



# **Infrared Communication:** (Short-Range Wireless Technology)

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# What is Infrared?

## Electromagnetic Spectrum

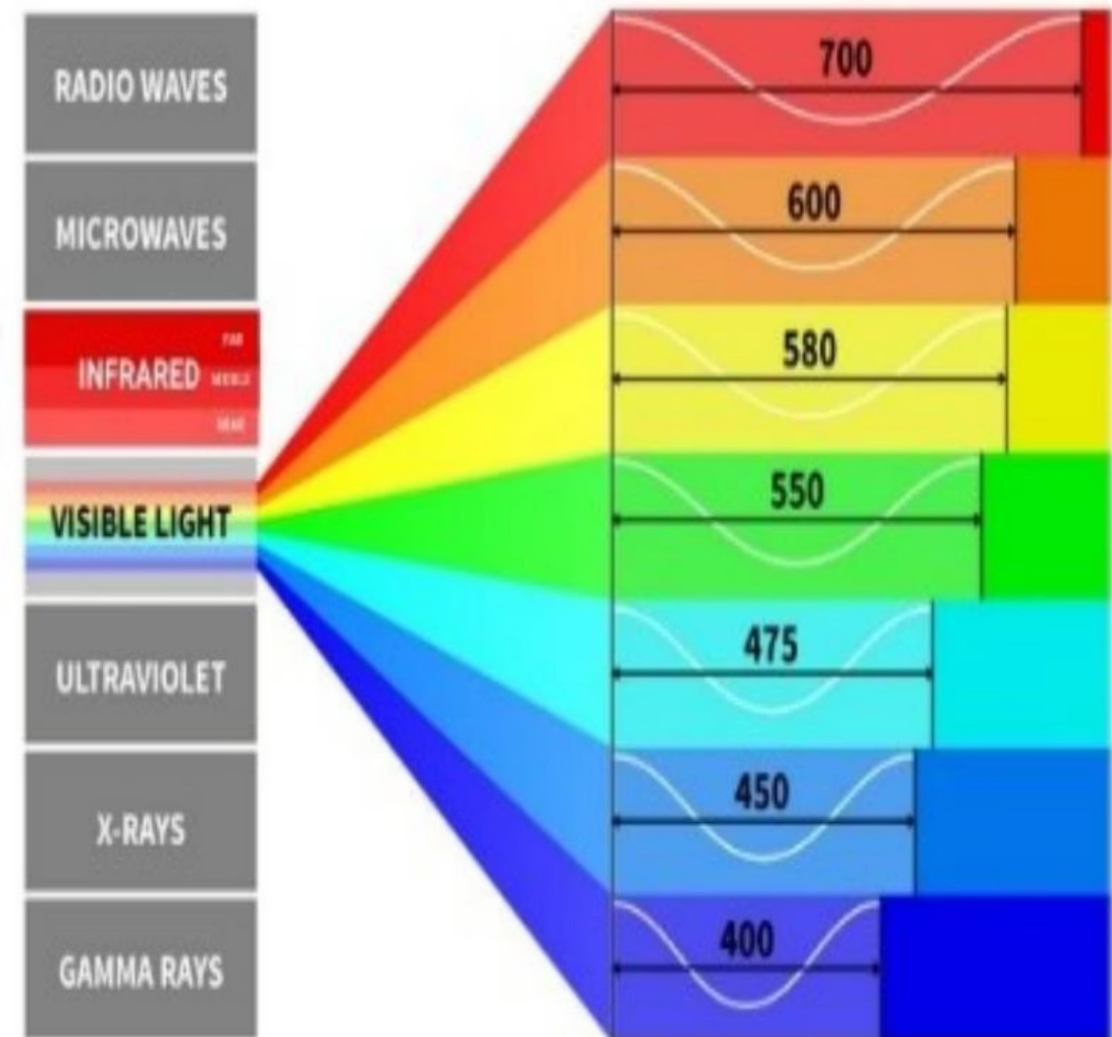
Infrared means 'below red' with a wavelength of 700 nm to 1 mm.

## Purpose

Developed as a low-cost, simple wireless alternative for device control.

## Communication Range

Used for short-range, line-of-sight communication, like TV remotes.





# The Basic Principle of IR Communication



## Light Waves

Communication occurs through invisible infrared light waves.



## Transmitter

An Infrared LED sends the signal.



