

Line Following Robot Competition - 2009

Date: 7th November, 2009

Competition Rules

The line following competition is open to all freshmen of IIT Bombay. Teams of upto four members are permitted.

Track Specifications:

The track surface and course line may have cross and discontinuities(not to exceed 30 mm).

The course line will be 3/4th-inch (19 mm) wide.

The course line will be black tape, on a white surface.

The course line may be curved, with a centerline radius of minimum 100 mm. There might also be abrupt angles, but these will not exceed 30 degrees.

The robot must deal with the lighting conditions as they appear. That is, room lighting will be set "as is" and won't be modified for individual contestants.

Robot Specifications:

Robots must be autonomous and powered by an onboard power source. Human-operated remote controls are not allowed.

The maximum robot base dimension is 250mm(L) x 250mm(B)

There are no constraints on robot height or weight.

The robot may start the race in either orientation.

Some Tips for Line Following

Sensors

IR tends to "see through" the surface (normal black chart paper is IR transparent!!). So the reflected intensity not only depends on the surface color but also IR properties of the surface. Using visible light more or less solves this problem. But most photo-diodes/transistors have a sensitivity peak in the IR region. Most of the times RED transmitters should work fine since RED is closest to IR. Use ultra-bright RED LED's in that case (the normal RED is too diffused). The advantage of using IR photo-diodes (say over LDR's) is that they would be less affected by ambient light (because they are more frequency selective).

Power Supply and Voltage Regulation

Some teams were powering op-amps and sensors directly from the battery. Although there is nothing wrong with this, but as the battery voltage drops, all thresholds etc. will keep changing. Main change will be in the diode currents (remember current voltage curve is exponential). This may cause problems in sensing. Also the battery voltage will fluctuate as u switch on/off the motors. So it would be better to use a voltage regulator like 7805 (5V) to

power the opamps and sensors. The motors can still be powered from the battery. Also there is no need for one separate battery for motors and another one for other electronics. Everything can be powered from one battery. Use big capacitors in the input and output side of voltage regulator. This will smoothen out the voltage ripples.

Driving Motors

It is not a good idea to power motors directly from op-amps [unless you are using power op-amps]. There is a limit to the current that you can draw from the output side of the op-amp (this is also limited by its output impedance). There is also a chance that you may destroy the op-amp output stage (no freewheeling diodes). Use transistors/MOSFETs/H-Bridges to drive the motors. Don't forget to use freewheeling diodes if they are not present in the IC. e.g.. L298 does NOT have these diodes. The datasheet will show external diodes. L293D has these diodes while L293 doesn't. For line following (where motors run in only one direction) a simple option is to use transistor array IC like ULN2803 (this also has the freewheeling diodes built-in).

Important Note:

- The organizers retain the right to change the statement.
- All changes/clarifications regarding the problem statement shall be conveyed on the Institute Technical Forums (<http://gymkhana.iitb.ac.in/~technic/techforum>)
- Please feel free to post any queries/doubts regarding the GC statement on the forum