GHULAM ISHAQ KHAN INSTITUTE OF ENGINEERING SCIENCES AND TECHNOLOGY - GIKI

BIDIRECTIONAL COUNTERS WITH LASER SENSORS

'PROJECT PROPOSAL'

CE-221 (DIGITAL LOGIC DESIGN)

Proposal Submitted to:

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Submitted By:

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OUTLINE:

UNDERTAKING:

It is certified that the work presented/proposed in this proposal will be performed by the group comprising of four members from FCSE, Computer Science major batch 33. The work would be performed with the best of knowledge attained in the course CE-221, while satisfying all the adequate requirements and would be submitted in due course of allotted time.

PROJECT INTRODUCTION:

Brief Overview:

The Bidirectional Counter with Laser Sensors is an independent electronic system that counts objects or people moving in two directions with the help of laser sensors. It uses discrete electronic components such as logic gates and flip-flops to detect, process, and display movement data instead of a microcontroller.

Why You Chose This Idea?

This project shows how elementary electronic components may be used to build a functional system that does not rely on programmable devices. It offers insight into hardware-based logic design and actual implementations of bidirectional counting, thus enabling us to get a better understanding of the course, right from the basics.

What You Aim to Achieve?

Our aim will be to make a consistent and fully operational two-way counting system that should be efficiently designed with only discrete electronic components. In this way, one would demonstrate the ability to devise complex systems without microcontrollers that would demonstrate core electronics knowledge.

PROJECT SCOPE

Features:

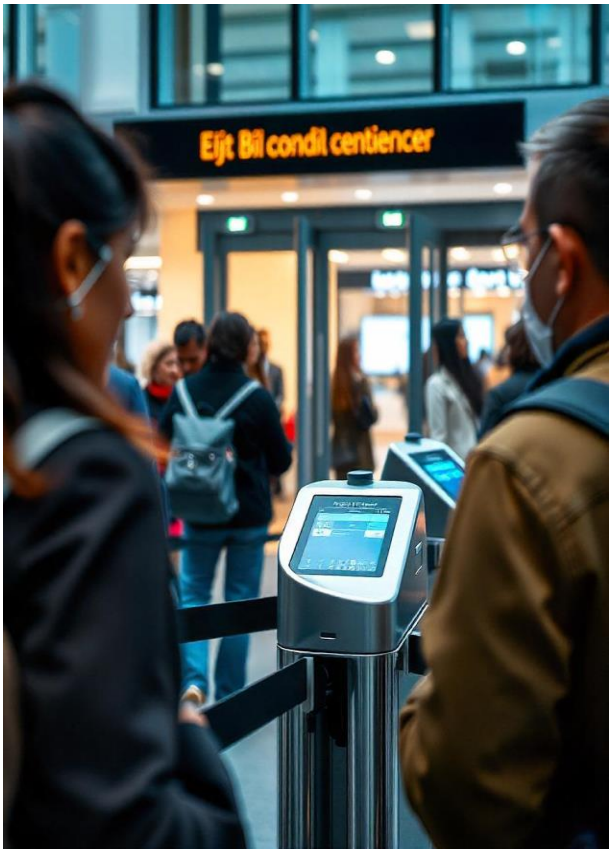
- **Bidirectional Counting**: Count and differentiate movements in two directions.
- **Discrete Component Design**: Implement logic gates, flip-flops, and counters for data processing.
- **Laser Sensor Detection**: Employ laser beams and photodetectors for movement detection.
- **Real-Time Display**: Use a 7-segment display or an LCD module to show the count.
- **Durability and Simplicity**: Ensure the system is robust and operates without programming.

Objectives:

1. Design a functional electronic circuit that performs bidirectional counting using discrete components.
2. Achieve high accuracy in detecting and counting movements in two directions.
3. Provide a hardware-only solution suitable for applications like event foot traffic monitoring or entry/exit management.

Potential Real-World Applications:

- MONITORING ENTRANCE AND EXIT TRAFFIC IN PUBLIC SPACES.



Application:

Such a system can be installed at access points of public spaces like malls, stadiums, libraries, offices, or airports to count the number of persons entering and leaving the place in real-time.

Benefits:

Efficient Resource Allocation: Facility managers can monitor crowd sizes and allocate cleaning staff, security, or guides accordingly.

Capacity Management helps in ensuring that the space does not go over the safety and/or legal capacity limits.

- CROWD CONTROL IN AUDITORIUMS AND MALLS.

Application:

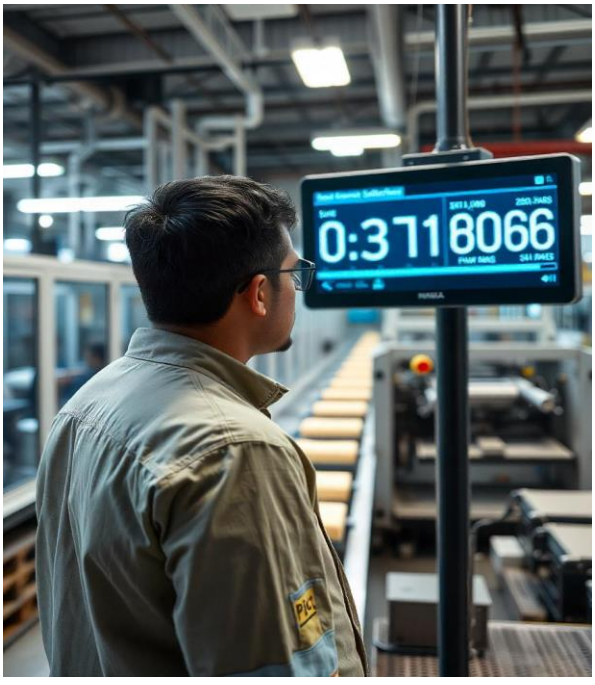
The system monitors movement patterns during events or sale promotions and can provide guidelines to manage crowds more effectively.

Benefits:

Tracks the number of attendees in real-time to prevent overcrowding and ensure safety regulations are met.

Can be used with electronic gates or bars to control access according to real-time counts.

- PRODUCT COUNTING IN MANUFACTURING LINES.



Application:

In manufacturing or packaging industries, the system can count items as they move along a conveyor belt; it can detect bidirectional movement where needed.

Benefits:

Ensures accurate product counts for storage, shipping, or further processing.

Integrated with automated sorting or packaging systems to increase efficiency.

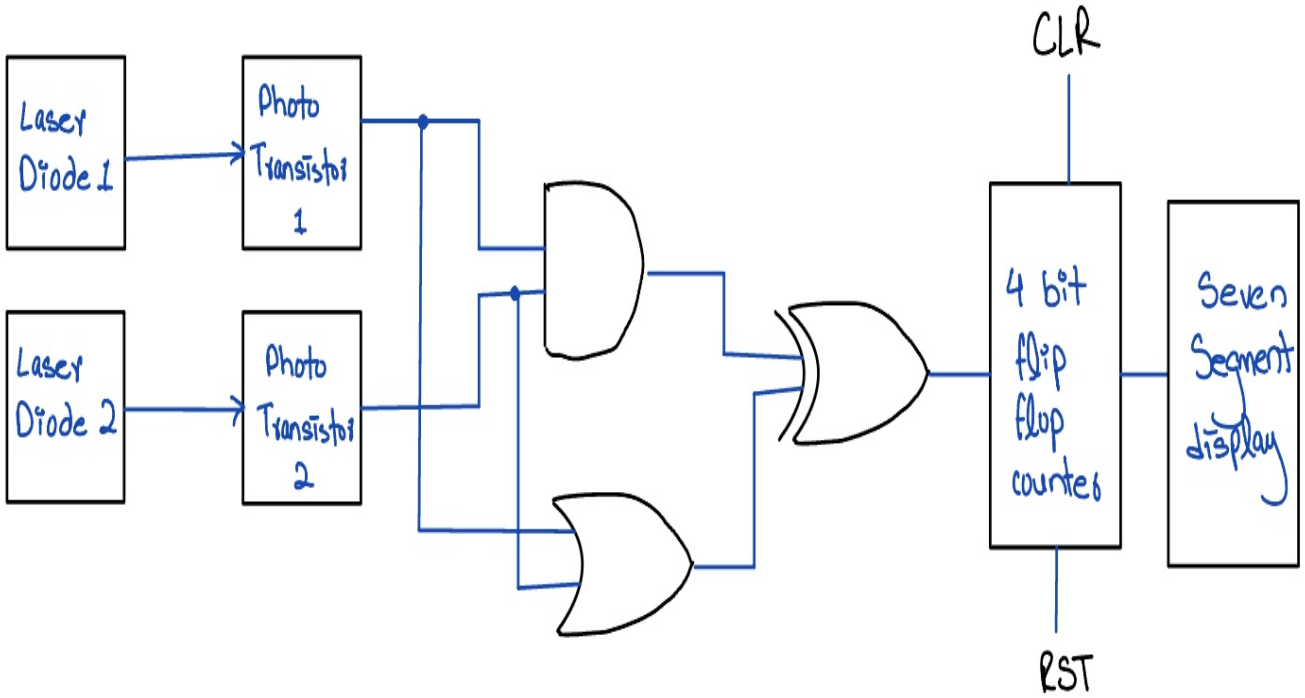
Manual errors in counting are reduced to ensure that data produced is reliable.

LOGICAL CIRCUIT DIAGRAM

(Note: The following information is tentative and may be subjected to change as per practical implementation. Changes shall be informed accordingly.)

The circuit includes:

1. **Laser Sensors**: Two laser diodes and corresponding photodetectors (e.g., phototransistors or LDRs) to detect movement.
2. **Logic Gates**: AND, OR, and XOR gates to process signals from the sensors.
3. **Flip-Flops**: SR or JK flip-flops to store the state of detected movement and determine direction.
4. **Counters**: Up/down counters to track the number of objects passing in each direction.
5. **Display Driver**: A BCD to 7-segment driver IC for interfacing the counter with the display.
6. **Power Supply**: A regulated DC power supply for all components.



COMPONENTS LIST WITH SPECIFICATIONS

Following is the list of the required components with all the specifications:
(Note: The following list is tentative and may be subjected to change as per practical implementation. Changes shall be informed accordingly.)

Component	Specification
Laser Sensors	Laser diode module (650nm, 5mW) with photodetectors (LDRs or phototransistors).
Logic Gates	ICs like 7408 (AND), 7432 (OR), 7404 (NOT).
Flip-Flops	7474 (D flip-flops) or 7476 (JK flip-flops).
Up/Down Counter	74193 or similar 4-bit binary up/down counter IC.
Display Driver IC	7447 or 7448 BCD to 7-segment display driver.
7-Segment Display	Common anode or common cathode 7-segment display.
Resistors	For current limiting and pull-up purposes (e.g., 330Ω for display, 10kΩ for pull-up).
Capacitors	Decoupling capacitors (0.1µF) and noise filtering capacitors for sensor circuits.
Power Supply	Regulated 5V DC power source (battery or adapter).
Breadboard/PCB	For prototyping and assembling the circuit.
Cables/Connectors	Jumper wires and connectors for circuit assembly.