BEGIN {

Program begin

{INPUT PORT SETTING}

Input port setting

{OUTPUT PORT SETTING}

Output port setting

{SERVO MOTOR}

Set the servo motor to the 150 degree

LOOP {

LOOP starting point (Repeat the command)

IF {

{DC MOTOR}

} //IF END

Condition 1
Left ⓑ IR sensor : Detect white color
Right ⓐ IR sensor : Detect white color
Robot goes forward.
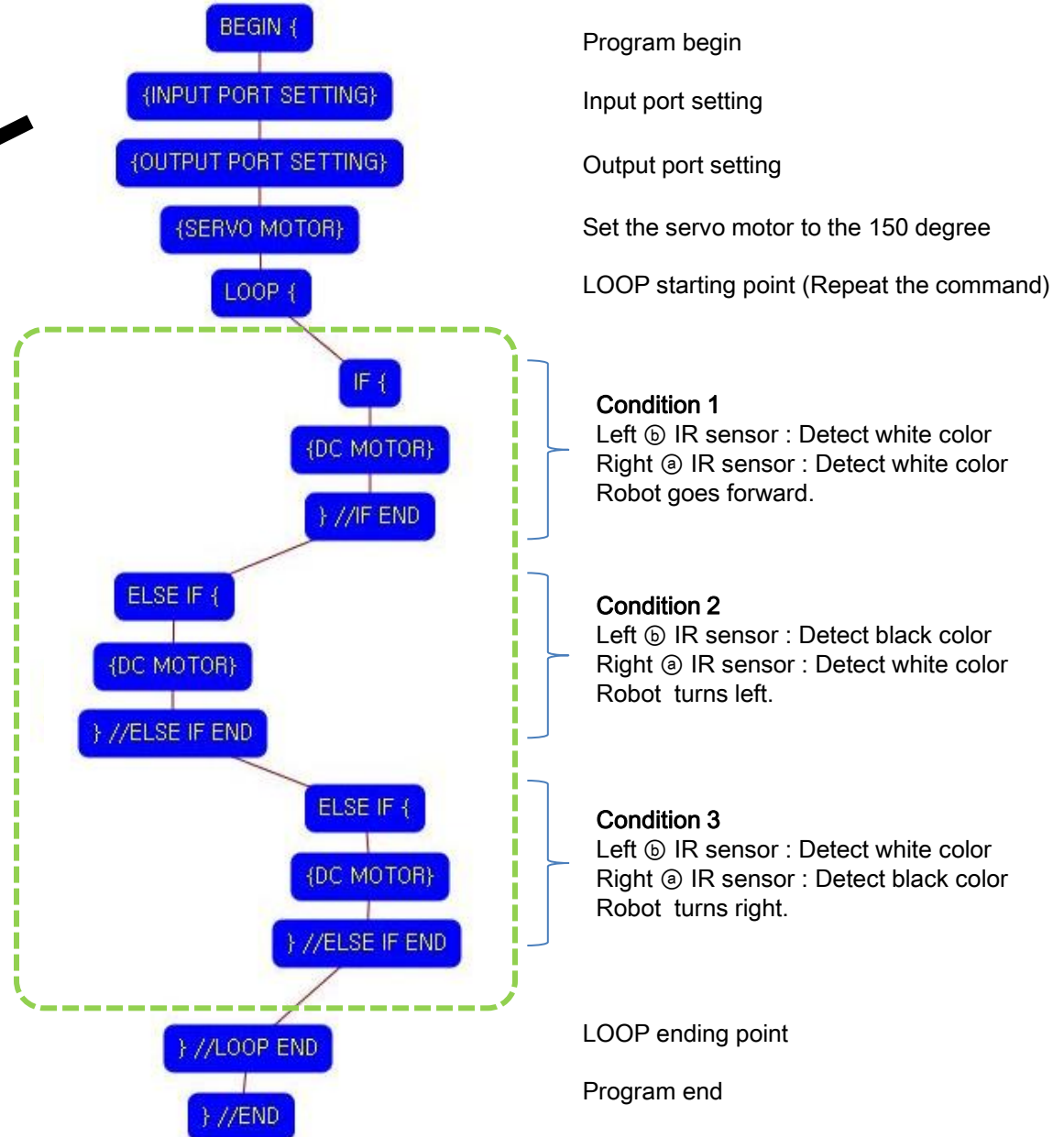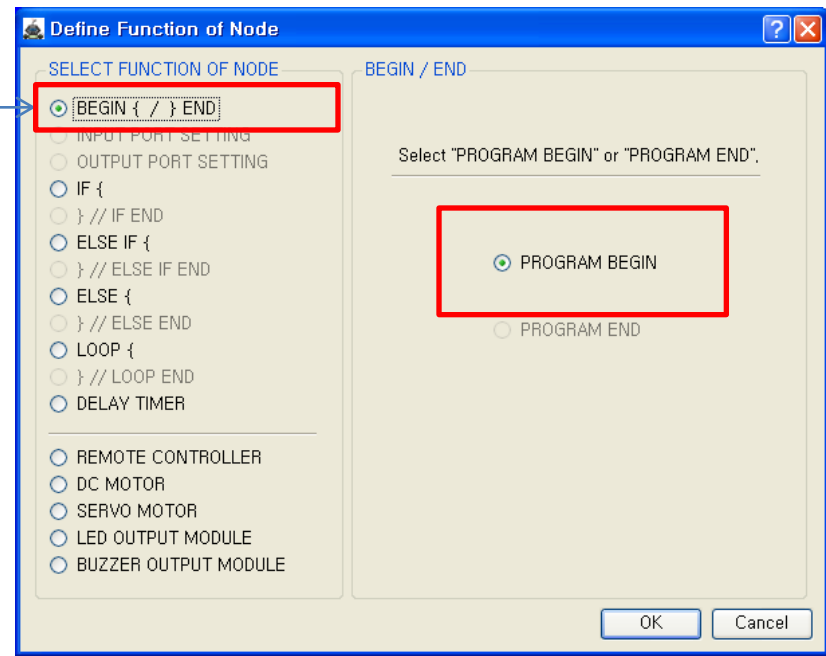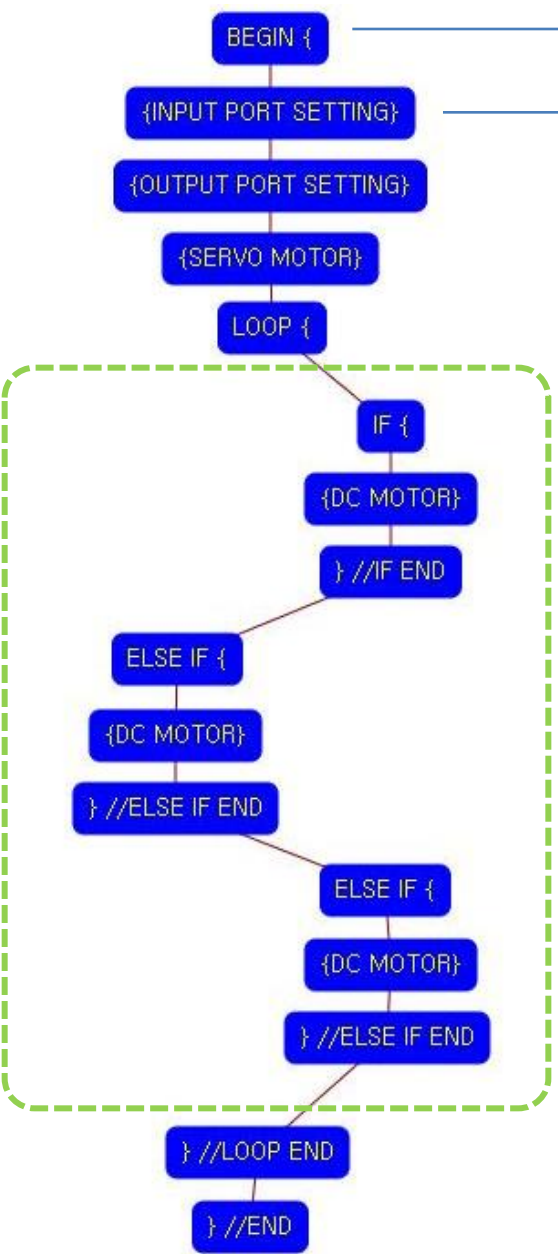
The line tracer with 2 IR sensors runs following the black line.