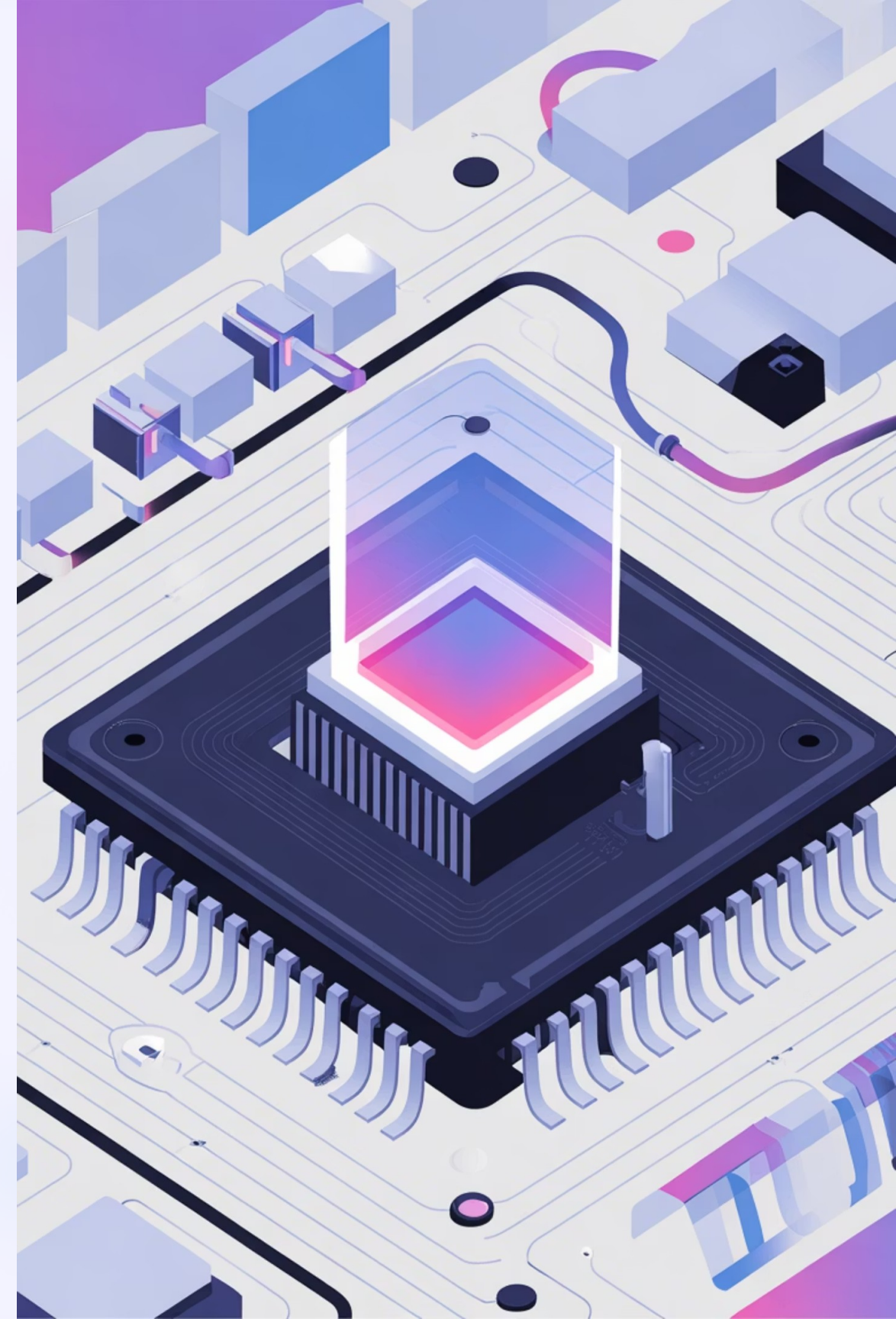
## Receiver

A photo-diode or phototransistor detects the signal.

