Cloud Computing & Cloud Robotics

2018

Actividad Final

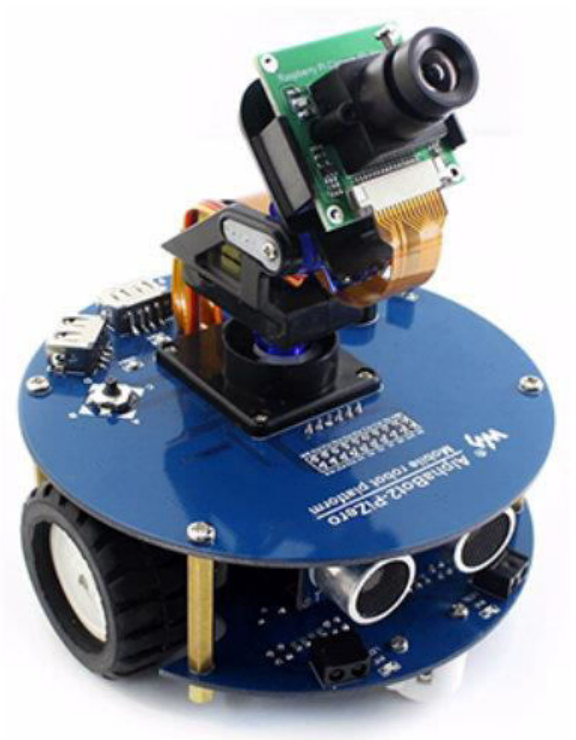
Abba, Pedro Nicolás
Ares, Charo
Galán, Martín Andrés

UNIVERSIDAD
NACIONAL
DE LA PLATA

Para la Actividad final se nos asignó un AlphaBot2 para manejar desde la herramienta Node-RED. Los kits de robot AlphaBot2 incluyen un chasis (chasis AlphaBot2-Base) y una placa Rasperry Pi Zero W.
Cuenta con las funciones de robot seguimiento de línea, mecanismos para evitar obstáculos, conectividad Bluetooth / infrarrojo / WiFi, monitoreo de video, etc.

Más específicamente, sus características son:

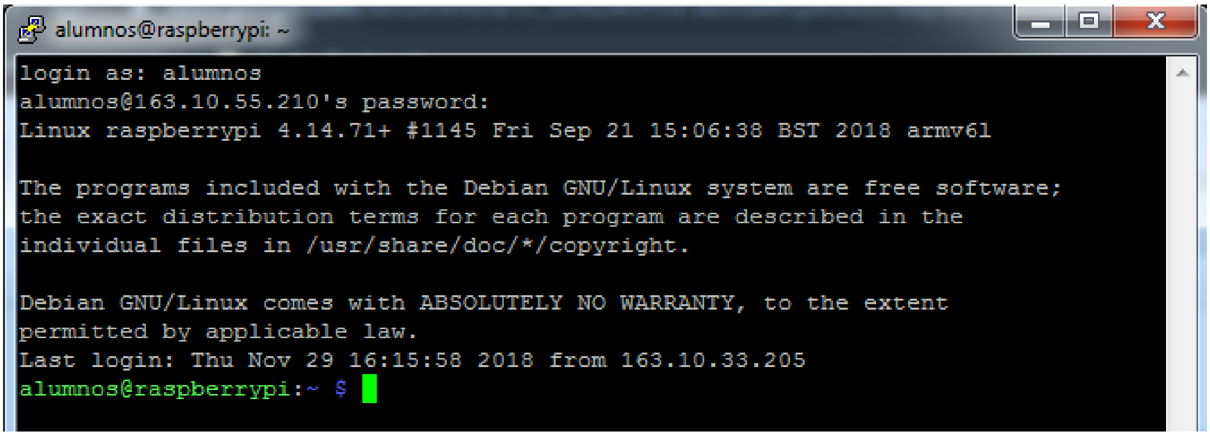
- Interfaz de control AlphaBot2
- Regulador de voltaje 5V
- Interfaz Raspberry Pi
- ST188: sensor fotoeléctrico infrarrojo reflectante, para evitar obstáculos
- ITR20001 / T: sensor fotoeléctrico infrarrojo reflectivo, para seguimiento de línea
- Rueda omnidireccional.
- Zumbador
- FE1.1S: chip USB HUB
- 12M cristal
- USB TO UART: fácil de controlar el Bot a través de UART
- Interfaz USB HUB: extiende el puerto USB de Raspberry Pi Zero
- CP2102: convertidor de USB a UART
- PCA9685: servo-control
- TLC1543: chip de adquisición AD de 10 bits, permite al Pi usar sensores analógicos
- Servo
- Indicadores USB
- Puertos USB: más capacidad USB



Para descubrir cómo funciona el robot vamos a acceder a las librerías de la Raspberry que están programadas en lenguaje Phyton. Tomando esto como ejemplo intentaremos darle algunas de las mismas funcionalidades al robot desde el flujo de Node-RED.

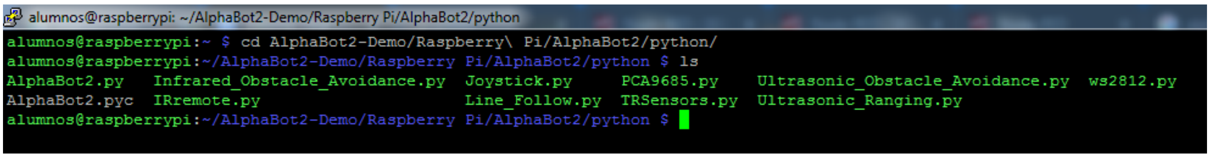
Nos conectamos con el robot a través de una consola de PuTTy:

Ingresamos usuario y contraseñas otorgadas por la cátedra

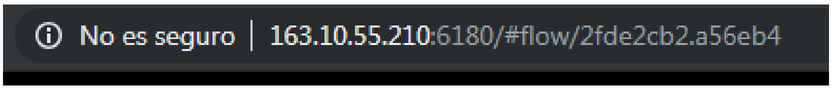


```
alumnos@raspberrypi: ~
login as: alumnos
alumnos@163.10.55.210's password:
Linux raspberrypi 4.14.71+ #1145 Fri Sep 21 15:06:38 BST 2018 armv6l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Nov 29 16:15:58 2018 from 163.10.33.205
alumnos@raspberrypi:~ $
```

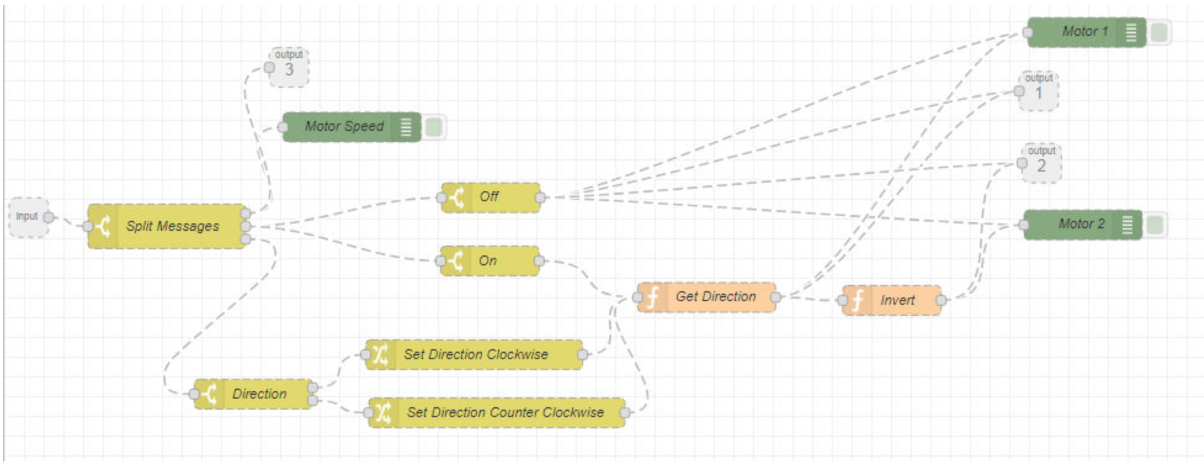
Analizamos las carpetas y archivos de la placa y encontramos los ejemplos que nos ayudarán a entender el funcionamiento del robot.



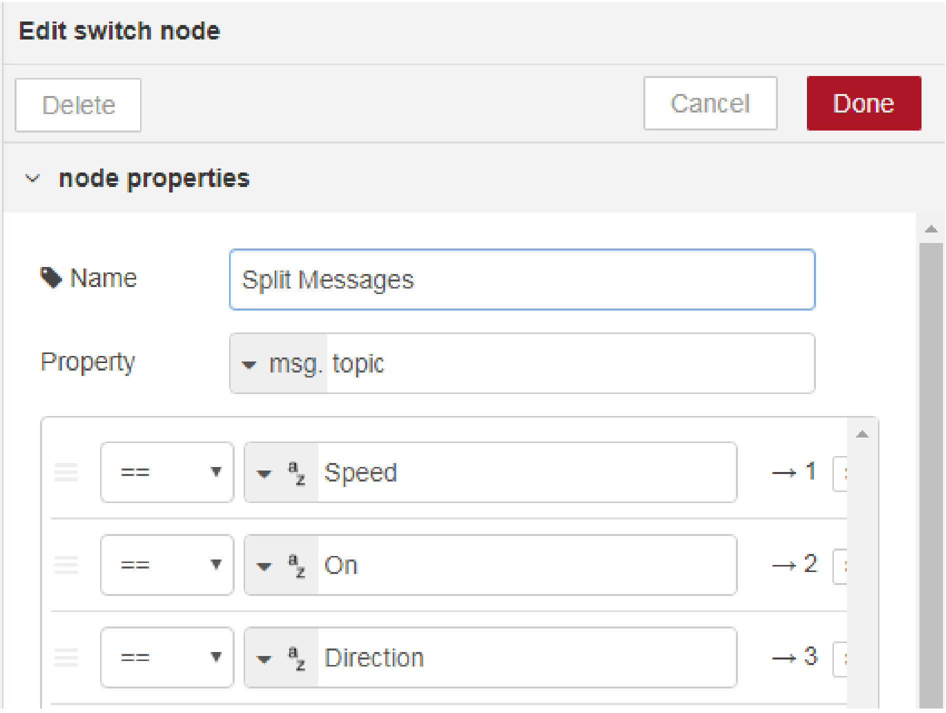
Una vez leídos los ejemplos, nos disponemos a ingresar a Node-RED lo hacemos con la dirección:



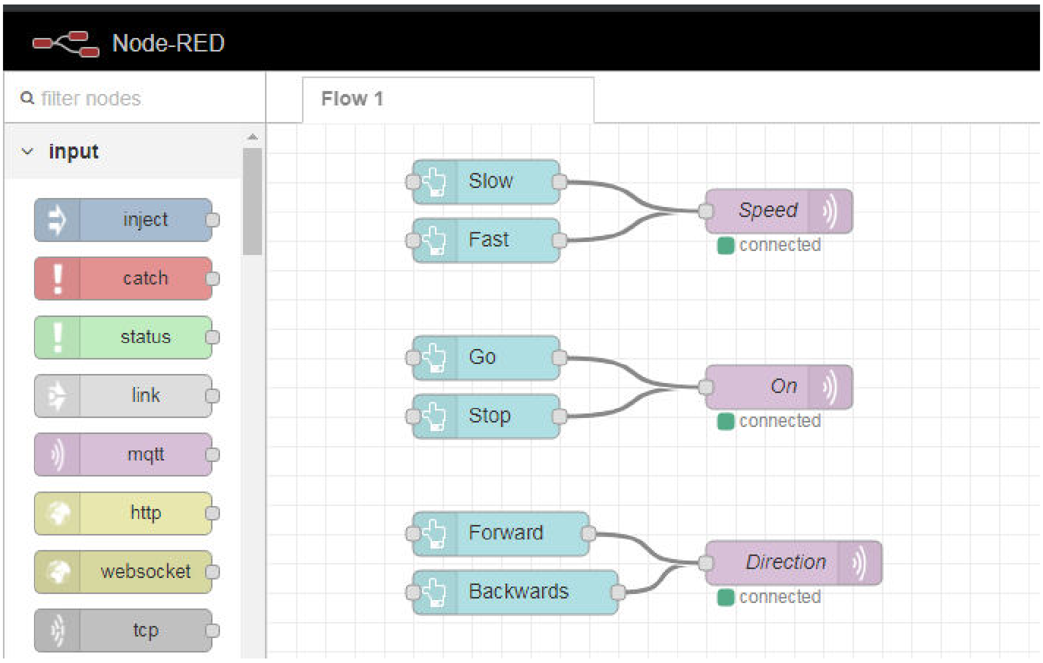
Ya adentro encontramos un Subflow también proporcionado por la cátedra llamado Motor Controller.



Este posee una entrada y tres salidas. La entrada va a un nodo Switch que separa los mensajes según su tópico: On, Speed o Direction. On refiere a si el motor está prendido o apagado, Speed refiere a la velocidad del motor, Direction al sentido que toma el robot.



Aplicando lo aprendido en las prácticas anteriores vamos a utilizar una VM con Node-RED instalado llamada Cloud Robotics que funcionará como publicador (PUB) y creamos un flujo con botones conectados como entrada a un Nodo MQTT (referido a cada uno de los tópicos).

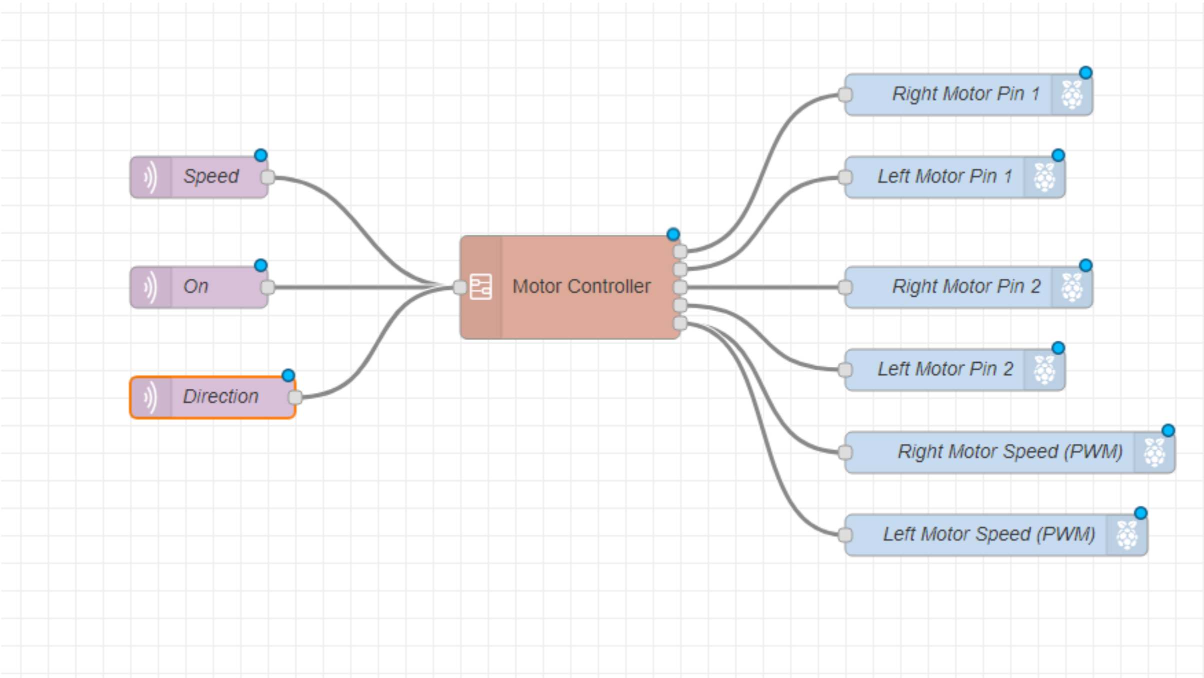


En el tópico Speed aplicamos dos entradas: Slow y Fast que son las distintas velocidades (20 y 45 respectivamente).
En el tópico On aplicamos las entradas Go para que se mueva y Stop para que pare (un 1 y un 0 respectivamente).

Y en el tópico Direction aplicamos Forward para que vaya hacia adelante y Backwards para que vaya hacia atrás (un 1 y un 0 respectivamente).

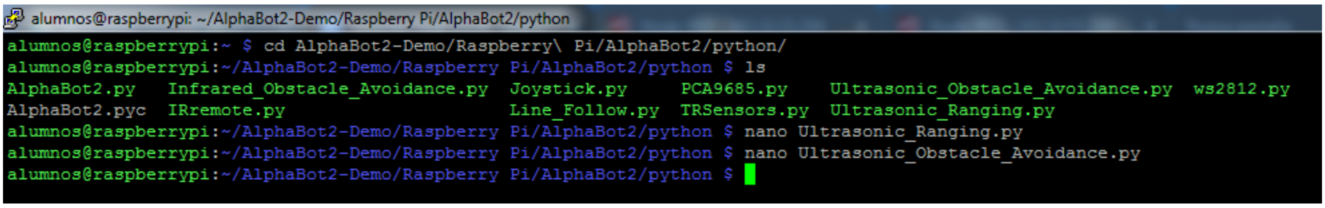
También abrimos una máquina “BROKER” con Mosquitto instalado para crear la conexión entre la máquina que publica (Cloud Robotics) y la máquina que se suscribe (RaspberryPi).

En el Node-RED de la Raspberry Pi agregamos nodos MQTT como entrada al subflow Motor Controller. Las salidas de los nodos serán, según las variables ingresadas en cada tópico: la velocidad de cada rueda, el sentido del giro de cada rueda y si se mueve o no.

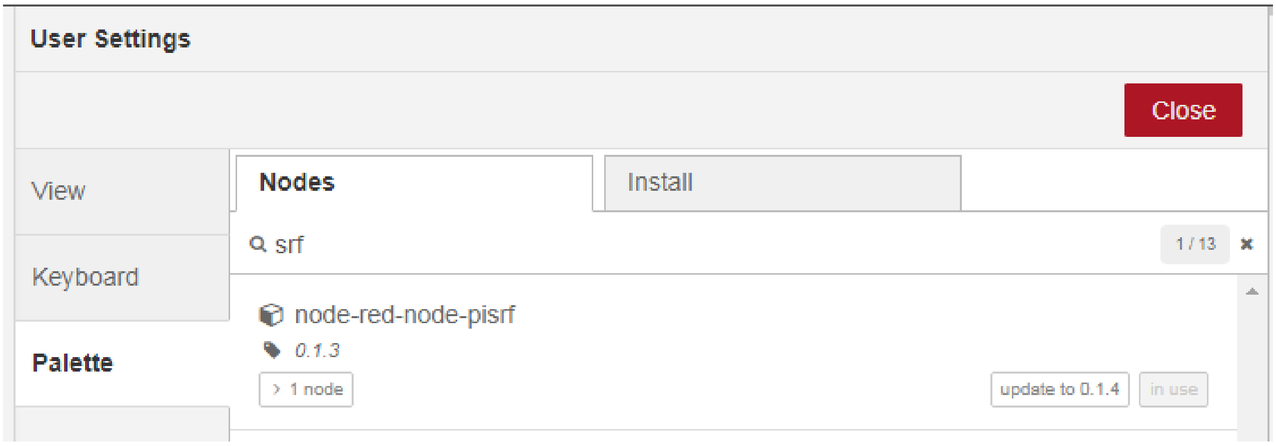


Una vez efectuada la conexión creamos un Dashboard para controlar desde ahí el Motor.

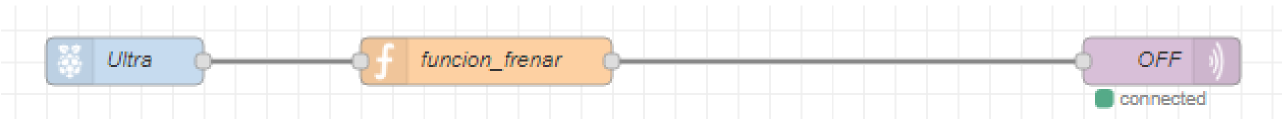
Cuando esto funcionó decidimos añadir la funcionalidad del sensor ultrasónico. Revisamos la biblioteca del Alphabot y analizamos los ejemplos del sensor.



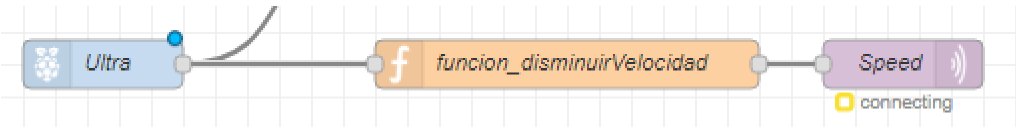
Intentamos implementar en Node-RED lo mismo que en el código de Python. Luego de unas horas de intentarlo nos dimos cuenta que la funcionalidad del sensor ya estaba implementada en un nodo que luego instalamos llamado **rpi srf**.



Con este nodo todo se torna más simple ya que podemos capturar la distancia que mide el sensor y, pasando por una función, decidir la acción que toma el robot.

