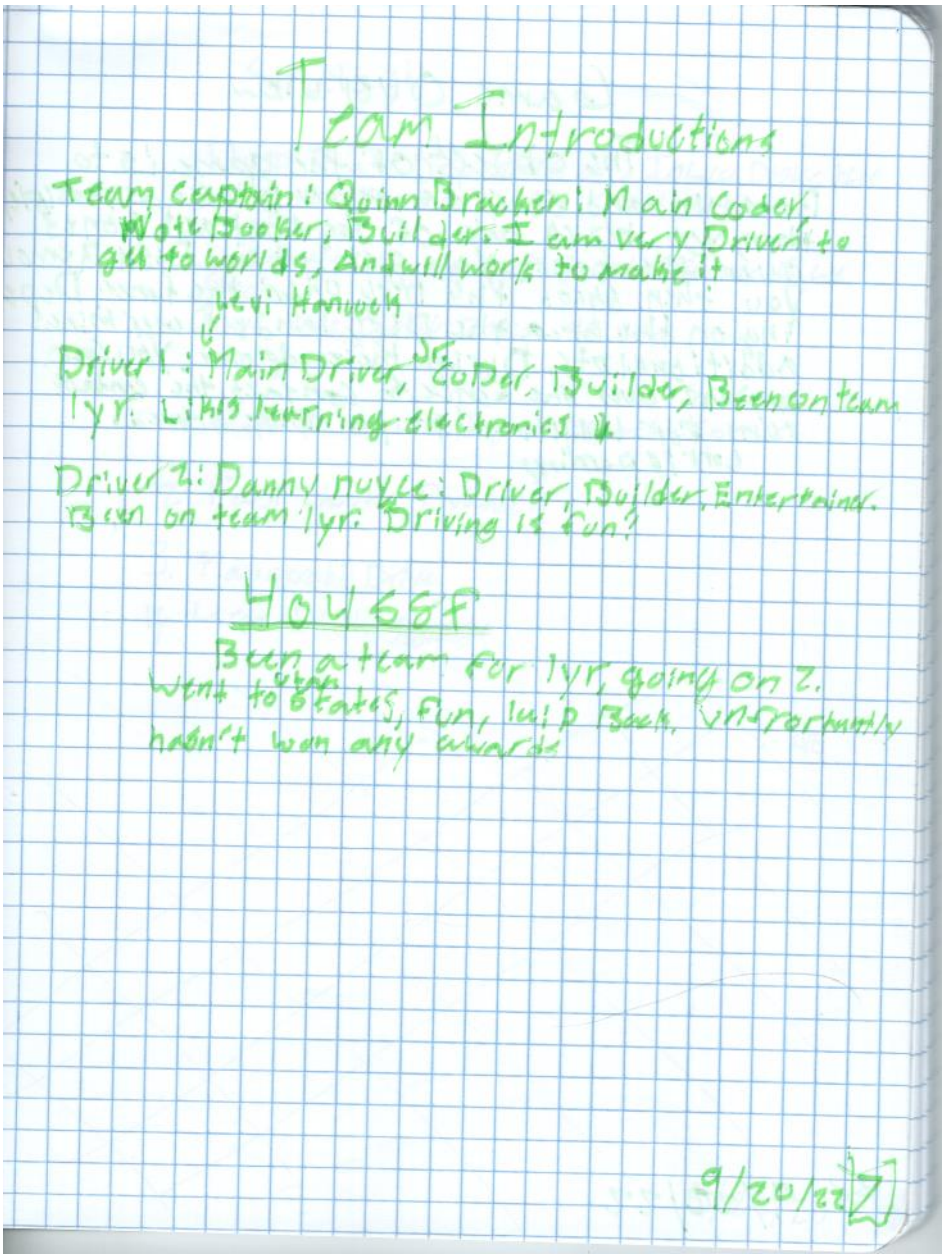

Game Overview

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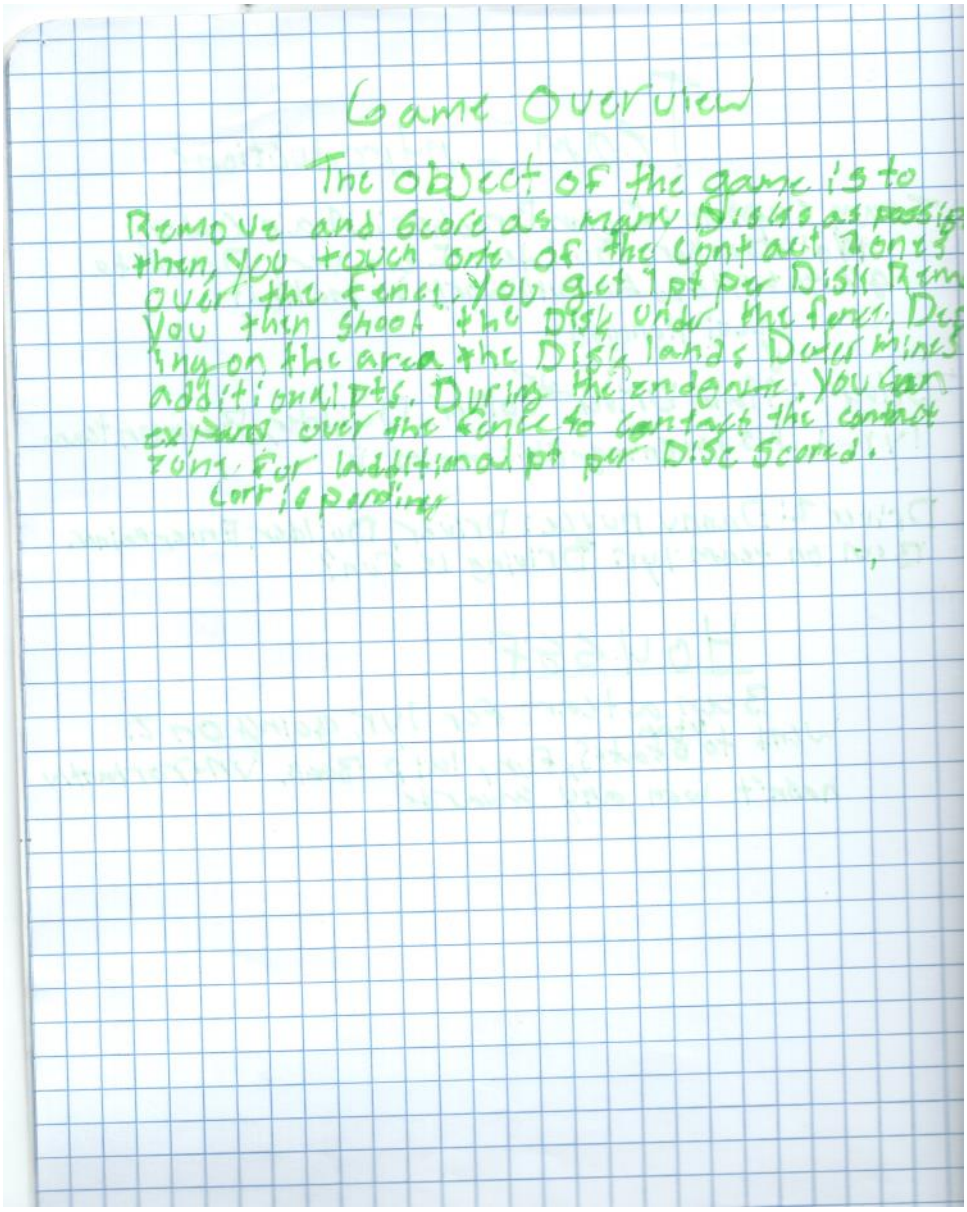

Strategy/Build Ideas

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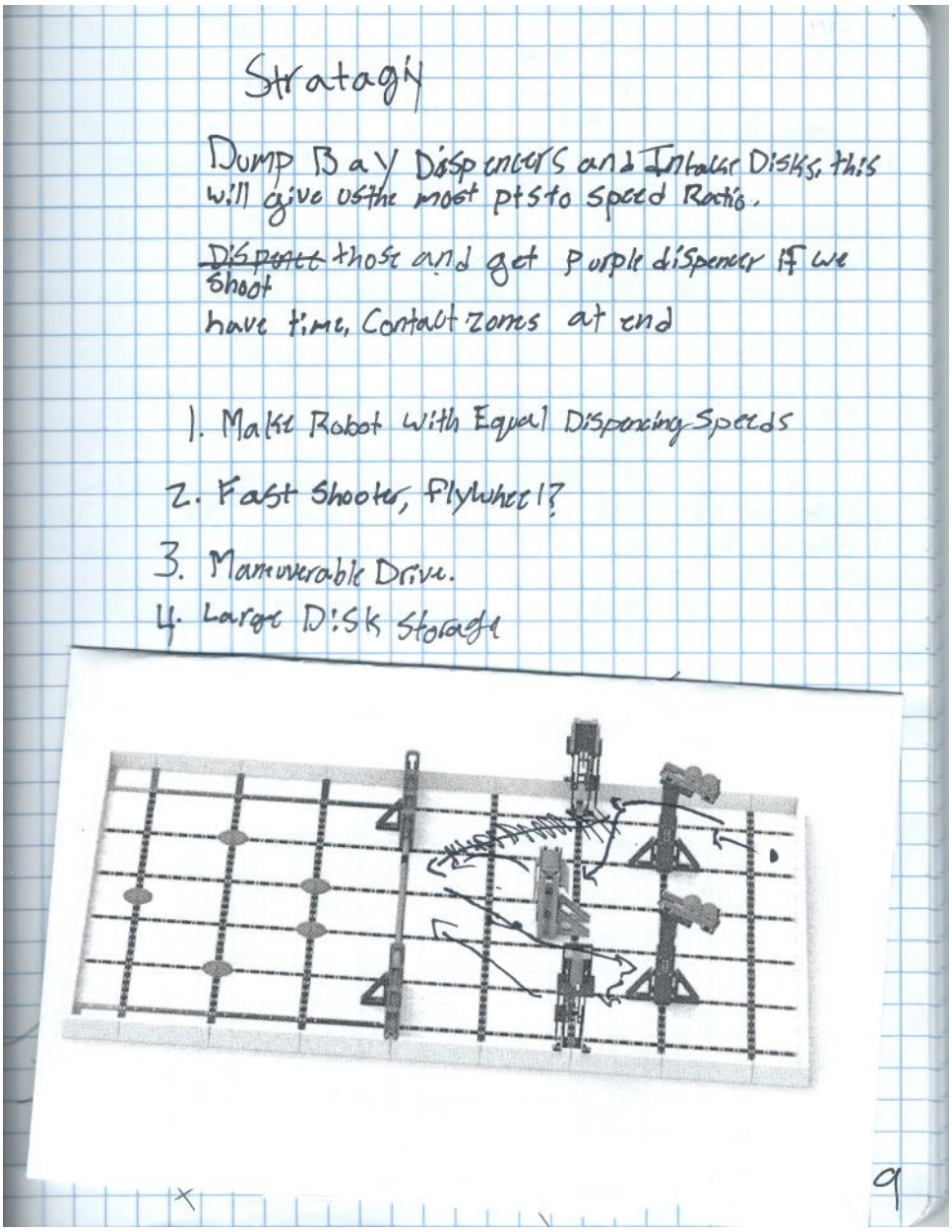

