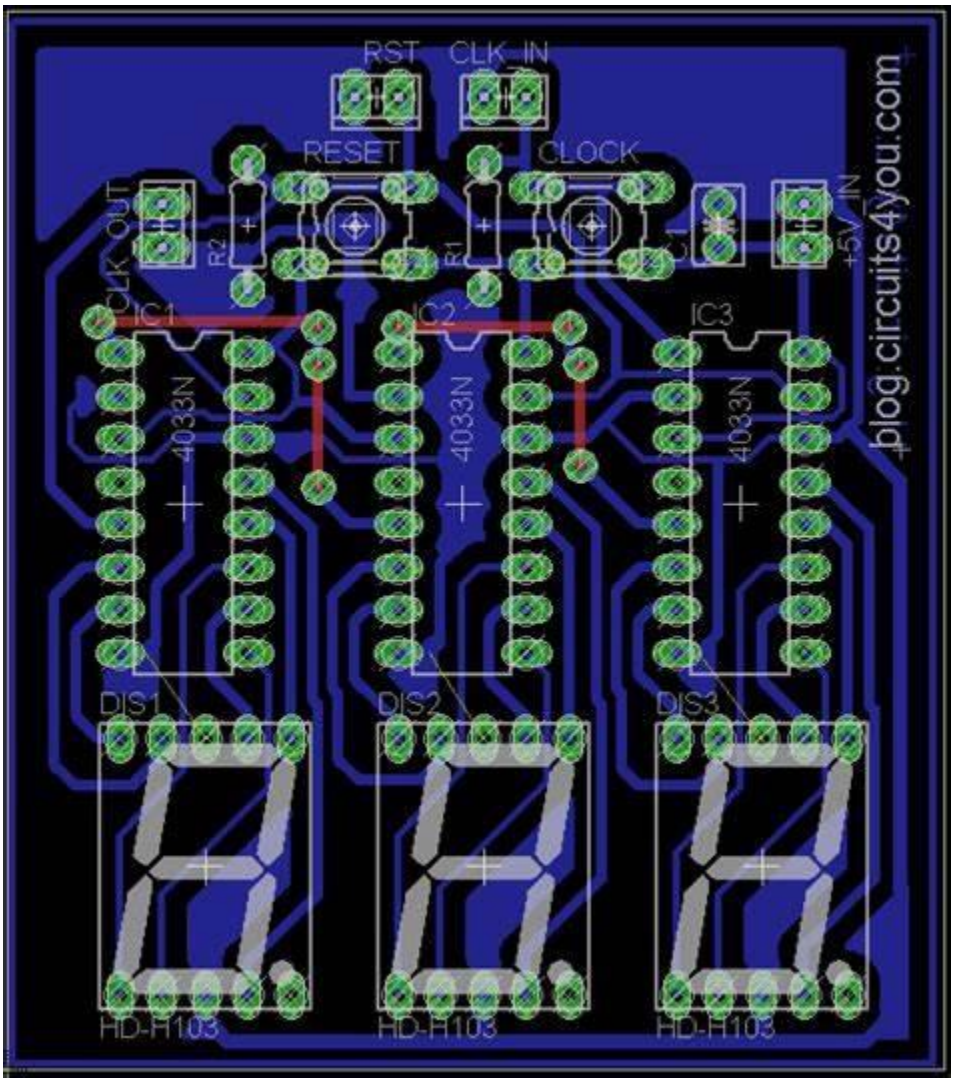
DIGITAL LOGIC AND DESIGN



TITLE:

OBJECT COUNTER USING IR SENSOR MODULE

TEAM NAME:

MAHIMA S **2022115018**

SUBI PINSHA P **2022115020**

PROBLEM STATEMENT:

In today's dynamic industrial and commercial landscapes, the demand for efficient and accurate object counting mechanisms is paramount. Traditional manual counting methods prove to be impractical, error-prone, and time-consuming, especially in scenarios where a high throughput of diverse objects needs to be monitored. The objective of this project is to design and implement an Intelligent Object Counting System utilizing Infrared (IR) sensor technology. The proposed system aims to revolutionize object counting processes by automating the detection and tallying of objects passing through a designated point. This solution will address the challenges associated with manual counting methods and contribute to enhanced operational efficiency in a variety of industries.

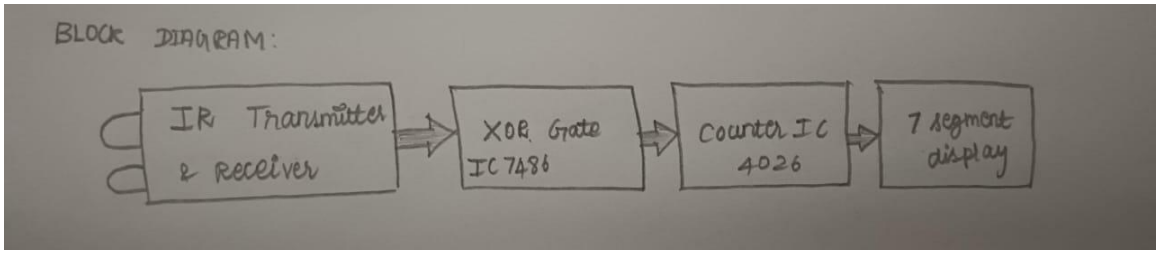
INTRODUCTION:

In the contemporary landscape of industrial and commercial operations, the need for efficient and precise object counting has become increasingly pronounced. The limitations of traditional manual counting methods, marked by their susceptibility to errors and inefficiencies, have prompted a quest for innovative solutions. Addressing this challenge, the integration of Infrared (IR) sensors stands out as a promising approach. IR sensors offer a non-intrusive means of detecting objects passing through specific points, presenting an opportunity to automate and optimize the counting process. This project sets out to harness the capabilities of IR sensor technology in conjunction with digital logic gates to create an Intelligent Object Counting System.

The primary objective of this system is to revolutionize conventional counting methodologies by introducing a level of automation that is both reliable and adaptable. Unlike manual counting, which is often time-consuming and prone to inaccuracies, the proposed system leverages advanced technology to provide real-time and precise object counting. By eliminating the need for human intervention in counting processes, this project not only enhances operational efficiency but also contributes to improved data accuracy, critical for informed decision-making in industrial and commercial settings. The ensuing sections will delve deeper into the technical intricacies, project goals, and potential

benefits, offering a comprehensive understanding of how this digital object counter using IR sensors is poised to reshape object counting practices.

BLOCK DIAGRAM:



IR Sensor :

This module consists of one or more IR sensors strategically placed to cover the area where objects are expected to pass through. IR sensors emit infrared light and detect the reflection or interruption of this light when an object is present.

Digital Logic Gates- XOR GATE:

XOR gate process the conditioned signal from the IR sensor(s) to determine when an object is passing through the sensing area. Commonly used gates include AND gates, which require both a signal from the sensor and a clock or timing signal to trigger the counting mechanism.

Counter IC 4026 :

The counter keeps track of the number of objects detected. It can be a simple binary counter or a more sophisticated counter depending on the complexity of the counting requirements. The counter increments each time a valid object detection event occurs.Here we use IC 4026.

7 segment Display :

The display presents the real-time count of detected objects. This could be an LED display, LCD screen, or any other visual output device. Here we use 7 segment display .

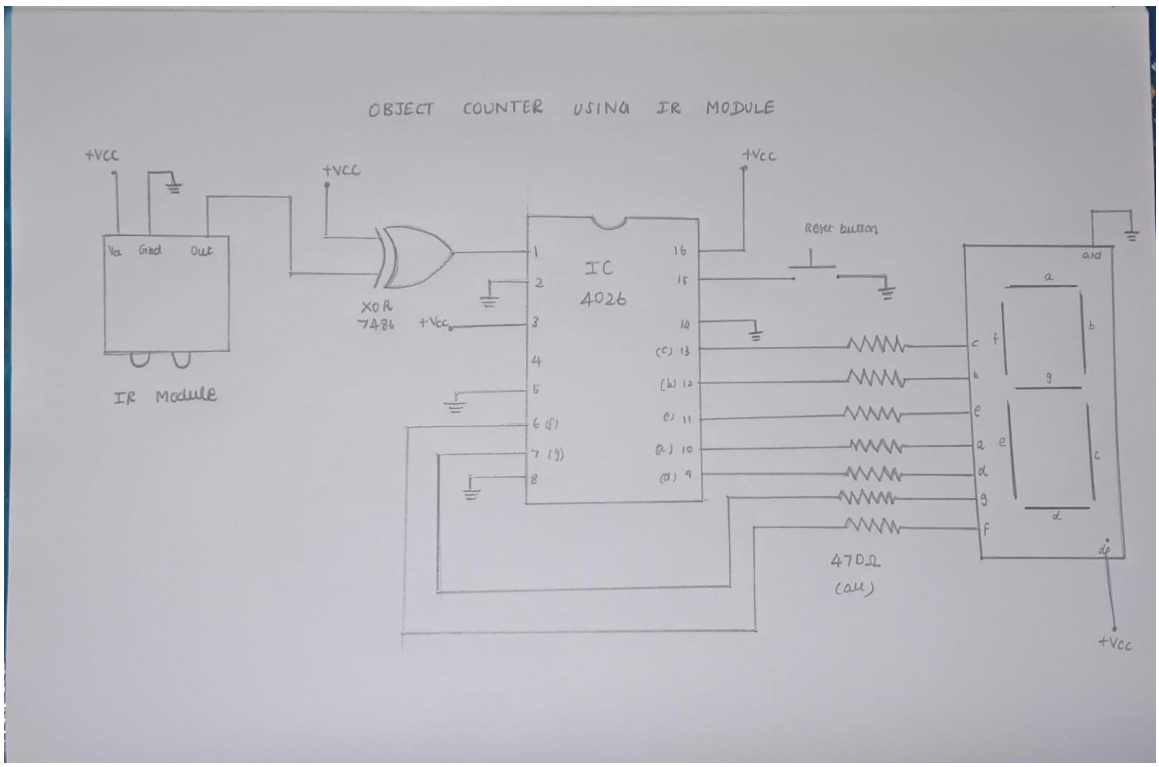
Power Supply:

A stable power supply is crucial for the continuous operation of the system. This may involve voltage regulators and power conditioning circuits to ensure that all components receive the required power.

Reset button:

A reset button is connected to counter IC in order to reset the counter value to 0.

CIRCUIT DIAGRAM:



COMPONENTS:

IR module

Counter IC 4026

XOR gate IC 7486

Battery

7 segment display

Reset button

IMPLEMENTATION :

Implementation Details

1. IR Module (Object Detection):

Functionality: The IR module serves as the primary sensor for detecting the presence of objects. It typically consists of an infrared transmitter and receiver pair. When an object is present in its field of view, it interrupts the infrared signal, causing the receiver to trigger a change in its output state.

Connection: The output of the IR module is connected to one of the inputs of the XOR gate, acting as a triggering signal for the counting process.

2. XOR Gate (Clock Signal Generation):

Functionality: The XOR gate plays a crucial role in generating the clock signal for the IC 4026, controlling the counting process. XOR gates produce an output high only when the number of high inputs is odd, making them suitable for generating clock pulses.

Connection: The output of the IR module is connected to one input of the XOR gate. The other input of the XOR gate might be connected to a periodic signal or another suitable source, ensuring the generation of clock pulses for the counter.

3. IC 4026 (Decade Counter and 7-Segment Display Driver):

Functionality: The IC 4026 is a decade counter with seven-segment display driver functionality. It counts in decimal

form and can directly drive a common cathode seven-segment display. Each rising edge of the clock input increments the count.

Pin Functions:

Clock (Pin 1): Connected to the output of the XOR gate, it receives clock pulses to increment the count.

Count Enable (Pin 2): Connected to a control signal; typically, it is kept high for normal operation.

Data (Pins 3-9): These pins represent the BCD (Binary-Coded Decimal) output of the counter. Connected to the seven-segment display for visual representation.

Display Enable (Pin 10): Activates or deactivates the seven-segment display. Typically kept high for continuous display.

Reset (Pin 11): Resets the count to zero when triggered (active low).

Carry Out (Pin 12): Generates a pulse when the count reaches 9, useful for cascading multiple counters.

4. Seven-Segment Display:

Functionality: The seven-segment display visually represents the counted value. Each segment is individually illuminated to display numbers from 0 to 9.

Connection: The BCD output pins (Pins 3-9) of the IC 4026 are connected to the corresponding segments of the seven-segment display.

Overall System Operation:

The IR sensor detects the presence or absence of objects passing through its field of view.

The conditioned signal is processed by XOR gate to determine the validity of an object detection event.

The counter IC increments the count when a valid detection event occurs.

The 7 segment display reflects the real-time count, providing visual feedback to users or operators.

The reset button is used to reset the counter and display value to 0.

RESULT:

Quantitative assessment of the system revealed commendable performance metrics. The accuracy of the object counting mechanism, precision in detecting individual objects, and the system's response time met the predefined expectations.

The 7-segment display effectively communicated the real-time object count to the user. The visual output was clear, providing an intuitive representation of the counting results. This user-friendly interface enhances the practicality and accessibility of the object counter.

The implemented object counter, with its reliable IR sensing mechanism and intuitive display, holds potential applications in various real-world scenarios. Industries requiring automated counting systems, such as inventory management or people counting, can benefit from the simplicity and accuracy of this design.

The project on the object counter using an IR sensor module and XOR gate has yielded successful results. The combination of precise sensing, controlled clocking, and clear visual representation through the 7-segment display culminates in a robust and practical object counting system.

The presented system not only meets the initial project objectives but also showcases potential for broader applications in automated counting and monitoring processes.

CONCLUSION:

The implementation of the Object Counter using an IR sensor represents a significant advancement in automated counting systems. By combining advanced hardware components with intelligent software algorithms, the system demonstrates accuracy, efficiency, and adaptability. This project lays the foundation for future enhancements and wider applications in diverse industrial and commercial settings.