HOME ALARM SYSTEM

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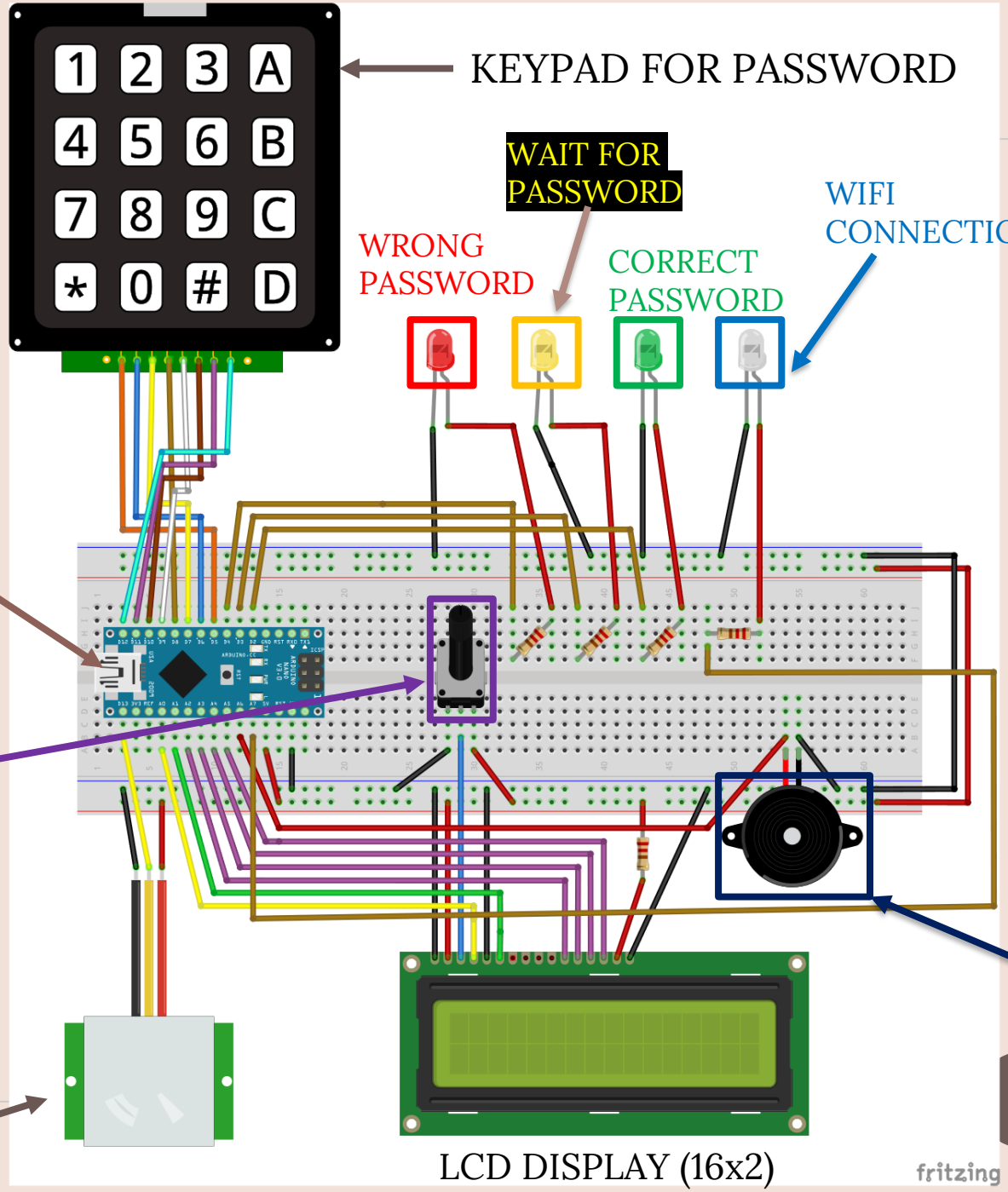
Electronics for Applied Physics