Base

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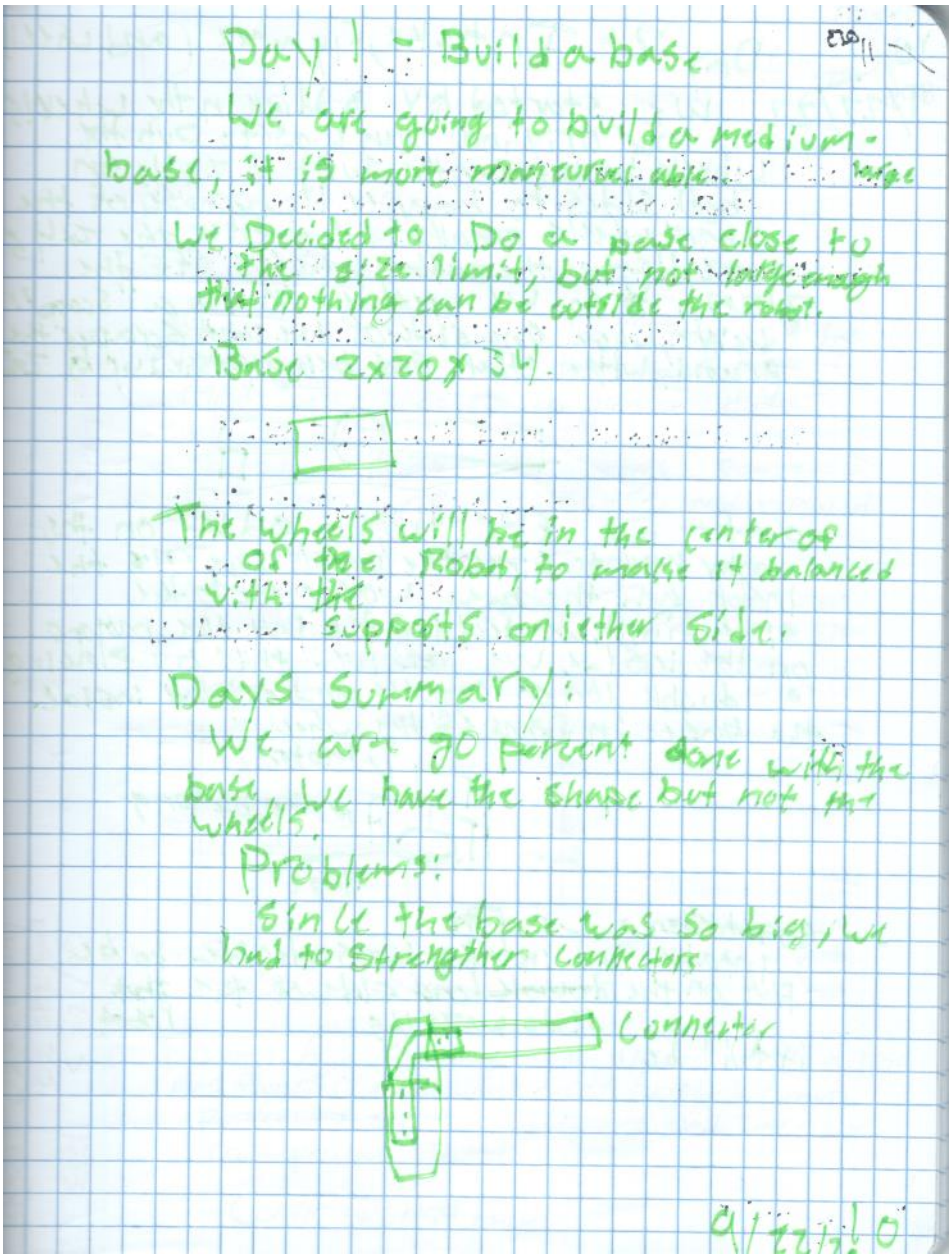

Intake, Flywheel, Wheels

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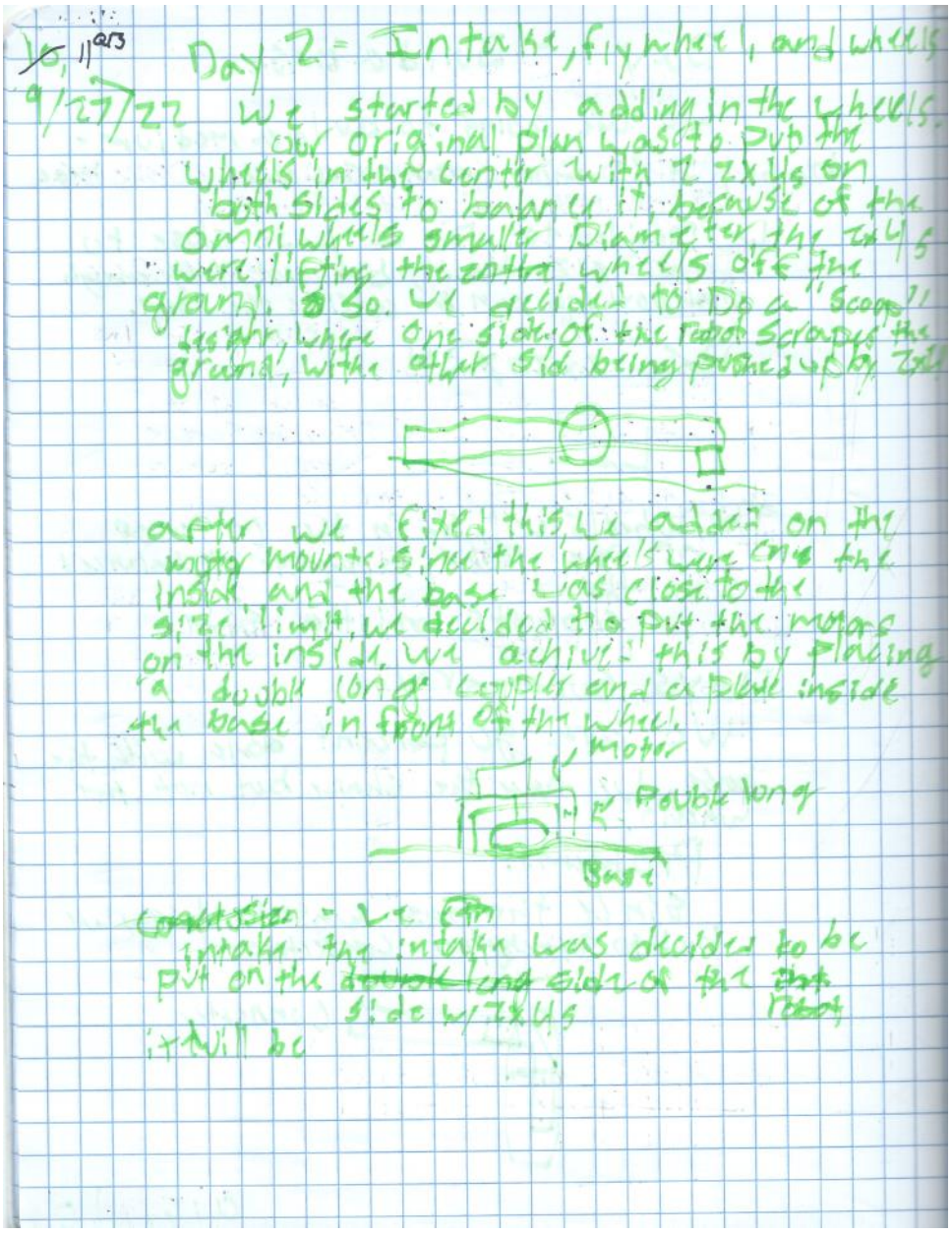

