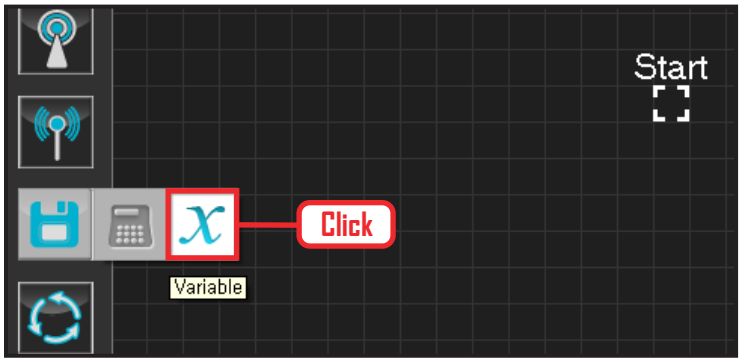
Sound Sensor(indepth) Example Step by Step

Example Description

Sound Sensor is located inside the DRC controller on both sides.

First sound program made the robot lift it's left or right arm in response to the location of the clapping sound.

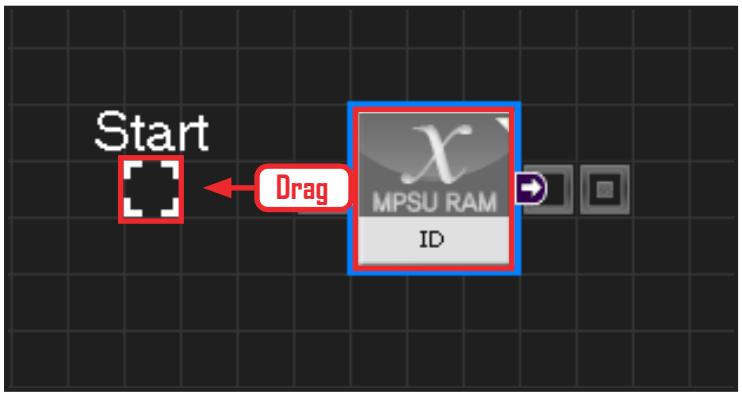
Robot may have difficulty distinquishing the direction of the clap when there is lots of background noise. It may respond by lifting both arms to a single clap from one direction or respond erratically. More refined programming is required to make the robot to respond more reliably regardless of the background noise. Refining the program by forcing a DELAY after registering the first sound so that it will not receive anymore sound input will increase the reliability.



01 Variable Setup

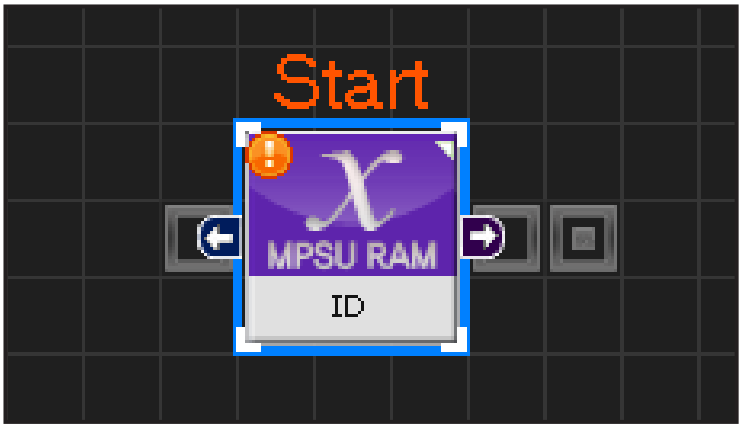
Operating the robot is same as operating the robot servo motor. Value has to be assigned so that servo will be able to operate.

Click Data 〉Variable module.



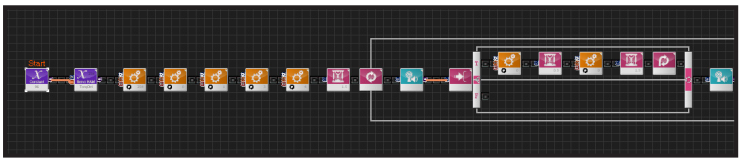
02 Start

Click and drag the connecting line located at left side of the module to the Start Point and dock



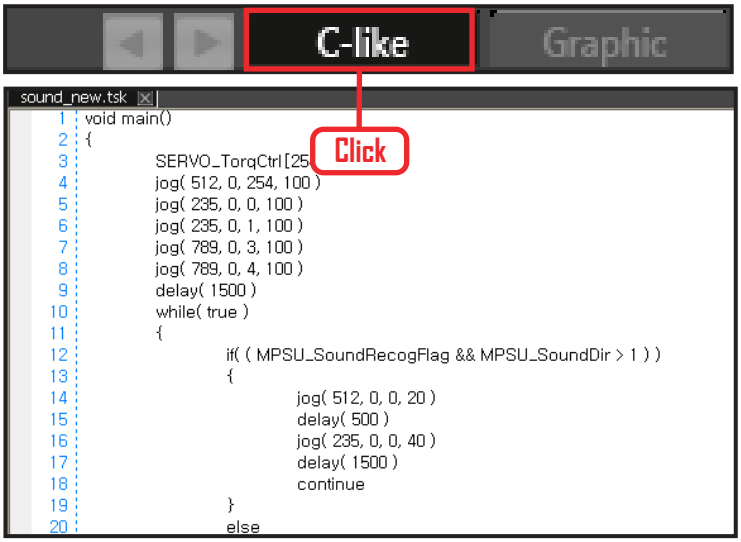
03 Start Programming

When the module and the Start Point is docked properly, module will become active and change color as seen in the photo to the left.This means programming has started..



