

OVERVIEW

The Multirole 2WD Robot Kit can be configured and programmed as either a line tracing/line follower, a sumobot, or an obstacle avoidance robot among other applications. This robot is based on the Saleng/Arduino Uno as its microcontroller but is also compatible with the Arduino Mega. Basic example programs are also available as a working template.

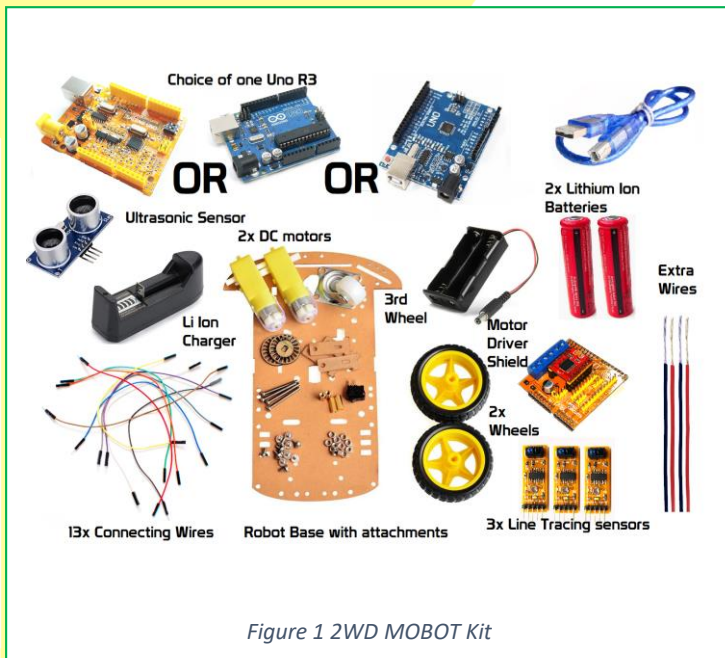


Figure 1 2WD MOBOT Kit

FEATURES

- General purpose kit for line tracing/follower, sumobot, obstacle avoidance among others
- Simplified wiring
- Minimal soldering
- 3x line sensors with non-inverted and inverted signals plus analog output
- Less heating
- Example programs available

KIT LIST

The kit contains the following parts:

Part Description	Quantity
Saleng Uno OR Arduino Uno OR Compatible board	1 pc
Acrylic base board with attachments for the wheels/motors	1 set
USB Cable	1 pc
3-9V geared DC motors	2 pcs
65mm Plastic-Rubber Wheels	2 pcs
Caster wheel	1 pc
2x18650 Li Ion Battery Holder with DC Plug	1pc
Lithium Ion 18650 Batteries	2 pcs
Single 18650 Battery Charger	1 pc
Kimat Motor Driver Shield	1 pc
Saleng Tracker line tracing sensors	3 pcs
HC-SR04 Ultrasonic sensor	1 pc
Female-Female Connecting Wires	13 pcs
Set of wires for motors	1 set
Standoff spacers for line tracing sensor	1 set

ASSEMBLY

The following are suggested notes on the assembly of the robot. This may be customized based on your application needs.

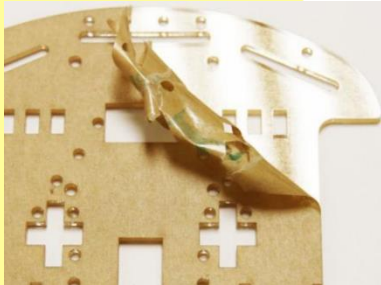
Tools and other materials required:

- Long nose / small pliers
- Phillip or narrow flat screw driver
- Soldering Iron for the Motor wires
- Solder wire
- Double sided tape or glue stick or other adhesives
- Optional: extra nuts and bolts
- Optional: extra casing material for sumobot protection e.g. thick plastic sheets, aluminum sheets, ply wood

Before Assembly:

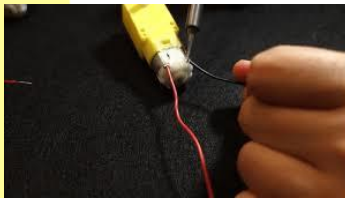
Prepare the base board.

Before proceeding, you may choose to peel off the protective cover on both sides of the acrylic base board. This will reveal the acrylic plastic underneath the cover. Do the same for the small motor brackets. Other users leave this on.