Base, Flywheel, Intake

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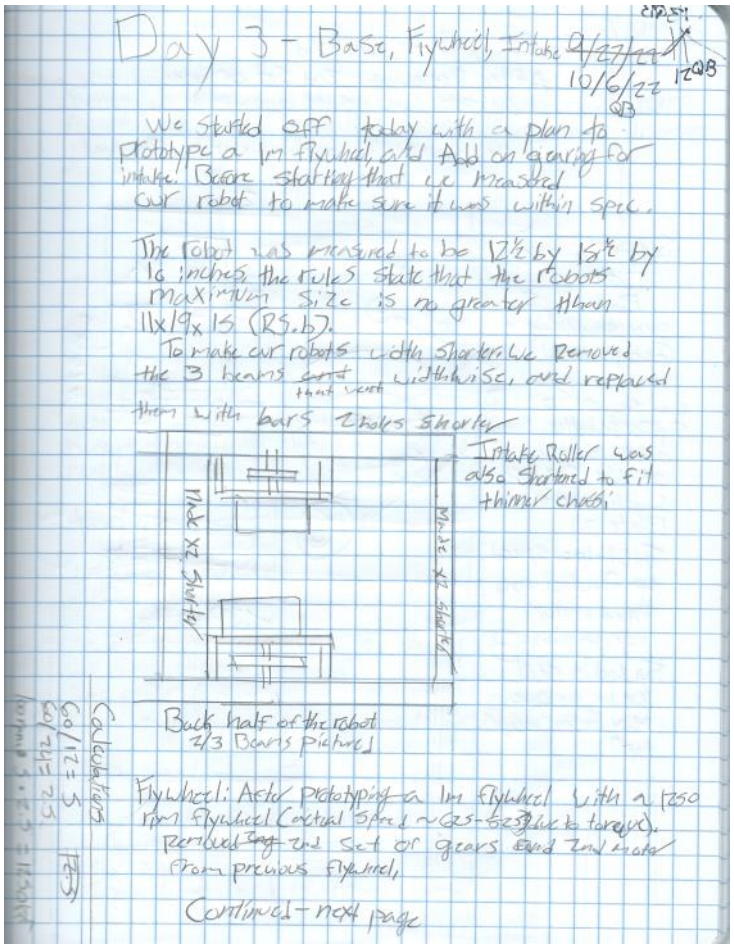

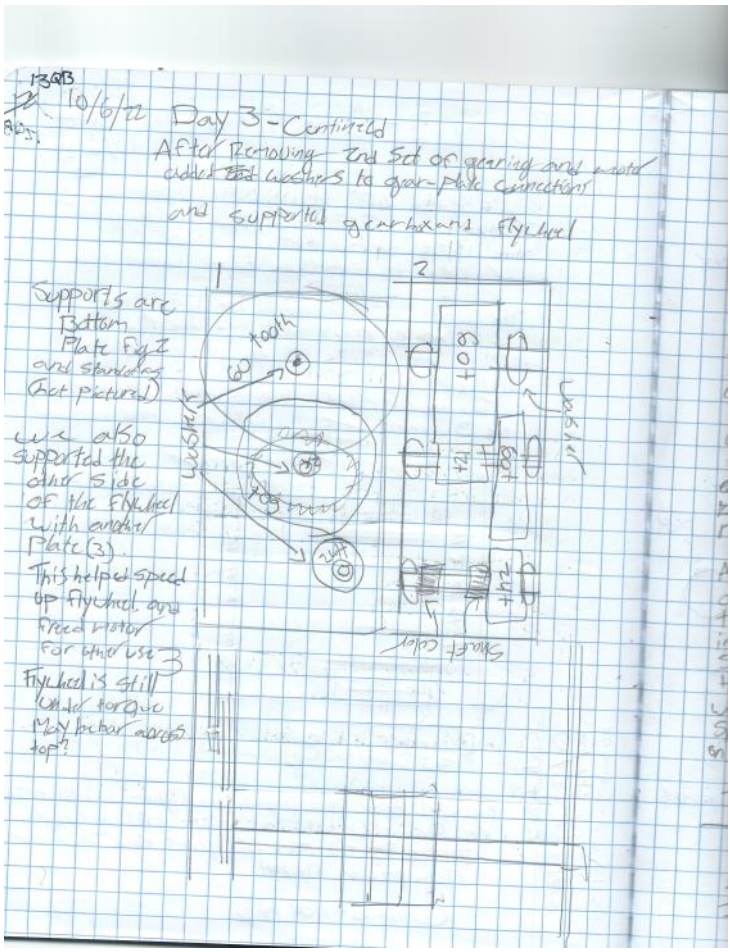

Size Reduction, Disk Transport Brainstorming, Flywheel

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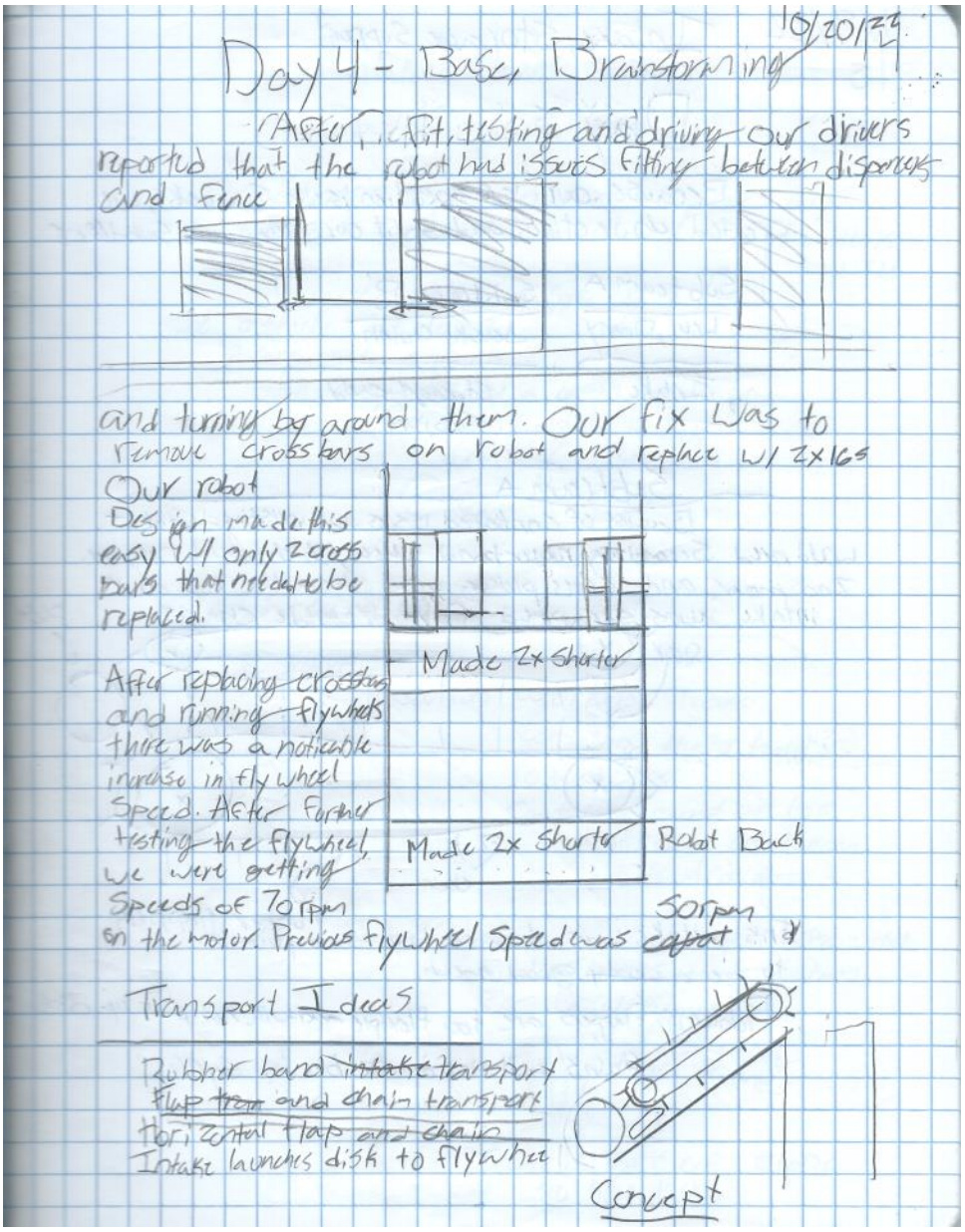