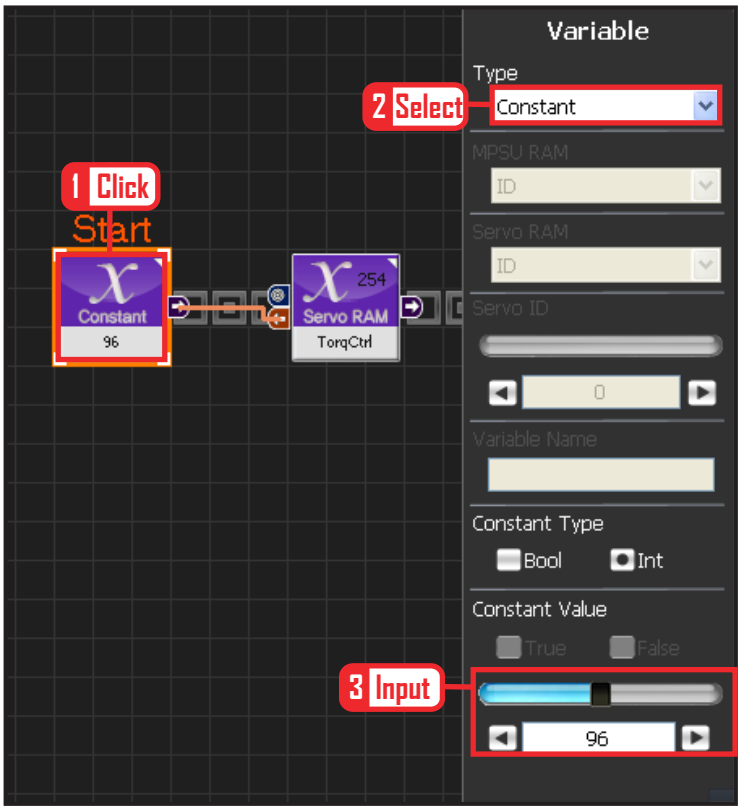
04 Entire Program

Program increases the sensitivity of the sound sensor to make the robot response more reliable.



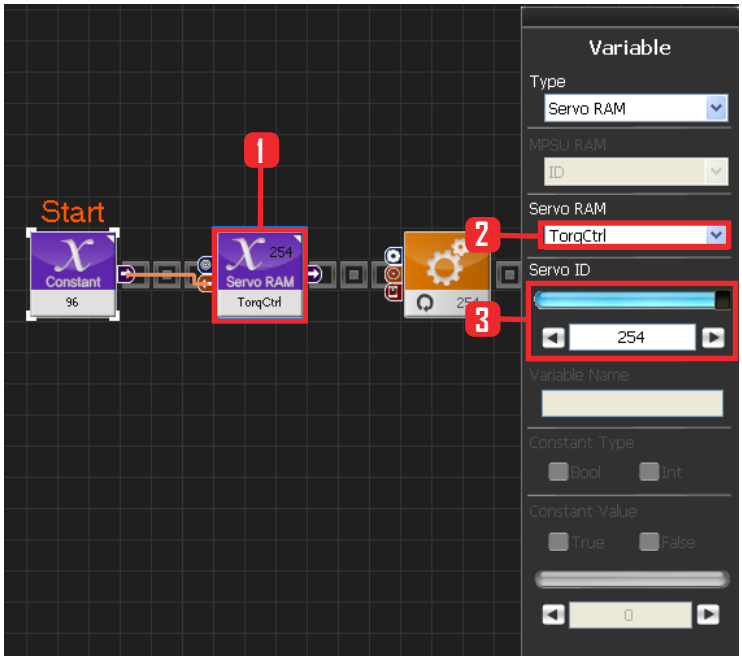
05 Viewing C-Like

Click the 'C–like' tab near the top right and task programming window will open as shown in the photo to the left. This is the task window of the entire program. Codes are very similar to the C language structure so studying the codes will help the user become familiar with the C language structure. Cursor will jump follwing the clicked module, making it easy to see the module changing to text.



06 Setup Constant

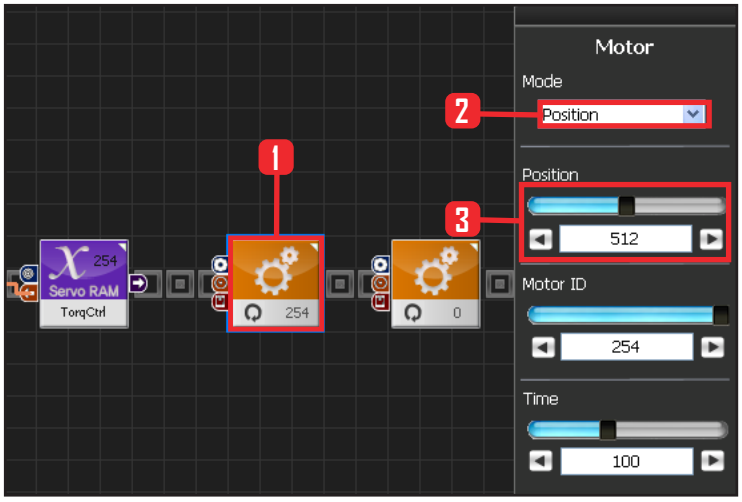
This section allows the servo motor to operate on it's own.
Select Constant as the Variable Type. In properties, set constant value as 96.
When 96(0x60) is entered in the servo TorgControl register, servo becomes ready to operate. This value is sent to the torque value of the next moduel through the output connector.