The key point of programming is that the black line is to be between the ⓐ and ⓑ IR sensor.

To more funny, the robot make head up when it starts.

Program name :
  eq2-3-p08_2IR_TurtleBot.ufc

ELSE IF {

{DC MOTOR}

} //ELSE IF END

Condition 2
Left ⓑ IR sensor : Detect black color
Right ⓐ IR sensor : Detect white color
Robot turns left.

ELSE IF {

{DC MOTOR}

} //ELSE IF END

Condition 3
Left ⓑ IR sensor : Detect white color
Right ⓐ IR sensor : Detect black color
Robot turns right.

} //LOOP END

LOOP ending point

} //END

Program end

BEGIN {

{INPUT PORT SETTING}

{OUTPUT PORT SETTING}

{SERVO MOTOR}

LOOP {

IF {

{DC MOTOR}

} //IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

} //LOOP END

} //END

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

BEGIN / END

Select "PROGRAM BEGIN" or "PROGRAM END".

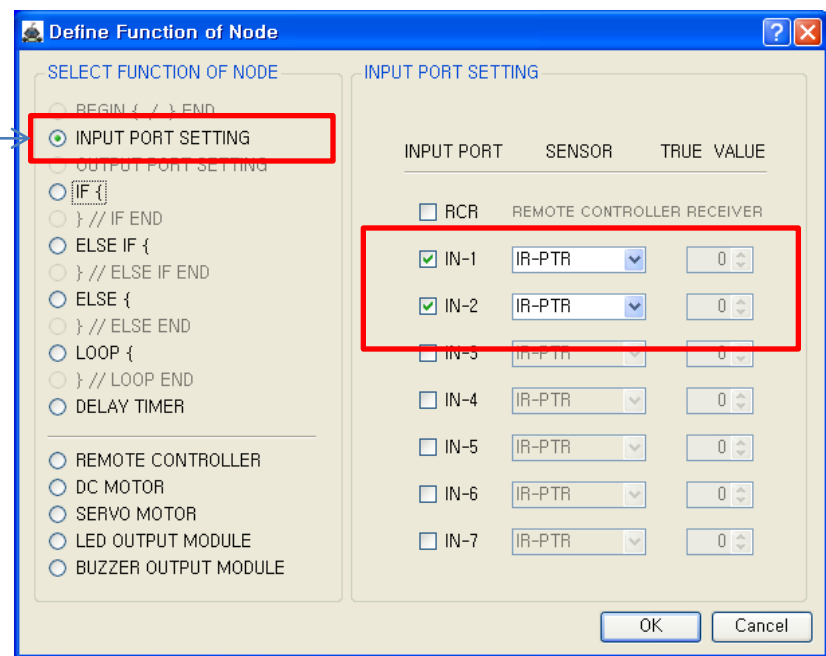- ⦿ PROGRAM BEGIN
- ◯ PROGRAM END

[OK] [Cancel]

This means that program begins from hear.

You have to place this node at the first of program.

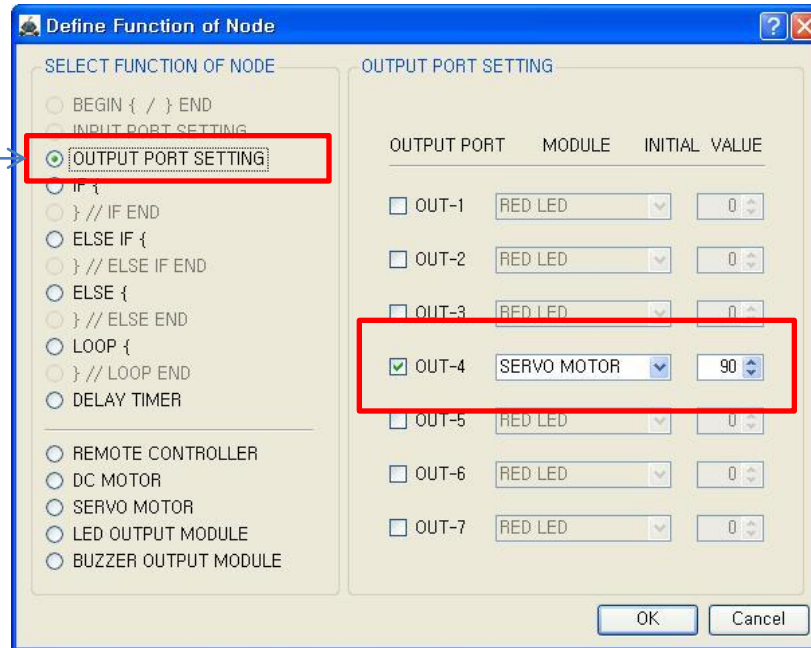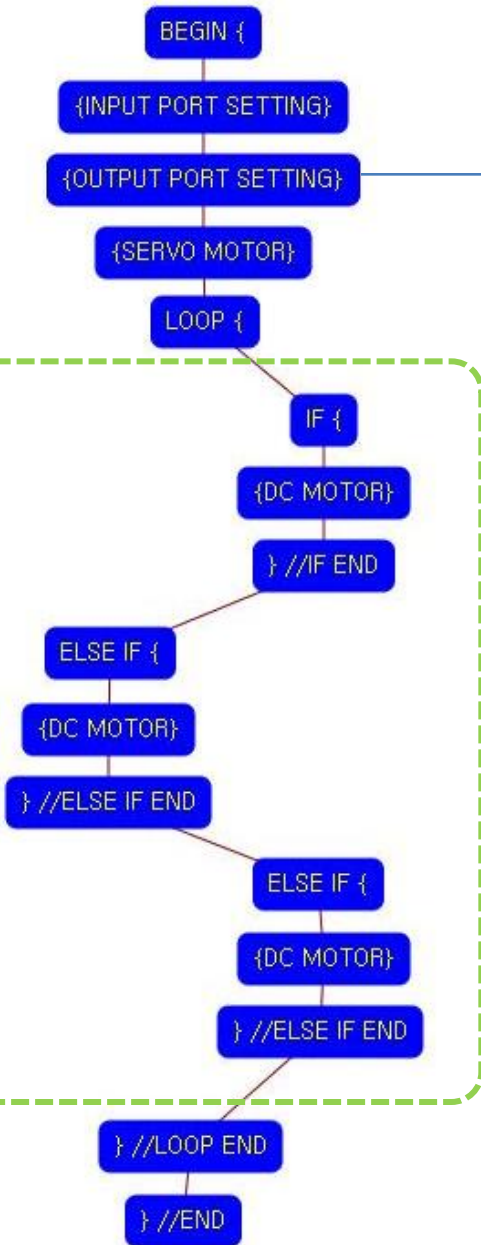"PROGRAM END" is not active because you did not define "PROGRAM BEGIN" yet.