Intake, Disk Storage, Support

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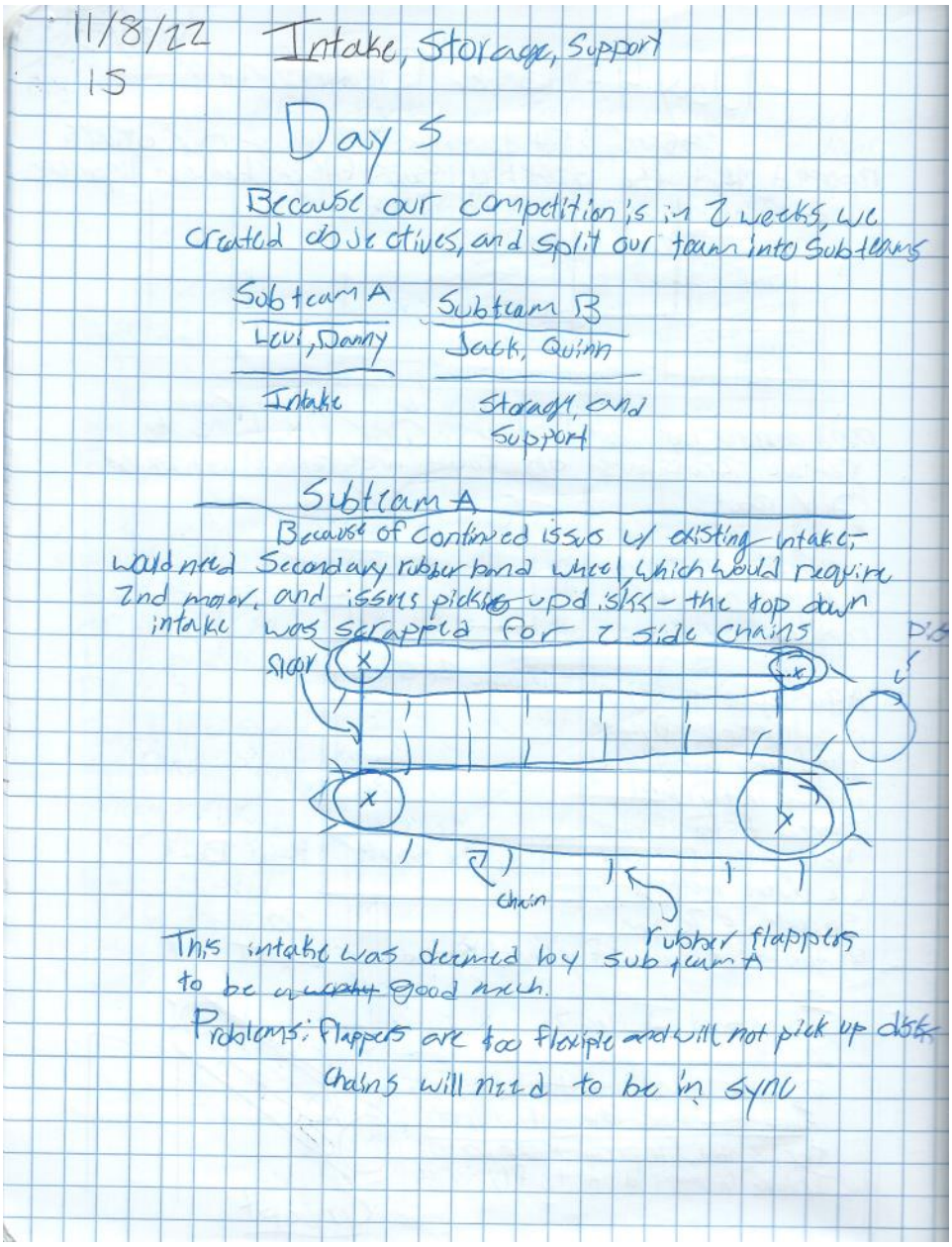

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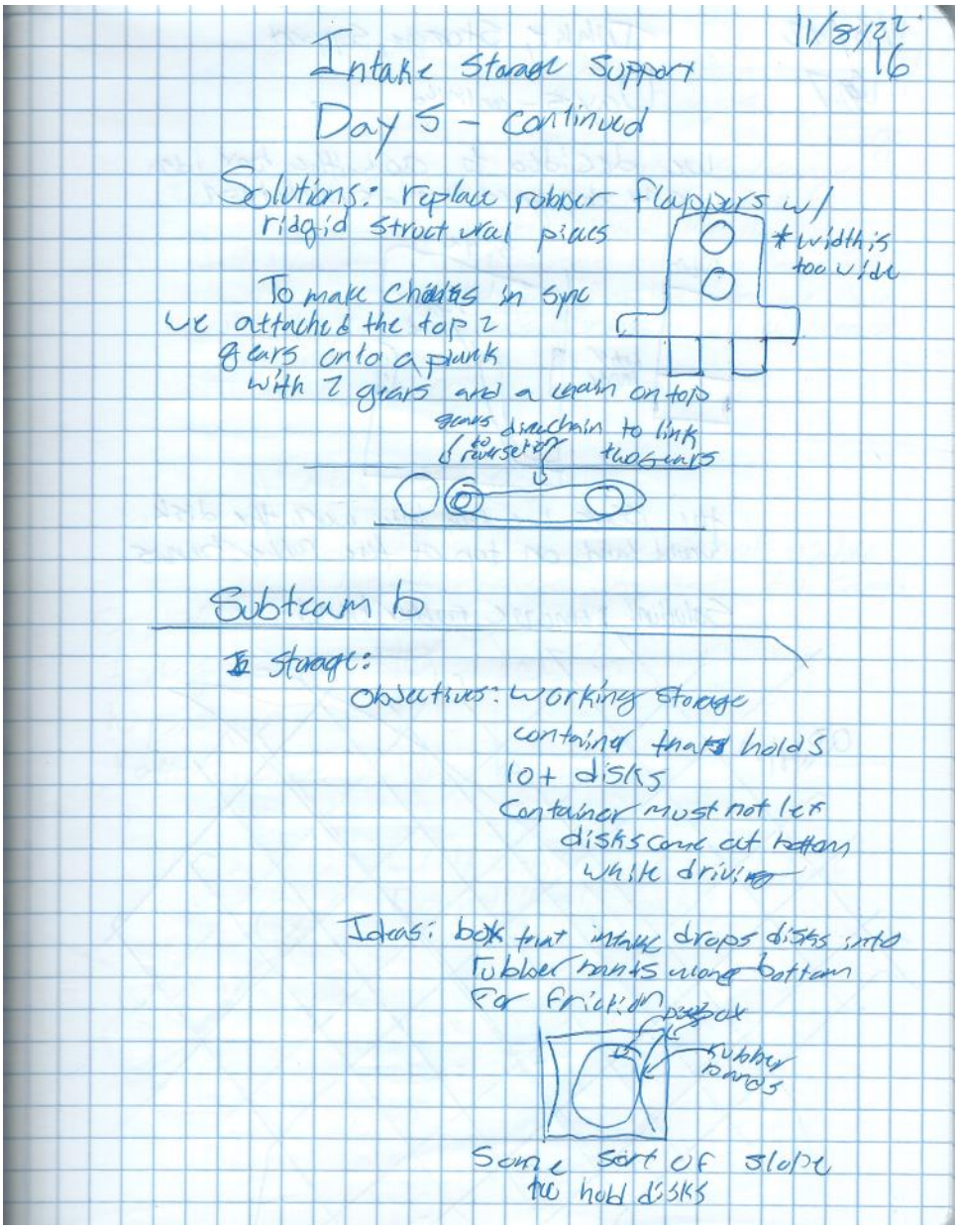

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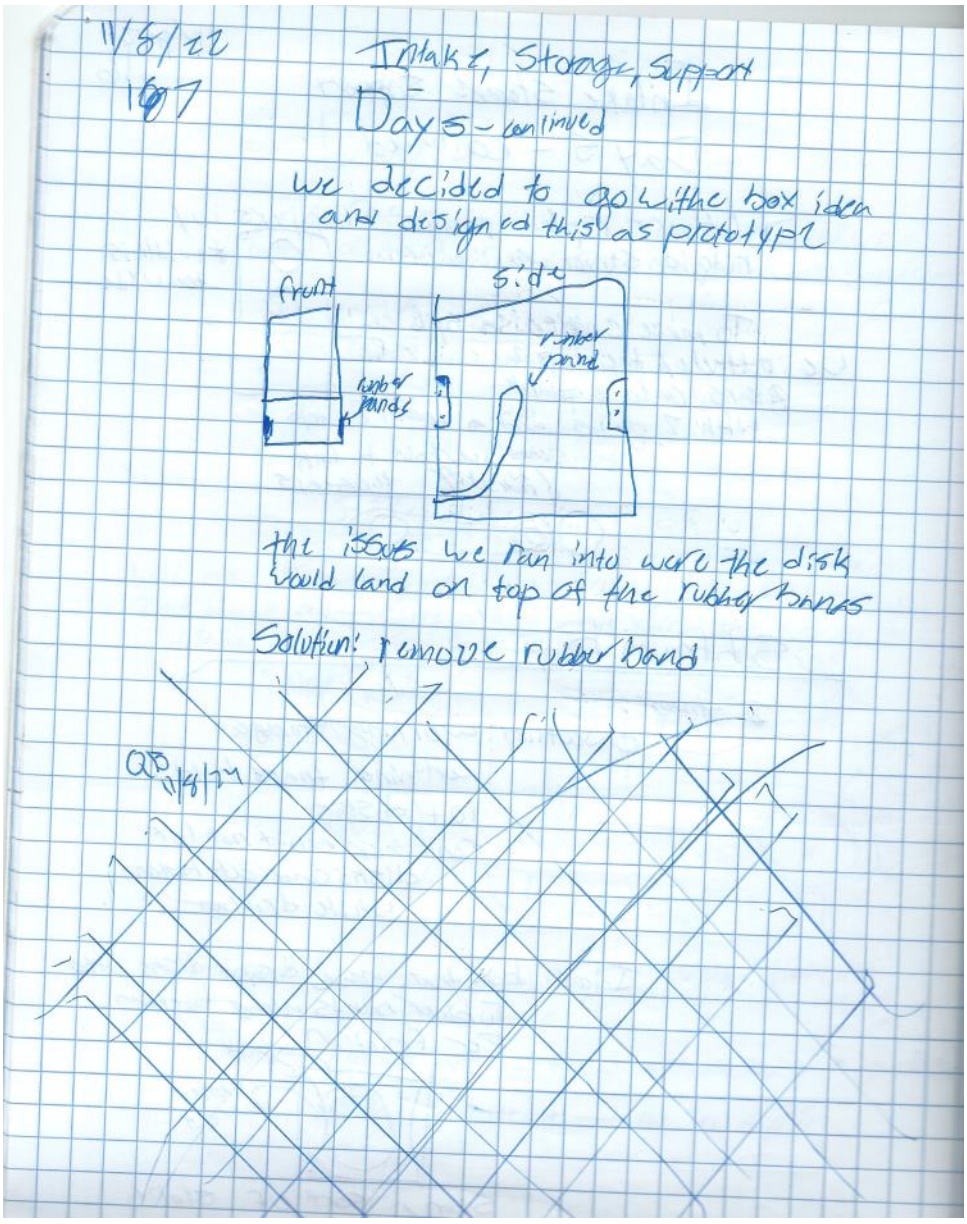