07 Apply to All Servos

This section applies contact value 96 to all servos.

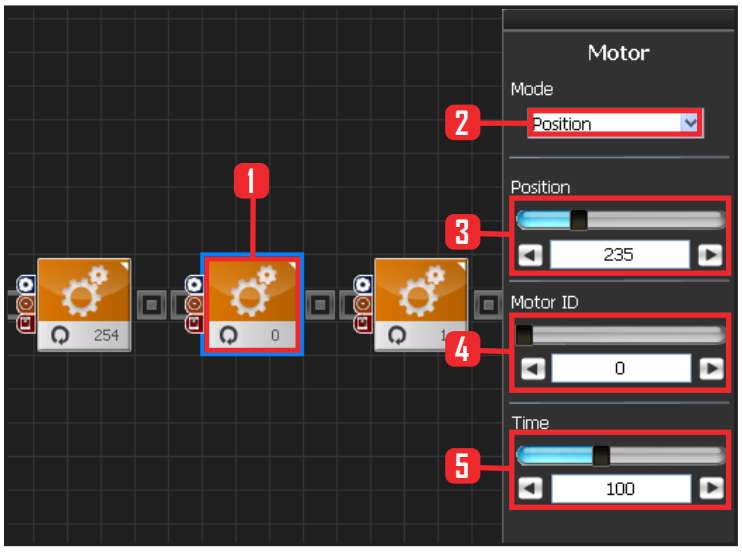
Select Variable 〉Type : Servo RAM.
Select Servo RAM : TorqCtrl .
Set Servo ID : 254. 254 means it will be applied to all connected servos.



08 Set Angle to All Servos

This section sets all servo motor angles to the center.

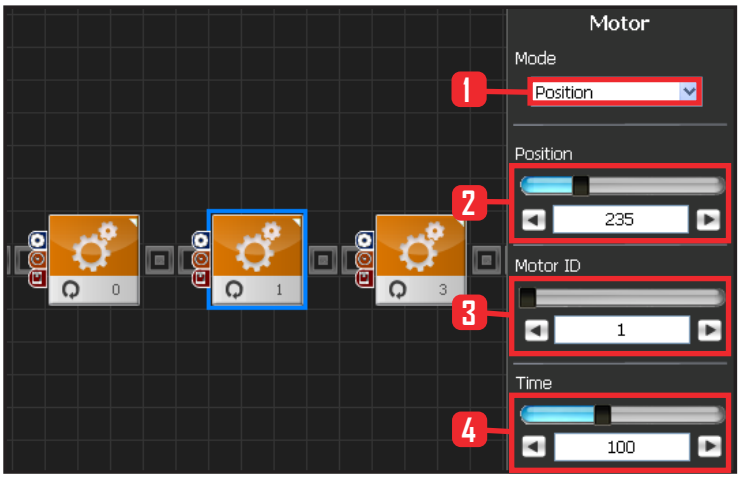
Select Motion 〉Motor.
Select Mode : Positon. adjust angle.
Set Position : 512 . 512 means motor will be sent to the center
Set Motor ID : 254 . 254 means it will be applied to all connected servos.
Set Time : 100 . 1 unit = 11.2ms, 100 units would be approximately 1.12s.
It means motors will be positioned at the desired angle in 1.12s.



09 Setup Motor ID 0 (Right Shoulder)

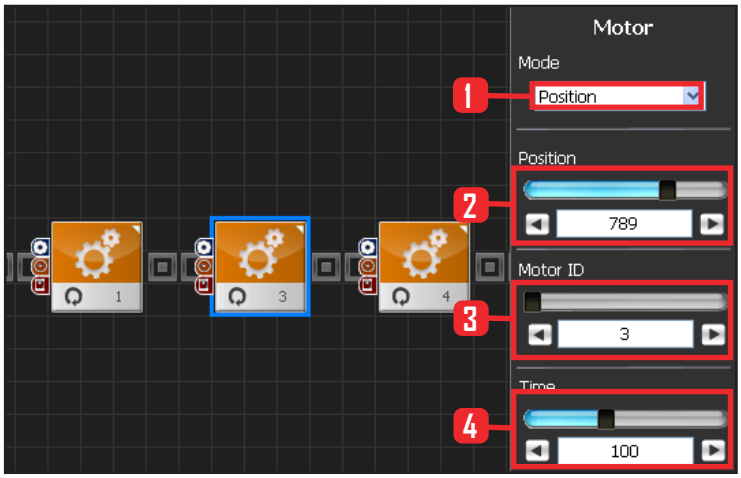
Creating attention posture (Basic Posture)
When all robot motors are aligned to the center, humanoid robot arms will be stretched out to the side. Setup below lowers one arm to the side of the body.

