



FLORIDA ATLANTIC UNIVERSITY

Magic wand

Students: Jose Caraballo & Adrian Suarez

Advisors: Dr. Bassem Alhalabi

Intro to Embedded Systems

Objectives

The project aimed to create a secure, gesture-based door lock system using smartphone accelerometer data. The focus was on providing a user-friendly, energy-efficient, and reliable keyless entry system to enhance convenience and security.

General Description

The Magic Wand unlocked doors through smartphone hand gestures by converting accelerometer data into a secure six-digit PIN. An ESP32 microcontroller powered the system, utilizing Bluetooth communication, a 12V solenoid lock, and the Dabble app for gesture input. Features included a low-power sleep mode, mode switching using buttons, and secure access control mechanisms.

Design Issues, Lessons Learned, and Future Enhancements

The project encountered various challenges. Integrating hardware components, such as the ESP32, relay, and motion sensor, proved complex. Voltage limitations of the ESP32 were addressed by incorporating a relay. Ensuring reliable gesture accuracy from accelerometer data also required significant effort. Time constraints necessitated the use of the Dabble app instead of creating a custom mobile application.

Through these challenges, the team gained practical experience in embedded system design, gesture recognition algorithms, energy-efficient solutions, and troubleshooting multi-component systems. These experiences established a strong foundation in hardware-software integration and real-world application development.

Future enhancements include developing a custom mobile app for greater flexibility, expanding gesture recognition capabilities, integrating voice control for improved accessibility, and adding an LCD display to provide real-time feedback and system status information.

Conclusion

The Magic Wand project demonstrated the feasibility of gesture-based door lock systems, effectively combining security, convenience, and modern technology. The prototype highlighted innovative possibilities for home automation and access control, paving the way for further advancements in this field.

