

Our Journey Through Virtual Skills



Team 5225a - The πlons
Burlington, Ontario, Canada

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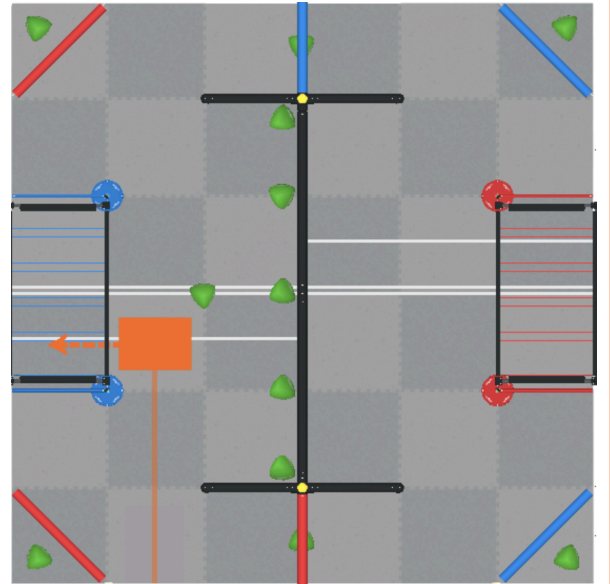
Our Autonomous Skills Routine

Score Both Red Tribals into the goal by starting with a preload and moving to the location of the second preload and pushing both in simultaneously

MoveToPoint -28 -10 false

TurnToAngle -90

ScoreTribal



Picks up a tribal and jumps over the bar while outtaking to score the tribal into the net

MoveToPoint -12 13.5 false

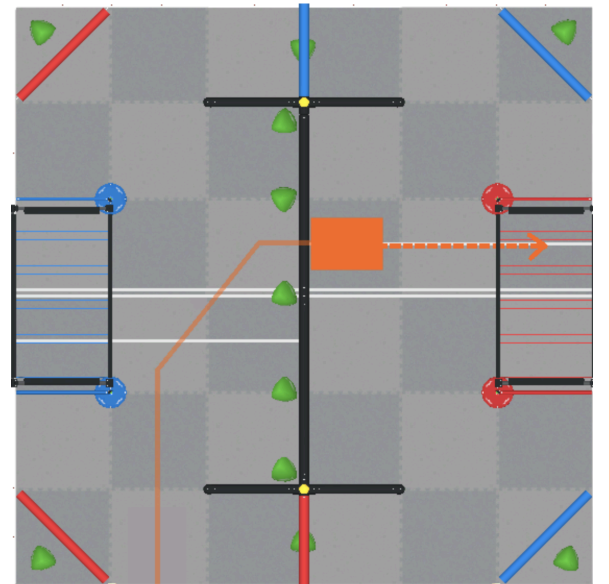
PickUpTribal

TurnToAngle 90

ScoreTribal

MoveToPoint 12 GPS position Y in inches false

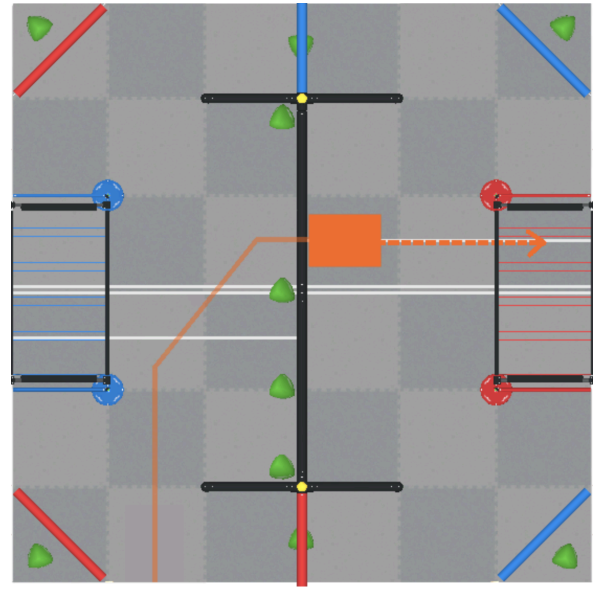
MoveToPoint -14 GPS position Y in inches true



