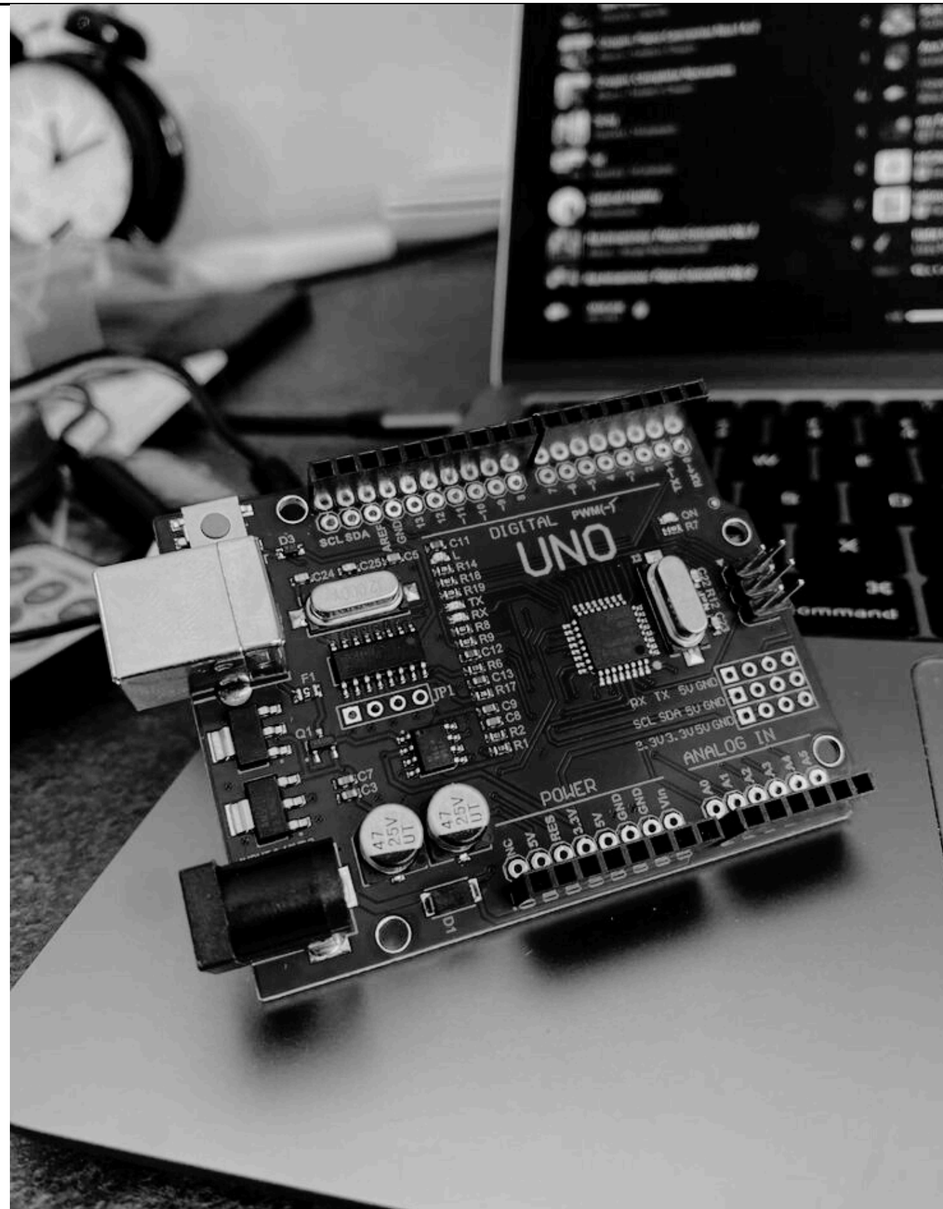
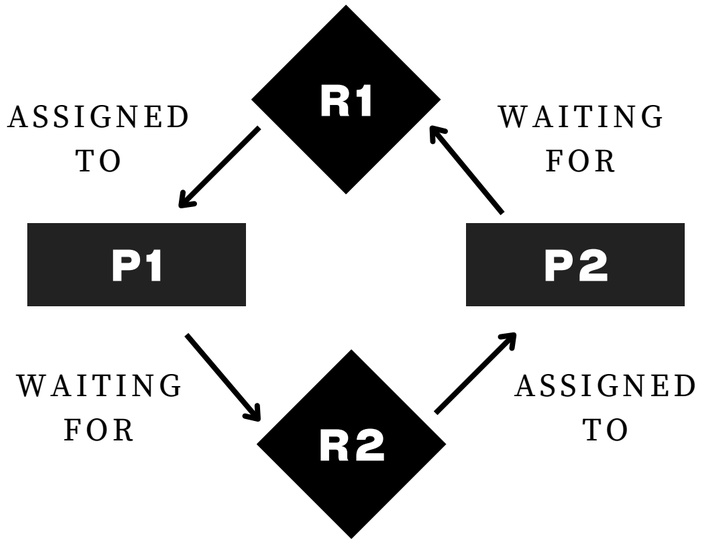
# SIMULATION OF PRIORITY INVERSION IN A HOME AUTOMATION SYSTEM

