

# A quick look at the line follower vehicle

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<https://www.embeddedrelated.com/showarticle/902.php>

In its most basic form, a Line Following Vehicle (LFV) consists of a line sensor, a vehicle, some way to process the signal, and batteries.

A basic line can consist of black 3/4" electrical tape on a white background. Other lines consist of a white line on a black background. While usually solid, a line can consist of dashes and even change between colors. Turns are generally sweeping and gradual, but can include angles. Each of these changes adds a layer of difficulty to the processing.

Sensors can vary in number. One sensor is more difficult to implement because the vehicle is unable to detect which side of the line it crossed over. Vehicles with one sensor must be programmed to refind the line, usually by turning in a circle. Two sensors are more easy to implement. With two sensors, the right wheel runs until its sensor finds the line. Then the right wheel stops, and the left wheel runs until its sensor finds the line. With three sensors, the middle sensor can detect the line and the two outer sensors can detect angled turns or detect to which side the vehicle went if the middle sensor loses the line. More sensors can detect sharper turns.

Placing the sensor on the front of the vehicle allows the vehicle to detect turns quicker.

The sensor is usually either infrared emitter and phototransistor or a photoresister and an LED. Either sensor can be affected by ambient light and may need to be covered with opaque tape or similar container.

There are two types of steering generally used. The first is Ackerman type similar to that used on automobiles. It is usually found on radio controlled cars, and is better suited to gradual turns and higher speeds. The second is skid steer where both wheels having the same speed causes the vehicle to go in a straight line. If the left side stops and the right side continues, the vehicle will turn to the left. If the left side reverses and the right side continues, the vehicle will turn left very quickly.

The vehicle chassis can be made of many materials including: foamboard, cardboard, wood, plastic, aluminum, and steel. It must be sturdy enough to hold the sensor array, batteries, motors and controller. The motors must have sufficient torque to move everything, and the batteries sufficient power to power everything.

Though it is heavy and slow, the MakeIt Radio Shack Line Follower is easy to build. It uses pre-drilled metal pieces that are fastened together with machine screws. While

similar to the Meccano, Hillman and Steel Tec pieces, the holes may not match between brands. This is inconvenient, but it just means you have to use the same brand for like pieces. For example, pieces running from front to back can be one brand, and pieces from side to side or vertical can be another brand so the widths are the same.



A more in-depth look at the Make:It Radio Shack LFV can be found here:

<http://www.joestechblog.com/2014/07/10/makeit-robo...>

There are many ways to process the signal from the line sensors, including transistors, voltage comparators, logic gates, and microcontrollers. The Make:It LFV uses an Arduino Uno to process the signal, but could use a couple transistors.

For further reading:

[http://www.societyofrobots.com/member\\_tutorials/bo...](http://www.societyofrobots.com/member_tutorials/bo...)

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=...>

<http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnum...>

<http://www.ermicro.com/blog/?p=1097>

<http://www.joestechblog.com/2014/07/10/makeit-robo...>