Goes Back To pick up another tribal onto the bar, turns and picks it up, and then faces the goal and jumps over the barrier again while outtaking to score the tribal

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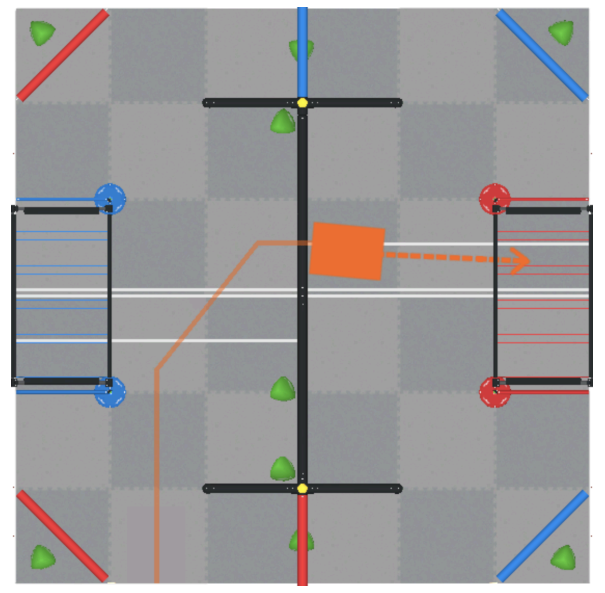
MoveToPoint 12 GPS position Y in inches false
MoveToPoint -14 GPS position Y in inches true
PickUpTribal
TurnToAngle 15
ScoreTribal
MoveToPoint 12 GPS position Y in inches false
MoveToPoint -12 GPS position Y in inches true
  
```



Goes backwards, turns to face tribal while intaking, then turns back to face the goal and scores the tribal while going over the center barrier

