

Components Overview

1. Automatic Light and Temperature Based Control System Using LDR
and DHT11 Sensor

AND

2. Smart Object Detection and Environment Control System Using LDR
and Ultrasonic Sensor

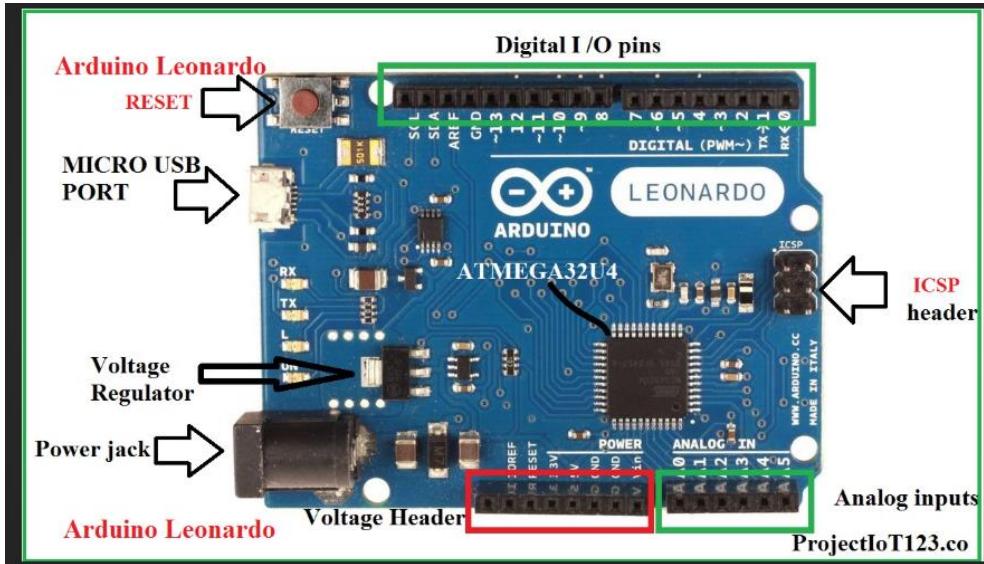
Name: TEENA SHARMA

Year: 2025

Technology: Arduino

Common Components (Used in Both Projects)

1. Arduino Uno



Role

Arduino Uno acts as the main microcontroller board of the system. It reads sensor inputs and controls output devices such as the LED and DC fan.

Why Used in the Project

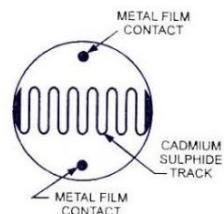
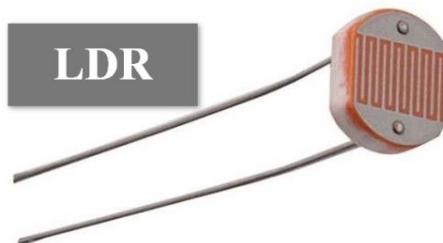
It was used because it provides sufficient digital and analog input/output pins to connect sensors like LDR, DHT11, and Ultrasonic Sensor. It enables implementation of logical control conditions through programming.

Working Concept

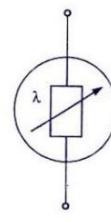
Arduino receives input signals from connected sensors through its analog and digital pins. The ATmega328P microcontroller processes these inputs based on programmed logic. After processing, it sends output signals through digital or PWM pins to control devices like LEDs and fans.

2. LDR (Light Dependent Resistor)

Photoresistor or Light Dependent Resistor (LDR)



(a) Basic Structure



(b) Symbol

Role

The LDR detects the intensity of surrounding light and provides analog input to the Arduino.