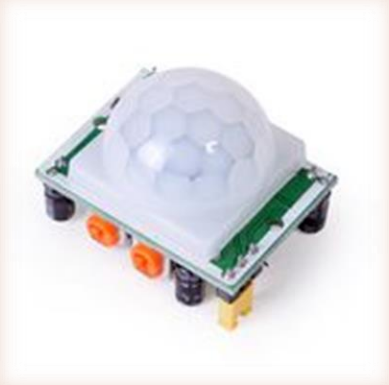
SCHEMATICS


KEYPAD FOR PASSWORD
WAIT FOR PASSWORD
WRONG PASSWORD
CORRECT PASSWORD
WIFI CONNECTION
ARDUINO NANO 33 IOT (WITH WIFI MODULE)
10kΩ POTENTIOMETER FOR DISPLAY CONTRAST
PIEZO SPEAKER (PASSIVE BUZZER)
PIR SENSOR
LCD DISPLAY (16x2)
fritzing

THE OVERALL SYSTEM

PASSIVE INFRARED SENSOR

- PIR -> light radiation (**infrared radiation**).
- Passive because PIR **don't radiate** energy.
- PIR **only detect** the **radiation** emitted or reflected from objects.
- All objects (with T > 0 K) emit **heat energy** in the form of EM radiation. This radiation usually is not visible to the human eye (infrared radiation).



FINITE STATE MACHINE (FSM)

- **Finite** number of **states.**
- One state at any given time.
- FSM can change from one state to another in response of some **inputs**. This change is called **transition**.

The FSM is defined by its states and the inputs for the transition.

ALL THE STATES OF THE SYSTEM

- **OFFLINE** -> INITIAL STATE
- **WAITING** -> HANDLE THE PASSAGE FROM DIFFERENT STATES
- **PIR ACTIVATED** -> THE PIR SENSOR IS ACTIVATED
- **BUZZER ACTIVATED** ->THE BUZZER SPEAKER IS ACTIVATED
- **INCORRECT** -> THE USER TYPES WRONGLY THE PASSWORD