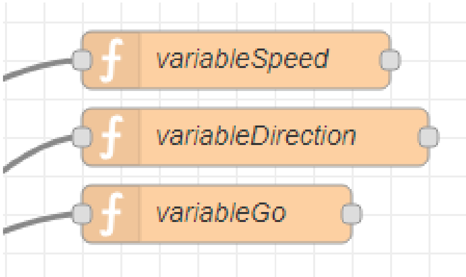


En este caso, si la velocidad del motor Fast y la distancia al objeto que detecta es menor a 50 centímetros, se pasa a la velocidad Slow. Si se sigue avanzando y el objeto se encuentra a menos de 20 centímetros el robot detiene su marcha. Si el objeto se aleja se vuelve a mover hacia adelante.

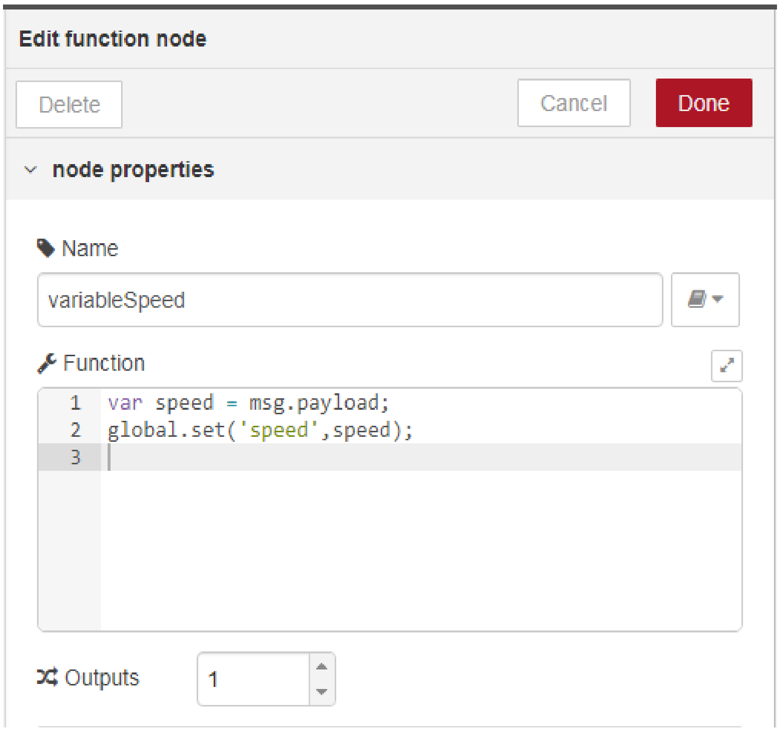


Para obtener las variables de entrada al Controlador, creamos funciones que asignan las entradas a variables globales y simplifican la consultas a los datos.

Estas son:



La forma en la que toman los datos (a modo explicativo solo capturamos una de ellas) es la siguiente:



Explicado esto podemos presentar las funciones que manejan el cambio de velocidad y el frenado según las distancias del sensor ultrasónico.

funcion_disminuirVelocidad:

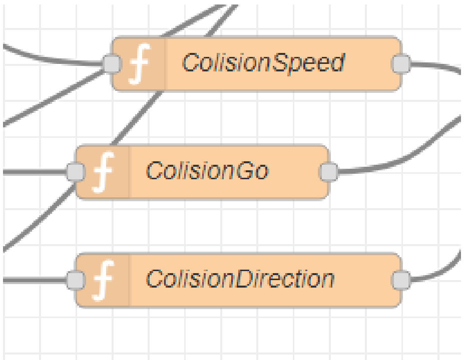
```
distancia = parseInt(msg.payload);
direction= global.get('direction');
go=global.get('go');
speed=global.get('speed');
if (go && direction !== '0'){
    if (speed == "45" || global.get('disminucion')){
        if (distancia < 50){
            msg.payload = "20";
            global.set('disminucion',"1");
            return msg;
        }else{
            msg.payload="45";
            global.set('disminucion',"0");
            return msg;
        }
    }
}
```

funcion_frenar:

```
distancia = parseInt(msg.payload);
direction= global.get('direction');
go=global.get('go');
speed=global.get('speed');
if (go && direction !== '0'){
        if (distancia < 20){
            msg.payload = 0;
            global.set('colision',"1");

            return msg;
        }else{
             global.set('colision',"0");
        }

}
```

Para evitar que el robot realice movimientos indeseados cuando hay un objeto delante agregamos funciones “Colisión”.

ColisionSpeed evita que el usuario pueda pasar del nivel de velocidad Slow a Fast en el caso de que la variable global ‘disminución’ esté activa. Esta variable se



activa cada vez que el sensor ultrasónico del AlphaBot detecta un objeto a menos de 50 centímetros.

```
speed = msg.payload;
disminucion = global.get('disminucion');
direction = global.get('direction');
if (speed == "45" && disminucion !== "1" && direction =="1"){
    return msg;
}else{
    return msg;
}
```

ColisionGo y *ColisionDirection* evitan que pase el valor forward o go al motor en el caso de que la variable global 'colision' este activa. Esta variable se activa cada vez que el sensor ultrasónico del AlphaBot detecta un objeto a menos de 20 centímetros.

ColisionGo:

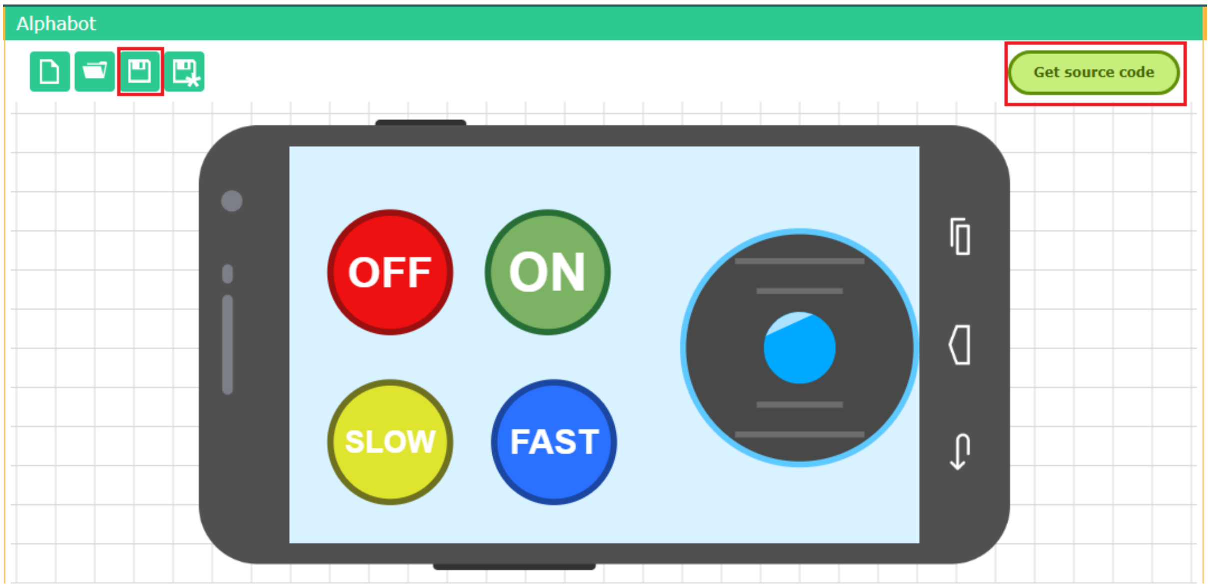
```
go = msg.payload;
colision = global.get('colision');
if (go == "1" && colision != "1"){
    return msg;
}else{
    if (go == "0"){
        return msg;
    }
}
```

ColisionDirection

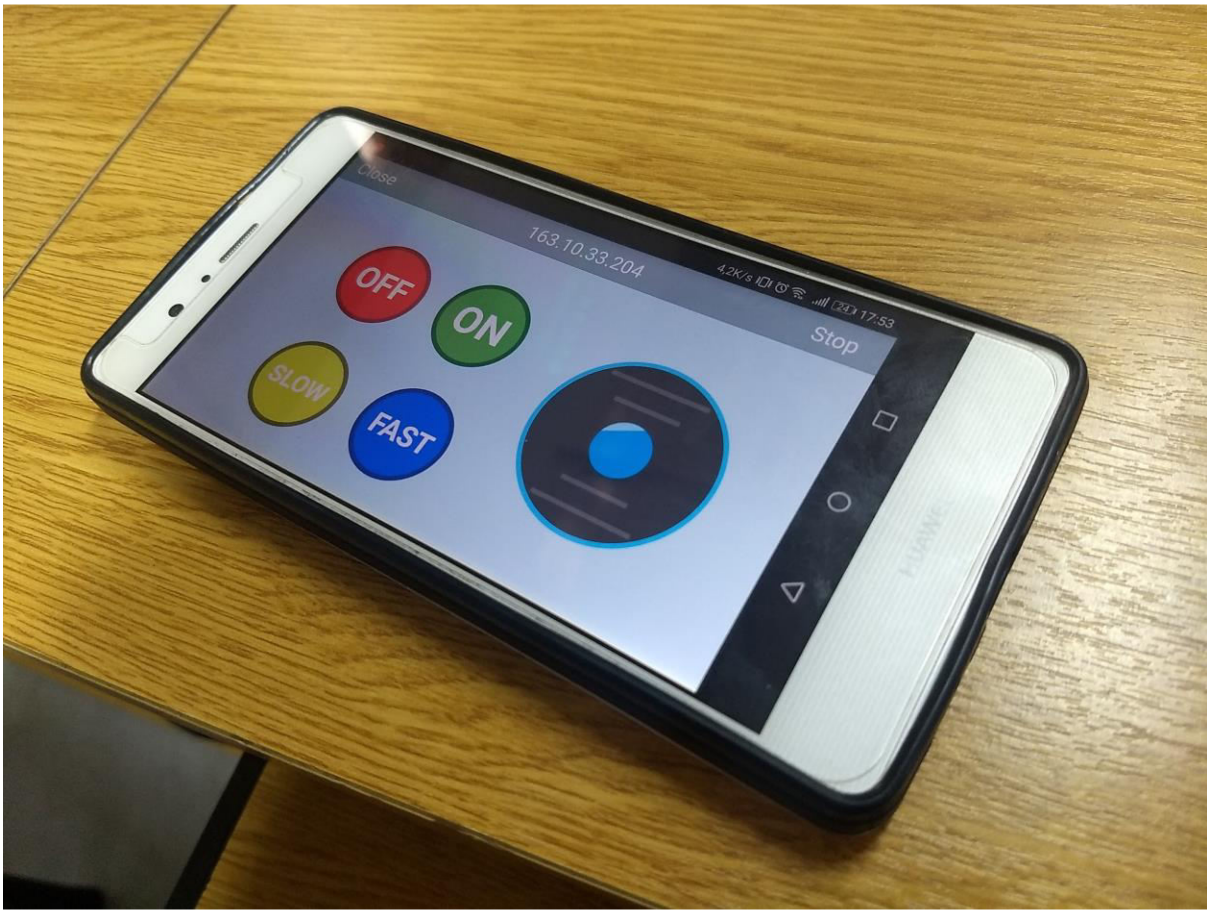
```
direction = msg.payload

colision = global.get('colision');
if (direction == "1" && colision != "1"){
    return msg;
}else{
    if (direction == "0"){
        return msg;

    }
}
```

Una vez que logramos hacer funcionar el frenado y la disminución de la velocidad se nos ocurrió que sería interesante poder manejar el robot de forma remota y para esto utilizamos la aplicación Remote XY que permite agregar diferentes controles (botones, joystick, etc) en una APP de Android y así controlar el movimiento.

