

ABSTRACT

The present technology provides a simple and relatively low cost way of performing a leakage test to determine whether or not the system is subject to leakage. A gas sensor will be fixed in the area where there is any chance of gas leakages. If the system leaks, sensor detects that gas leakage exists. Since human cannot enter into the area where there is a chance of hazardous gases, robot is employed to move to that area and detects the gases.

In this final project, robot were an automated design, wall follower but not collide to the obstacle, and able to detect the gas leakage. In order to do the job well, robot needed an adaptive PID controller. An adaptive PID controller was used so that a robot could keep the distance along with a wall around the environment. It was used to determine the difference an error value input of an ultrasonic sensor by using an adaptive algorithm called least mean square. To support on gas detection, gas sensor that was used to have a high sensitivity to the type of a gas leak.

Testing parameters in this final project focused on the effects of the changes in gain K_p , K_i , K_d of an adaptive PID controller to the value of the transient response. The best performance characteristics robot with the appropriate parameter values were $K_p = 3$, $K_i = 1$, and $K_d = 20$ with time sampling 11.4 ms. Performance parameter values were 148.2 ms of the rise time, 79.8 of the delay time, 102.6 ms of the peak time, and max. overshoot which were not too far from the desired set point. The process of gas leakage detection was quite well with the percentage success rate reached 80% with its average time 11 seconds.