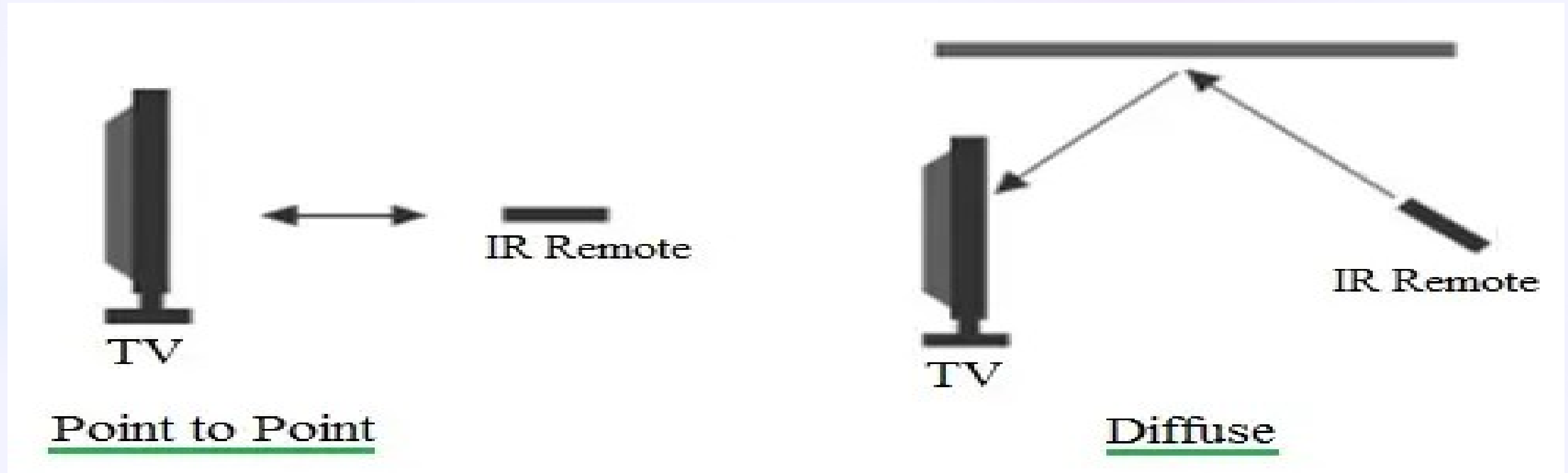


## Data Transmission

Data is sent as light pulses representing binary data.



# Three Types of Infrared Communication



## Point-to-Point

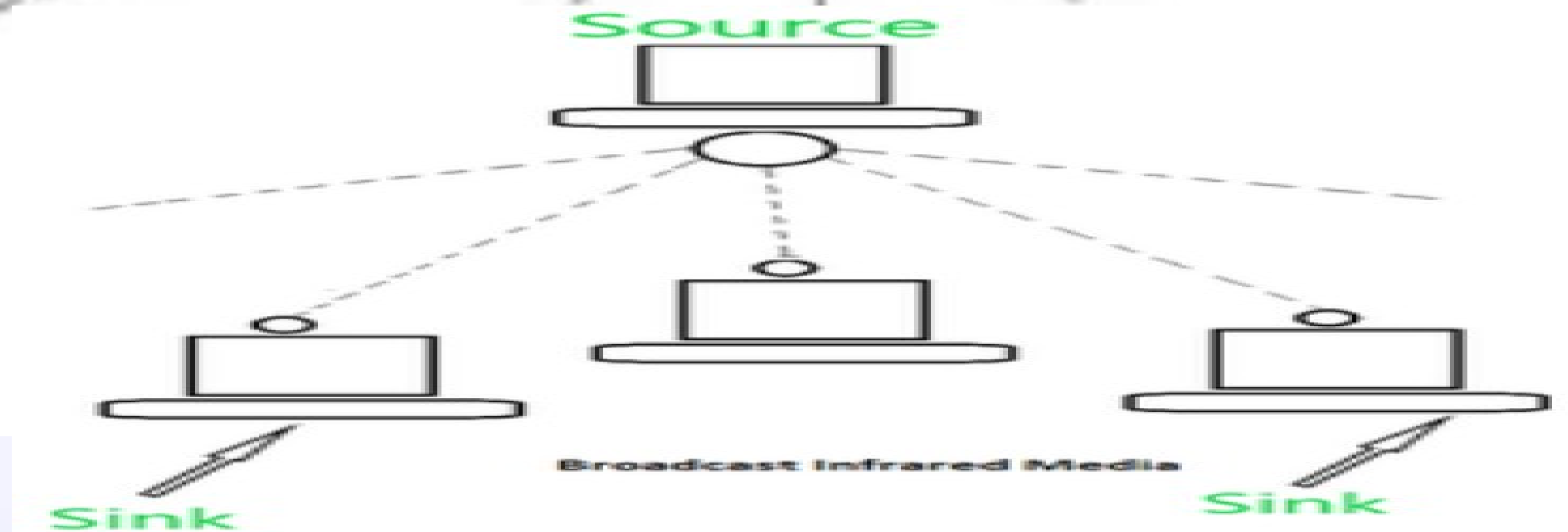
Direct, line-of-sight communication between two devices (e.g., remote and TV).

## Diffuse

Signals are reflected from walls or ceilings to reach the receiver.

## Ir-DA Standard

High-speed data exchange protocol (older technology) for devices like laptops or phones.



## Key Characteristics of IR Technology

1-5m

Range

Short communication distance.