Select Motion 〉Motor .
Select Mode : Position.
Set Position : 235. 235 turns the motor so that that the arm stretched out horizontally will be lowered to vertical down position.
Set Motor ID : 0. Right shoulder motor has ID 0
Set Time : 100. Motor will turn to the desired angle in approximately 1.12s.



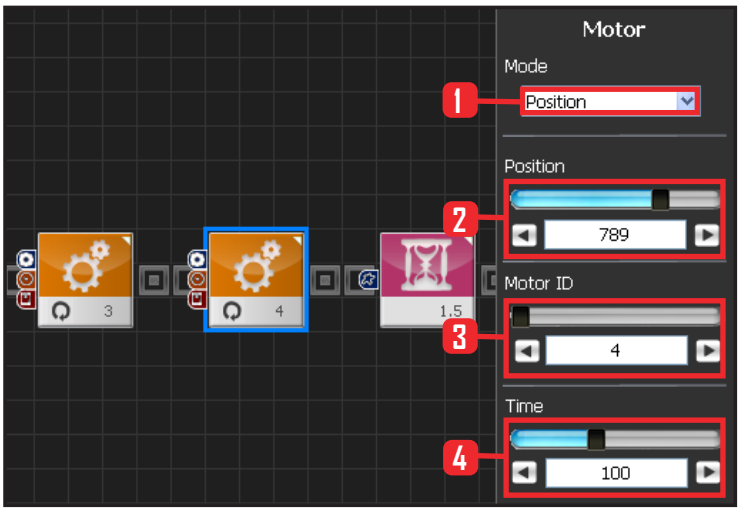
10 Setup Motor ID 1 (Right Arm)

Select Mode : Postion.
Set Position : 235. 235 lowers the horizonally stretched arm to vertical down position.
Set Motor ID : 1. Right upper arm motor connected to the should has motor ID 1.
Set Time : 100 . Motor will turn to the desired angle in apporoximately 1.12s...



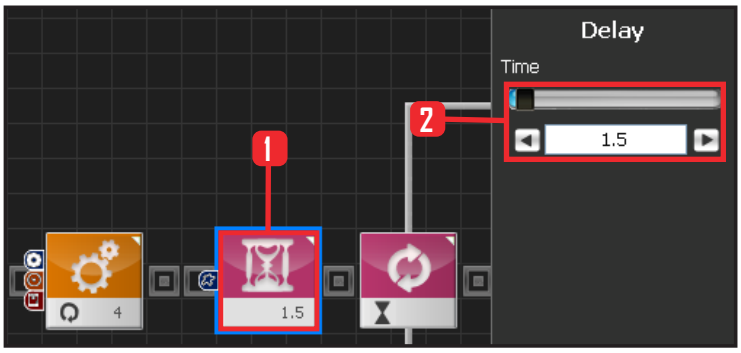
11 Setup Motor ID 3 (Left Shoulder)

Select Motion 〉Motor .
Select Mode : Position.
Set Position : 789. 789 turns the motor so that that the arm stretched out horizontally will be lowered to vertical down position.
Set Motor ID : 0. Left shoulder motor has ID 3
Set Time : 100. Motor will turn to the desired angle in approximately 1.12s..



12 Setup Motor ID 4 (Left Arm)

Select Mode : Postion.
Set Position : 789. 789 lowers the horizonally stretched arm to vertical down position.
Set Motor ID : 4. Right upper arm motor connected to the should has motor ID 4.
Set Time : 100 . Motor will turn to the desired angle in apporoximately 1.12s..



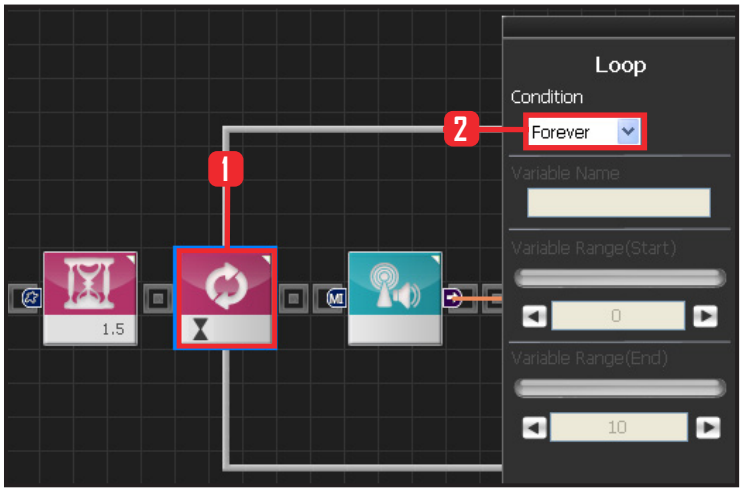
13 Delay

This section makes the robot wait untill the robot is at attention posture and ready to run the next module.

Select Flow 〉 Delay module.

Set Time : 1.5 . Unit is in seconds.

Delay 1.5s.