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

INPUT PORT SETTING

INPUT PORT	SENSOR	TRUE VALUE
☐ RCR	REMOTE CONTROLLER RECEIVER	
☑ IN-1	IR-PTR	0
☑ IN-2	IR-PTR	0
☐ IN-3	IR-PTR	0
☐ IN-4	IR-PTR	0
☐ IN-5	IR-PTR	0
☐ IN-6	IR-PTR	0
☐ IN-7	IR-PTR	0

[OK] [Cancel]

This model use 2 IR sensors as input device.

You have to connect the right ⓐ IR sensor to the IN-1 input port and the left ⓑ IR sensor to the IN-2 input port of main board.
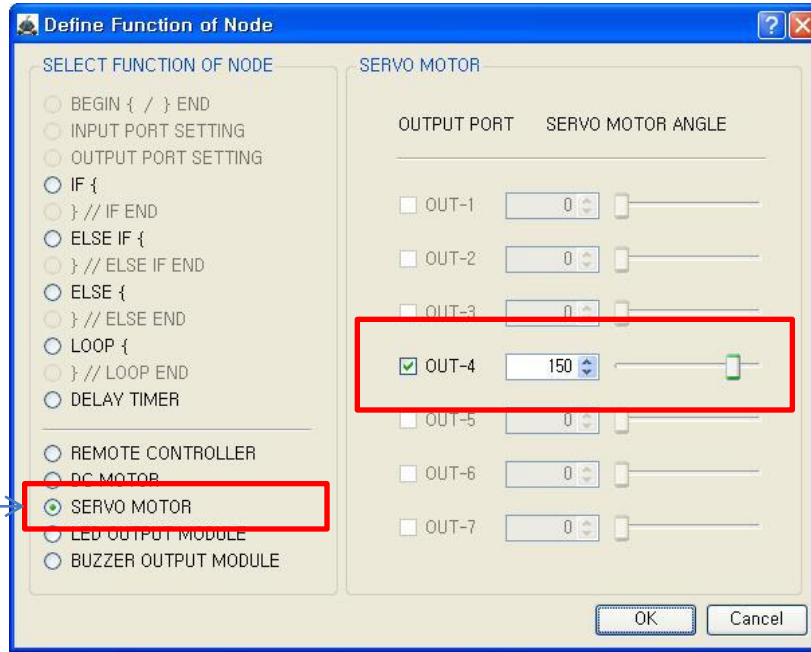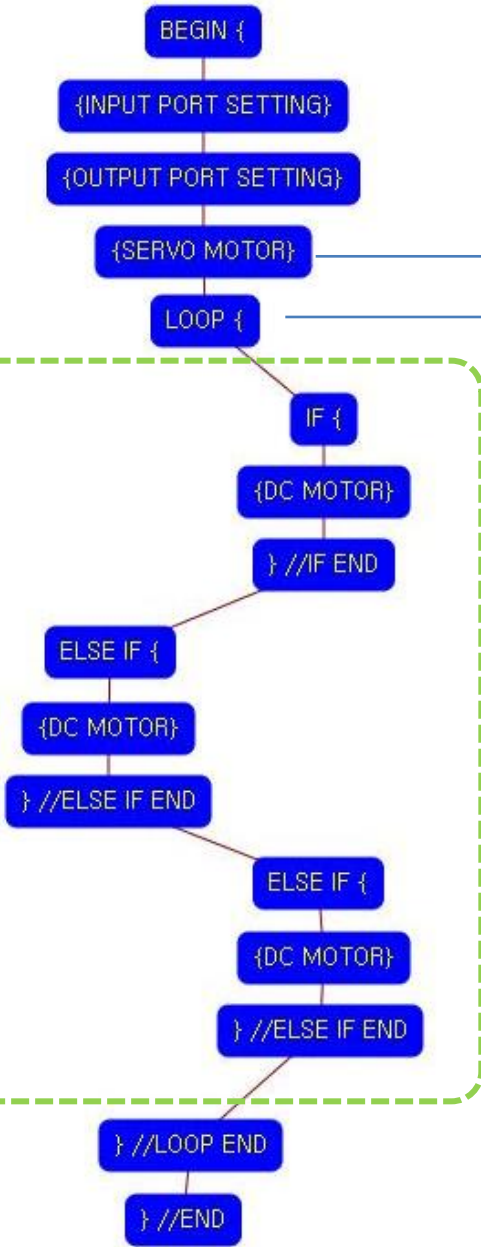And check the IN-1, IN-2 with "IR-PTR" in software.

If the real connection of sensors are different to the setting on software, it will make robot to wrong operation.

BEGIN {

{INPUT PORT SETTING}

{OUTPUT PORT SETTING}

{SERVO MOTOR}

LOOP {

IF {

{DC MOTOR}

} //IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

} //LOOP END

} //END

Define Function of Node

SELECT FUNCTION OF NODE

○ BEGIN { / } END
○ INPUT PORT SETTING
◉ OUTPUT PORT SETTING
○ IF {
○ } // IF END
○ ELSE IF {
○ } // ELSE IF END
○ ELSE {
○ } // ELSE END
○ LOOP {
○ } // LOOP END
○ DELAY TIMER

○ REMOTE CONTROLLER
○ DC MOTOR
○ SERVO MOTOR
○ LED OUTPUT MODULE
○ BUZZER OUTPUT MODULE

OUTPUT PORT SETTING

OUTPUT PORT	MODULE	INITIAL VALUE
☐ OUT-1	RED LED	0
☐ OUT-2	RED LED	0
☐ OUT-3	RED LED	0
☑ OUT-4	SERVO MOTOR	90
☐ OUT-5	RED LED	0
☐ OUT-6	RED LED	0
☐ OUT-7	RED LED	0

OK   Cancel

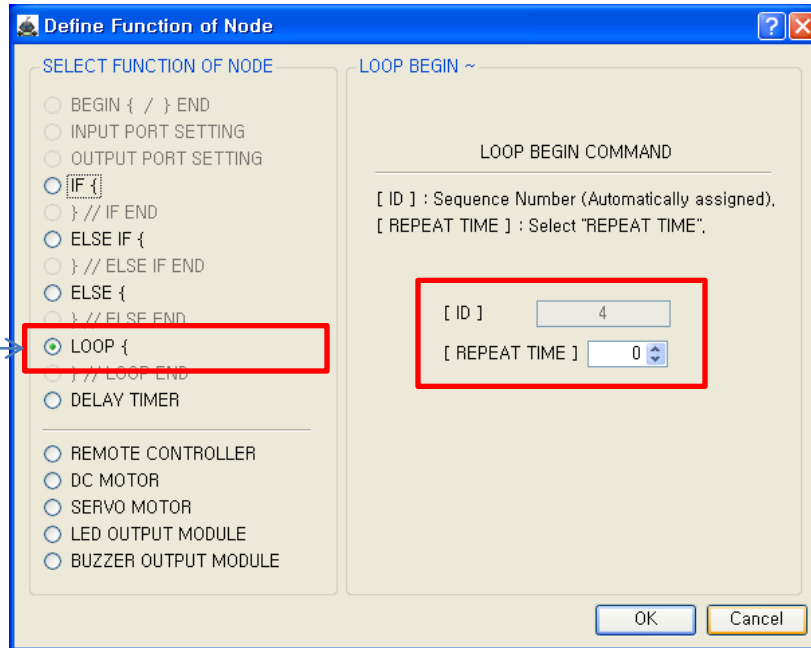This model use 1 Servo Motor as output device.