Intake Redesign + Team Changes

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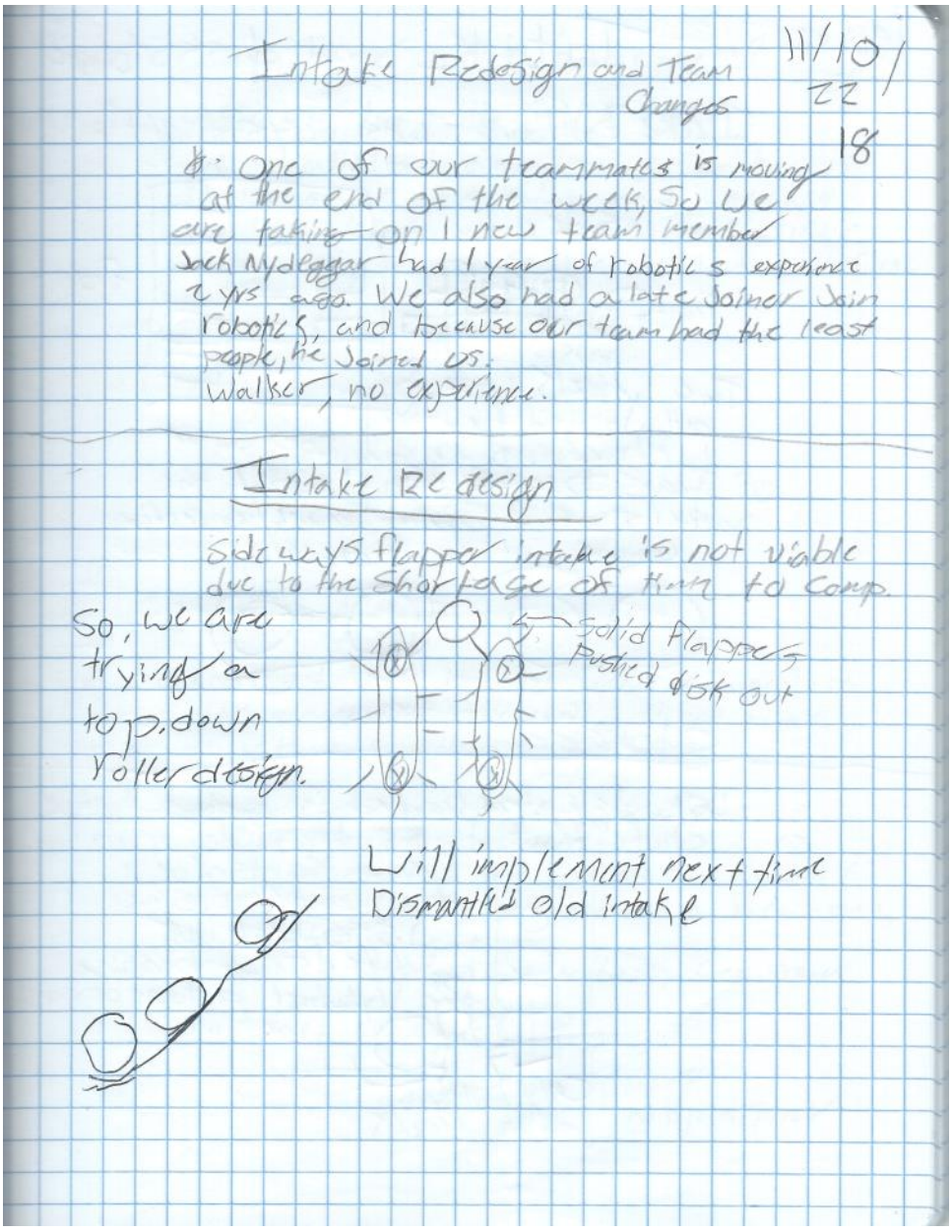

Disk Storage & Intake

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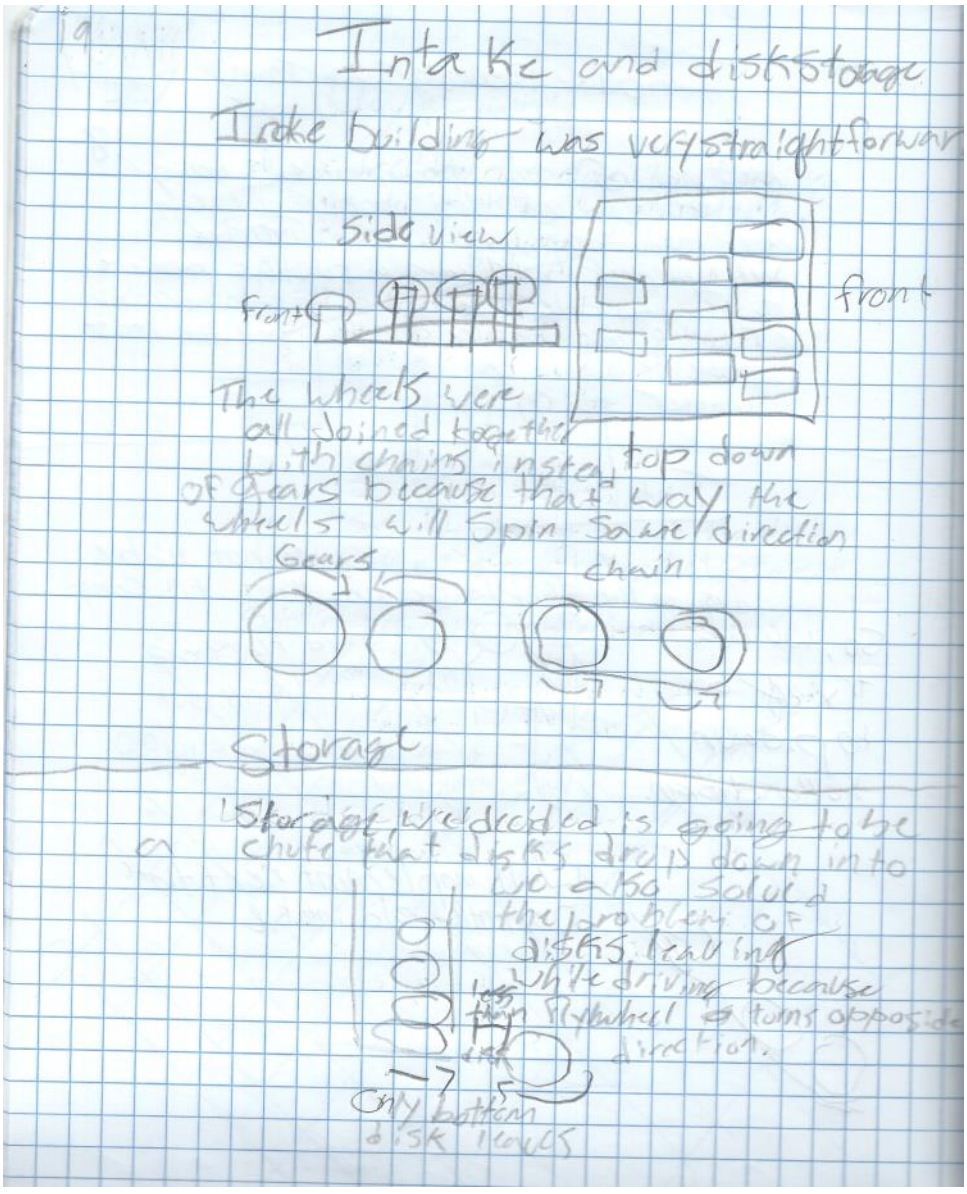