La aplicación con los controles agregados quedó de la siguiente forma:

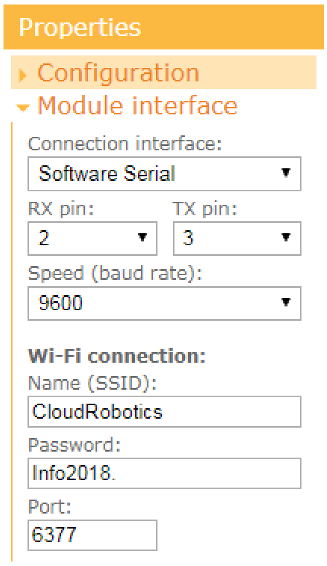


En nuestro celular se ve de la siguiente manera:



Para poder efectuar la conexión entre la APP y lo hecho en Node-RED debemos realizar varios pasos:

-Configurar Remote XY:

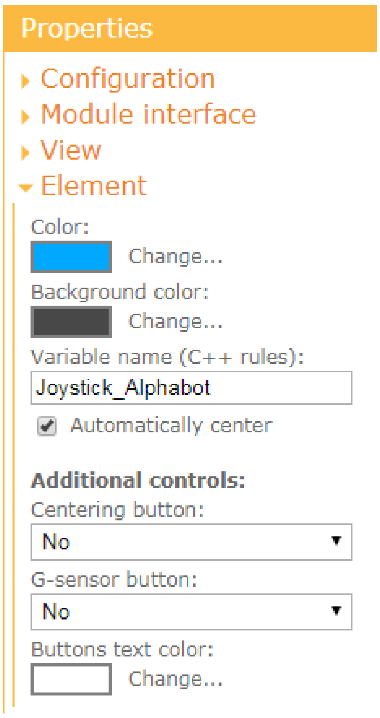


Elegimos Ethernet TCP/IP y configuramos el nombre de la red, la contraseña y el puerto que es el 6377. También habilitamos el puerto en Virtual Box.

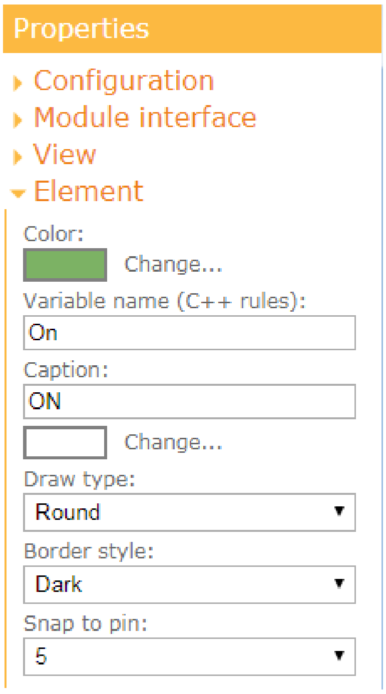
Nombre	Protocolo	IP anfitrión	Puerto anfitrión	IP invitado	Puerto invitado
NODE-RED	TCP		1880		1880
Rule 1	TCP		6377		6377
SSH	TCP		22		22

Configuramos cada uno de los componentes. 4 botones y un joystick.

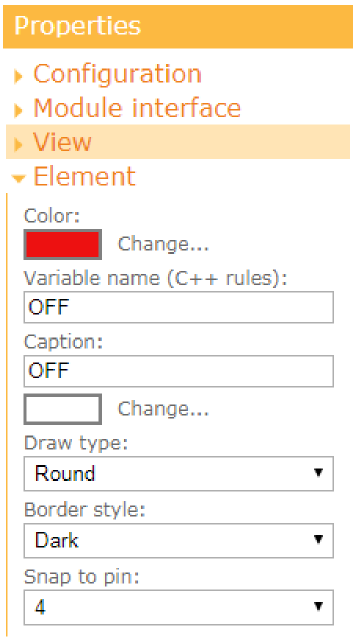
Configuración del joystick:



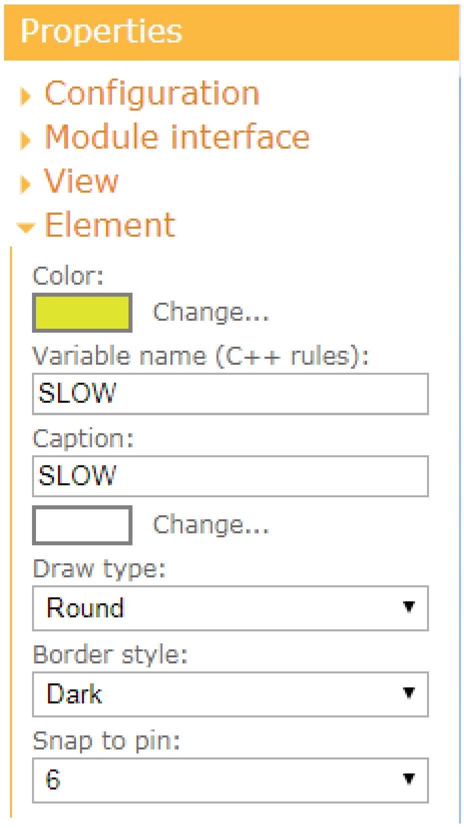
Configuración del botón On:



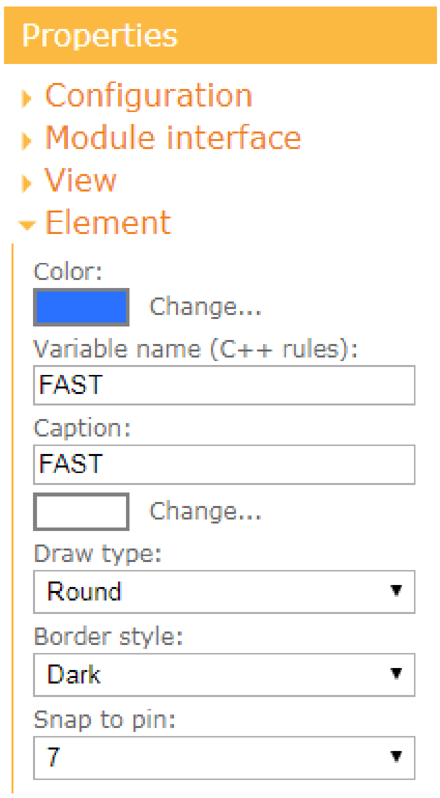
Configuración del botón Off:



Configuración del botón Slow:



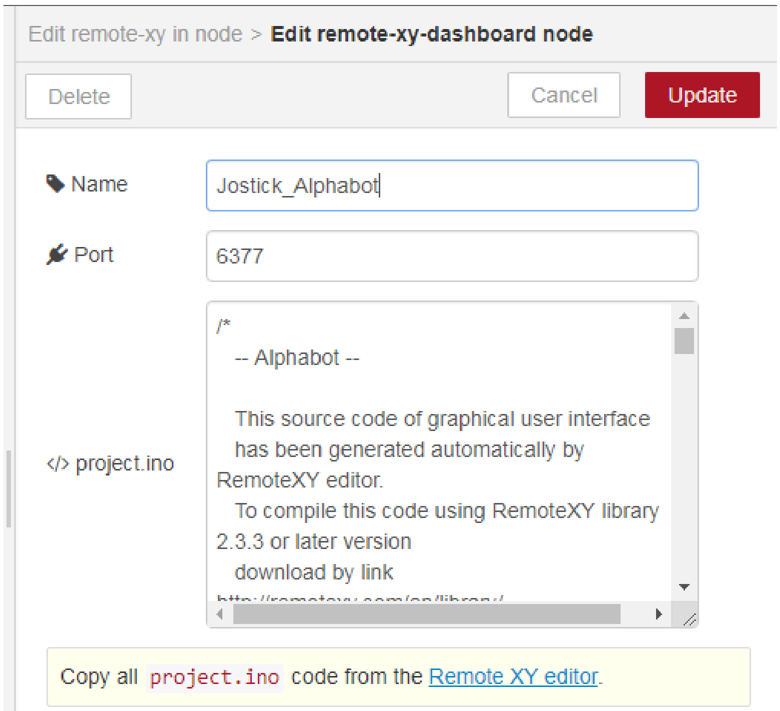
Configuración del botón Fast:



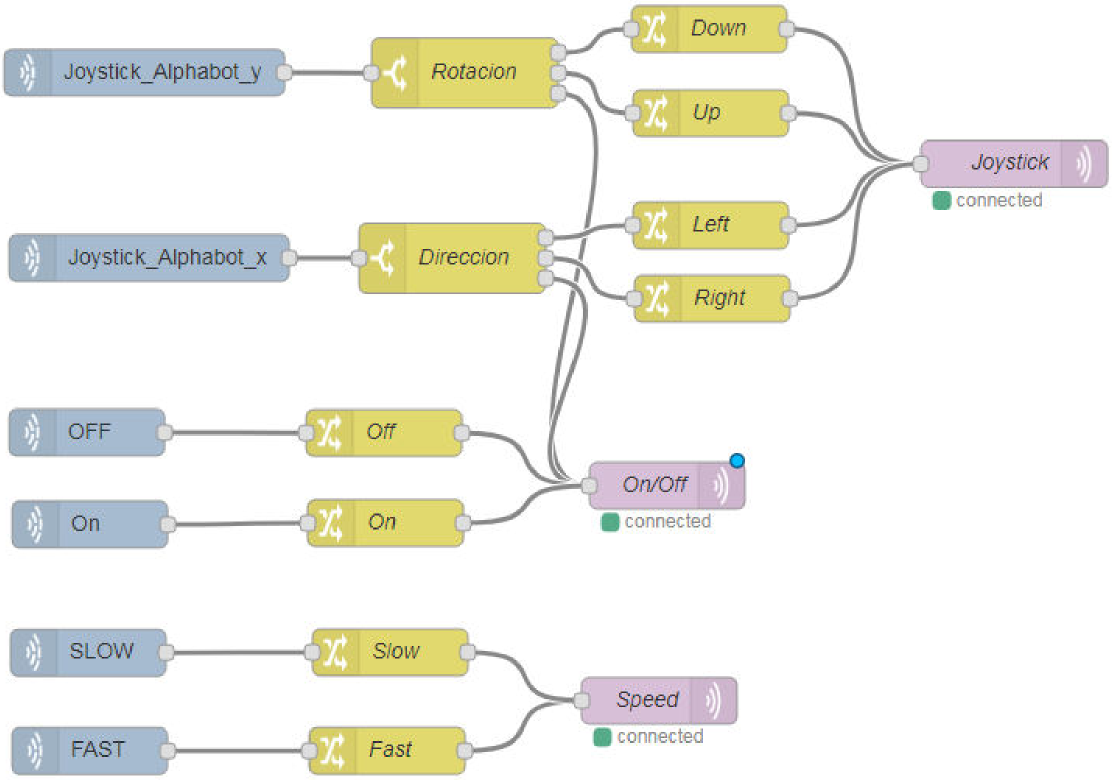
Luego guardamos y exportamos el código fuente para importarlo en Node-RED, no sin antes instalar el nodo **node-red-contrib-remote-xy**:

Cabe destacar que debemos configurar el nodo en el puerto 6377.