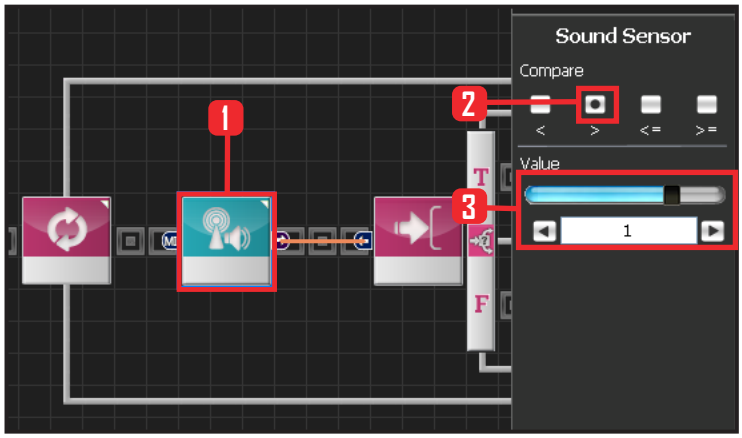


14 Loop 반복문

Select Flow 〉 Loop module.

Select Condition: Forever.

Infinite loop.



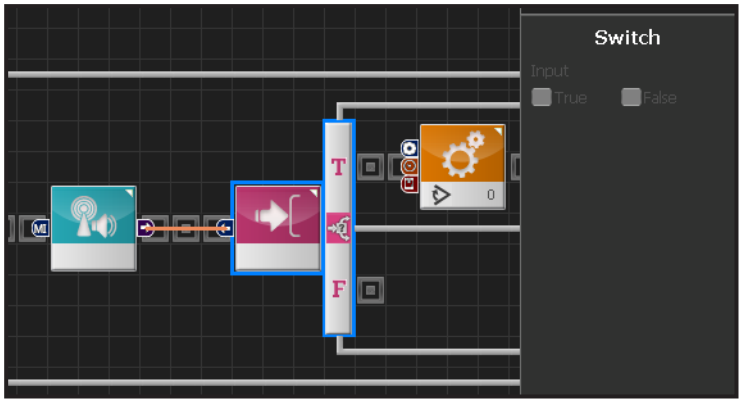
15 Sound Sensor

Select Sensor 〉 Sound Sensor module.

Select Compare : 〉 .

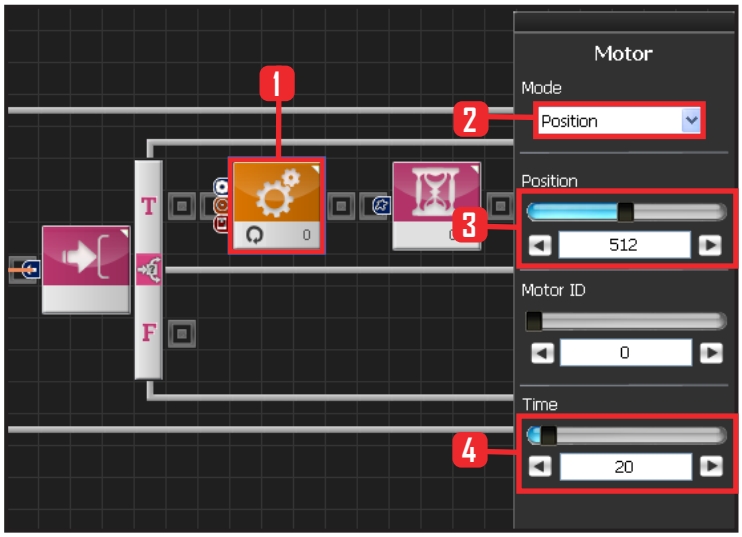
Set Value : 1 .

Median sound value is 0. However, setting the value to 1 will decrease the sensitivity so that only the sound larger than 1 (loud noise from the right) will be registered. This will prevent the robot from responding to the background noise or lifting both arms.



16 Switch IF Conditional Statement

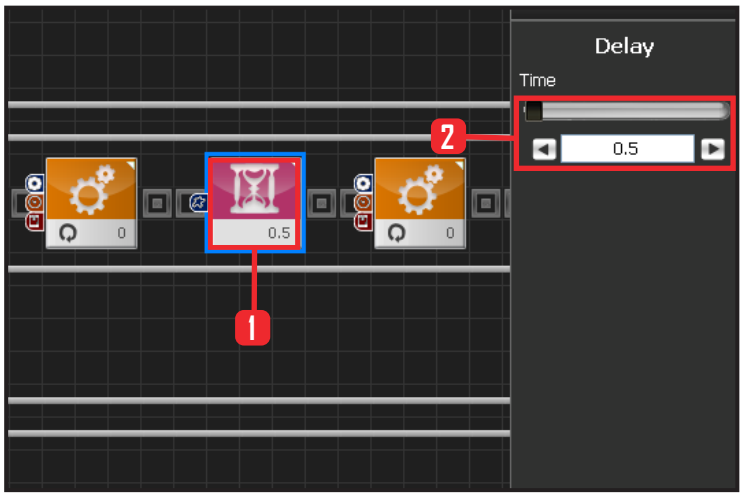
Proceed only if the previous condition is True.