You have to connect the Servo motor to the OUT-4 output port of main board. The initial value of Servo motor is to be 90.

If the real connection of output modules are different to the setting on software, it will make robot to wrong operation.

BEGIN {
{INPUT PORT SETTING}
{OUTPUT PORT SETTING}
{SERVO MOTOR}
LOOP {
IF {
{DC MOTOR}
} //IF END
ELSE IF {
{DC MOTOR}
} //ELSE IF END
ELSE IF {
{DC MOTOR}
} //ELSE IF END
} //LOOP END
} //END

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

SERVO MOTOR

OUTPUT PORT	SERVO MOTOR ANGLE
OUT-1	0
OUT-2	0
OUT-3	0
OUT-4	150
OUT-5	0
OUT-6	0
OUT-7	0

OK   Cancel

Move the Servo motor of OUT-4 port to the 150 degree.

This makes the head of turtle robot heads up.

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

LOOP BEGIN ~

LOOP BEGIN COMMAND

[ID] : Sequence Number (Automatically assigned),
[REPEAT TIME] : Select "REPEAT TIME",

[ID]   4
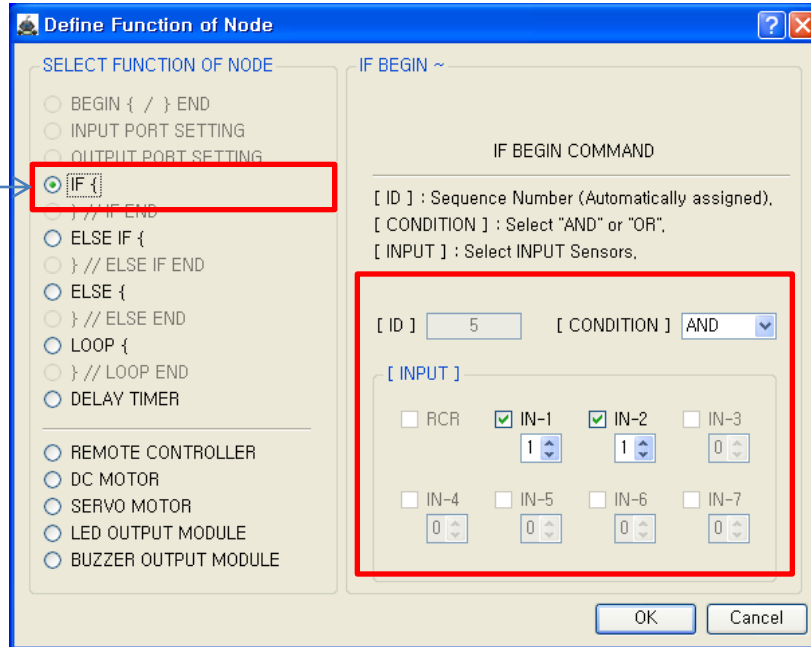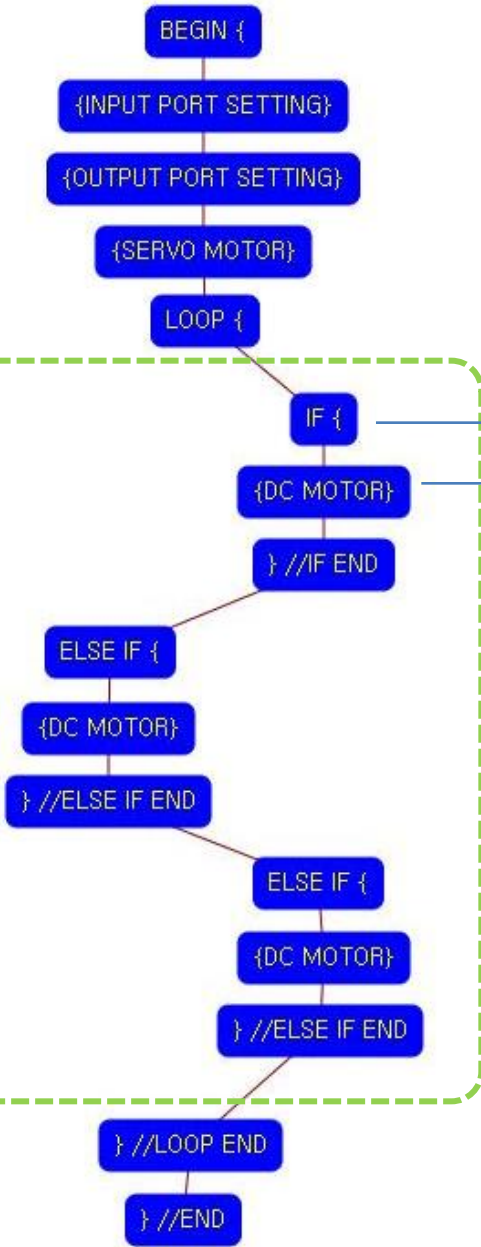[REPEAT TIME]   0

OK   Cancel

LOOP command is used to repeat the commands.

"REPEAT TIME" is the repeat number you want.
If you want permanent repetition, you have to set "0".

ID is automatically assigned.
You have to set the same ID at "LOOP END".

Automatically assigned ID is different according to the sequence of making nodes.
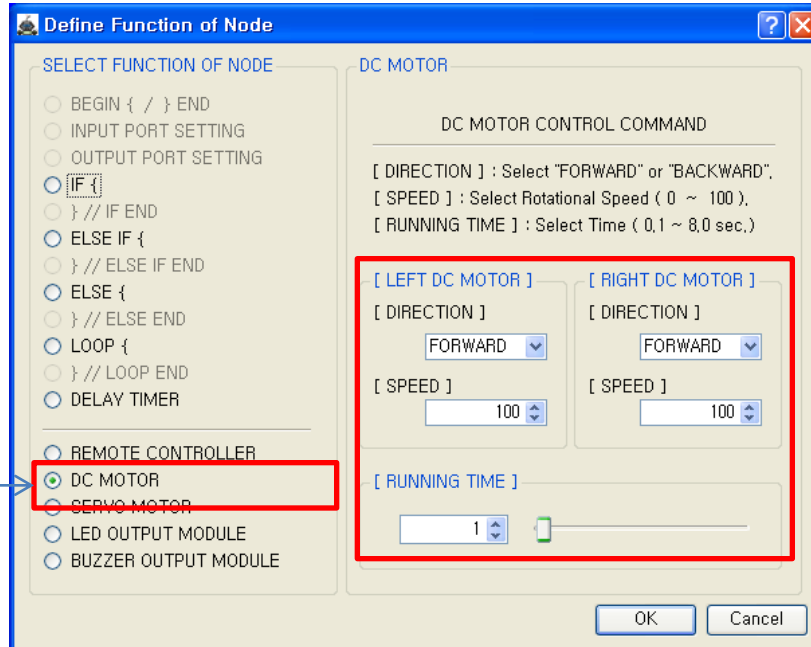
Flowchart (left):