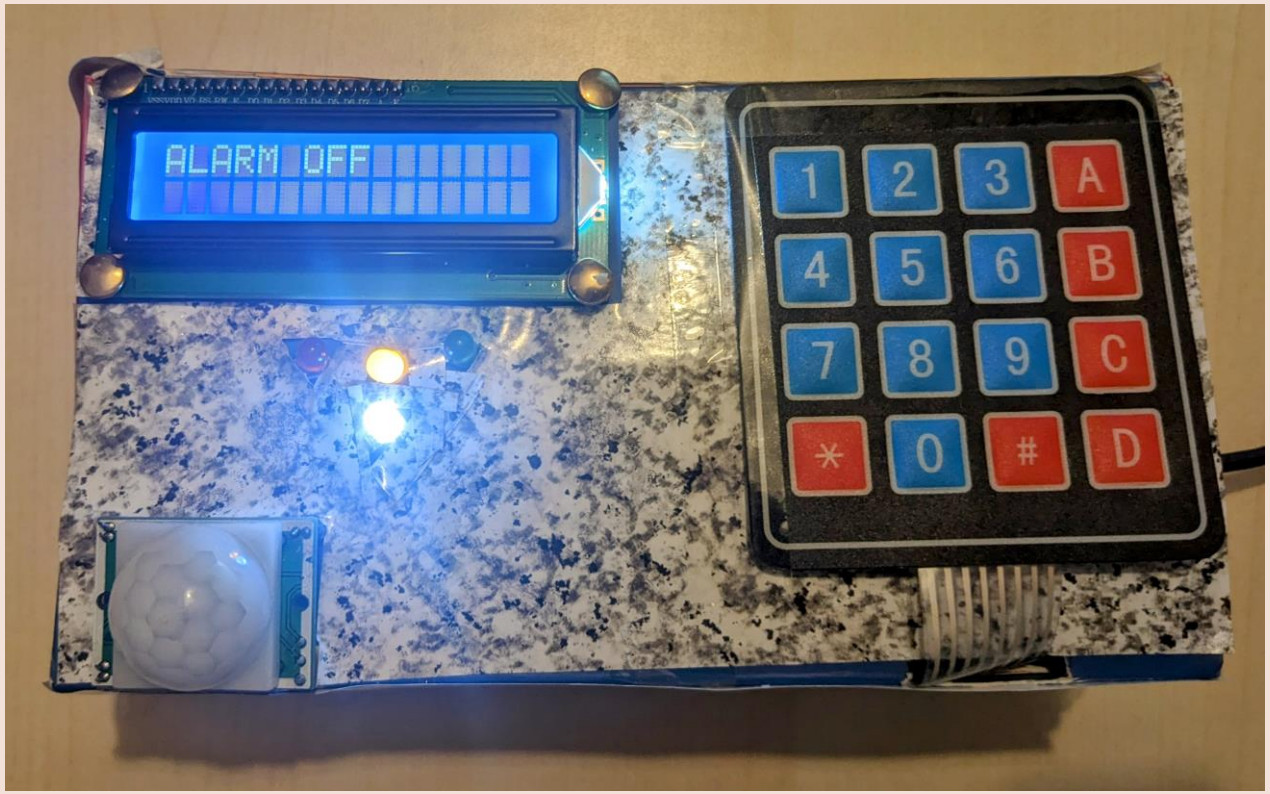
ALL THE TRANSITIONS BETWEEN STATES

- **OFFLINE** -> **WAITING** -> **PIR ACTIVATED**
- **OFFLINE** -> **INCORRECT** -> **OFFLINE**

- **PIR ACTIVATED** -> **BUZZER ACTIVATED**

- **BUZZER ACTIVATED** -> **WAITING** -> **OFFLINE**
- **BUZZER ACTIVATED** -> **INCORRECT** -> **BUZZER ACTIVATED**

INITIAL STATE



OFFLINE -> WAITING -> PIR ACTIVATED

- Initial state: **OFFLINE**.
- The correct password is: 1234* (the * is to conferm the pin).
- The user types the correct PIN.
- Waiting some seconds (the user exits from home).
- Final state: **PIR ACTIVATED**.
  From now it will detect movements.

OFFLINE -> INCORRECT -> OFFLINE

- Initial state: **OFFLINE**.
- The correct password is: 1234* (the * is to conferm the pin).
- The user types the wrong PIN.
- Final state: **OFFLINE** with an error message on LCD display.

PIR ACTIVATED -> BUZZER ACTIVATED

- Initial state: **PIR ACTIVATED**.
- When PIR sensor sees **some movements** there is the transition to BUZZER ACTIVATED state.
- Final state: **BUZZER ACTIVATED** with the speaker that turns on.

BUZZER ACTIVATED -> WAITING -> OFFLINE

- Initial state: **BUZZER ACTIVATED**.
- The correct password is: 1234* (the * is to conferm the pin).
- If the **buzzer is ON** and the user types the correct password the system goes OFFLINE with some waiting time.
- Final state: **OFFLINE**.

BUZZER ACTIVATED -> INCORRECT -> BUZZER ACTIVATED

- Initial state: **BUZZER ACTIVATED**.
- The correct password is: 1234* (the * is to conferm the pin).
- If the **buzzer is ON** and the user types the wrong password the system stays in the BUZZER ACTIVATED state.
- Final state: **BUZZER ACTIVATED** with an error message on LCD display.

WEBHOOKS AND IFTTT

- Arduino Nano 33 IOT Wi-Fi connectivity: Nina W102 uBlox module.
- Arduino can send a phone call when the **PIR sensor** is **HIGH**. Arduino send a POST HTTP request to **Webhooks** and, thanks to the integration with **IFTTT** it sends a **phone call** to the smartphone.

THANKS FOR THE ATTENTION

PIR ACTIVATED -> WAITING -> OFFLINE

- Initial state: **`PIR ACTIVATED`**.
- The correct password is: 1234* (the * is to conferm the pin).
- If the PIR sensor sees **no movement** and the user types the correct password the system goes offline.
- Final state: **`OFFLINE`**.

PIR ACTIVATED -> INCORRECT -> PIR ACTIVATED

- Initial state: **PIR ACTIVATED**.
- The correct password is: 1234* (the * is to conferm the pin).
- If the PIR sensor sees **no movement** and the user types the wrong password the system stays in PIR ACTIVATED state with an error message displayed.
- Final state: **PIR ACTIVATED**.