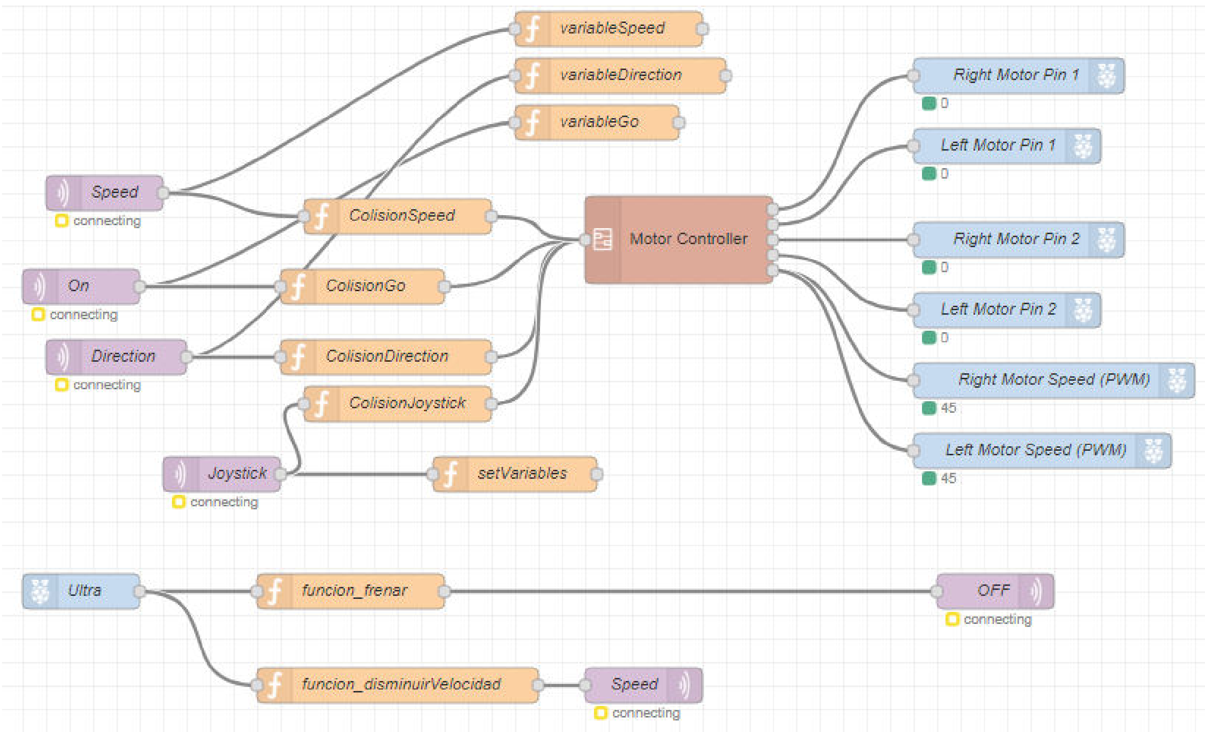
Pegamos el código fuente cuando editamos este nodo:



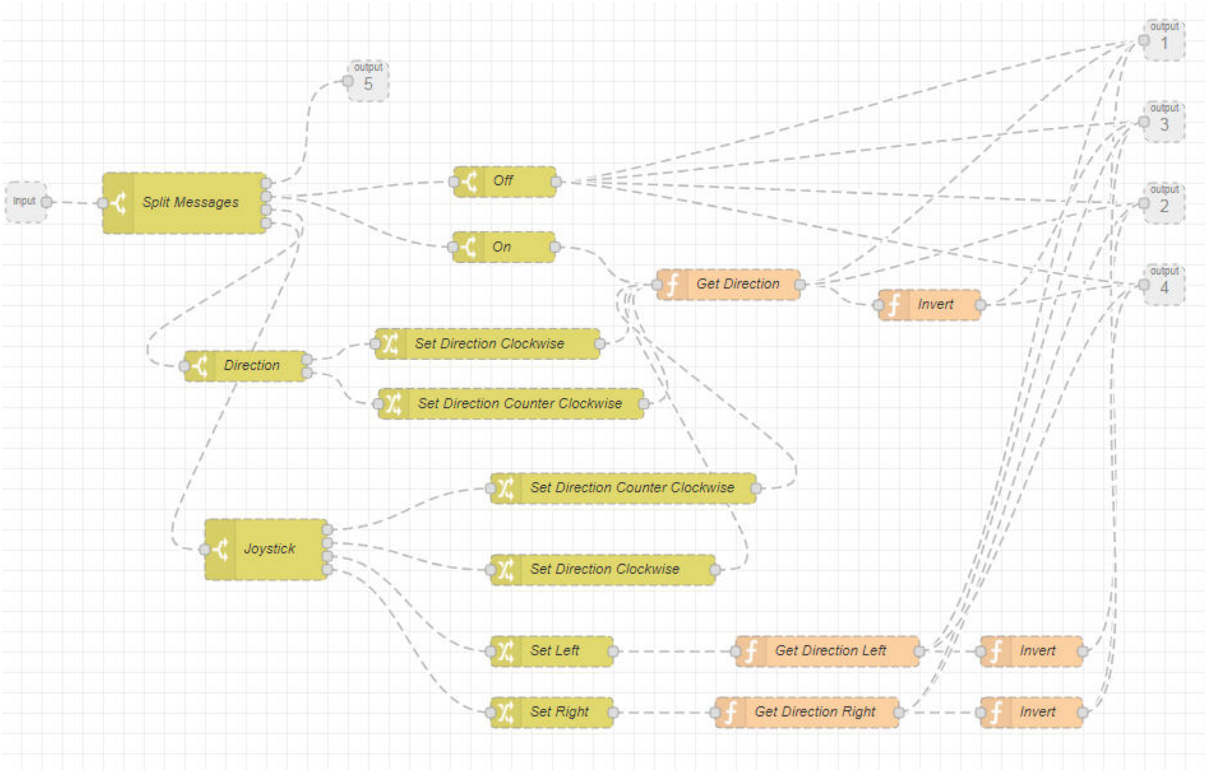
Y armamos un flujo en Node-RED para utilizar como entrada a los nodos MQTT los nodos remote xy recientemente configurados (botones On, Off, Slow y Fast).



En el flujo de la Raspberry



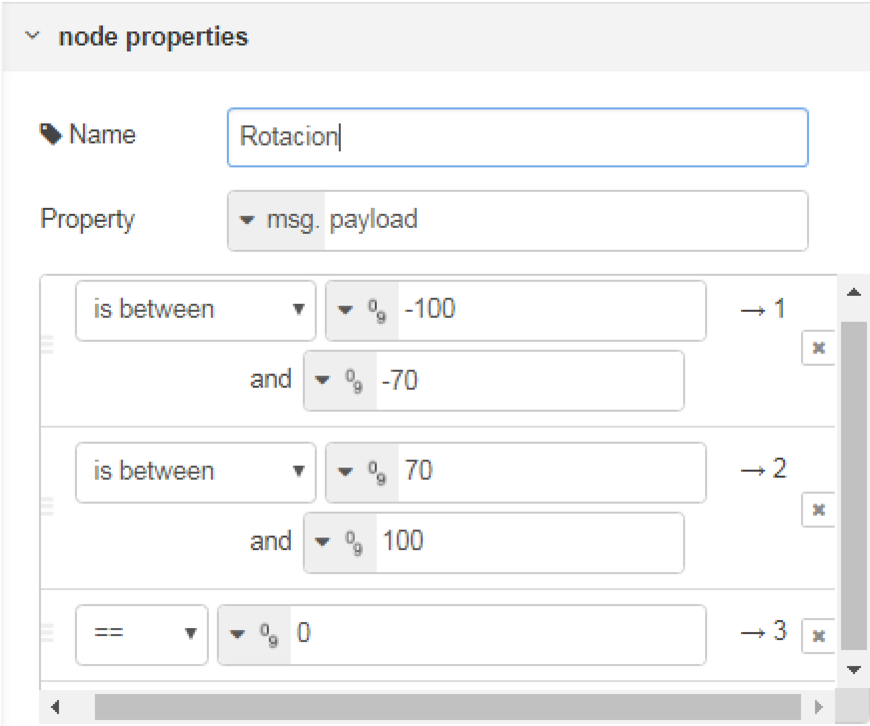
Y dentro del subflujo Motor Controller añadimos nodos de control respectivos al joystick:



Agregamos una nodo de colisión para evitar que el mensaje de ‘UP’ llegue al controlador del motor si el sensor detecta un objeto.

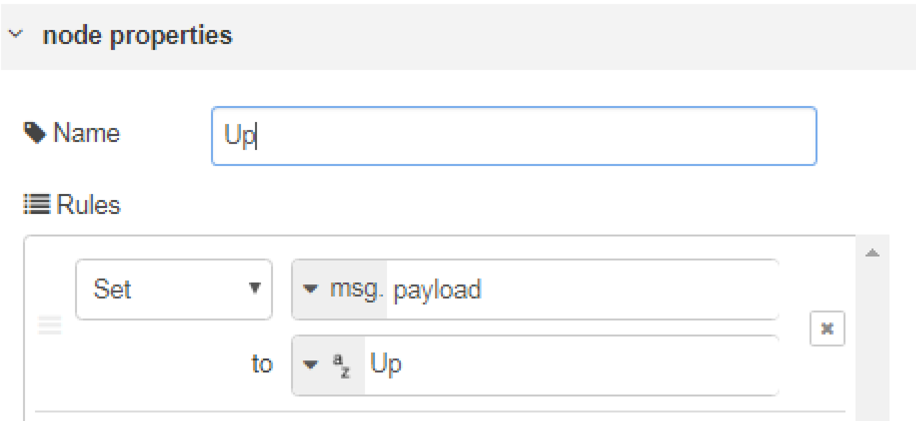
```
joystick = msg.payload

colision = global.get('colision');
if (joystick == "Up" && colision != "1"){
    return msg;
}else{
    if (joystick != "Up"){
        return msg;
    }
}
```

La aplicación de RemoteXY devuelve unos valores entre -100 y 100 tanto para el eje X como el eje Y a la hora de controlar el joystick. Para tener un mejor control en el Alphabot establecimos los márgenes entre 70 y 100. Cuando se suelta el Joystick, este vuelve al centro devolviendo un valor igual a 0, esta tercer salida es enviada por el tópico ON para que el Alphabot se deje de mover.