BEGIN {
{INPUT PORT SETTING}
{OUTPUT PORT SETTING}
{SERVO MOTOR}
LOOP {
IF {
{DC MOTOR}
} //IF END
ELSE IF {
{DC MOTOR}
} //ELSE IF END
ELSE IF {
{DC MOTOR}
} //ELSE IF END
} //LOOP END
} //END

Define Function of Node (top dialog):

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

IF BEGIN ~

IF BEGIN COMMAND

[ID] : Sequence Number (Automatically assigned),
[CONDITION] : Select "AND" or "OR",
[INPUT] : Select INPUT Sensors,

[ID]   5   [CONDITION] AND

[INPUT]

☐ RCR   ☑ IN-1   ☑ IN-2   ☐ IN-3
           1   1   0

☐ IN-4   ☐ IN-5   ☐ IN-6   ☐ IN-7
   0   0   0   0

OK   Cancel

Text (top right):

1st condition

True condition is
ⓐ IR sensor of IN-1 :
   detects white color
AND
ⓑ IR sensor of IN-2 :
   detects white color

If the condition is true, the next "{DC MOTOR}" command is executed, else the next "ELSE IF {" command is executed.
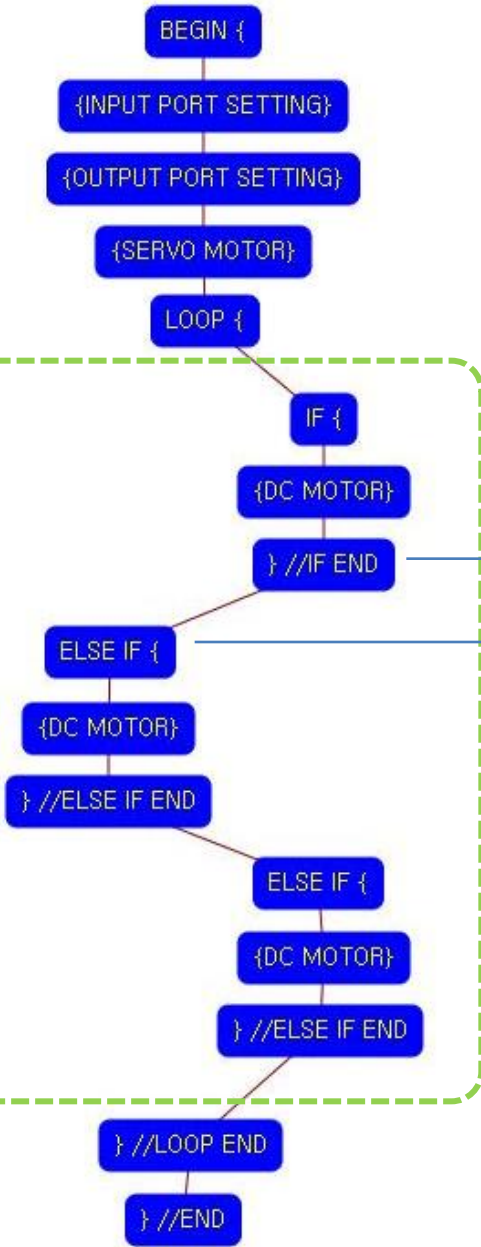
Define Function of Node (bottom dialog):

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

DC MOTOR

DC MOTOR CONTROL COMMAND

[DIRECTION] : Select "FORWARD" or "BACKWARD",
[SPEED] : Select Rotational Speed (0 ~ 100),
[RUNNING TIME] : Select Time (0.1 ~ 8.0 sec.)

[LEFT DC MOTOR]   [RIGHT DC MOTOR]
[DIRECTION]   [DIRECTION]
FORWARD   FORWARD
[SPEED]   [SPEED]
100   100

[RUNNING TIME]
1

OK   Cancel

Text (bottom right):

If the 1st "IF {" condition is true, both of DC motor run like as followings.

Both DC Motor
- Direction : Forward
- Speed : 100
- Running Time : 1
➔ Robot goes forward during 0.1 second

Motor speed is from 0 to 100 and running time is based on 0.1 second.
(1 is 0.1 second)

BEGIN {

{INPUT PORT SETTING}

{OUTPUT PORT SETTING}

{SERVO MOTOR}

LOOP {

IF {

{DC MOTOR}

} //IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

} //LOOP END

} //END

Define Function of Node

SELECT FUNCTION OF NODE

○ BEGIN { / } END
○ INPUT PORT SETTING
○ OUTPUT PORT SETTING
○ IF {
◉ } // IF END
○ ELSE IF {
○ } // ELSE IF END
○ ELSE {
○ } // ELSE END
○ LOOP {
○ } // LOOP END
○ DELAY TIMER

○ REMOTE CONTROLLER
○ DC MOTOR
○ SERVO MOTOR
○ LED OUTPUT MODULE
○ BUZZER OUTPUT MODULE

~ IF END

IF END COMMAND

[ID] : Sequence Number (Manually assigned).

[ID] 5

OK   Cancel

Define Function of Node

SELECT FUNCTION OF NODE

○ BEGIN { / } END
○ INPUT PORT SETTING
○ OUTPUT PORT SETTING
○ IF {
○ } // IF END
◉ ELSE IF {
○ } // ELSE IF END
○ ELSE {
○ } // ELSE END
○ LOOP {
○ } // LOOP END
○ DELAY TIMER

○ REMOTE CONTROLLER
○ DC MOTOR
○ SERVO MOTOR
○ LED OUTPUT MODULE
○ BUZZER OUTPUT MODULE

ELSE IF BEGIN ~

ELSE IF BEGIN COMMAND

[ID] : Sequence Number (Automatically assigned).
[CONDITION] : Select "AND" or "OR".
[INPUT] : Select INPUT Sensors.
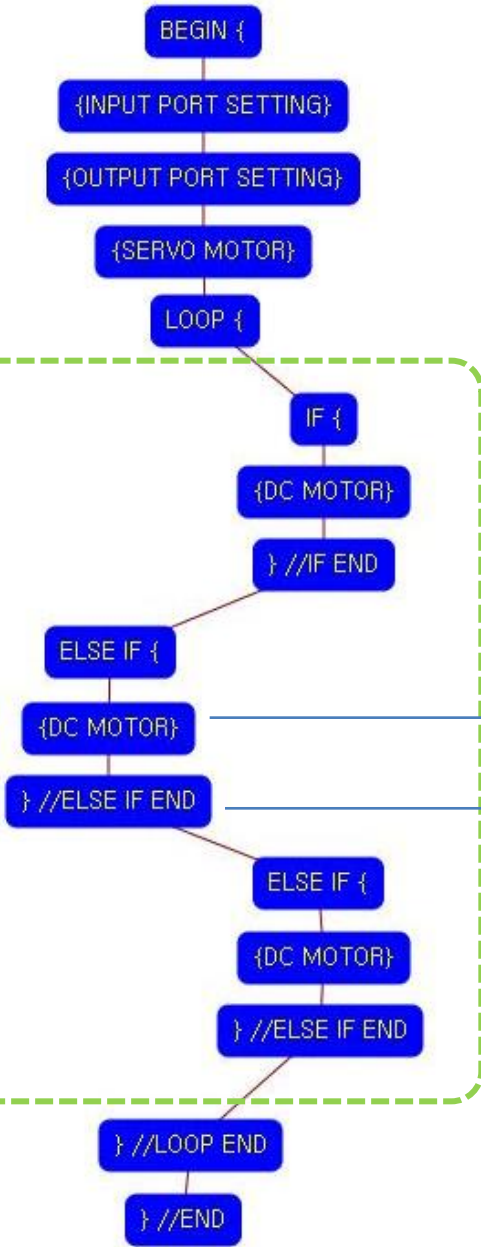
[ID] 8   [CONDITION] AND

[INPUT]

☐ RCR   ☑ IN-1   ☑ IN-2   ☐ IN-3
             1   0   0

☐ IN-4   ☐ IN-5   ☐ IN-6   ☐ IN-7
   0   0   0   0

OK   Cancel

The end point of 1st "IF {" condition.