17 Setup Motor ID 0 (Right Shoulder)

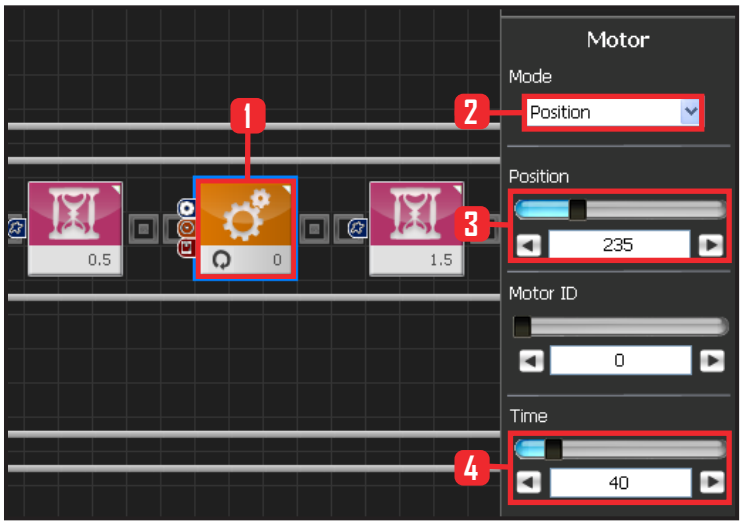
Lift right arm if True; the sound loation value is greater than 0. There are times when the other arm may start to move due to background or motor noise. This program prevents the other arm from moving when one arm is already in mototion.

Select Motion 〉Motor module.
Select Mode : Position .
Set Position : 512. Both arms streched out.
Set Time : 20
Robot arms lift up to 90 degrees angle from the attention posture.



18 Delay

Whle the arm is moving, other arm may start to move or the moving arm may respond again to the background noise. Delay is added to prevent such occurences while the arm is in motion.
No other motion is allowed during the 0.5s of Delay except for the right arm.

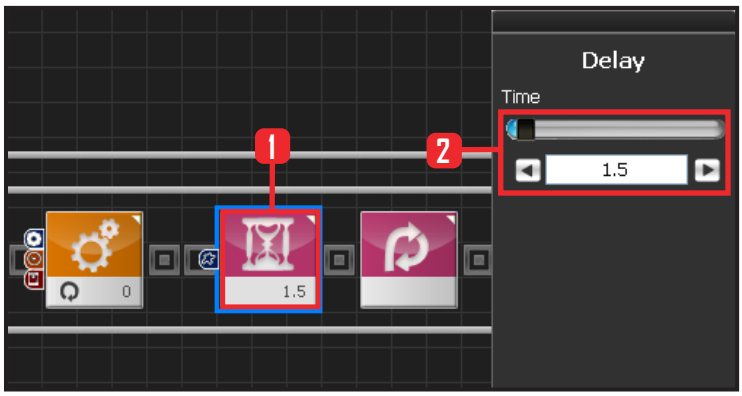


19 Motor ID 0 (Right Shoulder) Return to Attention Posture.

Lower the arm back to attention posture.

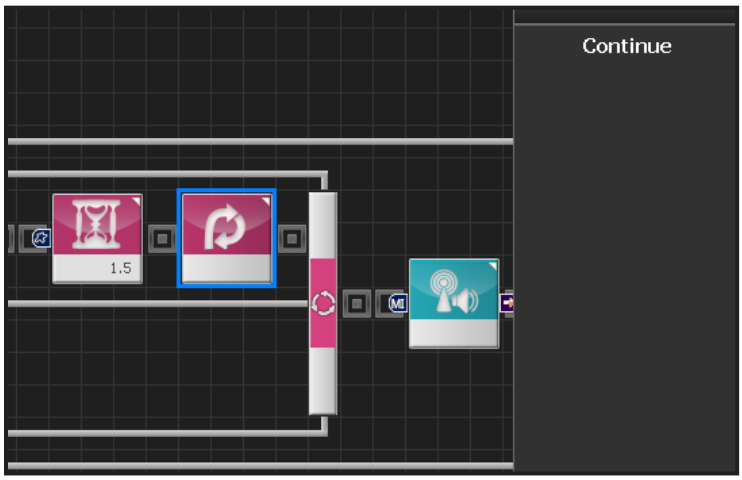
Select Motion 〉Motor module.
Select Mode : Position .
Set Position :235. Return to attention posture
Set Time:40.

Return right arm to attention posture.



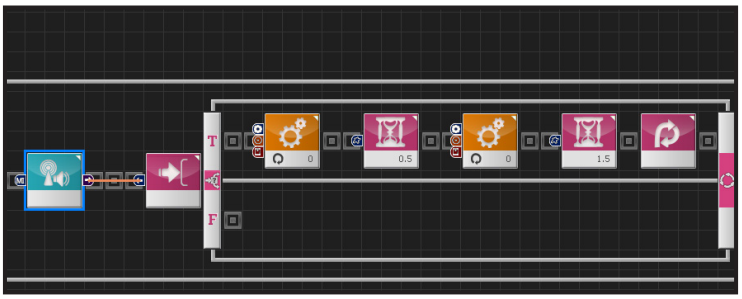
20 Delay

Add Delay to prevent any other motion after return-ing to attention posture.
When 1.5s Delay value is added. Robot will not move or register sound during the delay. Robot will respond to sound again after the Delay.



