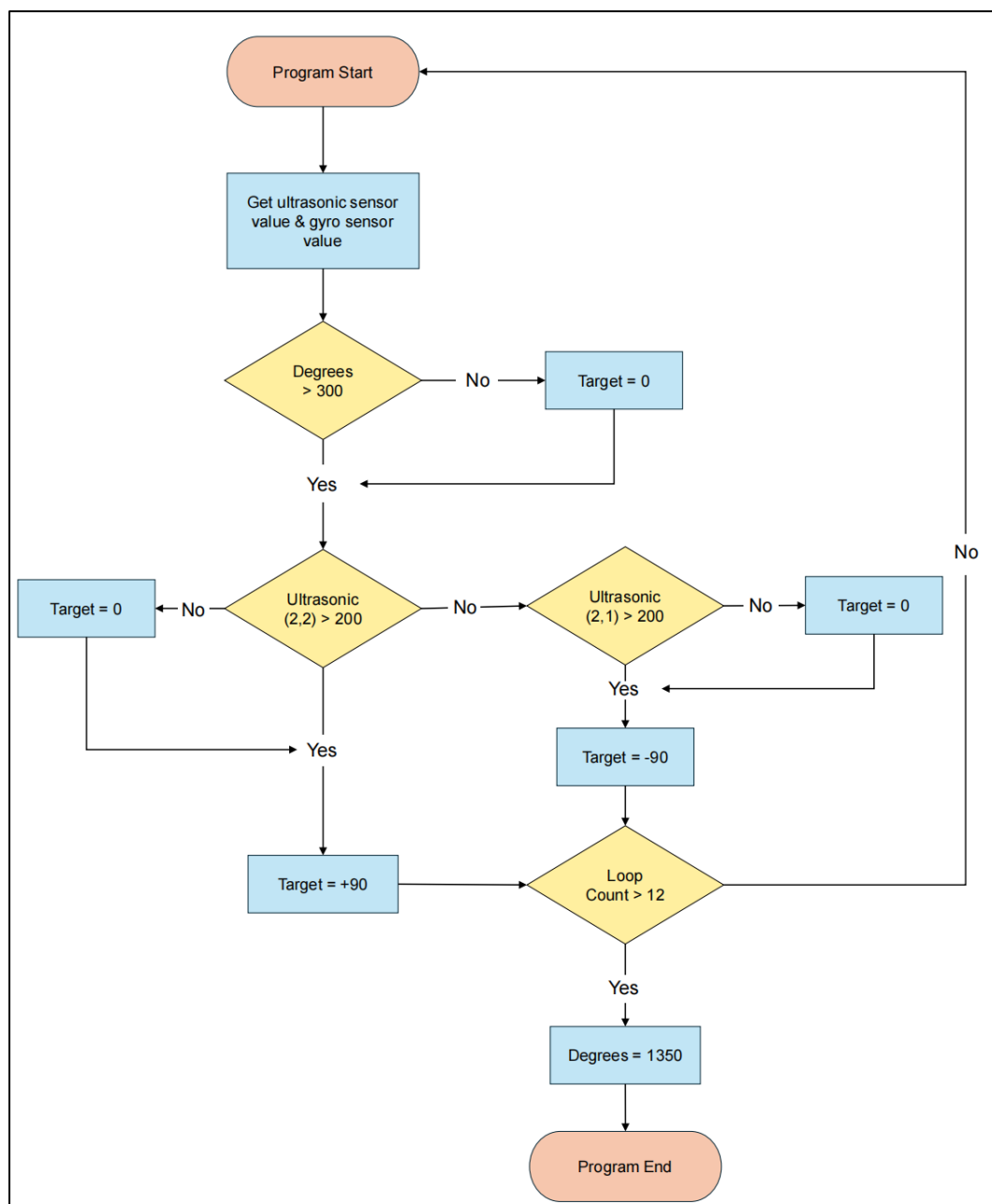### 3.1   Open Challenge

For the open challenges, we use the **ultrasonic sensors** to decide if the robot should move clockwise or counterclockwise. The robot will move clockwise if the right ultrasonic sensors detect a distance greater than 2000mm from the inner wall. The same goes for the left ultrasonic sensors. The ultrasonic sensors also help to measure the distance for both of the walls. It will assist the robot to adjust its steering to avoid hitting the wall as it moves closer. The **gyro sensor** ensures the robot stays on a straight path.

Diagram below shows the flowchart for Open Challenge:

The following is an explanation of the code that is used in the robot for Open Challenge:

1. **Getting direction:** The robot uses the gyro sensor to get the heading direction.

```
While loopCount<12
  If loopCount=0 Then
    waitDegrees(150)
    While leftDistance<2000 And rightDistance<2000
      getValue(2,1,leftDistance)
      getValue(2,2,rightDistance)
      Steering()
    EndWhile
    If rightDistance>2000 Then
      CW=1
    Else
      CW=-1
    EndIf
```

2. **Turning:** The robot uses the ultrasonic sensor to make sure the timing of turning. It will turn with the 90 degrees when the value between the ultrasonic and inner wall exceeds 800mm.

```
    If CW=1 Then
      While rightDistance<800
        Steering()
      EndWhile
    Else
      While leftDistance<800
        Steering()
      EndWhile
    EndIf
  EndIf
  target = target - 89.25 * CW
  loopCount = loopCount + 1
  Speaker.Tone(100,220,50)
EndWhile
```

3. **Avoid Walls:** The robot uses an ultrasonic sensor to maintain the distance between the walls and the robots. When the robot gets closer to the inner wall, the steering will do a correction to avoid hitting the wall.

```
'Gyro Correction
gyroCorrection = relativeHeading * 0.8 +
(relativeHeading-gyroLastError) * 10

'Wall Correction
wallError= (200 - Wall) * cw
wallCorrection = wallError * 0.07 + (wallError-wallLastError) * 0.5

'Steering Correction
turn = gyroCorrection + wallCorrection

'Save Last Error
gyroLastError=relativeHeading
wallLastError=wallError
```