PROJECT REPORT

DIGITAL ELECTRONICS LAB

EEE 3104

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Title: Smart Room Automation System using Combinational Logic Circuit and Sensors

Working Principle:

The smart room automation system functions based on the inputs received from three sensors: a light sensor (photoresistor), a temperature sensor (thermistor), and a human presence sensor (PIR sensor). These sensors output binary signals used to control an LED light and a fan via a Logic Array using AND and NOT gates.

The system operates as follows:

1. **Light Sensor (L):**
    - **Outputs `0` if it is dark.**
    - **Outputs `1` if it is light.**
2. **Temperature Sensor (T):**
    - **Outputs `0` if the temperature is 20 degrees Celsius or lower.**
    - **Outputs `1` if the temperature is above 20 degrees Celsius. 3.**

Human Presence Sensor (H):

- **Outputs `0` if no human is present.**
- **Outputs `1` if a human is present.**

Logic Operations Output:

1. **LED Light (L):**
    - **The LED light turns ON (L=1) if a human is present (H=1) and it**

is dark (L=0).

- **The LED light remains OFF (L=0) if no human is present (H=0) or if it is light (L=1).**

2. Fan (F):

- **The fan turns ON (F=1) if a human is present (H=1) and the temperature is above 20 degrees (T=1).**
- **The fan remains OFF (F=0) if no human is present (H=0) or if the temperature is 20 degrees or lower (T=0).**

Equipment List with Estimated Costs:

Breadboard: 200tk

PIR Motion Sensor: 95tk

7408 AND Gate: 25tk

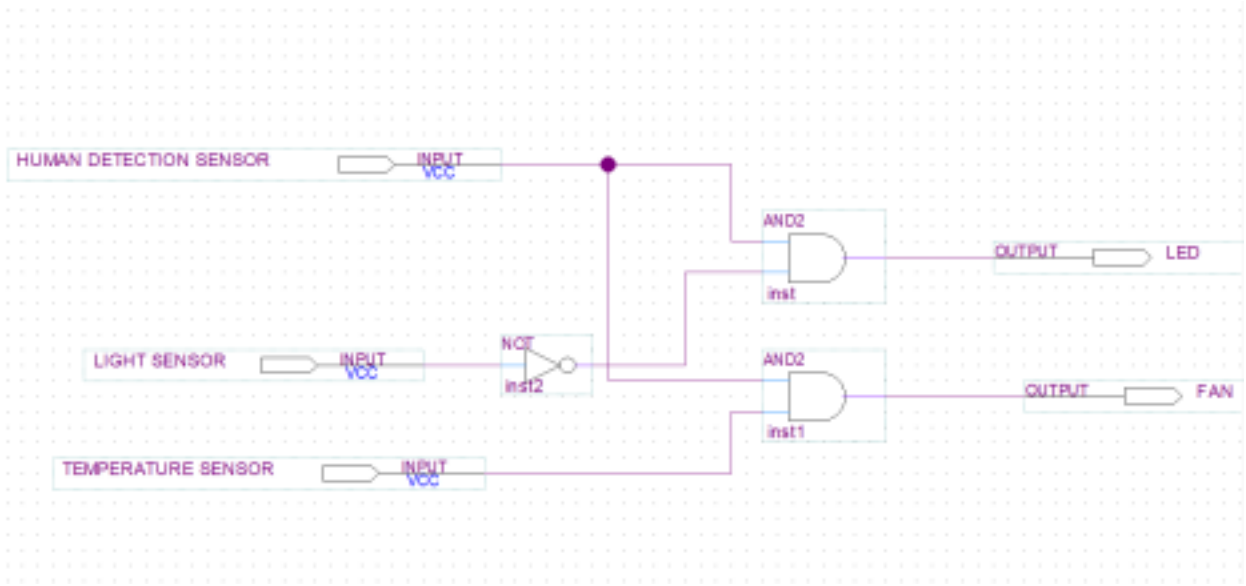
7404 NOT Gate: 20tk

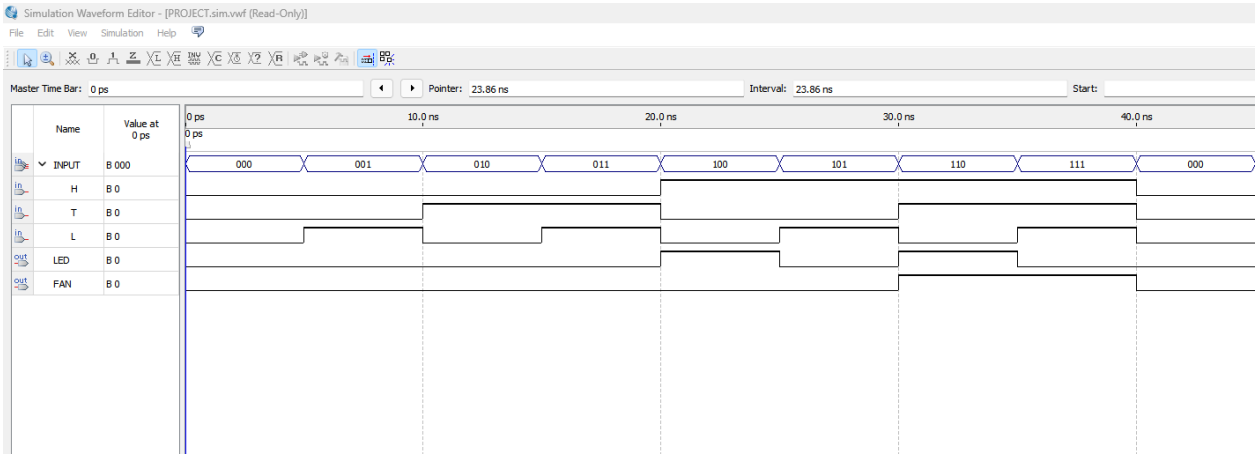
Digital Temperature Module: 95tk

LDR Sensor Module: 75tk

Wires: 50tk
LED: 5tk
DC Fan: 90tk

Diagram:


HUMAN DETECTION SENSOR
INPUT
VCC
LIGHT SENSOR
INPUT
VCC
TEMPERATURE SENSOR
INPUT
VCC
NOT
inst2
AND2
inst
AND2
inst1
OUTPUT
LED
OUTPUT
FAN


Simulation Waveform Editor - [PROJECT.sim.vwf (Read-Only)]
File Edit View Simulation Help
Master Time Bar: 0 ps
Pointer: 23.86 ns
Interval: 23.86 ns
Start:
Name
Value at 0 ps
INPUT
B 000
H
B 0
T
B 0
L
B 0
LED
B 0
FAN
B 0
0 ps
10.0 ns
20.0 ns
30.0 ns
40.0 ns
000
001
010
011
100
101
110
111
000

Discussion:

The Smart Room Automation System is a highly effective example of combinational logic circuits being integrated with real-world applications through sensors. This project utilizes basic components, such as a light sensor (L), temperature sensor (T), and human presence sensor (H), combined with logical gates (AND, NOT) to automate two devices: an LED light and a fan.

The system's design demonstrates how environmental and human factors can be efficiently utilized to control room automation. By making use of a combination of sensors, the system reduces unnecessary energy consumption. For instance, the LED light turns on only when both conditions are met: it is dark in the room, and a human is present. This ensures that the lighting system operates only when it is required, minimizing wastage of electrical energy, particularly in environments like homes and offices.

Similarly, the fan operates only when a person is in the room and when the temperature exceeds 20°C. This conditional activation allows the system to provide comfort while conserving energy when the room is unoccupied or the temperature is already low.