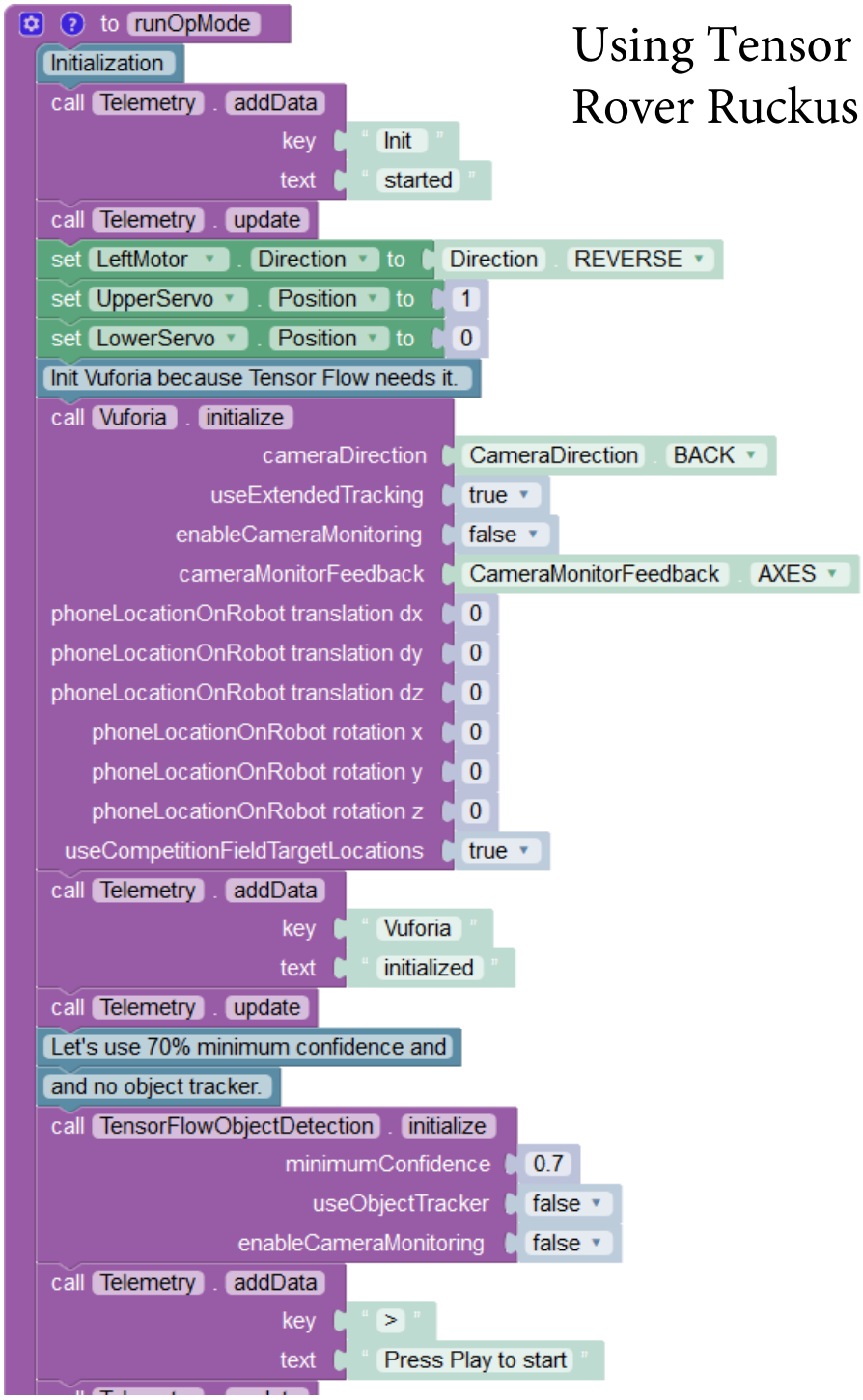
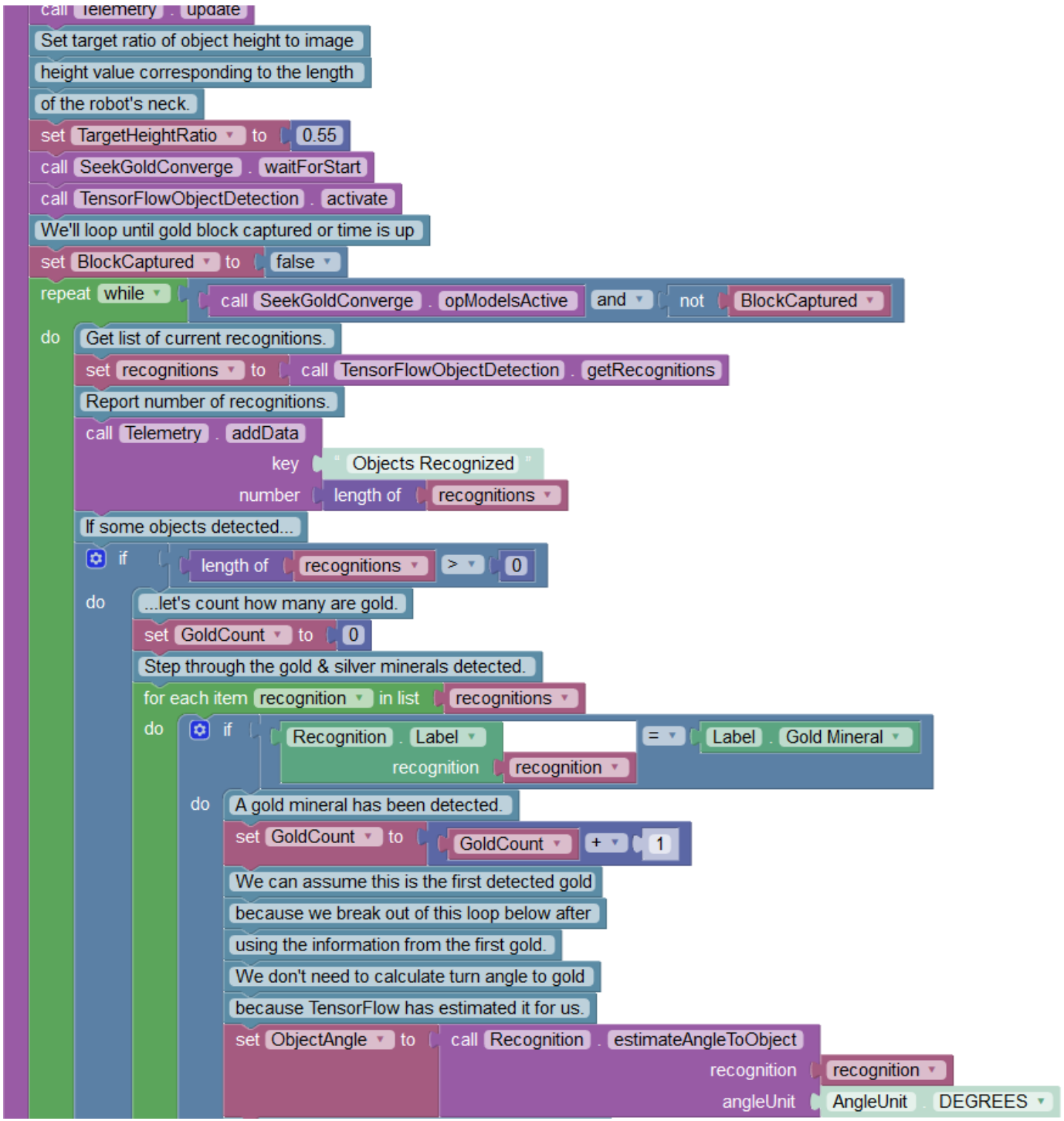
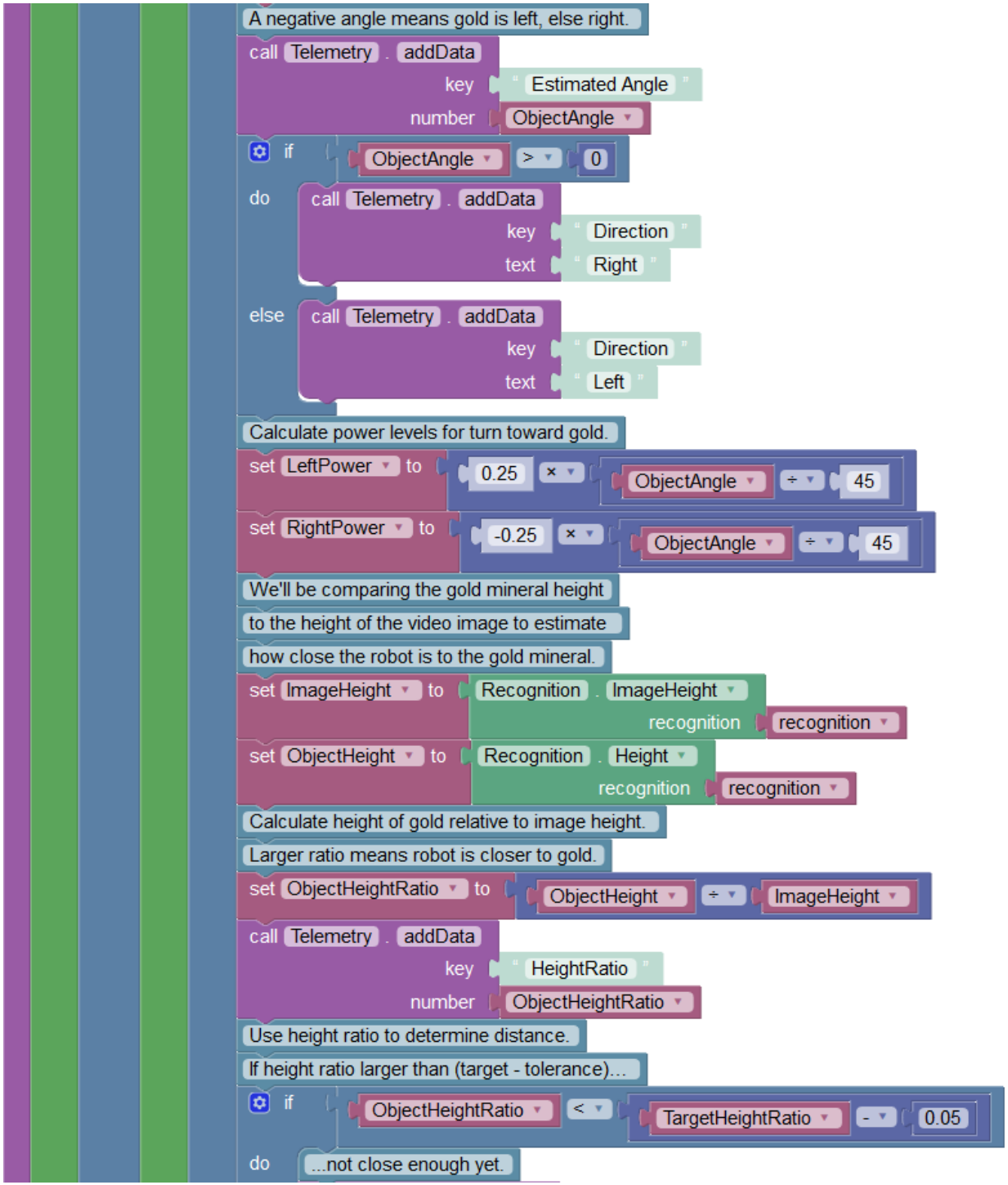
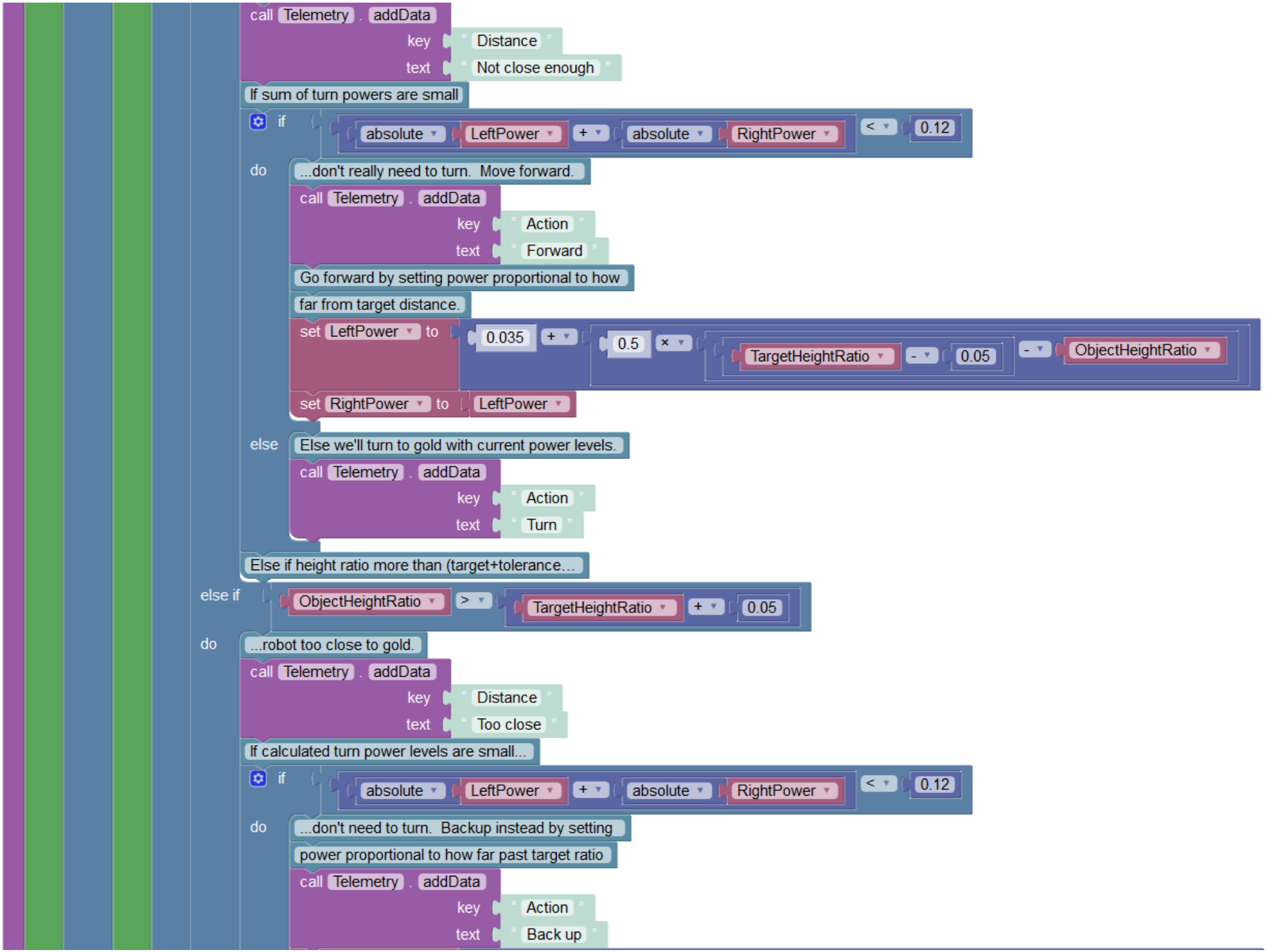
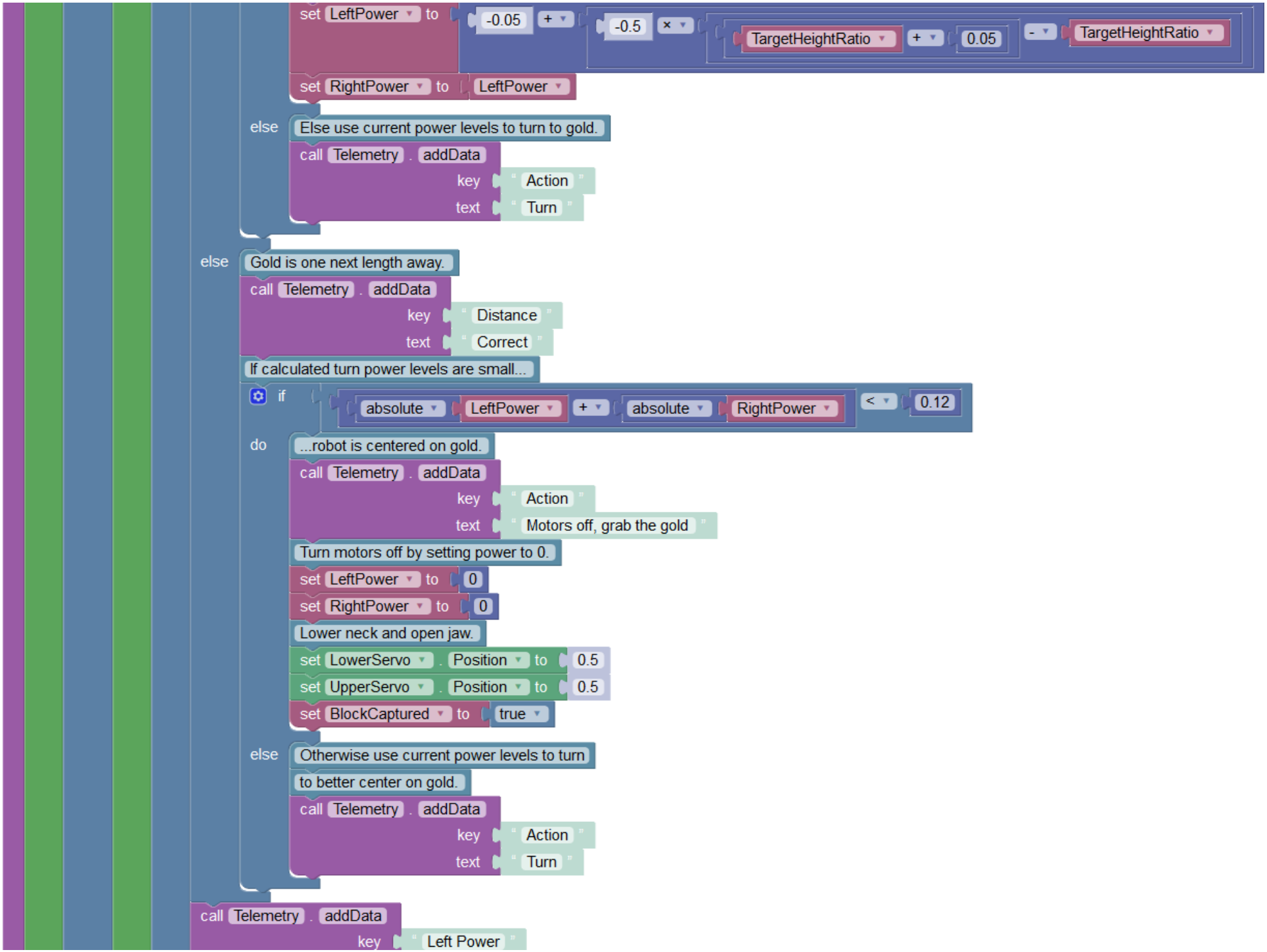
Using Tensor Flow to Find and Grab Rover Ruckus Gold Minerals