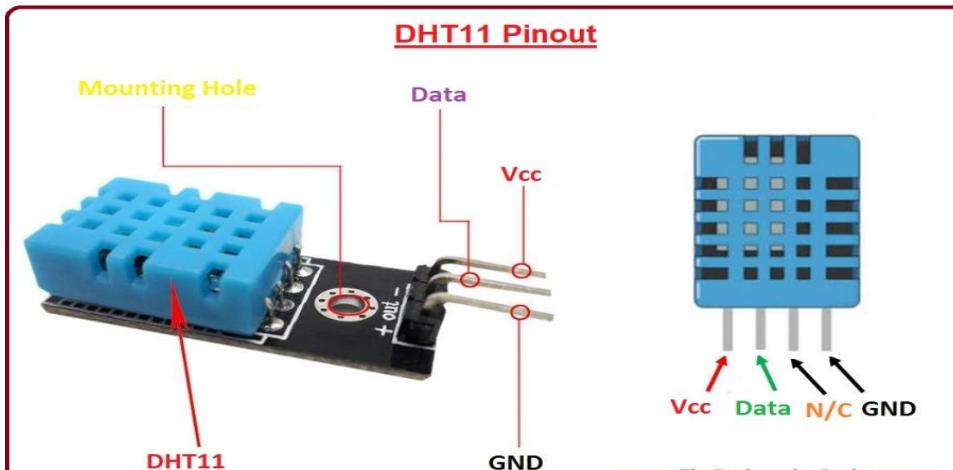
Why Used in the Project

It was used to automatically control the LED based on ambient light conditions. When light intensity decreases, the system turns the LED ON.

Working Concept

The resistance of the LDR decreases as light intensity increases. It is connected in a voltage divider circuit, producing varying analog voltage values that are read by the Arduino to determine brightness levels.

3.DHT11 Sensor (Project 1)



Role

The DHT11 sensor measures temperature and humidity of the environment.

Why Used in the Project

It was used to automatically activate the DC fan when the temperature exceeds a predefined threshold.

Working Concept

The sensor measures environmental temperature and converts it into a digital signal. This data is transmitted to the Arduino, which compares it with preset conditions and controls the fan accordingly.

4. Ultrasonic Sensor (HC-SR04) (Project 2)



Role

The ultrasonic sensor measures the distance of nearby objects.

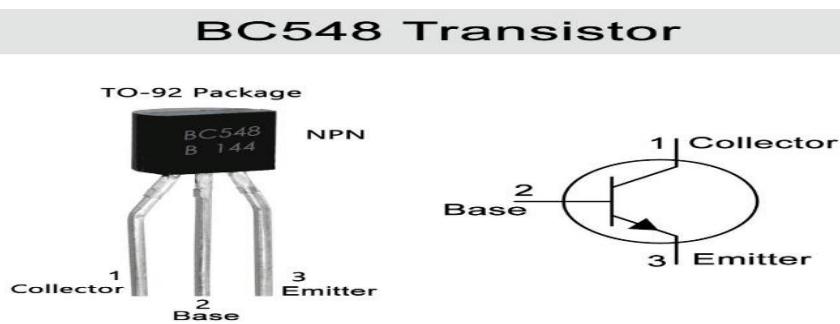
Why Used in the Project

It was used to detect the presence of an object within a specified range and trigger automatic control actions.

Working Concept

The sensor emits ultrasonic sound waves and waits for the echo to return after hitting an object. The time taken for the echo to return is used to calculate the distance, which is then processed by the Arduino.

5. BC548 Transistor



Role

The BC548 transistor acts as a switching device to control the DC fan.

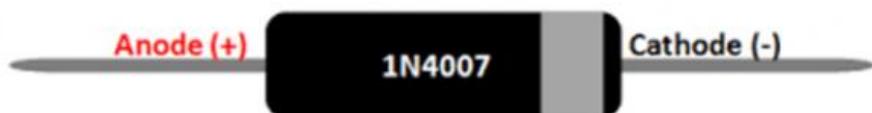
Why Used in the Project

It was used because the Arduino cannot directly supply enough current to drive the fan safely. The transistor allows a small control signal to switch a higher current load.

Working Concept

A small current from the Arduino is applied to the base terminal of the transistor. This allows a larger current to flow between collector and emitter, thereby powering the fan.

6. Diode (1N4007)



Role

The diode protects the circuit from voltage spikes generated by the DC fan.

Why Used in the Project

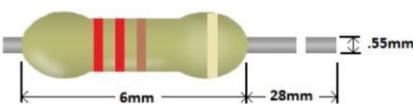
It was used to prevent damage to the transistor and Arduino caused by back EMF from the motor.

Working Concept

When the fan is switched OFF, it may generate reverse voltage. The diode provides a safe path for this reverse current, preventing it from reaching sensitive components.

7. Resistors (220Ω and Base Resistor)

220 Ohm , 1/4W , 5%
CF14JT220R



PRECISION - Have three significant-figure bands, a multiplier band and a tolerance band. Tolerances 1% or less.

GENERAL PURPOSE - Have two significant-figure bands, a multiplier band and a tolerance band. Tolerances 2% or greater.

COLOR BAND DESCRIPTION		
BAND	PRECISION	GENERAL PURPOSE
1ST BAND	NOMINAL	NOMINAL
2ND BAND	NOMINAL	NOMINAL
3RD BAND	NOMINAL	MULTIPLIER
4TH BAND	MULTIPLIER	TOLERANCE
5TH BAND	TOLERANCE	-

Role

Resistors control current flow within the circuit.

Why Used in the Project

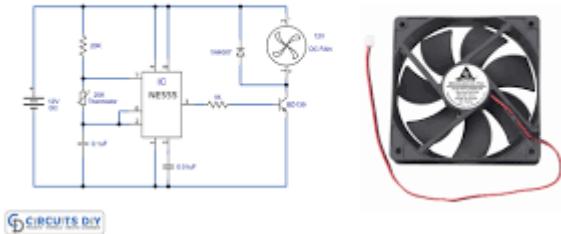
The 220Ω resistor was used to limit current to the LED and prevent damage. The base resistor was used to control current entering the transistor.

Working Concept

Resistors reduce current to safe levels by opposing the flow of electrical charge, ensuring safe and stable circuit operation.

8. DC Fan

Temperature Controlled Fan



Role

The DC fan acts as the output device for ventilation and cooling.

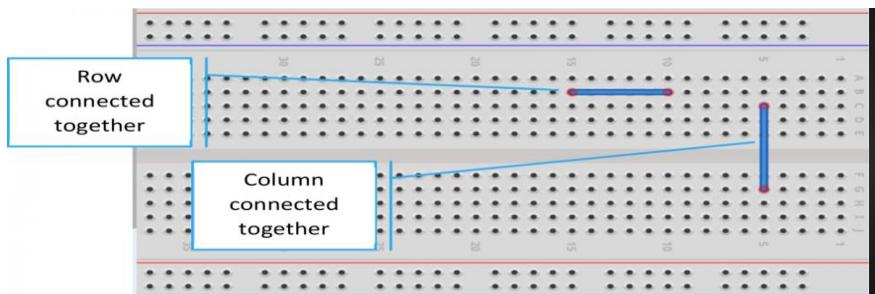
Why Used in the Project

It was used to demonstrate automatic environmental control based on temperature or object detection conditions.

Working Concept

When the Arduino sends a control signal through the transistor, electrical power is supplied to the fan, causing it to rotate and provide airflow.

9. Breadboard and Jumper Wires



Breadboard



Jumper Wires

Role

They are used to assemble and connect the circuit components.

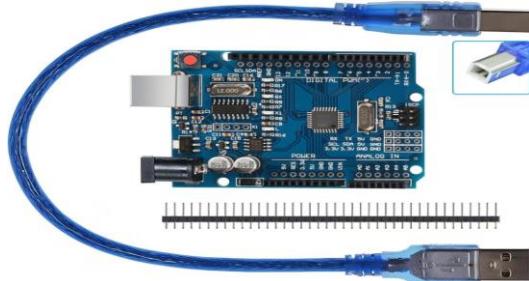
Why Used in the Project

They allow easy circuit setup and modification without soldering.

Working Concept

The breadboard provides interconnected internal pathways that enable components to be connected electrically using jumper wires.

10. USB Cable and Arduino IDE



Role

They are used for programming the Arduino board.

Why Used in the Project

They enable writing, editing, and uploading the program that controls the entire system.

Working Concept

The USB cable connects the Arduino to a computer. The Arduino IDE compiles the code and uploads it to the microcontroller for execution.