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CSE461 Assignment-2

Infrared Ray Sensors are used to find out the position of a line follower with respect to the robot position. For the sensing operation, IR sensors are the one which are widely used for the development of a line follower robot. To detect any line minimum two ~~see~~ IR sensors are required ~~Using~~ because using these two IR sensor a robot can easily follow a straight line or simple wave line. The error in movement, I can ~~control~~ calculate by doing calibrating the values of IR sensor. For example, if I put a random value on those sensor and ~~If~~ if I notice that the robot is not following the track then I will calibrate the value of IR sensor by increasing or decreasing some value in my PID algorithm. In PID controller function, there are three types of action. One is 'Proportional Action' which function is to perform simplest controller function. Then comes 'Integral Action' which eliminates steady-state error also it can cause oscillations. The last part is 'Derivative Action'. It is effective in transient periods. It provides faster response (higher sensitivity). Also it never used alone.

P.T.O

Basic PID controller Function:

Proportional control: $u(t) = K_p e(t)$ $\quad \frac{U(s)}{E(s)} = K_p$

Integral control: $u(t) = K_i \int_0^t e(t)\,dt$ $\quad \frac{U(s)}{E(s)} = \frac{K_i}{s}$

Differential control: $u(t) = K_d \frac{d}{dt} e(t)$ $\quad \frac{U(s)}{E(s)} = K_d s$

PID Tuning:

To get the PID parameter values, we can use two methods.

(i) Root-Locus method: If we know the transfer function, analytical methods we can use this method to meet the transient and ~~ans~~ steady-state specs.

(ii) Ziegler-Nicols Rules for PID controller:

Using only proportional control, turn up the gain until the system oscillates without dying down, i.e. is marginally stable. Assuming that 'K' and 'P' are the resulting gain and oscillation period, respectively then,

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for P control

$K_p = 0.5K$

for PI control

$K_p = 0.45K$

$K_i = 1.2/P$

for PID control

$K_p = 0.6K$

$K_i = 2.0/P$

$K_d = P/8.0$