Disk Flicker & Blue Dispenser Arm

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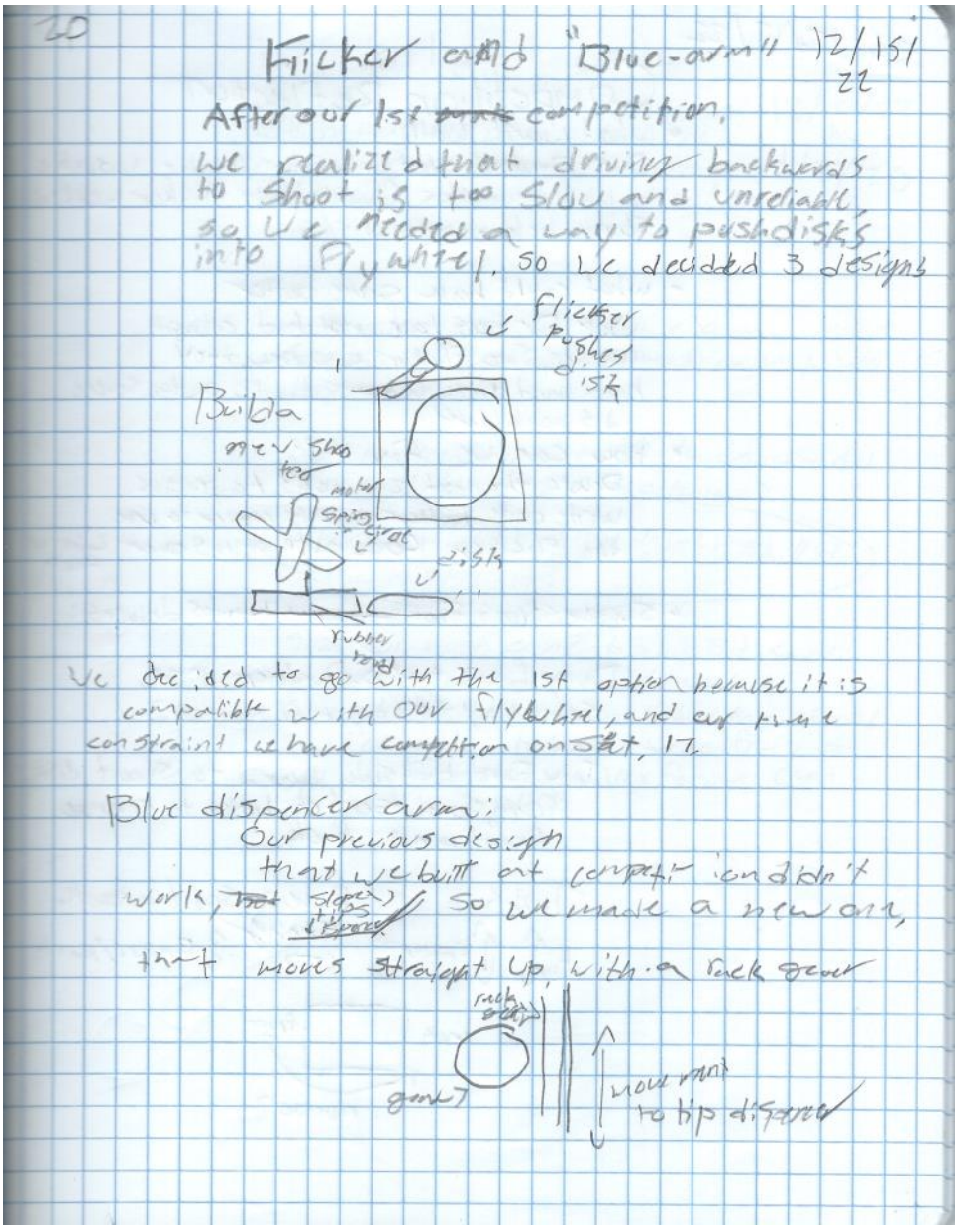

Syracuse Comp Reflection/Overview

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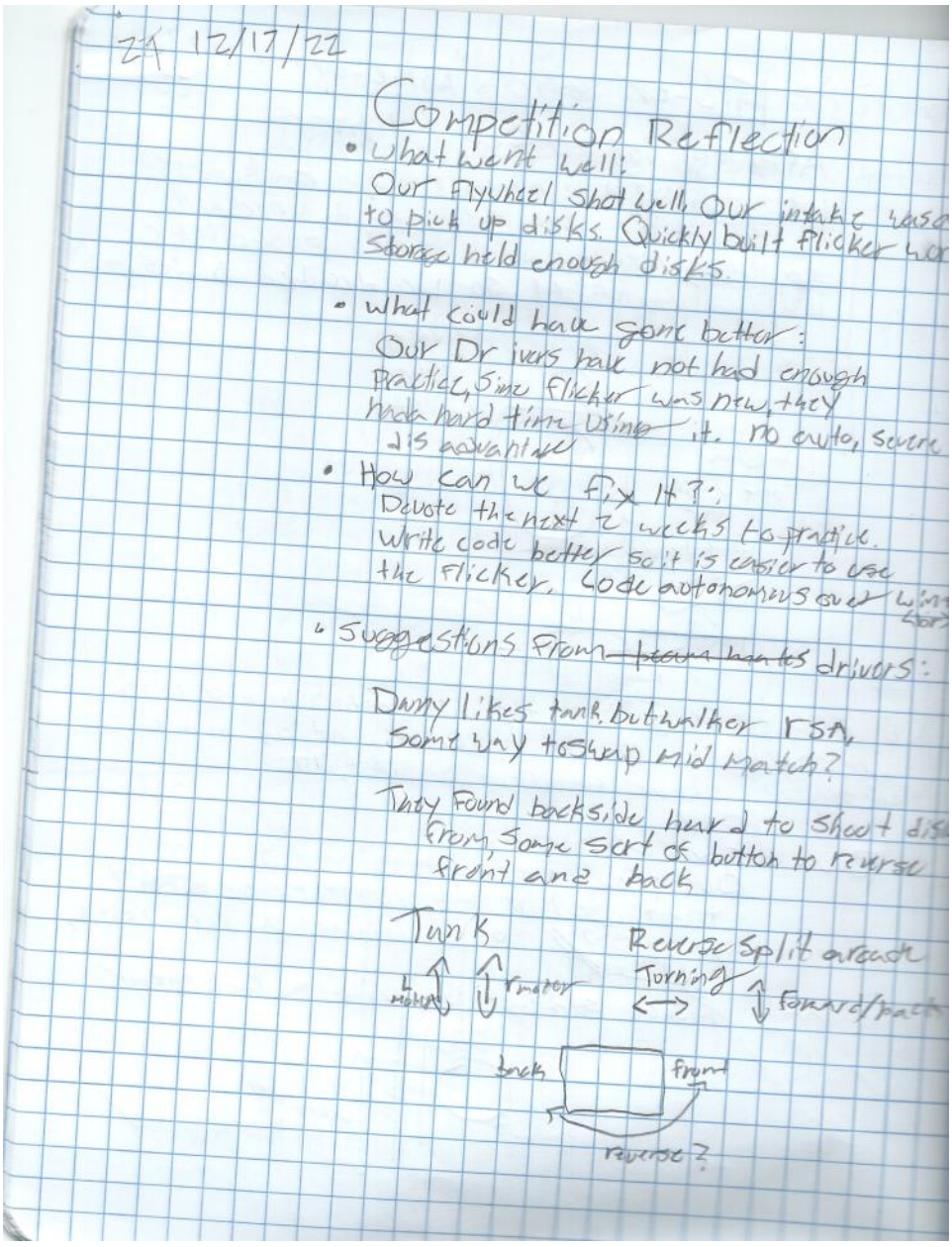

Code - Winter Break - 12/21/22 -- 1/03/23

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Overview:

As Team Captain I was tasked with bringing home the robot, and keeping it over Winter Break 12/21/22 - 1/03/23, I judged that it would be wisest to work on Driver Code and implement some of the changes that the drivers had requested. Some of the Changes requested included:

- Separate Driver Controls, each of the drivers preferred different driving schemes
- Ease of use for Intake, Flywheel, and Blue Arm Controls
- Reversible Driver Controls, so it would be easier to aim disks

Ideas/Initial Thoughts:

- Find out what driver controls the drivers wanted
- Custom Driver Control would mean removing drivetrain from code config
- If I had time, maybe a way to copy driver actions for autonomous?

Implementation:

After Looking at the driver control #pragma code (this is where the code that vexcode automatically generates is stored) I discovered a couple things, Arcade controls, the driving style one of the drivers preferred, was simpler than I imagined, and Vexcode automatically creates motor groups with the motors for each side of the drivetrain, this means that I do not have to remove the drivetrain from the vexcode devices config. The arcade control boils down to just Power Axis(the axis which just moves the robot forward or back) - or +(depending on which side) Turn Axis (the axis on the joystick that turns the robot). To start, I thought I could just modify the #pragma driver code, which already includes deadbands for joystick drift, start with the default Arcade Controls, and add in a Boolean value (true or false) to decide which control scheme to use, so the code looked something like this:

If (tank) {
Leftside = LeftJoystickYAxis
Rightside = RightJoystickYAxis
} else {
Leftside = LeftJoystickYAxis + RightJoystickXAxis
Rightside = LeftJoystickYAxis - RightJoystickXAxis
}

This says, if tank controls are enabled, set the values for tank, otherwise use arcade

After talking with the driver who wanted arcade, I misunderstood, he wants the Right Joystick to control power, and left to control turning. I modified the code so that this was now the case:

If (tank) {
Leftside = LeftJoystickYAxis
Rightside = RightJoystickYAxis
} else {
Leftside = RightJoystickYAxis + LeftJoystickXAxis
Rightside = RightJoystickYAxis - LeftJoystickXAxis
}

This code now drives like the driver requested it, however after saving, I realized something, the #pragma code resets after each close and reopen of the program. To fix this I copied the entire driver control portion of the #pragma code, and its variables, and put it in my main code. After uploading, the driver control now didn't work, it acted like the default arcade controls. I realized that the code I made conflicts with the preset driver code, so I removed the drivetrain controls from the controller configuration menu. This fixed the problem

The drivers requested this control set for the buttons:
Top Right Shoulder button Controls Intake Spinning or not, the bottom one stops intake
E Up and Down Control the Blue Arm
F Up starts and controls different modes of the flywheel
F Down Stops Flywheel

The Blue Arm controls were easily set up in the device config menu
F Up and down were just setting event handlers one for starting and changing modes, and one for stopping
Changing modes was accomplished with another boolean value
Shoulder buttons were set with another "mode" boolean value, one for holding, to spin intake backwards, and one to spin forwards, and an event handler for stopping

Problems:

Because of time constraints, I was not able to implement reversable driver controls, though in theory it should be very quick.
Drivers have a hard time adjusting to new control set.

Solutions:

Drivers Practice adjusting to the new control
Allocate some time to working on code, earliest possible after next competition?

Driver Skills

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As our robot was almost finished, we turned our attention to practicing, these are our scores for matches, we wanted to get at least 15 done, but due to time constraints we were only able to get through 8

Looking at World and State standings, we are currently in 26 in the state, with a 48 in driver and a 10 in autonomous. If the autonomous code could be improved to be more accurate, and possibly code it to shoot, that would mean a 29-50 pt autonomous(variability due to auton accuracy) and up to a 65 pt driver skills, accounting for nervousness and other factors during comp.

