TWO WHEELER SELF BALANCING ROBOT

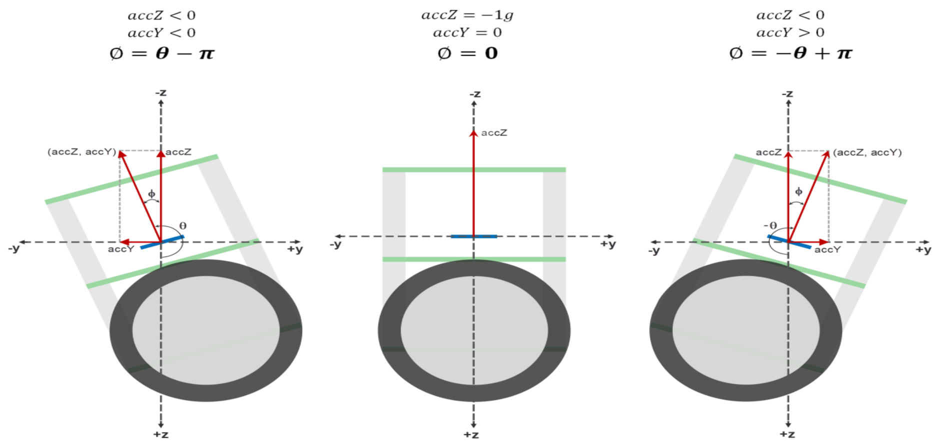
INTRODUCTION

As the name suggests, the self-balancing robot is an automated vehicle that balances itself without any outside help or support. This project is a rather complex one as it involves using PID Control and involuted programming.
Self-balancing robot which fuses the data from two sensors such that a better estimation of tilt angle is obtained. Hence, this system would also be designed in such a way that it optimises the use of energy and satisfies human needs.

WORKING CONCEPT:

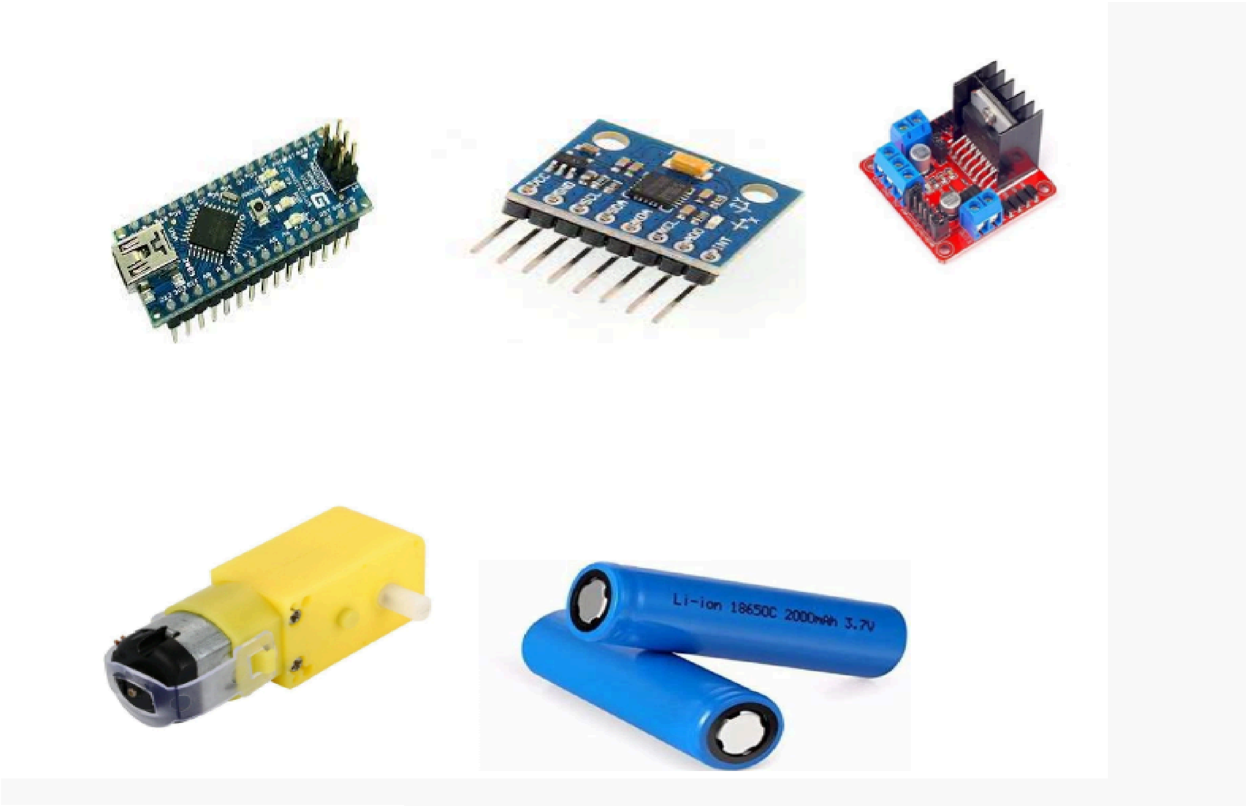
The concept of a Self-balancing robot is related to the Proportional-Integral-Derivative control (PID). A gyroscope is used to measure the angle and choose the setpoint for the PID Control.