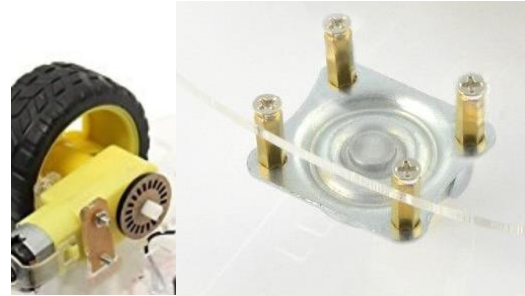
Solder the motor wires.

Insert the wires into the holes in the motor terminals and then solder the wires. Avoid overheating to prevent damage to the plastic or rubber materials used in the motor.



Wheel, Motor and Chassis Assembly:

Use the acrylic brackets to install the motor into the base board. Use the long bolt and its nuts to hold the motor in place. To facilitate neat wiring, the motor terminals face inward. The wheels may then be installed into the motor shaft. The optional encoder disc goes into the other side of the shaft if you will be using them.



The caster wheel is installed with the brass stand offs.

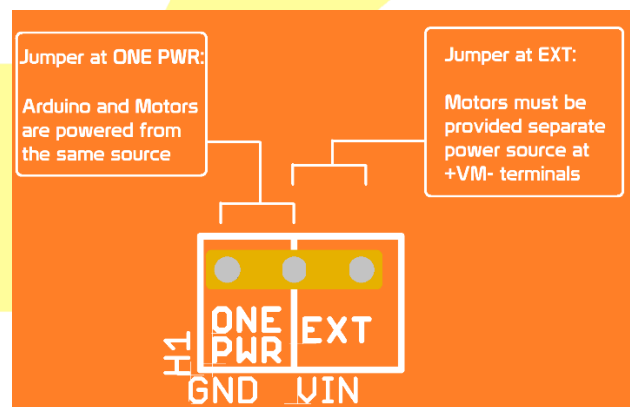
Electronics Installation:

Find a spot on the acrylic base board for the Saleng/Arduino Uno board and the battery holder to sit on. Double sided, glue stick, cable ties or nuts and bolts may be used to keep them in place.

Install the motor driver shield on top of the Uno board. The pins should mate in alignment.

Microjumper on H1

Check the motor shield and ensure that the micro jumper on header H1 is at the "One Pwr" position. This means that the power of the motors will be taken from the VIN pin of the Uno. This means that we no longer need to apply separate power at the VM+/- pins on the motor shield.