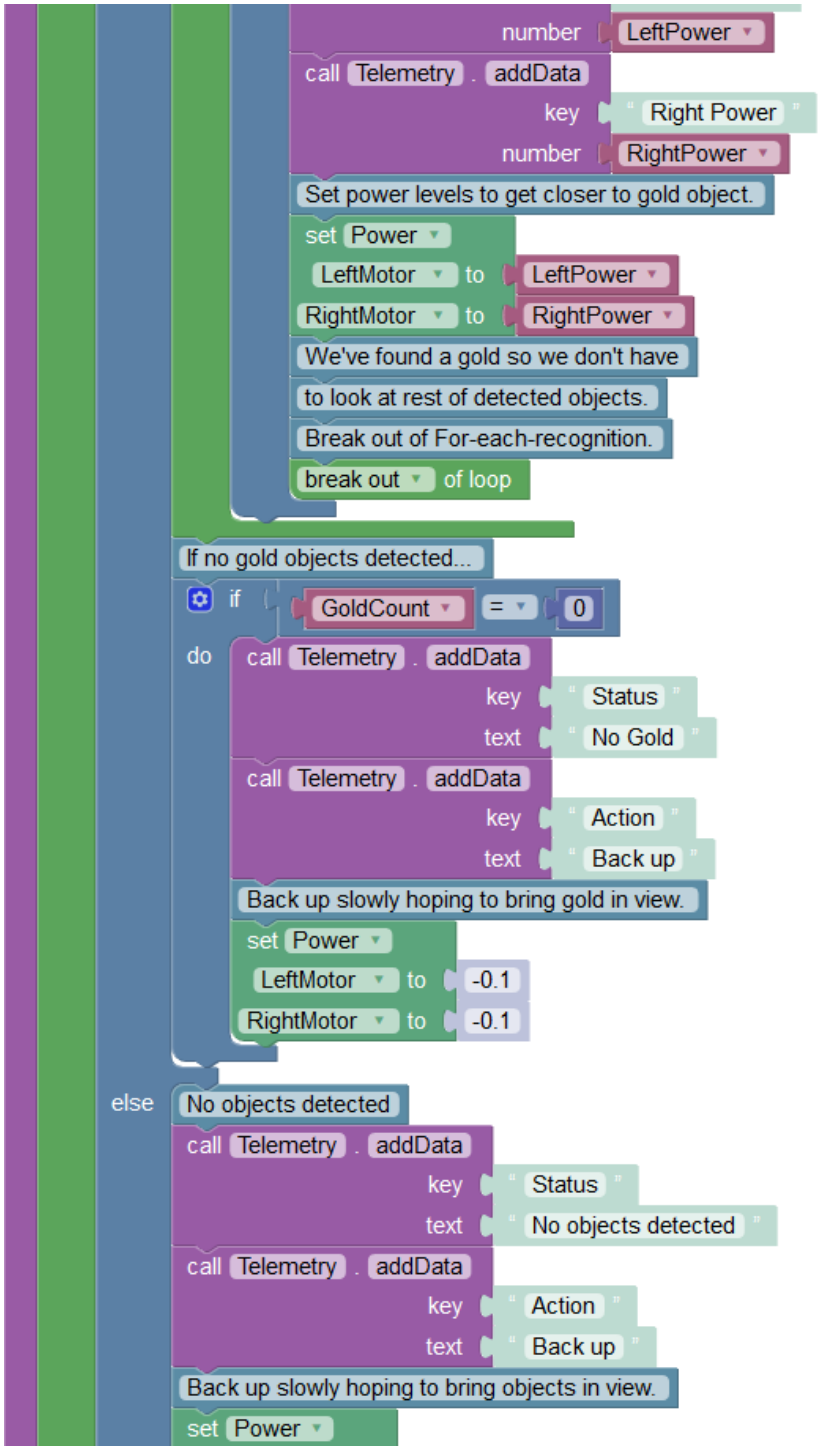


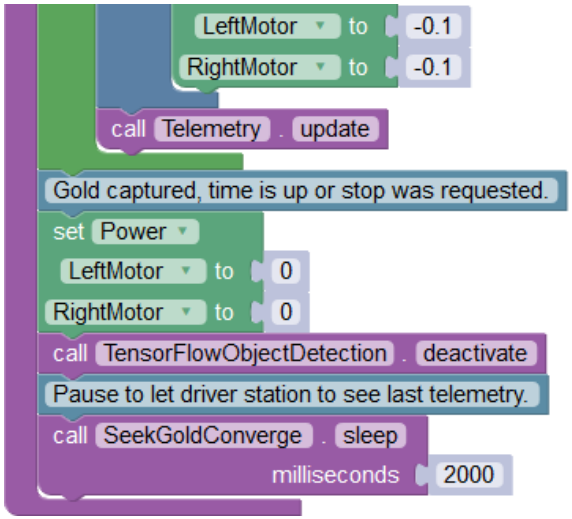

call Telemetry . update
Set target ratio of object height to image
height value corresponding to the length
of the robot's neck.
set TargetHeightRatio to 0.55
call SeekGoldConverge . waitForStart
call TensorFlowObjectDetection . activate
We'll loop until gold block captured or time is up
set BlockCaptured to false
repeat while call SeekGoldConverge . opModelsActive and not BlockCaptured
do Get list of current recognitions.
set recognitions to call TensorFlowObjectDetection . getRecognitions
Report number of recognitions.
call Telemetry . addData
key " Objects Recognized "
number length of recognitions
If some objects detected...
if length of recognitions > 0
do ...let's count how many are gold.
set GoldCount to 0
Step through the gold & silver minerals detected.
for each item recognition in list recognitions
do if Recognition . Label
recognition recognition
= Label . Gold Mineral
do A gold mineral has been detected.
set GoldCount to GoldCount + 1
We can assume this is the first detected gold
because we break out of this loop below after
using the information from the first gold.
