Feedback Control of Driverless Buses

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Recently, driverless cars attract a lot of attention to avoid human errors. Buses usually run on prescribed routes, and are easier to automatically control. As a running course of a bus is prescribed, we suppose we have a private line between the start and goal points, and let our robot which portrays a bus follow the line. To confirm the basic movement, the robot should be as simple as possible. From the simplicity constraint, only 1 active light sensor is used to follow the line. My first goal is to improve the ride quality. For that, the acceleration of the robot should not exceed a certain limit. To achieve a smoothly running robot, PID feedback control is used, and optimal parameters are obtained by a highly practical Ultimate Gain Method, which is hard to disturb a control object. Optimal parameters are actually obtained, and we confirmed that a pen standing on a robot does not fall. My second goal is to let the bus run despite changes in the environmental brightness such as day and night. This problem was solved by calibration at the start. In addition, online calibration is introduced to cope with localized brightness changes such as sunshine and shade. For that another passive light sensor is used. This technology can also apply to automatic driving of electric wheelchairs and it'll be useful for blind people, people who have difficulty in walking. In the future, I would like to research systems that communicate with traffic lights.

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