The gyroscope used in this case is MPU6050. As the angle of the robot changes, the Arduino sends the signal to the L298N motor driver to direct the motors in such a way that it counters the fall of the robot. This in turn helps the robot to balance itself upright.

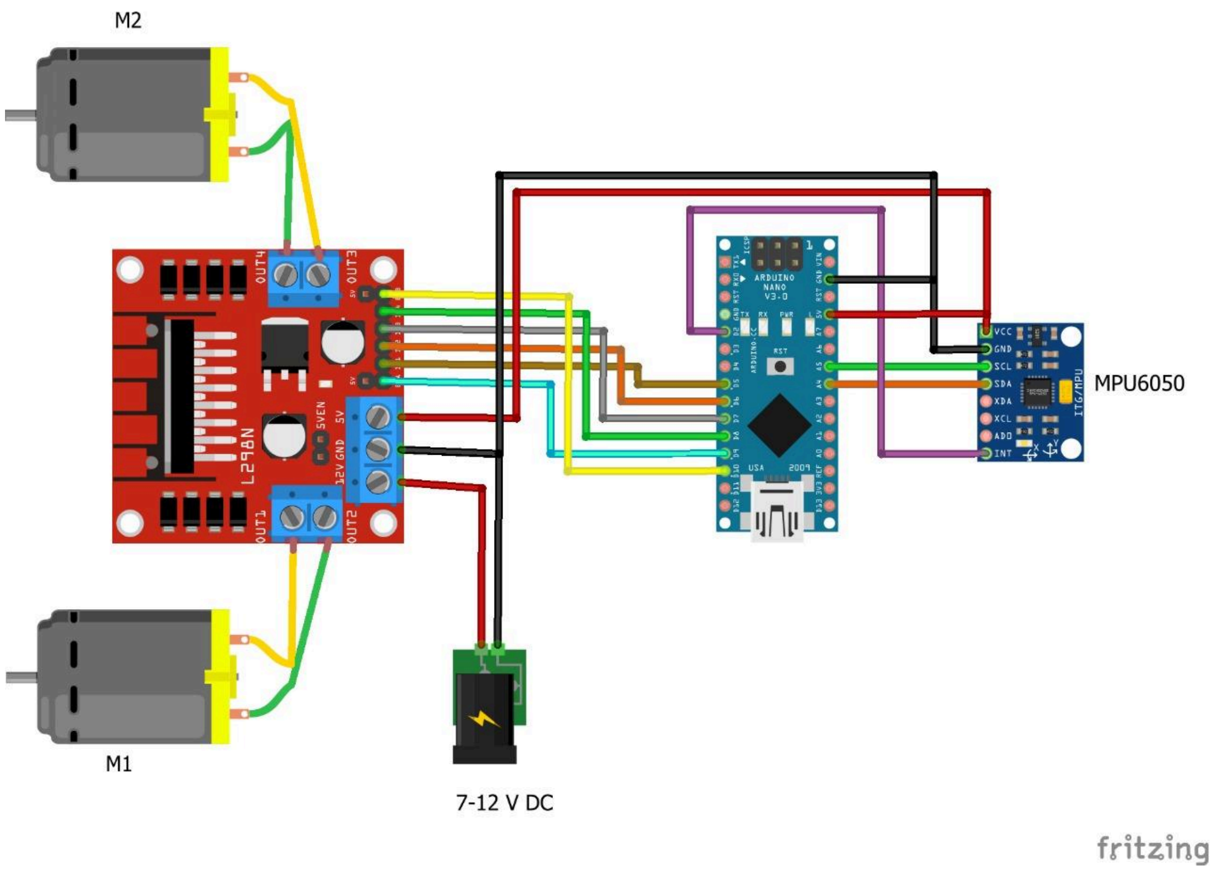


COMPONENTS LIST:

1. Arduino Nano
2. MPU6050
3. geared motors
4. L298N Motor driver
5. Li-ion battery



CIRCUIT DIAGRAM:



Coding part that we write from sketch
coding part of Self_balancing robot

INITIAL OBJECTIVE:

Initially,we want to the achieve the following objectives:
1. **Simple Balancing using MPU6050 sensor**: Initially, we'll focus on achieving basic stability and balance control for the robot using an MPU6050 sensor. This sensor will provide us with crucial data about the robot's orientation and movement, allowing us to implement algorithms for maintaining balance during motion.

2. **Remote Control using WiFi Module**: To enhance the robot's versatility and control options, we plan to integrate a WiFi module. This will enable remote control of the robot through a smartphone or a computer over a wireless network.

After achieving the above objectives, it will serve the following purposes:

1. **Entertainment and Education**: Initially, the self-balancing robot serves as an entertaining and educational tool. It captures the curiosity of users, especially students and hobbyists, by demonstrating principles of balance and control in a fun and interactive manner.

2. **Demonstration of Technology:** It showcases the capabilities of sensors and control systems in robotics. By maintaining balance without external support, the robot highlights advancements in sensor technology and control algorithms, making it a compelling demonstration of engineering prowess.

3. **Enhanced Control and Versatility**: With the integration of a WiFi module and remote control capabilities, the self-balancing robot becomes more versatile. Users can control it from a distance, opening up possibilities for exploration in various environments and applications beyond the immediate vicinity.

FUTURE WORK:

Following are the objectives that we want to achieve in future by this project:

1. **Obstacle Dodger using Sensors and Auto Braking System**: we will be incorporating multiple sensors to detect obstacles in the robot's path. These sensors will provide real-time feedback to the control system, allowing the robot to navigate around obstacles autonomously. Additionally, we'll implement an auto-braking system that can swiftly halt the robot's movement in case of emergencies or unexpected obstacles.

2.**Image Processing along with Gesture Control**: We're exploring advanced control methods beyond traditional remote control interfaces. By leveraging image processing techniques, we aim to enable gesture recognition for controlling the robot's movements.

3. **Master-Slave Concept for Coordination Among Multiple Robots**: To scale up our system and explore cooperative behaviours among multiple robots, we're adopting a master-slave concept. In this setup, one robot will act as the master, coordinating the movements and actions of other slave robots. This distributed control architecture will facilitate collaborative tasks such as swarm navigation or distributed sensing in complex environments.

<u>On Achieving the above future objectives it will serve the following purposes:</u>

1.Safety and Autonomous Navigation: The addition of obstacle detection sensors and an auto-braking system significantly enhances the robot's safety features. It can now navigate autonomously, avoiding obstacles in its path and reacting swiftly to potential hazards, making it suitable for applications in crowded or dynamic environments.

2. **Human-Robot Interaction**: Incorporating image processing and gesture control adds a new dimension to human-robot interaction. Users can now interact with the robot intuitively using hand gestures, fostering a more natural and engaging experience. This feature finds applications in interactive exhibits, educational settings, and assistive technologies where intuitive control is desirable.

3. Scalability and Collaboration: By adopting a master-slave concept, multiple robots can collaborate and coordinate their actions effectively. This scalability opens up possibilities for applications such as distributed sensing, surveillance, and swarm robotics, where a team of robots can work together to achieve complex tasks efficiently.

By incorporating these future works into our project, we aim to enhance the functionality, versatility, and safety of our self-balancing robot while exploring cutting-edge technologies in robotics and control systems.