You have to assigned the ID of paired "IF {" condition.

(It is necessary to know that which "IF {" among the many "IF {" conditions in program.

2nd condition

True condition is
ⓐ IR sensor of IN-1 : detects white color
AND
ⓑ IR sensor of IN-2 : detects black color

If the condition is true, the next "{DC MOTOR}" command is executed, else the next "ELSE IF {" command is executed.

BEGIN {

{INPUT PORT SETTING}

{OUTPUT PORT SETTING}

{SERVO MOTOR}

LOOP {

IF {

{DC MOTOR}

} //IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

ELSE IF {

{DC MOTOR}

} //ELSE IF END

} //LOOP END

} //END

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- **DC MOTOR**
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

DC MOTOR

DC MOTOR CONTROL COMMAND

[DIRECTION] : Select "FORWARD" or "BACKWARD",
[SPEED] : Select Rotational Speed (0 ~ 100),
[RUNNING TIME] : Select Time (0.1 ~ 8.0 sec.)

[LEFT DC MOTOR]   [RIGHT DC MOTOR]
[DIRECTION]   [DIRECTION]
FORWARD   FORWARD
[SPEED]   [SPEED]
0   100

[RUNNING TIME]
1

OK   Cancel

If the 2nd condition is true, both of DC motor run like as followings.

Left DC Motor
- Direction : Forward
- Speed : 0
- Running Time : 1
Right DC Motor
- Direction : Forward
- Speed : 100
- Running Time : 1
➔ Robot turns left during 0.1 second

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- **} // ELSE IF END**
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

~ ELSE IF END

ELSE IF END COMMAND

[ID] : Sequence Number (Manually assigned),
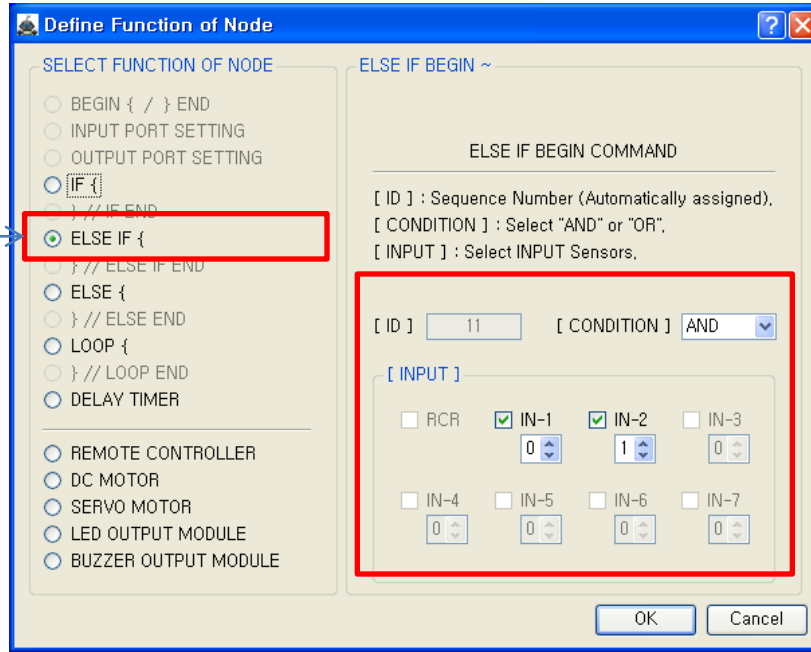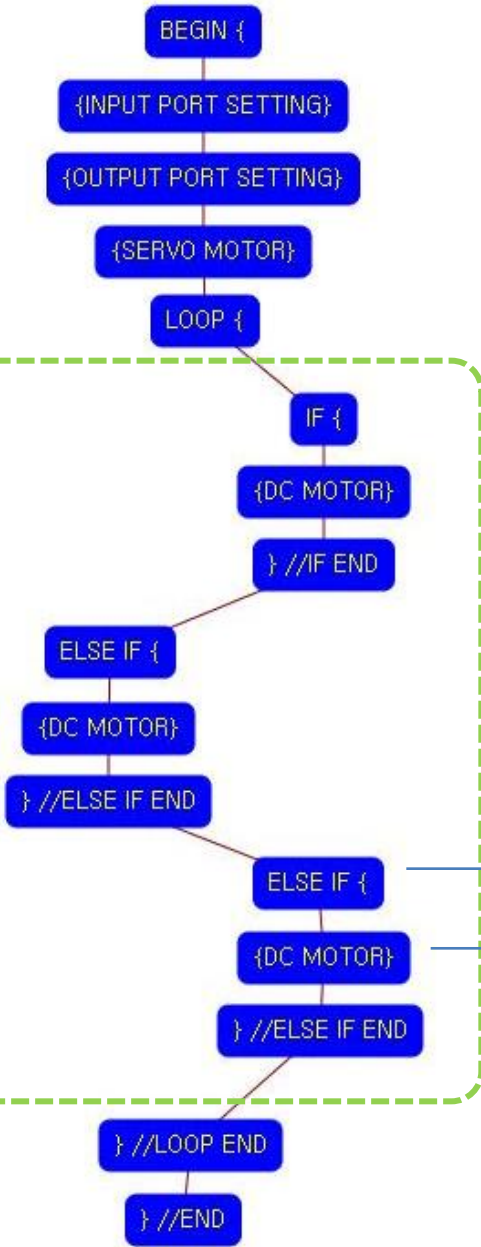
[ID]   8

OK   Cancel

The end point of 2nd condition.

You have to assigned the ID of paired "ELSE IF {" condition.

(It is necessary to know that which "ELSE IF {" among the many "ELSE IF {" conditions in program.