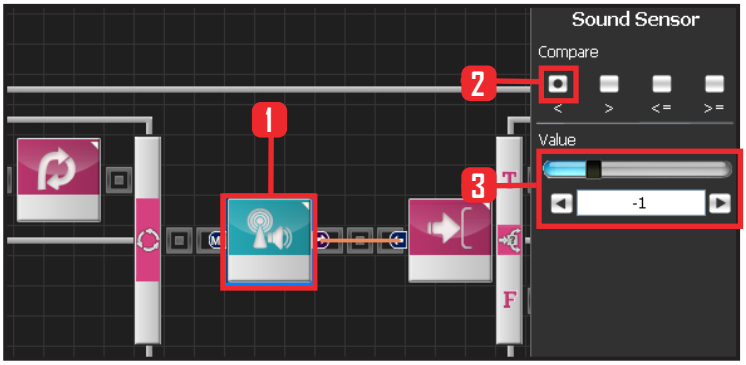
21 Continue

Return to the beginning of the loop after 1.5s Delay.



22 Summary

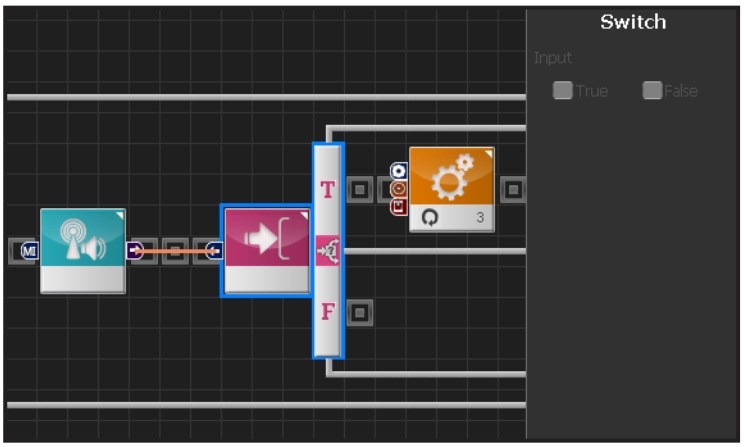
Just completed program blocked certain external stimulus from being registered by the robot. This increased the reliability of the robot response to the sound coming from the right direction.



23 Sound Sensor (2nd)

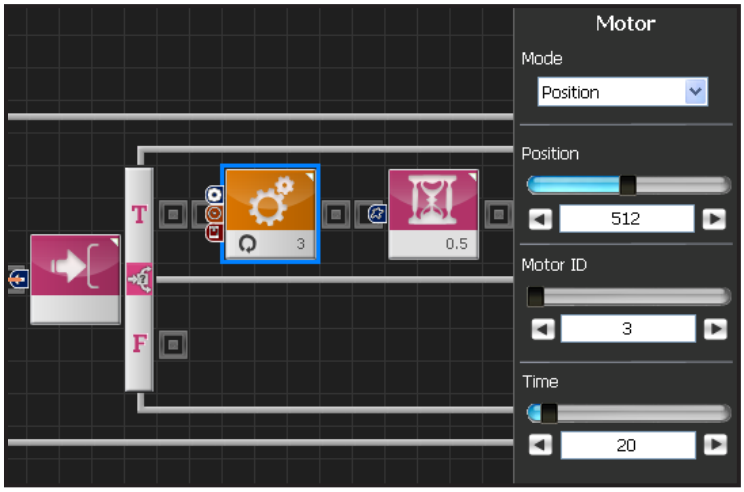
Setup second sound sensor. Left arm will respond to the sound coming from the left.

Select Sensor 〉Sound Sensor module.
Compare : 〈 .
Value : –1 . Respond when smaller than –1.



24 Switch IF Conditional Statement

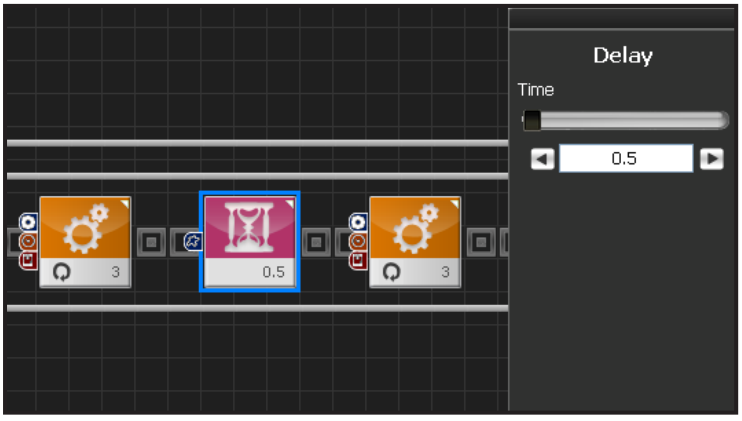
Proceed only if the previous condition is True.



