

# Smart Cycle Dashboard

## Abstract

Cycling is a popular mode of transport and fitness, but riders often lack access to integrated, real-time data that enhances both safety and health tracking. This project presents a Smart Cycle Dashboard using ESP32 to monitor heart rate, temperature, speed, and turning direction. It features automatic turn indicators, a mobile app interface, and modular sensor integration. With future GPS support and solar charging plans, this solution aims to modernize cycling without increasing cost or complexity.

## Introduction with Motivation

Modern cyclists face challenges such as:

- Manual hand signaling that compromises safety.
- Difficulty monitoring vital signs like heart rate and temperature.
- Lack of low-cost systems that integrate health and navigation features.

Motivation: To develop an affordable, multi-functional dashboard that supports safe, connected, and health-aware cycling.

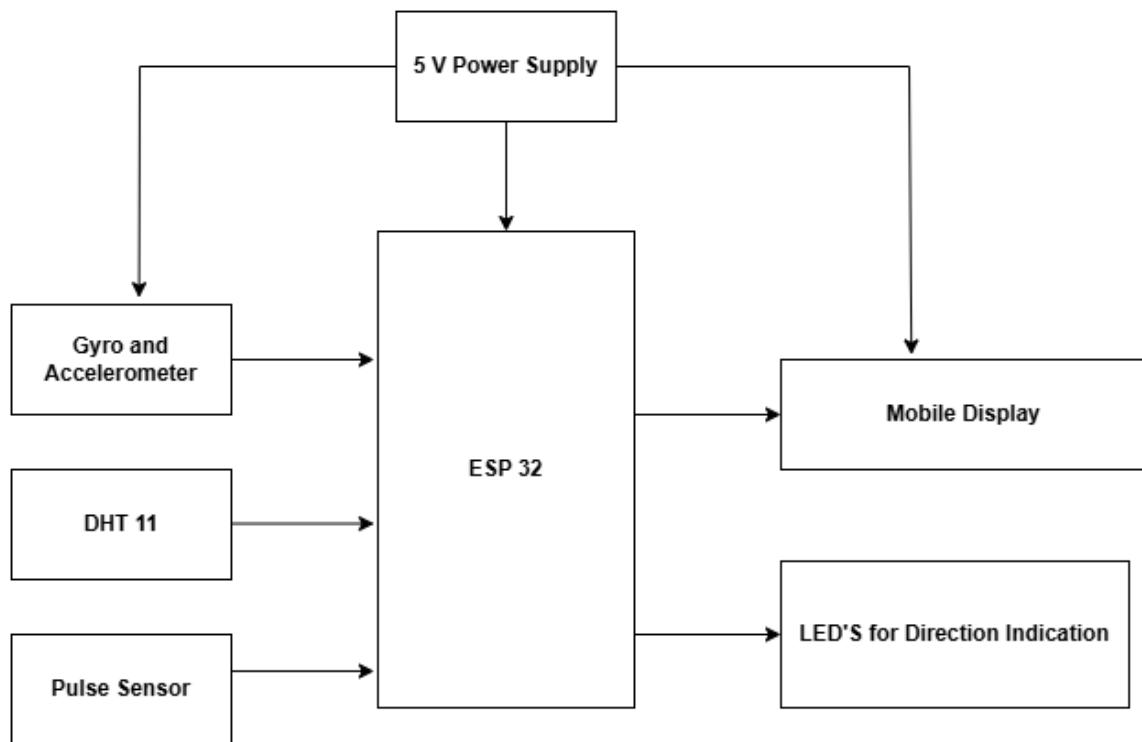
## Proposed Solution

The Smart Cycle Dashboard is a compact IoT-enabled system with the following key features:

- Health Monitoring: Pulse and temperature sensors track vitals in real time.
- Safety Features: Auto turn indicators using a gyroscope to detect tilt.
- Speed Monitoring: Basic speed calculations derived from motion sensors.
- Mobile App: Bluetooth-based data display and logging using the Blynk app.
- Scalability: Designed for future GPS integration and solar power.

