# PID

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PID control has such advantages as a simple structure, good control effect and robust and easy implementation

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Unfortunately, this method does not deal with parameter optimization and automatically adapt to the environment caused by the complexity of vehicle dynamics, uncertainty of the external environments and the non‐holonomic constraint of the vehicle

# Adaptive PID

adaptive control includes:

* model reference adaptive PID control [16],
  + in solving the problem of trajectory tracking of unmanned vehicles, the reference model of adaptive PID control based on the model reference is hard to ascertain because the motion model of the vehicle is influenced greatly by environments
* fuzzy adaptive PID control [17],
  + requires much priori knowledge. The vehicle finds it hard to obtain comprehensive priori knowledge when the vehicle travels in unknown environments.
* adaptive PID control based on neural network [18][19],
  + use supervised learning to optimize the parameters, so it is also limited by some application conditions, for instance, the teacher signal of supervised learning is hard to obtain exactly
* adaptive PID control based on genetic algorithm [20][21]
  + requires less priori knowledge, it has the disadvantage of long computing times, i.e., not real time on line optimization