```

PickUpTribal
TurnToAngle 165
TurnToAngle 90
TurnToPoint 12 GPS position Y in inches + -2 false
ScoreTribal
MoveToPoint 12 GPS position Y in inches + -2 false
  
```



Turns and goes backwards to get closer to corner tribal, then turns to pick up tribal, and turns back to face the goal and score tribal while travelling over the center bar

MoveToPoint -16 35 true

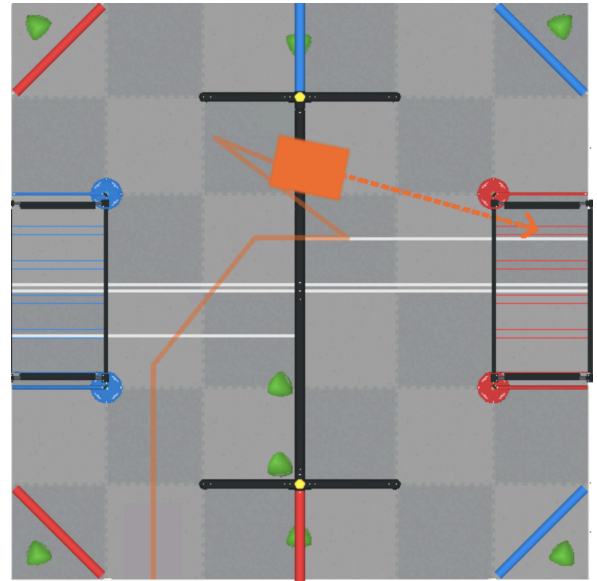
PickUpTribal

TurnToAngle 30

TurnToPoint 12 GPS position Y in inches - 10 false

ScoreTribal

MoveToPoint 12 GPS position Y in inches - 10 false

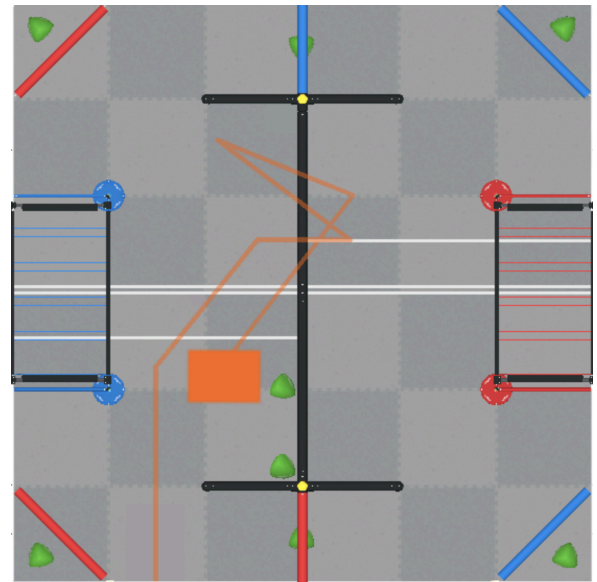


Travels backwards to go towards the last two tribals left on the left side of the center bar.

MoveToPoint -16 -21 true

PickUpTribal

TurnToAngle 110



Picks up closest tribal and faces the net to score it while travelling over the center bar

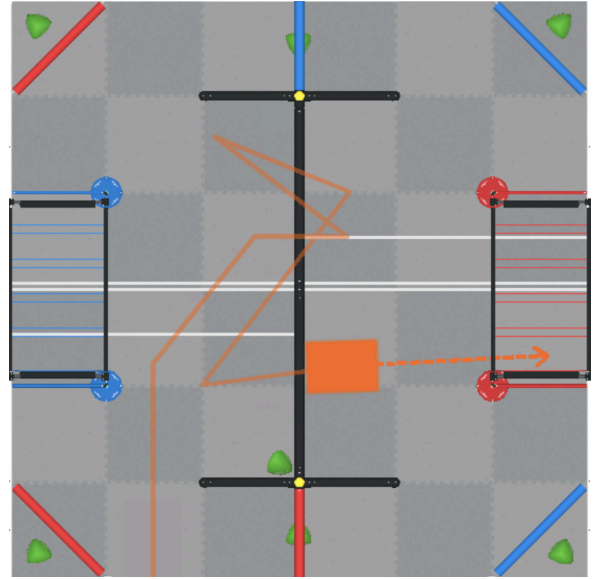
PickUpTribal

TurnToAngle 110

TurnToPoint 12 GPS position Y in inches + 2 false

ScoreTribal

MoveToPoint 14 GPS position Y in inches + 2 false



Goes back to intake the last tribal and scores it while travelling over the center bar

MoveToPoint -15 -30 true

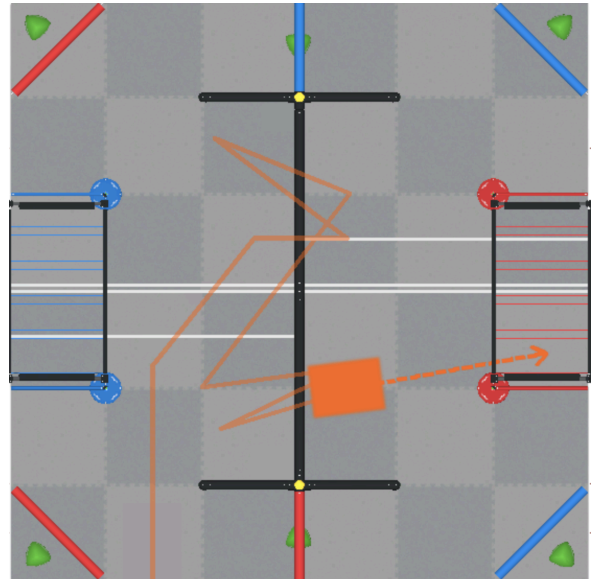
PickUpTribal

TurnToAngle 135

ScoreTribal

MoveToPoint 14 GPS position Y in inches + 7 false

Done Shooting All tribals



Turns towards the close right corner and picks up a starting tribal from the match load zone. Then faces the net and moves forward while outtaking to score it into the goal.