We don't need to calculate turn angle to gold
because TensorFlow has estimated it for us.
set ObjectAngle to call Recognition . estimateAngleToObject
recognition recognition
angleUnit AngleUnit . DEGREES


A negative angle means gold is left, else right.
call Telemetry . addData
key " Estimated Angle "
number ObjectAngle
if ObjectAngle > 0
do call Telemetry . addData
key " Direction "
text " Right "
else call Telemetry . addData
key " Direction "
text " Left "
Calculate power levels for turn toward gold.
set LeftPower to 0.25 × ObjectAngle ÷ 45
set RightPower to -0.25 × ObjectAngle ÷ 45
We'll be comparing the gold mineral height
to the height of the video image to estimate
how close the robot is to the gold mineral.
set ImageHeight to Recognition . ImageHeight
recognition recognition
set ObjectHeight to Recognition . Height
recognition recognition
Calculate height of gold relative to image height.
Larger ratio means robot is closer to gold.
set ObjectHeightRatio to ObjectHeight ÷ ImageHeight
call Telemetry . addData
key " HeightRatio "
number ObjectHeightRatio
Use height ratio to determine distance.
If height ratio larger than (target - tolerance)...
if ObjectHeightRatio < TargetHeightRatio - 0.05
do ...not close enough yet.


call Telemetry . addData
key " Distance "
text " Not close enough "
If sum of turn powers are small
if absolute LeftPower + absolute RightPower < 0.12
do ...don't really need to turn. Move forward.
call Telemetry . addData
key " Action "
text " Forward "
Go forward by setting power proportional to how
far from target distance.
set LeftPower to 0.035 + 0.5 × TargetHeightRatio - 0.05 - ObjectHeightRatio
set RightPower to LeftPower
else Else we'll turn to gold with current power levels.
call Telemetry . addData
key " Action "
text " Turn "
Else if height ratio more than (target+tolerance...
else if ObjectHeightRatio > TargetHeightRatio + 0.05
do ...robot too close to gold.
call Telemetry . addData
key " Distance "
text " Too close "
If calculated turn power levels are small...
if absolute LeftPower + absolute RightPower < 0.12
do ...don't need to turn. Backup instead by setting
power proportional to how far past target ratio
call Telemetry . addData
key " Action "
text " Back up "


set LeftPower to
-0.05
+
-0.5
×
TargetHeightRatio
+
0.05
-
TargetHeightRatio
set RightPower to
LeftPower
else
Else use current power levels to turn to gold.
call Telemetry . addData
key
Action
text
Turn
else
Gold is one next length away.
call Telemetry . addData
key
Distance
text
Correct
If calculated turn power levels are small...
if
absolute
LeftPower
+
absolute
RightPower
<
0.12
do
...robot is centered on gold.
call Telemetry . addData
key
Action
text
Motors off, grab the gold
Turn motors off by setting power to 0.
set LeftPower to
0
set RightPower to
0
Lower neck and open jaw.
set LowerServo . Position to
0.5
set UpperServo . Position to
0.5
set BlockCaptured to
true
else
Otherwise use current power levels to turn
to better center on gold.
call Telemetry . addData
key
Action
text
Turn
call Telemetry . addData
key
Left Power


number LeftPower
call Telemetry . addData
key " Right Power "
number RightPower
Set power levels to get closer to gold object.
set Power
LeftMotor to LeftPower
RightMotor to RightPower
We've found a gold so we don't have
to look at rest of detected objects.
Break out of For-each-recognition.
break out of loop
If no gold objects detected...
if GoldCount = 0
do
call Telemetry . addData
key " Status "
text " No Gold "
call Telemetry . addData
key " Action "
text " Back up "
Back up slowly hoping to bring gold in view.
set Power
LeftMotor to -0.1
RightMotor to -0.1
else
No objects detected
call Telemetry . addData
key " Status "
text " No objects detected "
call Telemetry . addData
key " Action "
text " Back up "
Back up slowly hoping to bring objects in view.
set Power


LeftMotor to -0.1
RightMotor to -0.1
call Telemetry . update
Gold captured, time is up or stop was requested.
set Power
LeftMotor to 0
RightMotor to 0
call TensorFlowObjectDetection . deactivate
Pause to let driver station to see last telemetry.
call SeekGoldConverge . sleep
milliseconds 2000