This would total to a 45+60 = 105 pt skills total which would put us at 8th as of 1/20/23 this will change thought the season though

Driver Scores 1/19/23

55	37	42	45	43	47
77	48				

Code for Autonomous, and Full Code for Driver

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Autonomous code was just making the robot drive forward and turn over and over, and isn't worth explaining in detail. The general Strategy was to get the blue dispensers, the yellow and then shoot. However, due to time constraints, it was not coded to shoot, yielding in a 29 or sometimes 31 pt auto, because a disk would fall from the blue dispenser, and under the bar.

```
#pragma region VEXcode Generated Robot Configuration
// Make sure all required headers are included.
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>
#include <math.h>
#include <string.h>

#include "vex.h"
using namespace vex;
// Brain should be defined by default
brain Brain;

// START IQ MACROS
#define waitUntil(condition)                                                   \
  do {                                                                         \
    wait(5, msec);                                                             \
  } while (!(condition))
#define repeat(iterations)                                                     \
  for (int iterator = 0; iterator < iterations; iterator++)
// END IQ MACROS

// Robot configuration code.
inertial BrainInertial = inertial();
motor LeftDriveSmart = motor(PORT3, 1, false);
motor RightDriveSmart = motor(PORT4, 1, true);
gyro DrivetrainGyro = gyro(PORT10, true);
smartdrive Drivetrain = smartdrive(LeftDriveSmart, RightDriveSmart,
DrivetrainGyro, 200);
motor Bluearm = motor(PORT8, true);
motor Intake = motor(PORT1, true);
motor Flywheel = motor(PORT7, false);
void calibrateDrivetrain() {
  wait(200, msec);
  Brain.Screen.print("Calibrating");
  Brain.Screen.newLine();
  Brain.Screen.print("Gyro");
  DrivetrainGyro.calibrate(calNormal);
  while (DrivetrainGyro.isCalibrating()) {
    wait(25, msec);
```

```
  }
  // Clears the screen and returns the cursor to row 1, column 1.
  Brain.Screen.clearScreen();
  Brain.Screen.setCursor(1, 1);
}
#pragma endregion VEXcode Generated Robot Configuration
// Include the IQ Library
#include "vex.h"

// Allows for easier use of the VEX Library
using namespace vex;
float myVariable;
// "when started" hat block
int whenStarted1() {
  Drivetrain.driveFor(reverse, 20.0, mm);
  Drivetrain.turnToRotation(44.0, degrees);
  Drivetrain.driveFor(reverse, 65.0, mm);
  Drivetrain.turnToRotation(55.0, degrees);
  Bluearm.spinToPosition(285.0, degrees);
  wait(0.25, seconds);
  Bluearm.spinToPosition(0.0, degrees);
  Drivetrain.turnToHeading(90.0, degrees);
  Drivetrain.driveFor(forward, 200.0, mm);
  Drivetrain.turnToHeading(-102.0, degrees);
  Drivetrain.driveFor(reverse, 200.0, mm);
  Bluearm.spinToPosition(300.0, degrees);
  wait(0.25, seconds);
  Bluearm.spinToPosition(0.0, degrees);
  Intake.setVelocity(100.0, percent);
  Flywheel.setVelocity(40.0, percent);
  Flywheel.spin(reverse);
  Intake.spin(forward);
  Drivetrain.turnToHeading(180.0, degrees);
  Drivetrain.setHeading(0.0, degrees);
  Drivetrain.turnToHeading(-5.0, degrees);
  Drivetrain.setHeading(0.0, degrees);
  Drivetrain.driveFor(forward, 200.0, mm);
  Drivetrain.turnToHeading(-20.0, degrees);
  Drivetrain.driveFor(forward, 750.0, mm);
  Drivetrain.turnToHeading(-90.0, degrees);
  Drivetrain.driveFor(reverse, 350.0, mm);
  Bluearm.spinToPosition(90.0, degrees);
  Drivetrain.setTurnVelocity(100.0, percent);
  Drivetrain.turnToHeading(-60.0, degrees);
  //New Stuff
  wait(1,seconds);
  Drivetrain.turnToHeading(-90,degrees);
  Drivetrain.driveFor(forward, 50,mm);



  return 0;
}

int main() {
  // Calibrate the Drivetrain Gyro
  calibrateDrivetrain();
  whenStarted1();
```

```
}
```