TurnToPoint 55 -55 false

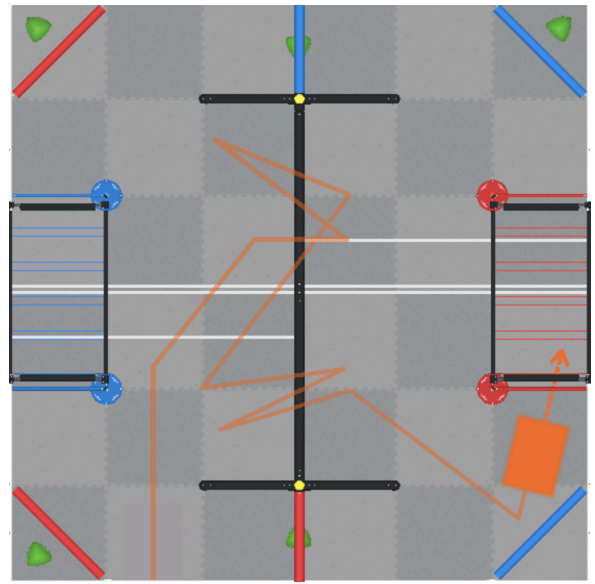
PickUpTribal

MoveToPoint 55 -55 false

TurnToPoint 58 -35 false

ScoreTribal

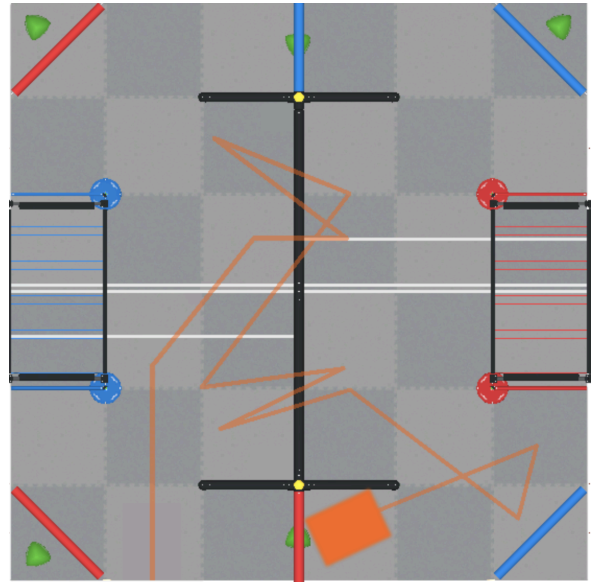
MoveToPoint 58 -35 false



Goes to pick up tribal from under the close horizontal elevation pole

TurnToPoint 6 -30 false

PickUpTribal



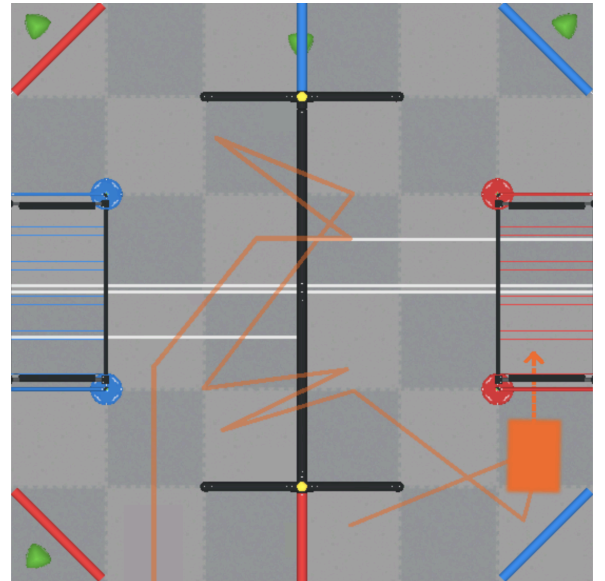
Goes back and scores the tribal from the right side of the goal

MoveToPoint 6 -60 false

MoveToPoint 58 -35 true

TurnToAngle 0

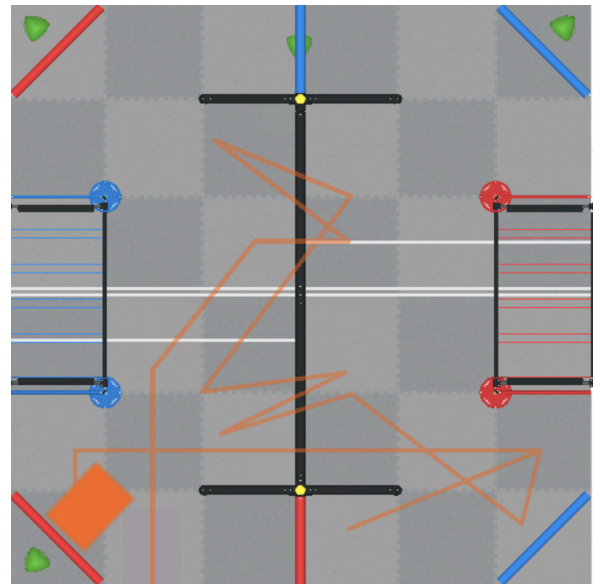
ScoreTribal



Goes back to the close match load zone to start match loading tribals

MoveToPoint -55 -50 true

PickUpTribal



Picks up a tribal from the match load zone, then goes towards the center bar and outtakes while travelling over. This "shoots" the tribals into the net. It repeats this three times

repeat 3

TurnToPoint -55 -55 false

PickUpTribal

MoveToPoint -55 -55 false

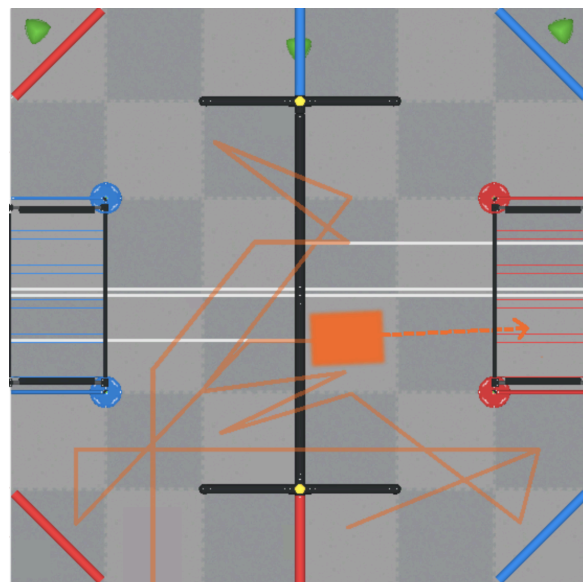
MoveToPoint -14 -10 true

TurnToPoint 14 GPS position Y in inches false

ScoreTribal

MoveToPoint 14 GPS position Y in inches + 0 false

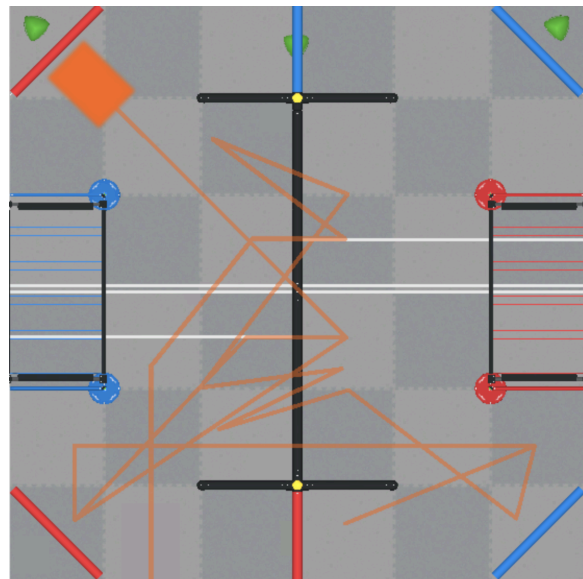
Done Match Loading



Goes towards the far match load zone and intakes one tribal

TurnToPoint -55 55 false

PickUpTribal



Goes under the far horizontal elevation pole, while carrying a tribal.