Flow Diagram (left)

- BEGIN {
- {INPUT PORT SETTING}
- {OUTPUT PORT SETTING}
- {SERVO MOTOR}
- LOOP {
  - IF {
    - {DC MOTOR}
  - } //IF END
  - ELSE IF {
    - {DC MOTOR}
  - } //ELSE IF END
  - ELSE IF {
    - {DC MOTOR}
  - } //ELSE IF END
- } //LOOP END
- } //END

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ⦿ ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

ELSE IF BEGIN ~

ELSE IF BEGIN COMMAND

[ID] : Sequence Number (Automatically assigned),
[CONDITION] : Select "AND" or "OR",
[INPUT] : Select INPUT Sensors,

[ID]   11   [CONDITION] AND

[INPUT]
- RCR
- ☑ IN-1   0
- ☑ IN-2   1
- IN-3   0
- IN-4   0
- IN-5   0
- IN-6   0
- IN-7   0

OK   Cancel

Define Function of Node

SELECT FUNCTION OF NODE

- BEGIN { / } END
- INPUT PORT SETTING
- OUTPUT PORT SETTING
- IF {
- } // IF END
- ELSE IF {
- } // ELSE IF END
- ELSE {
- } // ELSE END
- LOOP {
- } // LOOP END
- DELAY TIMER

- REMOTE CONTROLLER
- ⦿ DC MOTOR
- SERVO MOTOR
- LED OUTPUT MODULE
- BUZZER OUTPUT MODULE

DC MOTOR

DC MOTOR CONTROL COMMAND

[DIRECTION] : Select "FORWARD" or "BACKWARD",
[SPEED] : Select Rotational Speed (0 ~ 100),
[RUNNING TIME] : Select Time (0,1 ~ 8,0 sec,)

[LEFT DC MOTOR]   [RIGHT DC MOTOR]
[DIRECTION]   [DIRECTION]
FORWARD   FORWARD
[SPEED]   [SPEED]
100   0
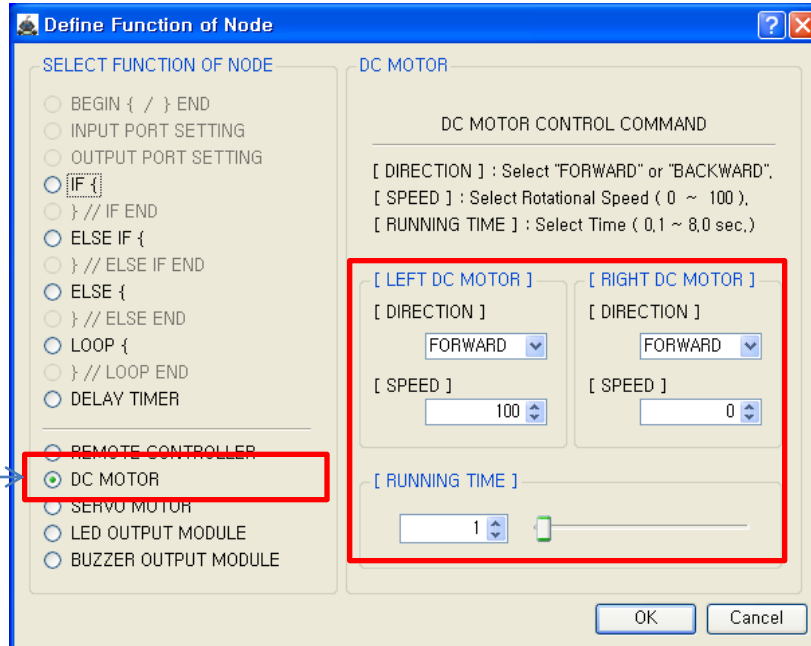
[RUNNING TIME]
1

OK   Cancel

Right-side text

3rd condition

True condition is
ⓐ IR sensor of IN-1 :
    detects black color
AND
ⓑ IR sensor of IN-2 :
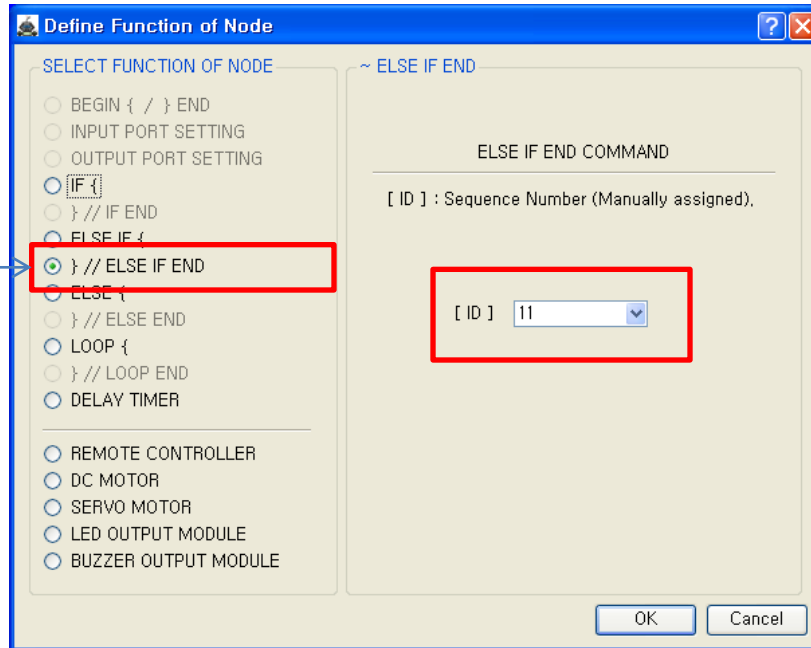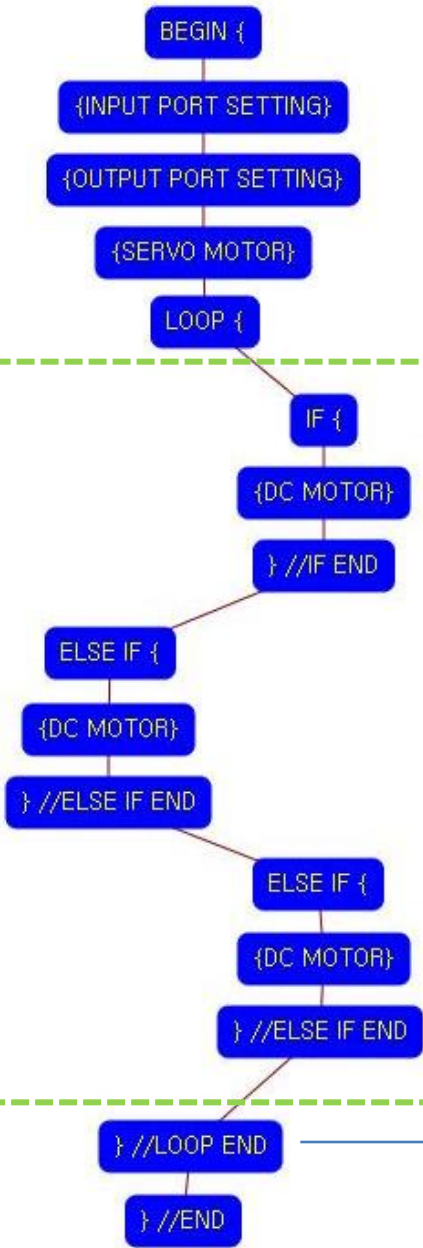   detects white color

