Republic of the Philippines
BATANGAS STATE UNIVERSITY
The National Engineering University
Alangilan Campus
Golden Country Homes, Alangilan, Batangas City, Batangas, Philippines 4200
Tel Nos.: (+63 43) 425-0139 loc. 2121 / 2221
E-mail Address: ceafa@g.batstate-u.edu.ph | Website Address: http://www.batstate-u.edu.ph

College of Engineering

TECHNICAL REPORT

Project Title:

No Man, No Power

In Partial Fulfillment of the Requirements for

ECE 415 - Microprocessor and Microcontroller Systems and Design

Bachelor of Science in Instrumentation and Control Engineering

Members:

Arellano, Kevin B.

Casalla, Joaquin Angelo

Mendaña, Sherine E.

ICE 3203

Date:

May 29, 2025

I. Introduction

The “No Man, No Power” system is an innovative automation project aimed at reducing unnecessary power consumption in indoor spaces by ensuring that electrical appliances are only active when a person is present. With the increasing need for sustainable energy use, especially in environments like dormitories, classrooms, and bedrooms, this system provides a practical solution by integrating motion sensing and smart control technologies.

The project is built using an ESP32 microcontroller, which serves as the central processing unit, and utilizes a PIR (Passive Infrared) motion sensor to detect human presence. The system controls a set of appliances, a DC motor simulating a fan and an LED simulating a light source through a dual-channel relay module. A physical switch acts as a manual override to activate or deactivate the system, and the Blynk IoT platform allows remote access and control via a smartphone application.

A Real-Time Clock (RTC) module ensures stable and reliable operation by maintaining accurate timekeeping, while an 12-C based LCD provides real-time status updates to the user. The entire system is designed to be energy-efficient, user-friendly, and scalable. By implementing a 30-second inactivity timeout, the system ensures that appliances are not left running unnecessarily when no motion is detected.

This project aligns with the goals of smart automation and energy conservation, and demonstrates how IoT and embedded systems can be combined to create intelligent and eco-conscious living environments.

II. Objectives

- To create a smart energy-saving system using motion detection.
- To integrate IoT-based control via Blynk for remote power switching.
- To utilize RTC to keep the system stable during power or connection drops.
- To implement a user-friendly LCD for system feedback.

III. Components Used

- ESP32 Dev Module
- Relay Module (2-Channel)
- DC Motor (Simulated as Fan)
- LED
- PIR Motion Sensor
- RTC Module
- 12C 16x2 LCD
- Blynk App (IoT Platform)
- Master Physical Switch
- Resistors (For Switch Logic Smoothing)
- Power Source: 5V from ESp32 and 7.4V Lithium Battery for the fan

IV. System Description

When the physical switch and Blynk switch are both ON, the system becomes active. The PIR Sensor detects motion, and the Relay Module powers the appliances (Fan and LED). If no motion is detected for 30 seconds, the appliances are automatically turned off to save electricity. The system remains off unless it is reactivated by motion or remote toggle via Blynk.

V. Circuit Overview

- PIR Sensor is connected to GPIO14 to detect movement.
- The Relay controlling the DC Motor is on GPIO27.
- The Relay controlling the LEDs is on GPIO26.
- The Physical Switch is on GPIO34 and tied with a pull-up resistor to stabilize logic levels.
- The LCD and RTC are both connected using the 12C protocol. Specifically, SDA to GPIO21 and SCL to GPIO22.

VI. Software Overview

- The code is written in Arduino C++ using the Arduino IDE.
- Blynk is used to monitor and control the system remotely.
- The logic checks both hardware (switch) and software (Blynk) states before turning on appliances.
- Timeout logic is implemented using *millis()* to avoid delays in motion checking.
- The LCD displays current system status in real-time.

VII. Results and Testing

The system was tested many times in a simulated environment using Wokwi and in a real-life setup. After a few adjustments, it responded correctly to motion detection, turned off after inactivity, and could be remotely turned off via the Blynk app. The LCD consistently displayed accurate status updates.

VIII. Challenges

- Ensuring stable digital input from the physical switch (solved with a pull-up resistor).
- Managing reconnection issues with Blynk (solved using timeout logic and a default state).
- Powering components with both the 5V pin and external battery safely.

IX. Conclusion

The "No Man, No Power" concept effectively illustrates how intelligent automation may raise living spaces' energy efficiency, especially for those who are frequently gone from their rooms, like students. The system can automatically turn appliances on when motion is detected and off after a period of inactivity by combining an ESP32 microcontroller with a PIR motion sensor, RTC module, relays, and the Blynk IoT platform. This prolongs the life of electrical gadgets while also saving electricity.

Additionally, the dual control system offers simplicity and flexibility via a mobile app and a physical master switch. Through Blynk, users can remotely control their devices or depend on the system to continue operating even in the event of a Wi-Fi loss. This hybrid strategy improves user control and dependability.

All things considered, the project succeeds in reducing needless energy use by developing a workable, real-world solution, demonstrating the usefulness of embedded systems and the Internet of Things in resolving common issues. Features like load monitoring, solar energy integration, and scheduled automation can be added to this project in the future to make it even bigger.