## USING ARDUINO UNO AND WOKWI FOR SIMULATION



# INTRODUCTION




- WHAT IS PRIORITY INVERSION?
- EFFECTS
- MITIGATION TECHNIQUES
- WHAT IS A DEADLOCK?
- THE 4 TYPES OF DEADLOCKS
- MITIGATION TECHNIQUES

# THE SIMULATION

## HOME AUTOMATION SYSTEM- TEMPERATURES/ SECURITY

LOW PRIORITY: TEMPERATURE LOGGING

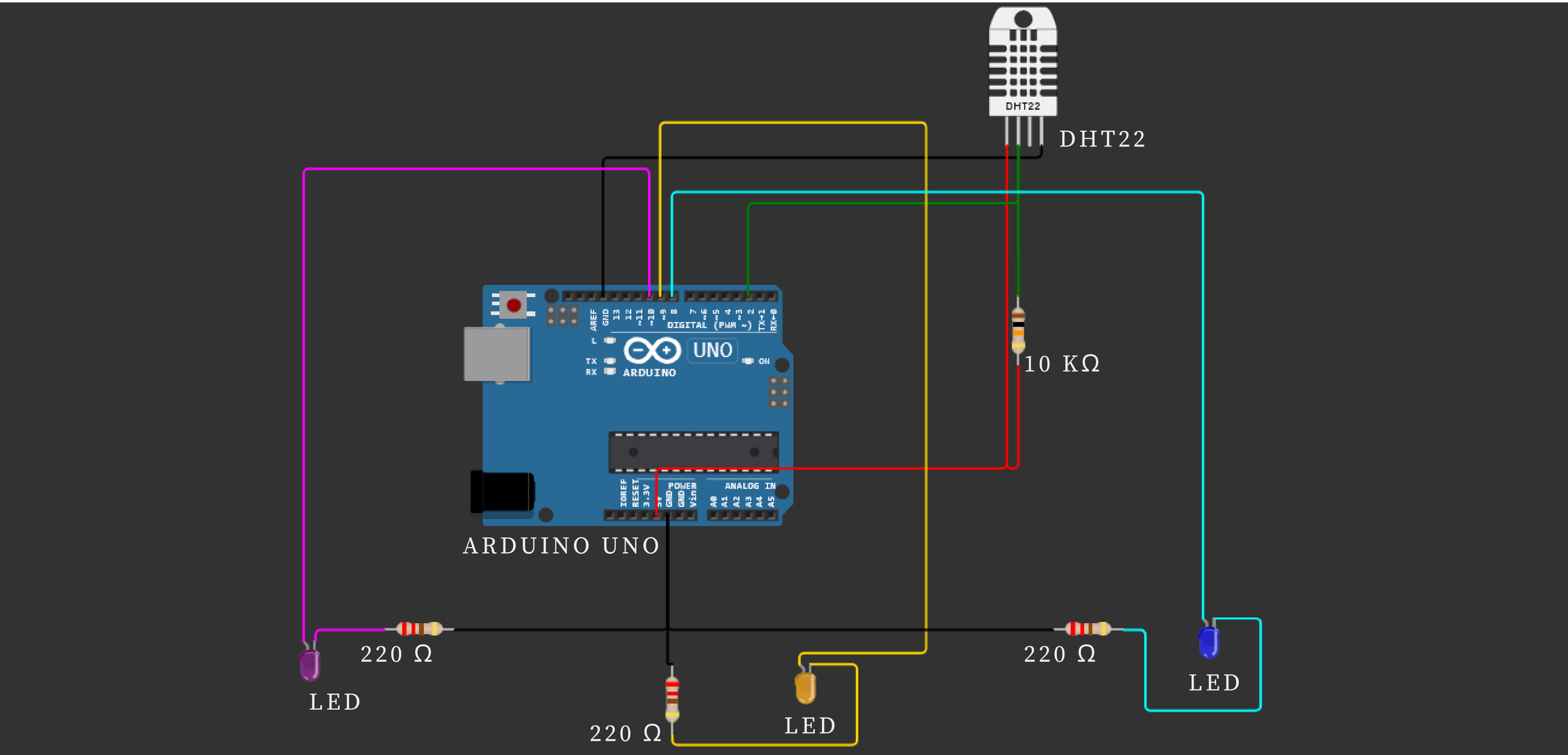
MEDIUM PRIORITY: DETECTING TEMPERATURES

HIGH PRIORITY: SECURITY SYSTEM (ANY FORM OF DISTURBANCE)

DEADLOCK SCENARIO: SUDDEN SPIKE IN TEMPERATURE