It pushes one tribal into the red offensive zone, and the scores the tribal
it's carrying into the left side of the red goal.

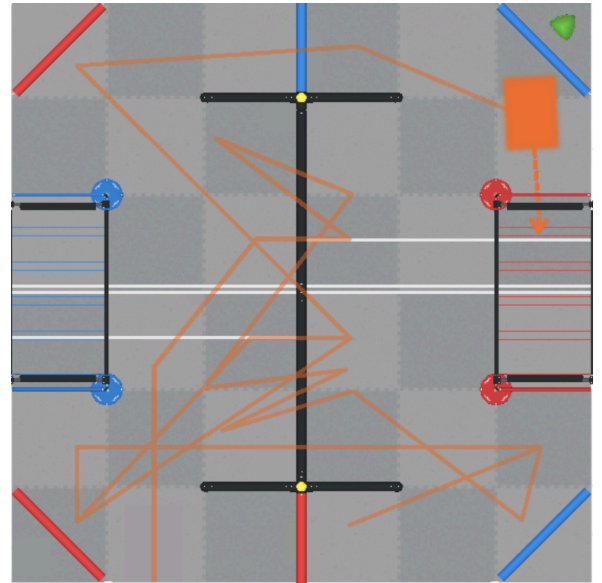
MoveToPoint -55 55 false ▾

MoveToPoint 10 60 true ▾

MoveToPoint 56 40 true ▾

TurnToAngle 179

ScoreTribal



It then finally moves backwards, turns, and picks up a starting tribal from the far
match load area. It then turns around, and scores the last tribal

MoveToPoint 55 55 true ▾

PickUpTribal

TurnToAngle 45

MoveToPoint 56 35 false ▾

TurnToAngle 180

ScoreTribal

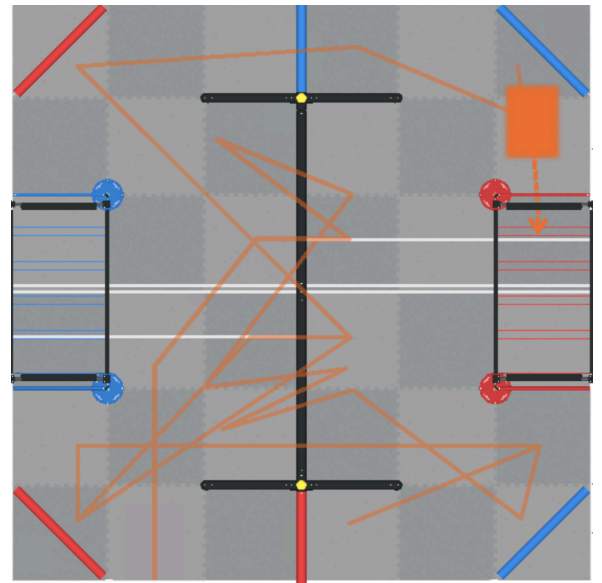
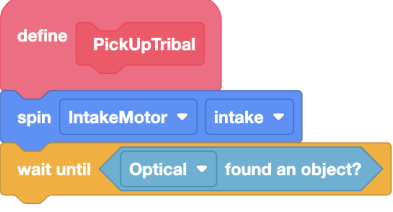
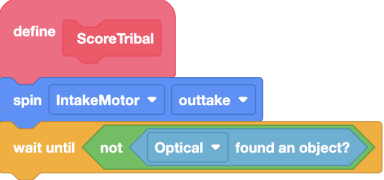

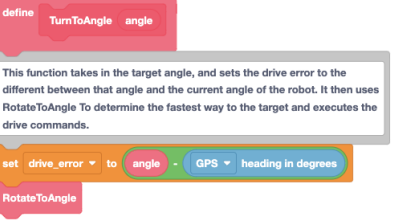


Table of Functions

Function	Parameters	Explanation
 <pre> define PickUpTribal spin IntakeMotor intake wait until Optical found an object? </pre>	None	<p>This function is used to pick up a tribal. It starts by spinning the intake, and waiting until the optical sensor finds an object(tribal). It then recognizes that it found a tribal, and returns to the main program to continue the skills routine.</p>
 <pre> define ScoreTribal spin IntakeMotor outtake wait until not Optical found an object? </pre>	None	<p>This function is used to score individual tribals into the net. It starts by outtaking the intake, and waiting until the optical sensor no longer sees a tribal, indicating it has been scored.</p>
 <pre> define RotateToAngle This function starts by figuring out the drive_error, which is the difference between where we are pointing now and where we want to point. After that, it decides whether to turn left or right using conditional logic and then turns the drivebase by an amount initially determined by the drive_error. set drive_error to remainder of drive_error / 360 if drive_error > 180 then set drive_error to drive_error - 360 if drive_error > 0 then turn right for drive_error degrees else turn left for abs of drive_error degrees </pre>	None	<p>This function uses no parameters, and instead uses the variable drive_error to determine how far off it's target it is. It then finds the fastest way to it's target using conditional logic, and then either turns left or right until it reaches its goal.</p>
 <pre> define TurnToAngle angle This function takes in the target angle, and sets the drive error to the different between that angle and the current angle of the robot. It then uses RotateToAngle to determine the fastest way to the target and executes the drive commands. set drive_error to angle - GPS heading in degrees RotateToAngle </pre>	<p>angle - This is a user given value used to determine the target angle</p>	<p>This function first sets the drive_error to the difference between the target angle, and the current angle given by the gps. It then uses the RotateToAngle which calculates the fastest path to that angle, and executes the drive command.</p>