If the condition is true, the
next "{DC MOTOR}"
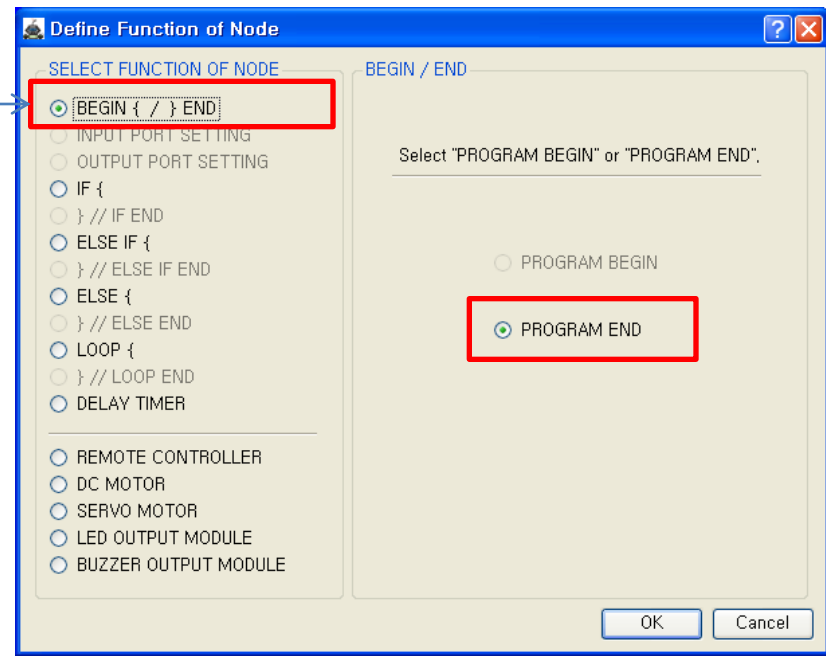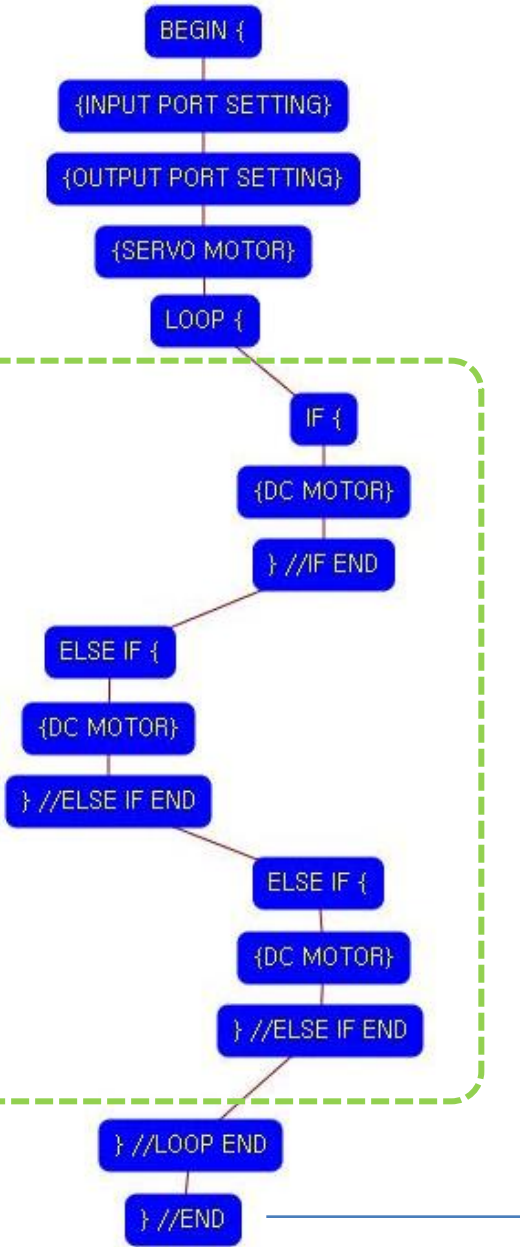command is executed,
else the next "} //LOOP END"
command is executed.

If the 3rd condition is true,
both of DC motor run like as
followings.

Left DC Motor
- Direction : Forward
- Speed : 100
- Running Time : 1
Right DC Motor
- Direction : Forward
- Speed : 0
- Running Time : 1
➔Robot turns right during 0.1
second

Flowchart (left side):

- BEGIN {
- {INPUT PORT SETTING}
- {OUTPUT PORT SETTING}
- {SERVO MOTOR}
- LOOP {
- IF {
- {DC MOTOR}
- } //IF END
- ELSE IF {
- {DC MOTOR}
- } //ELSE IF END
- ELSE IF {
- {DC MOTOR}
- } //ELSE IF END
- } //LOOP END
- } //END

Define Function of Node (top dialog):

SELECT FUNCTION OF NODE

- ○ BEGIN { / } END
- ○ INPUT PORT SETTING
- ○ OUTPUT PORT SETTING
- ○ IF {
- ○ } // IF END
- ○ ELSE IF {
- ⦿ } // ELSE IF END
- ○ ELSE {
- ○ } // ELSE END
- ○ LOOP {
- ○ } // LOOP END
- ○ DELAY TIMER

- ○ REMOTE CONTROLLER
- ○ DC MOTOR
- ○ SERVO MOTOR
- ○ LED OUTPUT MODULE
- ○ BUZZER OUTPUT MODULE

~ ELSE IF END

ELSE IF END COMMAND

[ID] : Sequence Number (Manually assigned),

[ID]   11

OK   Cancel

Right text (top):

The end point of 3rd condition.

You have to assigned the ID of paired "ELSE IF {" condition.

(It is necessary to know that which "ELSE IF {" among the many "ELSE IF {" conditions in program.

Define Function of Node (bottom dialog):

SELECT FUNCTION OF NODE

- ○ BEGIN { / } END
- ○ INPUT PORT SETTING
- ○ OUTPUT PORT SETTING
- ○ IF {
- ○ } // IF END
- ○ ELSE IF {
- ○ } // ELSE IF END
- ○ ELSE {
- ○ } // ELSE END
- ○ LOOP {
- ⦿ } // LOOP END
- ○ DELAY TIMER

- ○ REMOTE CONTROLLER
- ○ DC MOTOR
- ○ SERVO MOTOR
- ○ LED OUTPUT MODULE
- ○ BUZZER OUTPUT MODULE

~ LOOP END

LOOP END COMMAND

[ID] : Sequence Number (Manually assigned),

[ID]   4

OK   Cancel

Right text (bottom):

The end point of "LOOP {" repetition command.

You have to assigned the ID of paired "LOOP {" repetition command.

(It is necessary to know that which "LOOP {" among the many "LOOP {" repetition commands in program.

BEGIN {
{INPUT PORT SETTING}
{OUTPUT PORT SETTING}
{SERVO MOTOR}
LOOP {
IF {
{DC MOTOR}
} //IF END
ELSE IF {
{DC MOTOR}
} //ELSE IF END
ELSE IF {
{DC MOTOR}
} //ELSE IF END
} //LOOP END
} //END

Define Function of Node

SELECT FUNCTION OF NODE

- ● BEGIN { / } END
- ○ INPUT PORT SETTING
- ○ OUTPUT PORT SETTING
- ○ IF {
- ○ } // IF END
- ○ ELSE IF {
- ○ } // ELSE IF END
- ○ ELSE {
- ○ } // ELSE END
- ○ LOOP {
- ○ } // LOOP END
- ○ DELAY TIMER

- ○ REMOTE CONTROLLER
- ○ DC MOTOR
- ○ SERVO MOTOR
- ○ LED OUTPUT MODULE
- ○ BUZZER OUTPUT MODULE

BEGIN / END

Select "PROGRAM BEGIN" or "PROGRAM END".

- ○ PROGRAM BEGIN
- ● PROGRAM END

OK   Cancel

This means that program ends hear.

You have to place this node at the end of program.

"PROGRAM BEGIN" is not active because you already define at the program.

To run the robot, it is necessary to download the program into the robot.
(Refer to download manual)