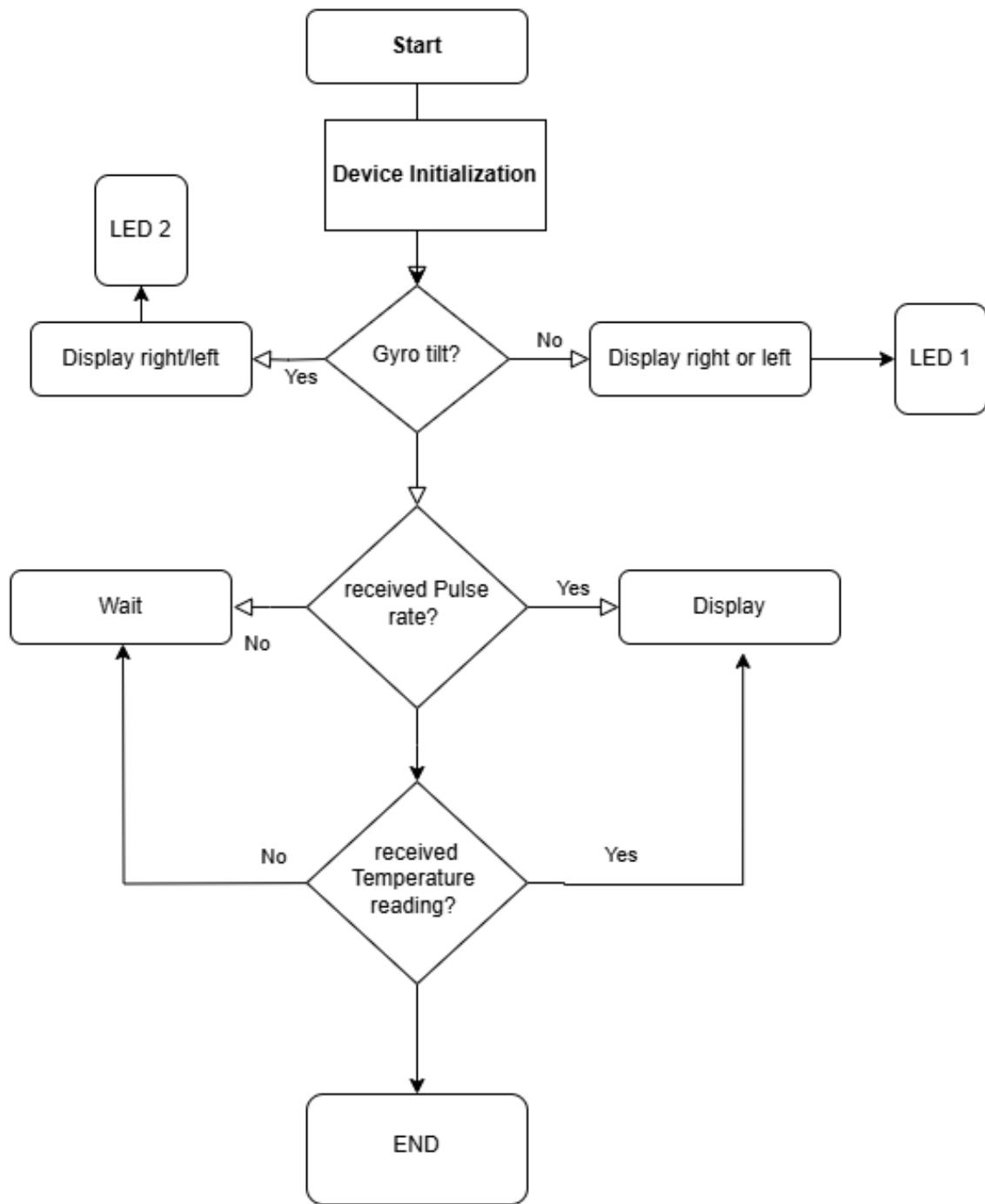
## Hardware Architecture with Block Diagram

The system is centered on the ESP32 microcontroller, which connects to various sensors and peripherals. The block diagram below illustrates the setup:



## Flowchart

The software logic follows a structured decision-based flow, ensuring efficient data acquisition and display. The process flow is as follows:



## Software Architecture and Mobile Application Using Blynk

Software Overview:

- Sensor Initialization: All sensors are initialized during startup.
- Data Acquisition: Periodic collection of heart rate, temperature, and motion data.
- Tilt Detection: Motion from the gyroscope triggers turn indicator LEDs.
- LCD Display: Real-time display of all vital signs.

- Bluetooth Communication: Uses ESP32 Bluetooth to send data to a mobile phone.

#### Mobile Application (Blynk):

- Developed using the Blynk IoT platform.
- Receives: Heart Rate, Temperature, Speed, Direction Indicator Status.
- Allows: Live monitoring during rides, Basic historical data tracking.

## Functionality Overview and Future Improvements

### Current Functionalities:

- Real-time health monitoring (heart rate, temperature).
- Direction indication based on tilt sensing.
- Bluetooth data transmission to mobile app.
- LCD display for quick on-bike viewing.

### Planned Future Enhancements:

- Live GPS Tracking and Route Mapping.
- Crash Detection and SOS Triggering.
- Solar Charging for sustainable energy.
- Speed Limit Notifications in the mobile app.
- Community Engagement via riding challenges and statistics.

## Conclusion

The Smart Cycle Dashboard addresses key safety and health-monitoring gaps for cyclists through a low-cost, microcontroller-based platform. With its modular sensor integration, Bluetooth connectivity, and app support, it offers both practicality and potential for expansion. This solution promotes a safer, smarter, and more connected cycling experience for users at all levels.