```

define TurnToPoint x y reverse
This function first calculates the target angle by using the atan2 function. It calculates the angle from the current position of the robot to the point. It then sets the drive error to the error between the current angle and the target angle, and adds 180 degrees if the robot needs to turn with it's back. After setting the drive_error, it calls on RotateToAngle to complete the turn.
set target_angle to atan2 of x - GPS position X in inches y - GPS position Y in inches
set drive_error to target_angle - GPS heading in degrees
if reverse then
set drive_error to drive_error + 180
RotateToAngle

```

X - The X coordinate of the target which the robot should turn towards
 Y - The y coordinate of the target which the robot should turn towards
 Reverse - A boolean to determine whether the robot should face the target forwards or backwards.

This function first converts the target (X, Y) coordinate into a target angle by determining the difference in both the x and y axis, and using the ATAN2 function to get the angle of the vector. It then sets the drive_error to the difference between the target_angle and the current angle, and utilizing conditional logic, it determines whether to add 180 degrees to reverse the robot's target angle. It then uses the RotateToAngle command to determine the fastest path there, and executes the drive command.

```

define MoveToPoint x y reverse
It first uses the parameters x, y, and reverse to turn to the target point. Then, it calculates the error in the x and y direction, and then calculates the total distance to that point. It then sets drive_error to the distance, and by utilizing the motor encoders and conditional logic, moves the robot for that distance until it reaches the point.
TurnToPoint x y reverse
set error_x to x - GPS position X in inches
set error_y to y - GPS position Y in inches
set drive_error to sqrt of error_x * error_x + error_y * error_y
if reverse then
drive reverse for drive_error inches
else
drive forward for drive_error inches

```

X - The X coordinate of the target which the robot should turn and move towards
 Y - The y coordinate of the target which the robot should turn and move towards
 Reverse - A boolean to determine whether the robot should arrive at the target forwards or backwards.

This function first runs the TurnToPoint command and gives the X, Y, and reverse parameters to it. It then calculates the distance from its current position to the target position by calculating the error in both axes, and using the pythagorean theorem to find the length of the hypotenuse. After this, it uses conditional logic to determine whether to go backwards or forwards for the distance determined by the drive_error.

Robot Analysis

<i>Robot Functions</i>	
Capable to intake/outtake tribals	Yes, there is one motor dedicated to intaking and outaking tribals!
Capable to drive	Yes, utilizing two motors, we are able to turn the robot, and drive the robot. However, we cannot do both functions in one single motion. The speed is 4 feet every second.
Capable to hang	No, unfortunately this robot is unable to hang.
<i>Sensors</i>	
GPS Sensor	This sensor allows us to determine our position on the field as (x, y) coordinates, and the current heading of the robot in degrees.
Optical Sensor	This sensor allows us to detect whether a tribal is currently in the intake and the color of the tribal.
Rotation Sensor	This sensor allows us to determine the position of the arm. Using this information we can move the arm to any position accurately.