And the Driver Code:

```
#pragma region VEXcode Generated Robot Configuration
// Make sure all required headers are included.
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>
#include <math.h>
#include <string.h>

#include "vex.h"
using namespace vex;
// Brain should be defined by default
brain Brain;

// START IQ MACROS
#define waitUntil(condition)                                                   \
  do {                                                                         \
    wait(5, msec);                                                             \
  } while (!(condition))
#define repeat(iterations)                                                     \
  for (int iterator = 0; iterator < iterations; iterator++)
// END IQ MACROS

// Robot configuration code.
inertial BrainInertial = inertial();
motor LeftDriveSmart = motor(PORT3, 1, false);
motor RightDriveSmart = motor(PORT4, 1, true);
drivetrain Drivetrain = drivetrain(LeftDriveSmart, RightDriveSmart, 200, 173, 76,
mm, 1);
controller Controller = controller();
motor BlueArm = motor(PORT8, true);
motor Intake = motor(PORT1, true);
touchled Ligh = touchled(PORT12);
motor Flicker = motor(PORT9, true);
motor Flywheel = motor(PORT7, false);


// define variable for remote controller enable/disable
bool RemoteControlCodeEnabled = true;
// define variables used for controlling motors based on controller inputs
bool eButtonsControlMotorsStopped = true;
// define a task that will handle monitoring inputs from Controller
int rc_auto_loop_function_Controller() {
  // process the controller input every 20 milliseconds
  // update the motors based on the input values
  while(true) {
    if(RemoteControlCodeEnabled) {
      // check the ButtonEUp/ButtonEDown status to control BlueArm
      if (Controller.ButtonEUp.pressing()) {
        BlueArm.spin(forward);
        eButtonsControlMotorsStopped = false;
      } else if (Controller.ButtonEDown.pressing()) {
```

```
        BlueArm.spin(reverse);
        eButtonsControlMotorsStopped = false;
      } else if (!eButtonsControlMotorsStopped) {
        BlueArm.stop();
        // set the toggle so that we don't constantly tell the motor to stop when
the buttons are released
        eButtonsControlMotorsStopped = true;
      }
    }
    // wait before repeating the process
    wait(20, msec);
  }
  return 0;
}
task rc_auto_loop_task_Controller(rc_auto_loop_function_Controller);
#pragma endregion VEXcode Generated Robot Configuration
//Declare
// Include the IQ Library
#include "vex.h"

//Stuff for driver control
bool DrivetrainLNeedsToBeStopped_Controller;
bool DrivetrainRNeedsToBeStopped_Controller;
//Fup Counter for flywheel
float FUPCounter = 0;
//I don't think this is needed, but I'll leave it just in case I forgot about
something
bool Stop;
//For flicker
bool x = true;
//Spinner direction 0 is stopped, 1 is reverse 40%, and 2 is forward 100%
float spinner = 0;
//For Driver control, this is to reverse the controls
bool reversed = false;


// Allows for easier use of the VEX Library
using namespace vex;
//Brain and Console stuff for printing see the switch function
int Brain_precision = 0, Console_precision = 3;
//Precision delay for motors and writing to Sd card
int precision = 100;
//Weather danny is driving or walker; danny is tank, walker is reversed split
arcade
//Also drivetrain stuff
int Danny = false, drivetrainLeftSideSpeed, drivetrainRightSideSpeed;
//Float values for SD card
float xaccel, rot, wheelturnsl, wheelturnsr, bluearmturns, intaketurns,
flicker_max = 18, flicker_min = 0, flickerpos, flywheelPos;
// Used to find the format string for printing numbers with the
// desired number of decimal places
const char* printToConsole_numberFormat() {
  // look at the current precision setting to find the format string
  switch(Console_precision){
    case 0:  return "%.0f"; // 0 decimal places (1)
    case 1:  return "%.1f"; // 1 decimal place  (0.1)
    case 2:  return "%.2f"; // 2 decimal places (0.01)
    case 3:  return "%.3f"; // 3 decimal places (0.001)
```

```
    default: return "%f"; // use the print system default for everthing else
  }
}

//Code For the Driver Control, I took this from the stuff vexcode automatically
makes, and modded it
int driving(){
  while(true) {
  if (Danny) {
       if (reversed) {
       drivetrainLeftSideSpeed = -(Controller.AxisA.position());
       drivetrainRightSideSpeed = -(Controller.AxisD.position());
       }else {
       drivetrainLeftSideSpeed = Controller.AxisA.position();
       drivetrainRightSideSpeed = Controller.AxisD.position();
       }
      } else {
        if (reversed) {
        drivetrainLeftSideSpeed = -(Controller.AxisD.position() -
Controller.AxisB.position());
        drivetrainRightSideSpeed = -(Controller.AxisD.position() +
Controller.AxisB.position());
        }else {
        drivetrainLeftSideSpeed = Controller.AxisD.position() +
Controller.AxisB.position();
        drivetrainRightSideSpeed = Controller.AxisD.position() -
Controller.AxisB.position();
        }
      }
      if (drivetrainLeftSideSpeed < 5 && drivetrainLeftSideSpeed > -5) {
        // check if the left motor has already been stopped
        if (DrivetrainLNeedsToBeStopped_Controller) {
          // stop the left drive motor
          LeftDriveSmart.stop();
          // tell the code that the left motor has been stopped
          DrivetrainLNeedsToBeStopped_Controller = false;
        }
      } else {
        // reset the toggle so that the deadband code knows to stop the left
motor nexttime the input is in the deadband range
        DrivetrainLNeedsToBeStopped_Controller = true;
      }
      // check if the value is inside of the deadband range
      if (drivetrainRightSideSpeed < 5 && drivetrainRightSideSpeed > -5) {
        // check if the right motor has already been stopped
        if (DrivetrainRNeedsToBeStopped_Controller) {
          // stop the right drive motor
          RightDriveSmart.stop();
          // tell the code that the right motor has been stopped
          DrivetrainRNeedsToBeStopped_Controller = false;
        }
      } else {
        // reset the toggle so that the deadband code knows to stop the right
motor next time the input is in the deadband range
        DrivetrainRNeedsToBeStopped_Controller = true;
      }

      // only tell the left drive motor to spin if the values are not in the
```

```
deadband range
      if (DrivetrainLNeedsToBeStopped_Controller) {
        LeftDriveSmart.setVelocity(drivetrainLeftSideSpeed, percent);
        LeftDriveSmart.spin(forward);
      }
      // only tell the right drive motor to spin if the values are not in the
deadband range
      if (DrivetrainRNeedsToBeStopped_Controller) {
        RightDriveSmart.setVelocity(drivetrainRightSideSpeed, percent);
        RightDriveSmart.spin(forward);
      }

    // wait before repeating the process
    wait(20, msec);
  }
}
//End Code For Driver




// Write To SD Card and Console
int whenStarted1() {
  //Calibrate Inertal
  BrainInertial.calibrate();
  while (BrainInertial.isCalibrating()) { task::sleep(50); }

  while (true) {


    //Set Data
    xaccel = BrainInertial.acceleration(xaxis)*986; //Reports in mm
    rot = BrainInertial.rotation(degrees);
    wheelturnsl = LeftDriveSmart.position(turns);
    wheelturnsr = RightDriveSmart.position(turns);
    bluearmturns = BlueArm.position(turns);
    intaketurns = Intake.position(turns);
    flickerpos = Flicker.position(turns);
    flywheelPos = Flywheel.position(turns);

     //Print to console stuff, disabled for speed
    //printf(printToConsole_numberFormat(), static_cast<float>(xaccel));
    //Print Data to Console

    //Print Left Wheel Rotations
    printf(printToConsole_numberFormat(), static_cast<float>(wheelturnsl));
    printf(",");
    //Print Right Wheel Rotations
    printf(printToConsole_numberFormat(), static_cast<float>(wheelturnsr));
    //New Line
    printf("\n");


    //Open AutoData file in append mode
    FILE* AutoData = fopen("AutoData.txt", "a");
    Ligh.setColor(white);

    //Print data to SD card
```

```
    //Rotation
    //fprintf(AutoData, "%8.2f", rot);
    //New Line
    //fprintf(AutoData, ",");
    //Left Wheel Turns
    //float time = Brain.Timer.value();
    //fprintf(AutoData, "%2.2f\n", time);
    fprintf(AutoData, "%2.2f", wheelturnsl);



    //New Line
    fprintf(AutoData, "\n");
    //Right Wheel Turns
    fprintf(AutoData, "%2.2f", wheelturnsr);
    fprintf(AutoData, "\n");
    //Blue Arm Turns
    fprintf(AutoData, "%2.2f", bluearmturns);
    fprintf(AutoData, "\n");
    //Flicker
    fprintf(AutoData, "%2.2f", flickerpos);
    fprintf(AutoData, "\n");

    //IntakeTurns
    fprintf(AutoData, "%2.2f", intaketurns);
    fprintf(AutoData,"\n");

    //Flywheel
    fprintf(AutoData, "%2.2f", flywheelPos);







    //New Line

    fprintf(AutoData, "\n");

    /* I tried this, but it is more complicated
    char test[256];
    sprintf(test, "%8.2f", wheelturnsl);
    fputs(test, AutoData);
    fputs(",", AutoData);
    sprintf(test, "%8.2f", wheelturnsr);
    fputs(test, AutoData);
    */
    //Close File
    fclose(AutoData);

    //Wait for the determined interval 0.1 sec
    //This can be changed to suit responsiveness of robot
    wait(precision, msec);
  }
  return 0;
}
//End SD Card Stuff
```

```
// ShoesStuff
int whenStarted2() {
  Drivetrain.setDriveVelocity(100,percent);
  Drivetrain.setTurnVelocity(80,percent);
  BlueArm.setVelocity(100,percent);
  Intake.setVelocity(100,percent);
  Flicker.setVelocity(100,percent);
  BlueArm.setStopping(hold);
  // Set F Up ounter to 0 to start
  FUPCounter = 1;

  Ligh.setColor(red);
  return 0;
  while(true) {


    //Brain.Screen.print(motpos);


    Brain.Screen.clearScreen();
  }//closed
}//closed
// "when Controller ButtonFUp pressed" hat block
void onevent_ControllerButtonFUp_pressed_0() {
  if (FUPCounter == 1.0) {
    Ligh.setColor(blue);
    // If Button Toggled On And Pressed
    // Start Slowing
    Flywheel.setVelocity(50.0, percent);
    Flywheel.spin(forward);
    wait(0.2, seconds);
    Flywheel.setVelocity(20.0, percent);
    Flywheel.spin(forward);
    wait(0.2, seconds);
    // Reverse Speed
    Flywheel.setVelocity(40.0, percent);
    Flywheel.spin(reverse);
    // Reset Toggle (Change var to Bool)
    FUPCounter = 0.0;
    //Set Data
    spinner = 1;
  }//if closed
  else {
    // Otherwise
    // When Button Pressed Slow flywheel, and set right direction, then speed up
    Ligh.setColor(green);
    Flywheel.setVelocity(20.0, percent);
    Flywheel.spin(reverse);
    wait(0.2, seconds);
    Flywheel.setVelocity(100.0, percent);
    Flywheel.spin(forward);
    // Set Toggle (Change var to Bool
    FUPCounter = 1.0;
    //Data
    spinner = 2;


  }//elseclosed
```

```
}//closed
// "when Controller ButtonRUp pressed" hat block
void onevent_ControllerButtonRUp_pressed_0() {
  // When Button Pressed, Set Intake reverse (only for jams)
  printf("LUP");
  Intake.setVelocity(80.0, percent);
  Intake.spin(reverse);
  //onevent_ControllerButtonFUp_pressed_0();
}//closed
// "when Controller ButtonRUp released" hat block
void onevent_ControllerButtonRUp_released_0() {
  // When Button Released Reset Intake (Also start button)
  Intake.setVelocity(100.0, percent);
  Intake.spin(forward);
}
//closed
// "when Controller ButtonRDown pressed" hat block
void onevent_ControllerButtonRDown_pressed_0() {
  Intake.stop();
}//closed
// "when Controller ButtonFDown pressed" hat block
void onevent_ControllerButtonFDown_pressed_0() {
  Ligh.setColor(red);
  Flywheel.stop();
  //Set Data
  spinner = 0;
}//closed
void onevent_ControllerButtonLDown_Pressed_0() {
  x = true;
  BlueArm.spinFor(forward,90,degrees);
  while (x) {
  //Flicker.spinToPosition(flicker_max, degrees);
  //Flicker.spinToPosition(flicker_min, degrees);
  Flicker.spin(forward);

  }//closed
  Flicker.stop();
}//closed
void onevent_controllerButtonLDown_Released_0(){
  x = false;
  //closed
}
void onevent_controllerButtonEUp_Pressed_0(){

    //closed

  //closed
}
void extras() {
  wait(1,seconds);
  BlueArm.setStopping(hold);

  Flywheel.setVelocity(100,percent);

 //Closed

}
void onevent_controllerButtonL3_Pressed_0() {
```

```
  if (Danny) {
    Danny = false;
  } else {
    Danny = true;
  }
}
void onevent_controllerButtonR3_Pressed_0() {
  if (reversed) {
    reversed = false;
  } else {
    reversed = true;
  }
}

int main() {
  // Calibrate the Drivetrain Gyro
  //calibrateDrivetrain();
  //Set Maxes
  BlueArm.setMaxTorque(100,percent);
  Flywheel.setMaxTorque(100,percent);
  Flywheel.setStopping(coast);
  Flicker.setMaxTorque(100,percent);


  //FUP
  Controller.ButtonFUp.pressed(onevent_ControllerButtonFUp_pressed_0);
  //From Shoes, Event Handlers
  //Intake Stuff
  //RUP
  Controller.ButtonRUp.pressed(onevent_ControllerButtonRUp_pressed_0);
  Controller.ButtonRUp.released(onevent_ControllerButtonRUp_released_0);
  //RDown
  Controller.ButtonRDown.pressed(onevent_ControllerButtonRDown_pressed_0);
  //Flywheel Stop
  Controller.ButtonFDown.pressed(onevent_ControllerButtonFDown_pressed_0);
  //LDown
  Controller.ButtonLDown.pressed(onevent_ControllerButtonLDown_Pressed_0);
  Controller.ButtonLDown.released(onevent_controllerButtonLDown_Released_0);
  //BlueArm
  Controller.ButtonEUp.pressed(onevent_controllerButtonEUp_Pressed_0);
  //Controller.ButtonEDown.pressed(onevent_controllerButtonEDown_Pressed_0);
  Controller.ButtonEUp.released(onevent_controllerButtonEUp_Pressed_0);
  //Controller.ButtonEDown.released(onevent_controllerButtonEDown_Pressed_0);
  Controller.ButtonL3.pressed(onevent_controllerButtonL3_Pressed_0);
  Controller.ButtonR3.pressed(onevent_controllerButtonR3_Pressed_0);
//Driving
vex::task ws1(driving);
//ShoesInit
//vex::task ws2(extras);
//Shoes Stuff
vex::task ws3(whenStarted2);

//SD Card Suff
//whenStarted1();
}
```