16 Mbps

Data Rate

Maximum speed under the IrDA standard.

Low

Power

Low power consumption, making it battery friendly.

High

Directionality

Requires a clear line-of-sight.

# Advantages: Why IR Remains Relevant



## Low Cost

Easy and inexpensive to implement in devices.



## High Security

Cannot penetrate walls, limiting eavesdropping.



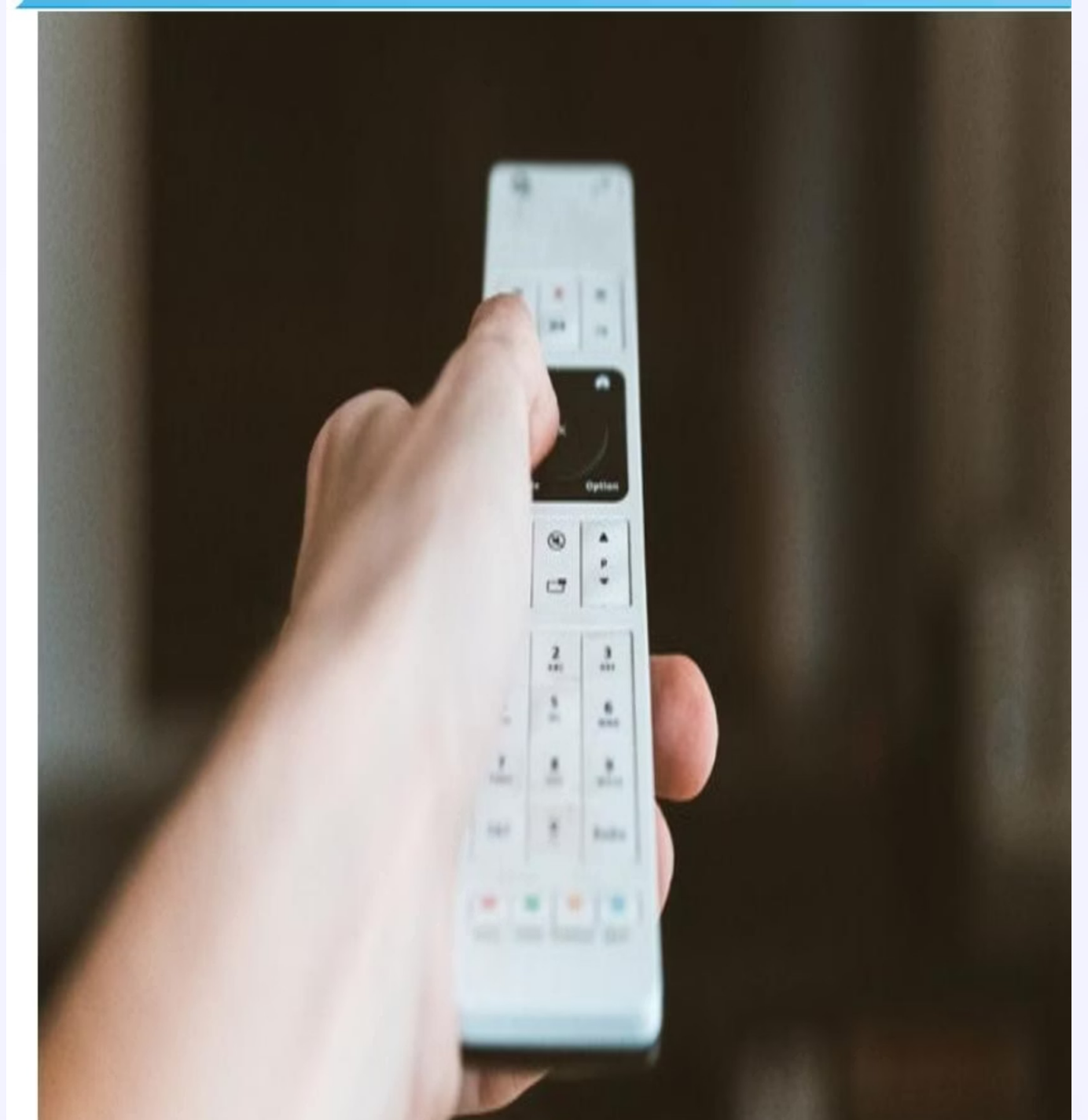
## Low Power Usage

Efficient and friendly for battery-operated devices.



## No Interference

Free from radio signal interference.







# Disadvantages: Limitations of IR



## Short Range

Limited communication distance (1-5 meters).



## Line-of-Sight

Requires clear path; easily blocked by obstacles.



