Design & Control of A Dual Wheel Self Balancing Robot

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The field of robotics is a playground of creative minds in the modern age. In this research, it designed and controlled a two-wheel self-balancing robot within a low cost and efficient manner. Two-wheel robots can easily be controlled, spin on the spot, or turn around in small places faster than four wheels robots. The main objective of this project is it has a small footprint to navigate nicely through doors and tight spaces and made within low cost. Another specialty of this robot is it acquires it's balanced even within some fluctuations (around 0.35 rad) around its mean position. The angle of the robot relative to the ground will be sensed from the gyroscope. H-bridge motor driver was used to control the motors and two DC gear motors gave force to stable the robot. ATMega microcontroller used to control and connect the modules, sensors. The system is kept balanced in a straight position in the presence of disturbances forces applied by calculating the PID controller. The robot can guide to its destination within an application with a cloud-based platform, through Wi-Fi with the use of Nodemcu. The gyroscope, motors, and control boards were selected by considering both accuracy and cost. The structure of the robot made by low-cost materials. Kalman filter used to eliminate the noise of the gyroscope value. It helps to filter and avoid noises of the robot and get precise angle values to stable the robot smoothly. The fraction of the floor and tires, weight, and height of the robot are the most important factors to calculate the PID values (K_p, K_i, K_d) for the stabilization of the robot. Finally, the self-balancing robot can be made as a very user-friendly, cost-effective, faster, and small size of the product that can be used to carry or send things easily. And also, it can be modified by adding stages with a camera, IR sensor, etc. because wheeled robots can handle higher payload capability and can control the balance by varying the PID values.

Keywords: PID controller, Self-balancing, cost effective, Kalman Filter, Gyroscope