Los nodos Change sirven para transformar las entradas numéricas del RemoteXY a salidas alfabéticas para poder comunicarnos correctamente con el controlador del motor.

Por ejemplo:



De esta forma logramos que el robot pueda ser manejado en forma remota y adicionalmente tenga las funciones de frenado y disminución de velocidad cuando el sensor ultrasónico detecte ciertas distancias.

FLOW del PUB

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","willQos":"0","willPayload":""},{"id":"4e55b158.f78a3","type":"remote-xy-
dashboard","z":"","name":"App","port":"6377","config":"/* \n   -- Alphabot -- \n   \n
This source code of graphical user interface \n   has been generated
automatically by RemoteXY editor. \n   To compile this code using RemoteXY
library 2.3.3 or later version \n   download by link http://remotexy.com/en/library/
\n   To connect using RemoteXY mobile app by link
http://remotexy.com/en/download/   \n   - for ANDROID 4.1.1 or later
version; \n   - for iOS 1.2.1 or later version; \n   \n   This source code is free
software; you can redistribute it and/or \n   modify it under the terms of the GNU

Lesser General Public \n   License as published by the Free Software Foundation; either \n   version 2.1 of the License, or (at your option) any later version.   \n*/ \n\n// \n//   RemoteXY include library   // \n// \n\n// RemoteXY select connection mode and include library \n#define REMOTEXY_MODE__ESP8266_SOFTSERIAL\n#include <SoftwareSerial.h> \n\n#include <RemoteXY.h> \n\n// RemoteXY connection settings \n#define REMOTEXY_SERIAL_RX 2 \n#define REMOTEXY_SERIAL_TX 3 \n#define REMOTEXY_SERIAL_SPEED 9600 \n#define REMOTEXY_WIFI_SSID \"CloudRobotics\" \n#define REMOTEXY_WIFI_PASSWORD \"Info2018.\" \n#define REMOTEXY_SERVER_PORT 6377 \n\n\n// RemoteXY configurate   \n#pragma pack(push, 1) \nuint8_t RemoteXY_CONF[] = \n { 255,6,0,0,0,61,0,8,181,0,\n 5,32,62,13,38,38,177,26,31,1,\n 0,6,10,20,20,1,31,79,70,70,\n 0,1,0,31,10,20,20,4,31,79,\n 78,0,1,0,6,37,20,20,3,31,\n 83,76,79,87,0,1,0,32,37,20,\n 20,191,31,70,65,83,84,0 }; \n \n// this structure defines all the variables of your control interface \nstruct { \n\n // input variable\n int8_t Joystick_Alphabot_x; // =-100..100 x-coordinate joystick position \n int8_t Joystick_Alphabot_y; // =-100..100 y-coordinate joystick position \n uint8_t OFF; // =1 if button pressed, else =0 \n uint8_t On; // =1 if button pressed, else =0 \n uint8_t SLOW; // =1 if button pressed, else =0 \n uint8_t FAST; // =1 if button pressed, else =0 \n\n   // other variable\n uint8_t connect_flag; // =1 if wire connected, else =0 \n\n} RemoteXY; \n#pragma pack(pop) \n\n// \n//   END RemoteXY include   // \n// \n\n#define PIN_OFF 4\n#define PIN_ON 5\n#define PIN_SLOW 6\n#define PIN_FAST 7\n\n\nvoid setup() \n{ \n RemoteXY_Init (); \n   \n pinMode (PIN_OFF, OUTPUT);\n pinMode (PIN_ON, OUTPUT);\n pinMode (PIN_SLOW, OUTPUT);\n pinMode (PIN_FAST, OUTPUT);\n \n // TODO you setup code \n   \n} \n\nvoid loop() \n{ \n RemoteXY_Handler (); \n \n digitalWrite(PIN_OFF, (RemoteXY.OFF==0)?LOW:HIGH);\n digitalWrite(PIN_ON, (RemoteXY.On==0)?LOW:HIGH);\n digitalWrite(PIN_SLOW, (RemoteXY.SLOW==0)?LOW:HIGH);\n digitalWrite(PIN_FAST, (RemoteXY.FAST==0)?LOW:HIGH);\n   \n // TODO you loop code \n // use the RemoteXY structure for data transfer
\n\n\n}"},{"id":"247cf588.1c297a","type":"remote-xy in","z":"2d7cf081.51983","name":"Joystick_Alphabot_y","dashboard":"4e55b158.f78a3","index":"1","x":167.079833984375,"y":83.90624904632568,"wires":[["49d5cb87.e46214"]]},{"id":"fb0d8566.289b28","type":"remote-xy in","z":"2d7cf081.51983","name":"remote-xy","dashboard":"4e55b158.f78a3","index":"0","x":140.0729217529297,"y":202.91670608520508,"wires":[["39a6abfd.954cf4"]]},{"id":"8aac88ed.af94a8","type":"remote-xy in","z":"2d7cf081.51983","name":"OFF","dashboard":"4e55b158.f78a3","index":"2","x":130.07983016967773,"y":314.9027910232544,"wires":[["329b6605.647e4a"]]},{"id":"1c1444d5.5bae2b","type":"remote-xy in","z":"2d7cf081.51983","name":"On","dashboard":"4e55b158.f78a3","index":"3","x":132.08332443237305,"y":373.9097852706909,"wires":[["95e941ac.858b"]]},{"id":"bd544a37.824478","type":"remote-xy in","z":"2d7cf081.51983","name":"SLOW","dashboard":"4e55b158.f78a3","index":"4","x":

131.01733016967773,"y":456.23266410827637,"wires":[["88cb6a76.86b2a8"]]},{"id":"9a0c3dbf.9289d","type":"remote-xy
in","z":"2d7cf081.51983","name":"FAST","dashboard":"4e55b158.f78a3","index":"5","x":132.0173225402832,"y":519.2328205108643,"wires":[["ad3cc8ee.e94fc8"]]},{"id":"5dbfae6e.4f459","type":"mqtt
out","z":"2d7cf081.51983","name":"Joystick","topic":"Joystick","qos":"","retain":"","broker":"d7b398e5.ab8718","x":726.0832481384277,"y":142.53823471069336,"wires":[]},{"id":"bfc346c7.88c978","type":"mqtt
out","z":"2d7cf081.51983","name":"On/Off","topic":"On","qos":"","retain":"","broker":"d7b398e5.ab8718","x":496.01734161376953,"y":345.0104112625122,"wires":[]},{"id":"9858d15d.e7ccf","type":"mqtt
out","z":"2d7cf081.51983","name":"Speed","topic":"Speed","qos":"","retain":"","broker":"d7b398e5.ab8718","x":498.01733779907227,"y":487.01051330566406,"wires":[]},{"id":"db4cf0db.d779d","type":"change","z":"2d7cf081.51983","name":"Up","rules":[{"t":"set","p":"payload","pt":"msg","to":"Up","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":531.0174255371094,"y":110.01042556762695,"wires":[["5dbfae6e.4f459"]]},{"id":"4355a7e7.2040e8","type":"change","z":"2d7cf081.51983","name":"Down","rules":[{"t":"set","p":"payload","pt":"msg","to":"Down","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":530.0173683166504,"y":56.010442733764650,"wires":[["5dbfae6e.4f459"]]},{"id":"81be8fd9.de88d","type":"change","z":"2d7cf081.51983","name":"Left","rules":[{"t":"set","p":"payload","pt":"msg","to":"Left","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":531.0173416137695,"y":182.0104694366455,"wires":[["5dbfae6e.4f459"]]},{"id":"5179b626.754ae8","type":"change","z":"2d7cf081.51983","name":"Right","rules":[{"t":"set","p":"payload","pt":"msg","to":"Right","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":532.0173683166504,"y":229.01044082641602,"wires":[["5dbfae6e.4f459"]]},{"id":"49d5cb87.e46214","type":"switch","z":"2d7cf081.51983","name":"Rotacion","property":"payload","propertyType":"msg","rules":[{"t":"btwn","v":"-100","vt":"num","v2":"-
70","v2t":"num"},{"t":"btwn","v":"70","vt":"num","v2":"100","v2t":"num"},{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":3,"x":373.08338165283203,"y":84.1701431274414,"wires":[["4355a7e7.2040e8"],["db4cf0db.d779d"],["bfc346c7.88c978"]]},{"id":"39a6abfd.954cf4","type":"switch","z":"2d7cf081.51983","name":"Direccion","property":"payload","propertyType":"msg","rules":[{"t":"btwn","v":"-
100","vt":"num","v2":"-
70","v2t":"num"},{"t":"btwn","v":"70","vt":"num","v2":"100","v2t":"num"},{"t":"eq","v":"0","vt":"num"}],"checkall":"true","repair":false,"outputs":3,"x":365.01738357543945,"y":203.01043224334717,"wires":[["81be8fd9.de88d"],["5179b626.754ae8"],["bfc346c7.88c978"]]},{"id":"329b6605.647e4a","type":"change","z":"2d7cf081.51983","name":"Off","rules":[{"t":"set","p":"payload","pt":"msg","to":"0","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":321.0729522705078,"y":315.1354503631592,"wires":[["bfc346c7.88c978"]]},{"id":"95e941ac.858b","type":"change","z":"2d7cf081.51983","name":"On","rules":[{"t":"set","p":"payload","pt":"msg","to":"1","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":322.01736068725586,"y":373.01042652130127,"wires":[["bfc346c7.88c978"]]},{"id":"ad3cc8ee.e94fc8","type":"change","z":"2d7cf081.51983","name":"Fast","rules":[{"t":"set","p":"payload","pt":"msg","to":"45","tot":"str"}],"action":"","property

":"","from":"","to":"","reg":false,"x":323.0764389038086,"y":519.145917892456,"wires":[["
9858d15d.e7ccf"]]},{"id":"88cb6a76.86b2a8","type":"change","z":"2d7cf081.51983","na
me":"Slow","rules":[{"t":"set","p":"payload","pt":"msg","to":"20","tot":"str"}],"action":"","p
roperty":"","from":"","to":"","reg":false,"x":325.01739501953125,"y":456.0104503631592,"
wires":[["9858d15d.e7ccf"]]}]