25 Setup Motor ID 3 (Left Shoulder)

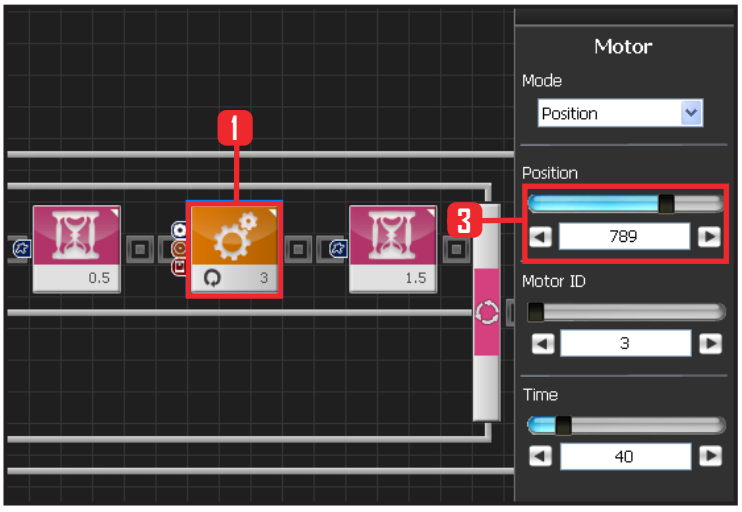
True if the sound location value is less than –1.Lift left arm to steched out position.

Select Motion〉Motor module.
Set Mode : Position .
Set Position: 512 .
Shoulder angle is 789 when in attention posture. Arm becomes streched out to the side when the angle changes from 789 to 512.
Set Time: 20.



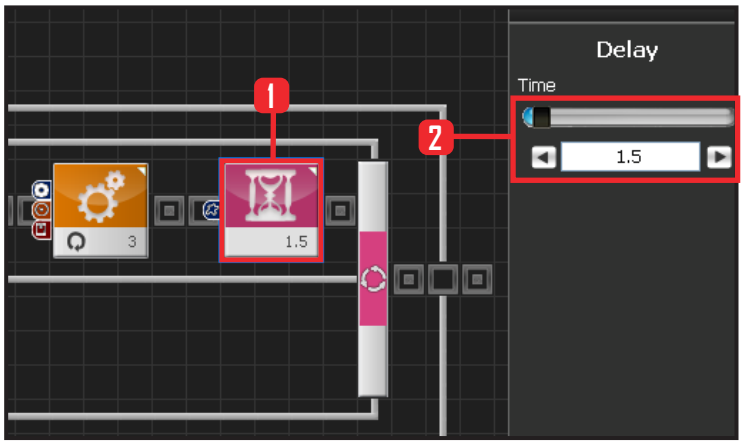
26 Delay

Whle the arm is moving, other arm may start to move or the moving arm may respond again to the background noise. Delay is added to prevent such occurences while the arm is in motion.
No other motion is allowed during the 0.5s of Delay except for the right arm.



27 Motor ID 3 (Left Shoulder) Return to Attention Posture.

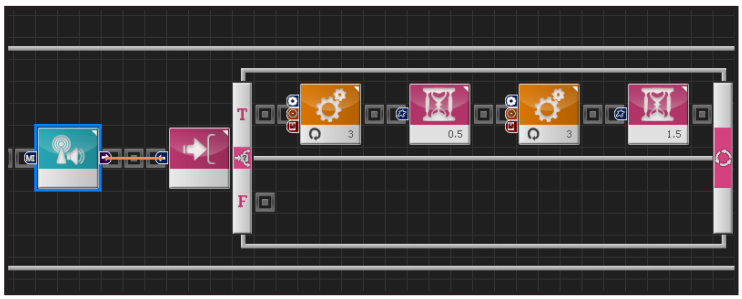
Set Motor ID 3 Position to 789 and return to at–tention posture.



28 Delay

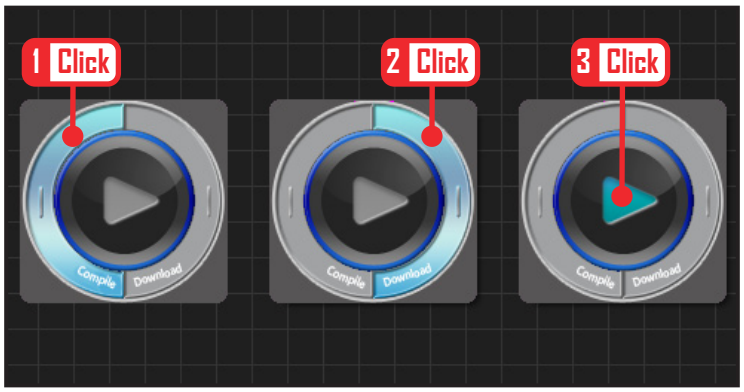
Add 1.5s Delay value to prevent other motions.

Motor ID 3 does not have Continue as Moto ID 0 since this is the end of the loop and progrm will automatically go back tothe beginning of the loop.



29 Left Arm Response

When robot registers a clap from the left, it will lift the left arm and then go back to the attention posture. Delay value makes the robot respond only to the first clap it registers. All other sounds all claps will be ignored. This refinement allows the robot to resopond more reliably in noisy environment.



30 Compile, Download, Run

Click 'Compile'. Click 'download' on the right if there is no compilation error. Download to robot. Click 'Run' button (Arrow button) after the down-load..

31 Robot Motion

robot will lift the left arm with left side clap and right arm with the right side clap.

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