PRIORITY INHERITANCE AS A MITIGATION TECHNIQUE

# THE SIMULATION



# EXPLANATION OF PARTS

## DHT22

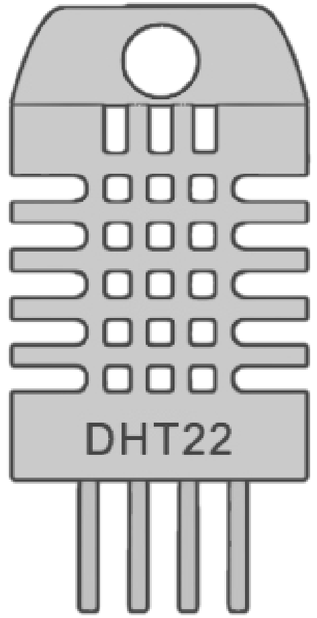
DHT STANDS FOR DIGITAL HUMIDITY AND TEMPERATURE SENSOR.

IT HAS 4 PINS:

A. VCC
B. SDA
C. NC
D. GND

IT HOSTS 2 ATTRIBUTES:

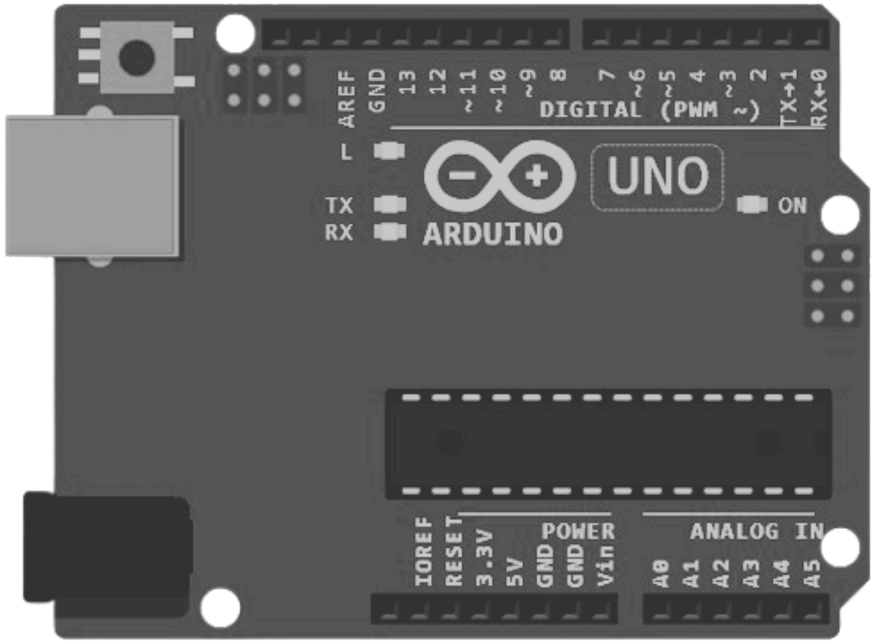
A. TEMPERATURE
B. HUMIDITY



# EXPLANATION OF PARTS

## ARDUINO UNO

PINS 0-13 ARE DIGITAL PINS
A0 -A5 DOUBLE AS ANALOG INPUT PINS
3 GND PINS
2 VCC (5V AND VIN)