FLOW del Alphabot

[{"id":"2fde2cb2.a56eb4","type":"tab","label":"Flow
2","disabled":false,"info":""},{"id":"14f8f27.5f5640e","type":"subflow","name":"Sensor
Ultasonico","info":"","category":"","in":[{"x":60,"y":200,"wires":[{"id":"5a08e30.64d911c"}
]}],"out":[{"x":660,"y":360,"wires":[{"id":"b7ac08f6.467048","port":0}]}]},{"id":"b3c4592.e
8190a8","type":"subflow","name":"Motor Controller","info":"Expects different
messages\nAn \"On\" message and a \"Direction\"
message","in":[{"x":25,"y":219,"wires":[{"id":"e4be50d6.92444"}]}],"out":[{"x":1140,"y":60,"
wires":[{"id":"672110be.f1345","port":0},{"id":"b15c1374.75d39","port":0},{"id":"f3f2d922.4
b17c8","port":0},{"id":"4302ba8e.38f164","port":0}]},{"x":1140,"y":220,"wires":[{"id":"67211
0be.f1345","port":0},{"id":"b15c1374.75d39","port":0},{"id":"93b28666.4a2de8","port":0},
{"id":"11893d39.8acb43","port":0}]},{"x":1140,"y":140,"wires":[{"id":"672110be.f1345","port"
:0},{"id":"5f470f3e.384f7","port":0},{"id":"93b28666.4a2de8","port":0},{"id":"11893d39.8a
cb43","port":0}]},{"x":1140,"y":300,"wires":[{"id":"5f470f3e.384f7","port":0},{"id":"672110b
e.f1345","port":0},{"id":"f3f2d922.4b17c8","port":0},{"id":"4302ba8e.38f164","port":0}]},{"
x":360,"y":100,"wires":[{"id":"e4be50d6.92444","port":0}]}]},{"id":"43e627be.821b68","ty
pe":"subflow","name":"Sensor
Ultrasonido","info":"","category":"","in":[{"x":60,"y":240,"wires":[{"id":"15a35a84.02a335"
}]}],"out":[]},{"id":"41cafe1c.53397","type":"mqtt-
broker","z":"","name":"MOSQUITTO","broker":"163.10.33.204","port":"1883","clientid":"",
"usetls":false,"compatmode":true,"keepalive":"60","cleansession":true,"birthTopic":""
,"birthQos":"0","birthPayload":"","closeTopic":"","closeQos":"0","closePayload":"","willT
opic":"","willQos":"0","willPayload":""},{"id":"e4204ebb.6fd0a","type":"rpi-gpio
in","z":"14f8f27.5f5640e","name":"Echo","pin":"13","intype":"tri","debounce":"25","read"
:false,"x":70,"y":420,"wires":[["8d501fdb.d3edb"]]},{"id":"e6652976.bf00e8","type":"rpi-
gpio
out","z":"14f8f27.5f5640e","name":"Trigger","pin":"15","set":true,"level":"0","freq":"","out
":"out","x":600,"y":260,"wires":[]},{"id":"9683f86a.fe1998","type":"inject","z":"14f8f27.5f56
40e","name":"Reset","topic":"","payload":"1","payloadType":"num","repeat":"","cronta
b":"","once":true,"onceDelay":"1","x":190,"y":60,"wires":[[]]},{"id":"b7ac08f6.467048","ty
pe":"function","z":"14f8f27.5f5640e","name":"Calcular Time","func":"while (!flow.echo
&& !flow.trig){\n}\nvar t1 = new Date().getTime();\nwhile (flow.echo && !flow.trig
){\n}\nvar t2 = new Date().getTime();\nreturn (t2-
t1)*34000/2;","outputs":1,"noerr":0,"x":520,"y":360,"wires":[[]]},{"id":"8d501fdb.d3edb","t
ype":"change","z":"14f8f27.5f5640e","name":"","rules":[{"t":"move","p":"payload","pt":"
msg","to":"echo","tot":"flow"}],"action":"","property":"","from":"","to":"","reg":false,"x":31
0,"y":420,"wires":[["b7ac08f6.467048"]]},{"id":"21cf6f66.1a52e","type":"change","z":"14f
8f27.5f5640e","name":"","rules":[{"t":"move","p":"payload","pt":"msg","to":"trig","tot":"fl
ow"}],"action":"","property":"","from":"","to":"","reg":false,"x":290,"y":340,"wires":[["b7ac
08f6.467048"]]},{"id":"e4be50d6.92444","type":"switch","z":"b3c4592.e8190a8","nam
e":"Split
Messages","property":"topic","propertyType":"msg","rules":[{"t":"eq","v":"Speed","vt":"
str"},{"t":"eq","v":"On","vt":"str"},{"t":"eq","v":"Direction","vt":"str"},{"t":"eq","v":"Joystick","
vt":"str"}],"checkall":"true","repair":false,"outputs":4,"x":180,"y":220,"wires":[[],["672110b

e.f1345","fcf22bb1.4ea708"],["5ea7bce.d02e044"],["f027b801.109358"]]},{"id":"672110b
e.f1345","type":"switch","z":"b3c4592.e8190a8","name":"Off","property":"payload","pro
pertyType":"msg","rules":[{"t":"eq","v":"0","vt":"str"}],"checkall":"true","repair":false,"out
puts":1,"x":494,"y":199,"wires":[[]]},{"id":"fcf22bb1.4ea708","type":"switch","z":"b3c4592.
e8190a8","name":"On","property":"payload","propertyType":"msg","rules":[{"t":"eq","v
":"1","vt":"str"}],"checkall":"true","repair":false,"outputs":1,"x":493,"y":263,"wires":[["b15c1
374.75d39"]]},{"id":"6881d47.553c92c","type":"change","z":"b3c4592.e8190a8","name":
"Set Direction
Clockwise","rules":[{"t":"set","p":"direction","pt":"flow","to":"1","tot":"num"}],"action":"","
property":"","from":"","to":"","reg":false,"x":477,"y":358,"wires":[["b15c1374.75d39"]]},{"id
":"b07096eb.f5e118","type":"change","z":"b3c4592.e8190a8","name":"Set Direction
Counter
Clockwise","rules":[{"t":"set","p":"direction","pt":"flow","to":"0","tot":"num"}],"action":"",
"property":"","from":"","to":"","reg":false,"x":500,"y":417,"wires":[["b15c1374.75d39"]]},{"id
":"b15c1374.75d39","type":"function","z":"b3c4592.e8190a8","name":"Get
Direction","func":"var direction = flow.get('direction')||0;\nmsg.payload =
direction;\nreturn
msg;","outputs":1,"noerr":0,"x":713,"y":300,"wires":[["5f470f3e.384f7"]]},{"id":"5f470f3e.
384f7","type":"function","z":"b3c4592.e8190a8","name":"Invert","func":"if
(msg.payload == 1) {\n   msg.payload = 0;\n}\nelse\n{\n   msg.payload =
1;\n}\nreturn
msg;","outputs":1,"noerr":0,"x":910,"y":320,"wires":[[]]},{"id":"5ea7bce.d02e044","type":"
switch","z":"b3c4592.e8190a8","name":"Direction","property":"payload","propertyTyp
e":"msg","rules":[{"t":"eq","v":"0","vt":"str"},{"t":"eq","v":"1","vt":"str"}],"checkall":"true","re
pair":false,"outputs":2,"x":240,"y":380,"wires":[["6881d47.553c92c"],["b07096eb.f5e118"
]]},{"id":"c76b4208.e684d","type":"rpi-gpio out","z":"2fde2cb2.a56eb4","name":"Right
Motor Speed
(PWM)","pin":"31","set":"","level":"0","freq":"50","out":"pwm","x":920,"y":340,"wires":[]},{"
id":"2394885f.5f6178","type":"rpi-gpio out","z":"2fde2cb2.a56eb4","name":"Right
Motor Pin
1","pin":"32","set":true,"level":"0","freq":"","out":"out","x":890,"y":80,"wires":[]},{"id":"5681
07f0.b37248","type":"rpi-gpio out","z":"2fde2cb2.a56eb4","name":"Right Motor Pin
2","pin":"33","set":true,"level":"0","freq":"","out":"out","x":890,"y":220,"wires":[]},{"id":"134
554c3.8858ab","type":"subflow:b3c4592.e8190a8","z":"2fde2cb2.a56eb4","name":"","x
":600,"y":220,"wires":[["2394885f.5f6178"],["69a13940.a1e8b8"],["568107f0.b37248"],["b
db7b19a.d3173"],["c76b4208.e684d","ba6ca138.39c9d"]]},{"id":"69a13940.a1e8b8","typ
e":"rpi-gpio out","z":"2fde2cb2.a56eb4","name":"Left Motor Pin
1","pin":"38","set":true,"level":"0","freq":"","out":"out","x":880,"y":140,"wires":[]},{"id":"bdb
7b19a.d3173","type":"rpi-gpio out","z":"2fde2cb2.a56eb4","name":"Left Motor Pin
2","pin":"40","set":true,"level":"0","freq":"","out":"out","x":880,"y":280,"wires":[]},{"id":"ba
6ca138.39c9d","type":"rpi-gpio out","z":"2fde2cb2.a56eb4","name":"Left Motor
Speed
(PWM)","pin":"37","set":"","level":"0","freq":"50","out":"pwm","x":910,"y":400,"wires":[]},{"
id":"60f8094f.bfd2a8","type":"mqtt
in","z":"2fde2cb2.a56eb4","name":"Speed","topic":"Speed","qos":"2","broker":"41cafe1

c.53397","x":110,"y":180,"wires":[["2a85469a.11eaca","a7d46b9e.de9ec8"]]},{"id":"8994e
0ae.98bc","type":"mqtt
in","z":"2fde2cb2.a56eb4","name":"On","topic":"On","qos":"2","broker":"41cafe1c.53397
","x":90,"y":260,"wires":[["e9b85af2.2d8528","d1b83f28.56a6a"]]},{"id":"a76f8306.083d1"
,"type":"mqtt
in","z":"2fde2cb2.a56eb4","name":"Direction","topic":"Direction","qos":"2","broker":"41
cafe1c.53397","x":120,"y":320,"wires":[["e0e8abcb.8bb958","af14d2a3.2547d"]]},{"id":"9
d31b193.ffa0a","type":"debug","z":"14f8f27.5f5640e","name":"MORITE","active":true,"t
osidebar":true,"console":false,"tostatus":false,"complete":"true","x":560,"y":140,"wires
":[]},{"id":"d7a73c59.1c6eb","type":"trigger","z":"14f8f27.5f5640e","op1":"1","op2":"0","op1
type":"str","op2type":"str","duration":"15","extend":false,"units":"ms","reset":"1","bytopi
c":"all","name":"Signal","x":370,"y":260,"wires":[["e6652976.bf00e8","21cf6f66.1a52e","9
d31b193.ffa0a"]]},{"id":"5a08e30.64d911c","type":"change","z":"14f8f27.5f5640e","name
":"Hola","rules":[{"t":"move","p":"payload","pt":"msg","to":"trig","tot":"flow"}],"action":"",
"property":"","from":"","to":"","reg":false,"x":150,"y":240,"wires":[["d7a73c59.1c6eb"]]},{"i
d":"15a35a84.02a335","type":"trigger","z":"43e627be.821b68","op1":"1","op2":"0","op1ty
pe":"str","op2type":"str","duration":"15","extend":false,"units":"ms","reset":"","bytopic":
"all","name":"","x":310,"y":240,"wires":[["c348f51f.f33348","1d48416b.3842af"]]},{"id":"c3
48f51f.f33348","type":"rpi-gpio
out","z":"43e627be.821b68","name":"Trigger","pin":"15","set":true,"level":"0","freq":"","o
ut":"out","x":520,"y":220,"wires":[]},{"id":"1d48416b.3842af","type":"function","z":"43e62
7be.821b68","name":"Calcular Time","func":"while (!flow.echo){\n   \n}\nreturn
1;\n//var t1 = new Date().getTime();\n//while (flow.echo && !flow.trig){\n//}\n//var t2 =
new Date().getTime();\n//return (t2-
t1)*34000/2;","outputs":1,"noerr":0,"x":440,"y":380,"wires":[["cbb2ceb3.6f9f2"]]},{"id":"c
bb2ceb3.6f9f2","type":"debug","z":"43e627be.821b68","name":"","active":true,"toside
bar":true,"console":false,"tostatus":false,"complete":"false","x":640,"y":400,"wires":[]},{
"id":"fcc60111.24652","type":"rpi-
srf","z":"2fde2cb2.a56eb4","name":"Ultra","topic":"SRF","pulse":"0.5","pins":"15,13","x":9
0,"y":520,"wires":[["c305bd1c.8d302","c5d168bd.6bac18"]]},{"id":"f3024a31.489298","ty
pe":"mqtt
out","z":"2fde2cb2.a56eb4","name":"OFF","topic":"On","qos":"2","retain":"","broker":"41
cafe1c.53397","x":870,"y":520,"wires":[]},{"id":"f73f6de9.fa37c","type":"mqtt
in","z":"2fde2cb2.a56eb4","name":"Joystick","topic":"Joystick","qos":"2","broker":"41ca
fe1c.53397","x":210,"y":420,"wires":[["5d2f1b77.646da4","9aee244e.e5e8b8"]]},{"id":"83
65254b.b77878","type":"change","z":"b3c4592.e8190a8","name":"Set Direction
Clockwise","rules":[{"t":"set","p":"direction","pt":"flow","to":"1","tot":"num"}],"action":"","
property":"","from":"","to":"","reg":false,"x":590,"y":580,"wires":[["b15c1374.75d39"]]},{"id
":"fa0da7db.c669b8","type":"change","z":"b3c4592.e8190a8","name":"Set Direction
Counter
Clockwise","rules":[{"t":"set","p":"direction","pt":"flow","to":"0","tot":"num"}],"action":"",
"property":"","from":"","to":"","reg":false,"x":610,"y":500,"wires":[["b15c1374.75d39"]]},{"id
":"f95a0768.eecad8","type":"change","z":"b3c4592.e8190a8","name":"Set
Left","rules":[{"t":"set","p":"direction","pt":"flow","to":"1","tot":"str"}],"action":"","property
":"","from":"","to":"","reg":false,"x":540,"y":660,"wires":[["f3f2d922.4b17c8"]]},{"id":"51684

ac.7bcb9b4","type":"change","z":"b3c4592.e8190a8","name":"Set
Right","rules":[{"t":"set","p":"payload","pt":"msg","to":"","tot":"str"}],"action":"","property
":"","from":"","to":"","reg":false,"x":540,"y":720,"wires":[["11893d39.8acb43"]]},{"id":"f3f2d
922.4b17c8","type":"function","z":"b3c4592.e8190a8","name":"Get Direction
Left","func":"var direction = flow.get('direction')||0;\nmsg.payload =
direction;\nreturn
msg;","outputs":1,"noerr":0,"x":810,"y":660,"wires":[["93b28666.4a2de8"]]},{"id":"93b28
666.4a2de8","type":"function","z":"b3c4592.e8190a8","name":"Invert","func":"if
(msg.payload == 1) {\n   msg.payload = 0;\n}\nelse\n{\n   msg.payload =
1;\n}\nreturn
msg;","outputs":1,"noerr":0,"x":1010,"y":660,"wires":[[]]},{"id":"11893d39.8acb43","type":"
function","z":"b3c4592.e8190a8","name":"Get Direction Right","func":"var direction =
flow.get('direction')||0;\nmsg.payload = direction;\nreturn
msg;","outputs":1,"noerr":0,"x":790,"y":720,"wires":[["4302ba8e.38f164"]]},{"id":"4302ba
8e.38f164","type":"function","z":"b3c4592.e8190a8","name":"Invert","func":"if
(msg.payload == 1) {\n   msg.payload = 0;\n}\nelse\n{\n   msg.payload =
1;\n}\nreturn
msg;","outputs":1,"noerr":0,"x":1010,"y":720,"wires":[[]]},{"id":"e9b85af2.2d8528","type":"
function","z":"2fde2cb2.a56eb4","name":"variableGo","func":"var go =
msg.payload;\nglobal.set('go',go);\n","outputs":1,"noerr":0,"x":530,"y":120,"wires":[[]]},{
"id":"e0e8abcb.8bb958","type":"function","z":"2fde2cb2.a56eb4","name":"variableDir
ection","func":"var direction =
msg.payload;\nglobal.set('direction',direction);\n","outputs":1,"noerr":0,"x":550,"y":80
,"wires":[[]]},{"id":"2a85469a.11eaca","type":"function","z":"2fde2cb2.a56eb4","name":"v
ariableSpeed","func":"var speed =
msg.payload;\nglobal.set('speed',speed);\n","outputs":1,"noerr":0,"x":540,"y":40,"wire
s":[[]]},{"id":"c305bd1c.8d302","type":"function","z":"2fde2cb2.a56eb4","name":"funcio
n_frenar","func":"distancia = parseInt(msg.payload);\ndirection=
global.get('direction');\ngo=global.get('go');\nspeed=global.get('speed');\nif (go &&
direction !== '0'){\n   if (distancia < 20){\n   msg.payload = 0;\n
global.set('colision',\"1\");\n   \n   return msg;\n   }else{\n
global.set('colision',\"0\");\n   }\n
\n}\n\n\n","outputs":1,"noerr":0,"x":320,"y":520,"wires":[["f3024a31.489298"]]},{"id":"5d2
f1b77.646da4","type":"function","z":"2fde2cb2.a56eb4","name":"setVariables","func":"
joystick = msg.payload;\nswitch(joystick) {\n   case \"Up\":\n\n
global.set('go',\"1\");\n   global.set('direction',\"1\");\n   break;\n   case
\"Down\":\n   \n   global.set('go',\"1\");\n   global.set('direction',\"0\");\n
break;\n   case \"Left\":\n   \n   global.set('go',\"1\");\n
global.set('direction',\"0\");\n   break;\n   case \"Right\":\n\n
global.set('go',\"1\");\n   global.set('direction',\"0\");\n
break;\n}","outputs":1,"noerr":0,"x":460,"y":420,"wires":[[]]},{"id":"af14d2a3.2547d","typ
e":"function","z":"2fde2cb2.a56eb4","name":"ColisionDirection","func":"direction =
msg.payload\n\ncolision = global.get('colision');\nif (direction == \"1\" && colision !=
\"1\"){\n   return msg;\n}else{\n   if (direction == \"0\"){\n   return msg;\n   \n
}\n}","outputs":1,"noerr":0,"x":350,"y":320,"wires":[["134554c3.8858ab"]]},{"id":"d1b83f28

.56a6a","type":"function","z":"2fde2cb2.a56eb4","name":"ColisionGo","func":"go = msg.payload;\ncolision = global.get('colision');\nif (go == \"1\" && colision != \"1\"){\n return msg;\n}else{\n if (go == \"0\"){\n return msg;\n }\n}","outputs":1,"noerr":0,"x":330,"y":260,"wires":[["134554c3.8858ab"]]},{"id":"9aee244e.e5e8b8","type":"function","z":"2fde2cb2.a56eb4","name":"ColisionJoystick","func":"joystick = msg.payload\n\ncolision = global.get('colision');\nif (joystick == \"Up\" && colision != \"1\"){\n return msg;\n}else{\n if (joystick != \"Up\"){\n return msg;\n }\n}","outputs":1,"noerr":0,"x":360,"y":360,"wires":[["134554c3.8858ab"]]},{"id":"abb53902.97dca8","type":"mqtt out","z":"2fde2cb2.a56eb4","name":"Speed","topic":"Speed","qos":"","retain":"","broker":"41cafe1c.53397","x":570,"y":600,"wires":[]},{"id":"c5d168bd.6bac18","type":"function","z":"2fde2cb2.a56eb4","name":"funcion_disminuirVelocidad","func":"distancia = parseInt(msg.payload);\ndirection= global.get('direction');\ngo=global.get('go');\nspeed=global.get('speed');\nif (go && direction !== '0'){\n if (distancia < 50){\n if (speed == \"45\"){\n msg.payload = \"20\";\n global.set('disminucion',\"1\");\n return msg;\n }\n }else{\n if (global.get('disminucion') == \"1\") {\n global.set('disminucion',\"0\");\n msg.payload=\"45\";\n return msg;\n }\n \n }\n \n}\n\n\n\n\n\n","outputs":1,"noerr":0,"x":360,"y":600,"wires":[["abb53902.97dca8"]]},{"id":"a7d46b9e.de9ec8","type":"function","z":"2fde2cb2.a56eb4","name":"ColisionSpeed","func":"speed = msg.payload;\ndisminucion = global.get('disminucion');\ndirection = global.get('direction');\nif (speed == \"45\" && disminucion !== \"1\" && direction ==\"1\"){\n return msg;\n}else{\n return msg;\n}","outputs":1,"noerr":0,"x":360,"y":200,"wires":[["134554c3.8858ab"]]},{"id":"f027b801.109358","type":"switch","z":"b3c4592.e8190a8","name":"Joystick","property":"payload","propertyType":"msg","rules":[{"t":"eq","v":"Up","vt":"str"},{"t":"eq","v":"Down","vt":"str"},{"t":"eq","v":"Left","vt":"str"},{"t":"eq","v":"Right","vt":"str"}],"checkall":"true","repair":false,"outputs":4,"x":260,"y":560,"wires":[["fa0da7db.c669b8"],["8365254b.b77878"],["f95a0768.eecad8"],["51684ac.7bcb9b4"]]}]