National Institute of Technology

Agartala



ELECTRONICS AND INSTRUMENTATION

# ENGINEERING DEPARTMENT

Group Name : The conquerors

Project : Digital solar tracker

Laboratory : Digital Electronics

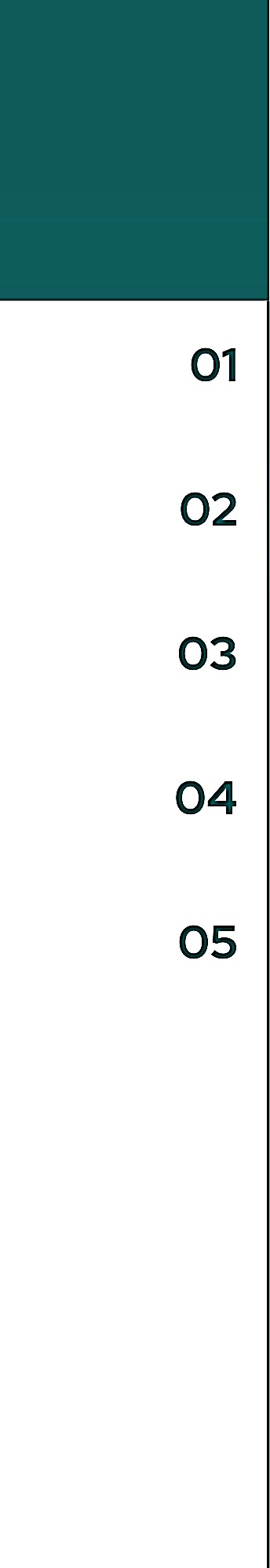
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Table of

# CONTENTS

Member List

Acknowledgement

Abstract

Working principle Circuit Diagram

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for "Digital Electronics" laboratory under the support and guidance of Dr. Yogesh Kumar Sariya for which we express our heartfelt gratitude. We expect that this project will be a valuable addition to both the laboratory and our skills and will act as a stepping point for all of us in learning and enjoying the Digital Electronics and knowing what it is all about. We again express our gratitude to Dr. Yogesh sir and hope we'll work closely for the completion of this project

- "The conquerors"

### Abstract

A solar tracker can be built using only logic gates or op-amps. This approach uses combinational logic circuits to compare light intensity from sensors and control the motor accordingly.

Instead of a microcontroller, we use basic logic gates (AND, OR, NOT, XOR, etc.) to process signals from Light Dependent Resistors (LDRs) and activate the motor in the correct direction.

**Components Required**

* LDRs (Light Dependent Resistors) – Two for detecting light
* Comparator Circuit (Using Resistors & Transistors or Schmitt Triggers) – Converts LDR signals into digital HIGH (1) and LOW (0)
* Logic Gates (AND, OR, XOR, NOT, etc.) – Implement decision-making logic
* H-Bridge Motor Driver (Using Transistors or IC like L293D) – Controls DC motor direction
* Power Supply – 5V or 12V battery/solar panel
* Diodes – To prevent reverse current
* Relay (Optional) – For switching large loads
* LDRs Detect Light Difference

The primary objective of a digital solar tracker is to maximize the efficiency of solar energy collection by automatically adjusting the position of solar panels or mirrors to follow the sun's movement throughout the day. This ensures that the panels remain perpendicular to the sun’s rays, optimizing energy absorption and improving overall power generation

**Working and references**

Two LDRs are placed on opposite sides of the solar panel.

When the sun moves, one LDR gets more light than the other, changing its resistance.

LDR Signals Converted to Digital Signals

Using voltage dividers and Schmitt Triggers (or comparators), we convert the analog LDR signals into binary 1 or 0.

Logic Circuit Controls Motor Direction

A simple XOR gate can determine which side gets more light.

AND/OR gates decide whether to move the panel left or right.

The output is sent to the H-Bridge motor driver.

Motor Adjusts the Panel

If LDR1 > LDR2, the panel rotates right.

If LDR2 > LDR1, the panel rotates left.

If both LDRs get equal light, the motor stops.

Logic Circuit Design

Assume:

A = LDR1 output (binary signal)

B = LDR2 output (binary signal)

Motor Left (ML) = A AND NOT(B)

Motor Right (MR) = B AND NOT(A)

LDR1 (A) LDR2 (B) ML (Left) MR (Right)

0 0 0 0

0 1 0 1

1 0 1 0

1 1 0 0

🔹 Logic Expression:

ML = A AND NOT(B) → Moves Left

MR = B AND NOT(A) → Moves Right

References:

1. Implementation of Logic gates:

Digital design global edition :M.Morris Mano,Michael Ciletti

1. Google

**Circuit diagram**