## LED

ANODE (LONGER PIN)
CATHODE

# RESULTS

### CASE 1: NORMAL RUN

LOW PRIORITY: EXECUTED. LOGS TEMPS.
MEDIUM PRIORITY: EXECUTED. MEASURES TEMPS.
HIGH PRIORITY: EXECUTED. ACTIVATES SECURITY SYSTEM.

### CASE 2: DEADLOCK

LOW PRIORITY: EXECUTED. BEGINS LOGGING TEMP.
MEDIUM PRIORITY: WAITS FOR TEMP VARIABLE WHICH IS IN USE
HIGH PRIORITY: WAITS FOR LOW PRIORITY TO RELEASE SHARED RESOURCE

### CASE 3: PRIORITY INVERSION

LOW PRIORITY: EXECUTED. LOGS TEMPS FIRST.
MEDIUM PRIORITY: EXECUTED AFTER HIGH PRIORITY TASK. MEASURES TEMPS.
HIGH PRIORITY: EXECUTED AFTER LOW PRIORITY. SHOWS PRIORITY INVERSION

# RESULTS

## CASE 4: PRIORITY INHERITANCE

LOW PRIORITY: EXECUTED. TEMPORARILY INHERITS HIGHER PRIORITY TO COMPLETE QUICKLY.

HIGH PRIORITY: EXECUTED AFTER LOW PRIORITY RELEASES THE SHARED RESOURCE.

MEDIUM PRIORITY: EXECUTED AFTER HIGH PRIORITY. MEASURES TEMPERATURE.

# SCOPE

### EDUCATIONAL USE

LEARNING OS CONCEPTS// PRACTICAL DEMONSTRATION

### HOME AUTOMATION SYSTEMS

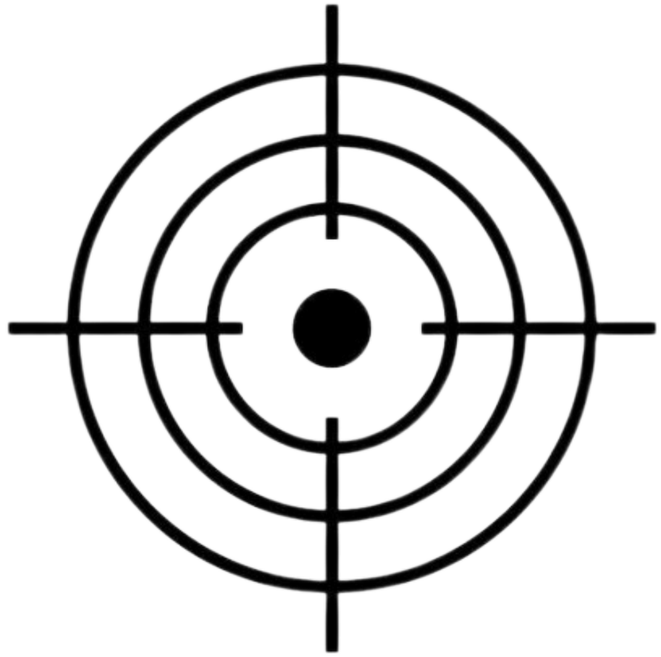
SIMULATIONS// FAILURE SCENARIO TESTING

### OPTIMISATION STRATEGIES

MUTEX AND SEMAPHORE IMPLEMENTATION// PERFORMANCE ANALYSIS

### EXTENSION OPPORTUNITIES

USER INTERACTION// PRIORITY INHERITANCE PROTOCOL// FAULT RECOVERY MECHANISMS



# THANK YOU

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