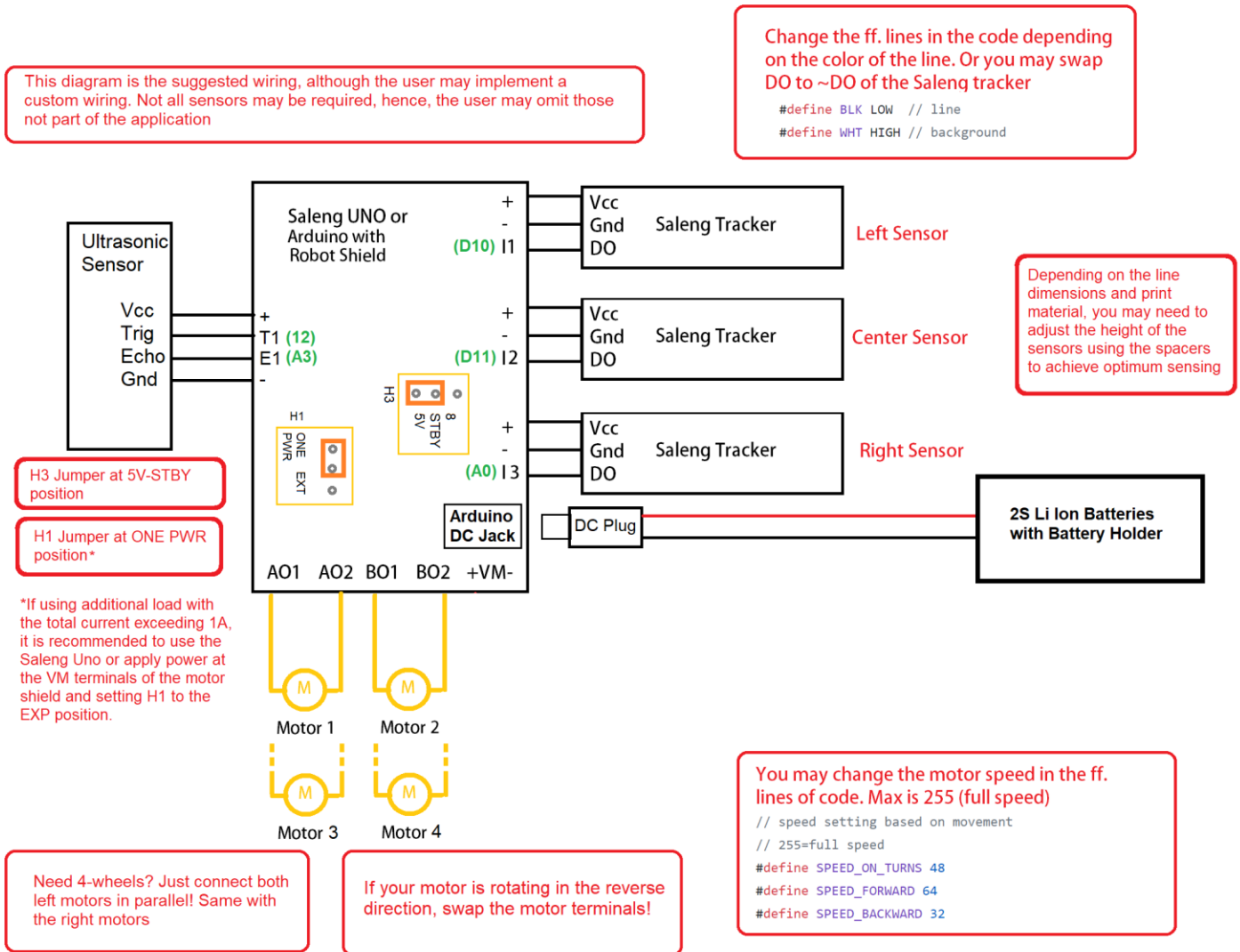


Microjumper on H3

The STBY signal allows the user to disable the motor driver if this signal is pulled LOW. It must be at HIGH level to operate the drivers and hence the motors. The other jumper on H3 may be placed between STBY and 8 if the user wants to control the STBY signal using pin 8 of the Uno. If the user need not enable or disable the motors using the STBY signal, the option is to keep this signal permanently connected to HIGH (5V) by installing the micro jumper between STBY and 5V. In most of the example codes provided, pin 8 is left HIGH in setup() and not used elsewhere in the code, effectively placing the STBY signal HIGH permanently. If you will not use STBY, simply set the microjumper between STBY and 5V. This should free up pin 8 on the Uno.

Electrical Connections

Refer to the schematic below for the suggested wiring. Use the connectors provided for the sensors:



Notes on Line Tracing

- At a minimum, use the 3 line tracing sensors
- Adjust the speed. This depends on several factors including the line thickness, print material, battery voltage among others. Decrease speed if robot overshoots the track often. Adjust the speed in the following lines of code or similar lines of code

```
#define SPEED_ON_TURNS 48
#define SPEED_FORWARD 64
#define SPEED_BACKWARD 32
```

Maximum speed is 255, minimum mobile speed varies with individual robot.
Alternately, you may adjust anywhere using `speedSetting(255);`
255 is the maximum value.

Notes on Sumobot

- Use 2 line tracing sensors, one installed at the front and the other at the rear side of the robot. These 2 are used to detect the limits of the playing area.
- Install the ultrasonic sensor for detecting opponents. The threshold distance for this need to be tuned according to rules or preferences. The value is in cm and indicates at which distance the robot should consider the opponent as in front of it:

```
#define DISTANCE_THRESHOLD_BEFORE_RAMMING 50
```
- The speed may also be adjusted in the following line:

```
speedSetting(200);
```
- The example code implements a very simple logic: rotate the robot until an opponent is detected on which it moves forward to attempt to push out the opponent.
- Additional enclosure may be implemented to protect the robot

Notes on obstacle avoidance robot

- At a minimum this robot need only the ultrasonic sensor
- Adjust the detection threshold for obstacles in this line of code:

```
const unsigned int THRESHOLD_DISTANCE_CM = 25;
```
- The speed may also be adjusted in the following line:

```
speedSetting(64);
```

IMPORTANT NOTICE

Layad Circuits Electronics Engineering Supplies & Services (Layad Circuits) reserves the right to make corrections, enhancements, improvements and other changes to its products, services and documentations, and to discontinue any product or service. Buyers or clients should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Additional terms may apply to the use or sale of Layad Circuits products and services.

