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Improvements & Modifications of PID

•**Integral-windup** refers to the situation in a PID controller where a large change in setpoint occurs (ALWAYS POSITIVE HERE) and the integral terms accumulates a significant error during the rise (windup), thus overshooting and continuing to increase as this accumulated error is unwound. The specific problem is the excess overshooting.

Solution

Clear up the integral every ten seconds

•Feed-forward is a term describing an element or pathway within a control system which passes a controlling signal from a source in the control system's external environment. Here it means the motor has a basic speed (reference speed) that is not effected by the errors. The output from PID controller is added to or minuses the feed-forward to adjust the robot's direction.







Follow state

Robot slows down or stops when detects another robot in front to avoid collision.

The program incorporates periodic readings from ultrasonic sensor, which can locate vehicles in front of the current vehicle



if(15<distance <30) - Slow down

if(distance <15) – Stop





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Branch point state

Branch point state is active when the robot recognizes the branch mark by the light sensors.

•The robot will decide whether to go straight forward or make a turn according to the **loop ID**

•If the robot chooses to turn left, it will activate the stop state and the wait state first, avoiding collision.



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Crossing state

Lanes are crossed at certain points, which will confuse the light sensors when the robot is tracking the lane. All the three sensors detect black at the crossing.

•In the crossing state, the program will force the robot to turn a slight distance via PID control module of motors

•Used light sensors, loop ID and state variable to enable the crossing state, avoiding turning while the robot is going straight





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Loop ID	
Loop ID is sent to each the robot is able to loca	robot when it is started to identify the loop. With the loop ID, the itself which stop & branch it is at.
•Outer loop straight	two stops
•Outer loop turn	one stop & one branch
•Inner loop-straight	two stops
•Inner loop-turn	one stop & one branch

