## Light Sensitivity

Performance is affected by sunlight or bright indoor lights.



## Slower Data Rate

Slower compared to modern standards like Wi-Fi or Bluetooth.

# Diverse Applications of Infrared

Infrared technology is used across various sectors, from consumer electronics to industrial systems.

## Device Control

TVs, AC units, and projectors.

## Sensing

Motion detectors and automatic doors.

## Security

Intrusion detection systems.

## Specialized Instruments

Industrial and medical equipment.





# Case Study: The TV Remote Process

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## Button Press

Circuit generates the corresponding binary code.

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## Signal Transmission

IR LED sends modulated light pulses.

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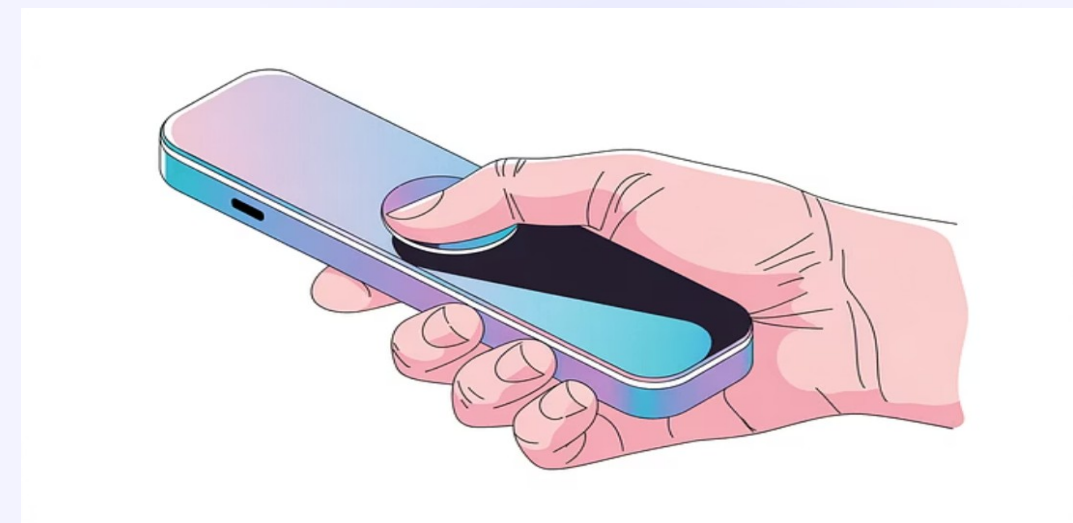
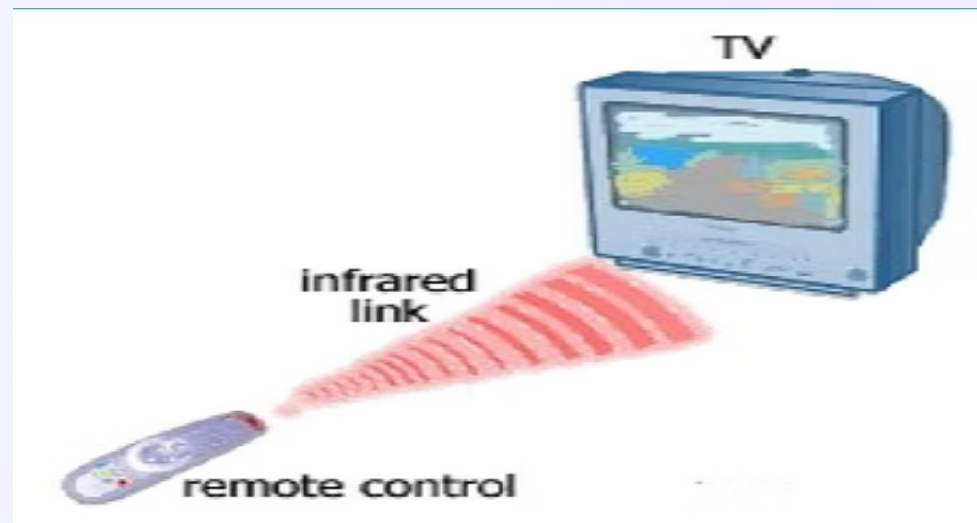
## Signal Reception

TV receiver detects and decodes the signal.

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## Action Performed

TV executes the desired command (e.g., volume up).



# Conclusion: The Enduring Role of IR

## Core Strengths

Secure, simple, and low-cost short-range communication.

## Best Use Cases

Ideal for device control, sensor applications, and embedded systems.

## Modern Relevance

Still vital in thermal imaging, robotics, and gesture control.

Invisible light continues to play a visible role in communication.



Thank You