Reproduction of significant portions of Layad Circuits information in Layad Circuits datasheets or user guides is permissible only if reproduction is without alteration, displays the Layad Circuits logo and is accompanied by all associated warranties, conditions, limitations, and notices. Layad Circuits is not responsible or liable for such reproduced documentation. Information of third parties may be subject to additional restrictions. Resale of Layad Circuits products or services with statements different from or beyond the parameters stated by Layad Circuits for that product or service voids all express and any implied warranties for the associated Layad Circuits product or service. Layad Circuits is not responsible or liable for any such statements.

Buyers and others who are developing systems that incorporate Layad Circuits products (collectively, "Designers") understand and agree that Designers remain responsible for using their independent analysis, evaluation and judgment in designing their applications and that Designers have full and exclusive responsibility to assure the safety of Designers' applications and compliance of their applications (and of all Layad Circuits products used in or for Designers' applications) with all applicable regulations, laws and other applicable requirements. Designer represents that, with respect to their applications, Designer has all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. Designer agrees that prior to using or distributing any applications that include Layad Circuits products, Designer will thoroughly test such applications and the functionality of such Layad Circuits products as used in such applications. Layad Circuits' provision of technical, application or other design advice, quality characterization, reliability data or other services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "Layad Circuits Resources") are intended to assist designers who are developing applications that incorporate Layad Circuits products; by downloading, accessing or using Layad Circuits Resources in any way, Designer (individually or, if Designer is acting on behalf of a company, Designer's company) agrees to use any particular Layad Circuits Resource solely for this purpose and subject to the terms of this Notice.

Layad Circuits' provision of Layad Circuits Resources does not expand or otherwise alter Layad Circuits' applicable published warranties or warranty disclaimers for Layad Circuits products, and no additional obligations or liabilities arise from Layad Circuits providing such Layad Circuits Resources.

Layad Circuits reserves the right to make corrections, enhancements, improvements and other changes to its Layad Circuits Resources. Layad Circuits has not conducted any testing other than that specifically described in the published documentation for a particular Layad Circuits Resource.

NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER LAYAD CIRCUITS INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF LAYAD CIRCUITS OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which Layad Circuits products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of Layad Circuits Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from Layad Circuits under the patents or other intellectual property of Layad Circuits. LAYAD CIRCUITS RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. LAYAD CIRCUITS DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS. LAYAD CIRCUITS SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY DESIGNER AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN LAYAD CIRCUITS RESOURCES OR OTHERWISE. IN NO EVENT SHALL LAYAD CIRCUITS BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF LAYAD CIRCUITS RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER LAYAD CIRCUITS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Unless Layad Circuits has explicitly designated an individual product as meeting the requirements of a particular industry standard, Layad Circuits is not responsible for any failure to meet such industry standard requirements. Where Layad Circuits specifically promotes products as facilitating functional safety or as compliant with industry functional safety standards, such products are intended to help enable customers to design and create their own applications that meet applicable functional safety standards and requirements. Using products in an application does not by itself establish any safety features in the application. Designers must ensure compliance with safety-related requirements and standards applicable to their applications. Designer may NOT use any Layad Circuits products in life-critical applications. Life-critical medical equipment is medical equipment where failure of such equipment would cause serious bodily injury or death (e.g., life support, pacemakers, defibrillators, heart pumps, neurostimulators, and implantables). Designers agree that it has the necessary expertise to select the product with the appropriate qualification designation for their applications and that proper product selection is at Designers' own risk. Designers are solely responsible for compliance with all legal and regulatory requirements in connection with such selection. Designer will fully indemnify Layad Circuits and its representatives against any damages, costs, losses, and/or liabilities arising out of Designer's noncompliance with the terms and provisions of this Notice.

Revision: v1.0 / 19 July 2019 C.D.MALECDAN

www.layadcircuits.com

Copyright 2019 © Layad Circuits All Rights Reserved
Layad Circuits Electronics Engineering Supplies & Services, B314 Lopez Bldg., Session Rd. cor. Assumption Rd., Baguio City, Philippines
General inquiries: info@layadcircuits.com Sales: sales@layadcircuits.com FB: facebook.com/layadcircuits Mobile: +639164428565

An IMPORTANT NOTICE: at the end of this guide addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers.