Whack A Mole Game.

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Abstract

This project focuses on designing and implementing a Whack-a-Mole game using basic electronic components. The game simulates the classic arcade experience where players hit randomly activated "moles" represented by LEDs. Push buttons are used for player interaction, while a scoring mechanism updates in real-time on a 7segment display. The system incorporates timers, logic gates, and counters to control LED activation and scoring. The outcome is an engaging, low-cost, and interactive circuit suitable for educational purposes.

Problem Statement

Traditional arcade games like Whack-a-Mole require expensive and bulky setups. This project aims to create a simplified, costeffective electronic version of the game using basic circuit components, making it accessible for hobbyists, students, and educators.

Objectives

1. Design a functional Whack-a-Mole game circuit.
2. Use LEDs to simulate "moles" lighting up randomly.
3. Implement a responsive scoring mechanism.
4. Ensure the game operates reliably using basic electronic components.
5. Create an educational and interactive system demonstrating the use of timers, counters, and logic gates.

I. Introduction

The Whack-a-Mole game is a popular arcade game where players hit targets that appear randomly within a short time frame. This paper presents the design and construction of a simplified electronic version of the game. The circuit uses logic gates, LEDs, push buttons, and scoring components to simulate the game's core functionality. The LEDs light up randomly, and players press corresponding buttons to score points. The game promotes reflex and timing skills while showcasing basic electronic principles.

II. Schematic Design

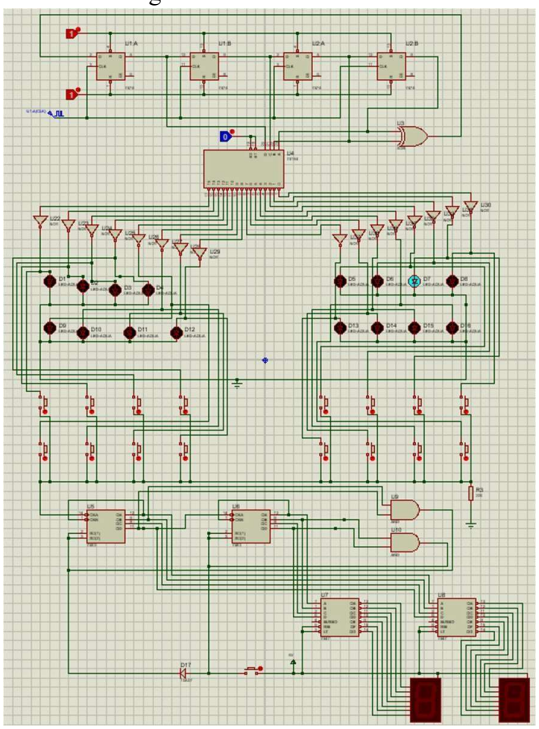

Fig - 1

Key Components and Features:

Software Simulation

The circuit was designed and simulated using Proteus software. The simulation validated the following functionalities:

1. Random LED Activation: Tested using a combination of 555 timer and decade counter circuits.

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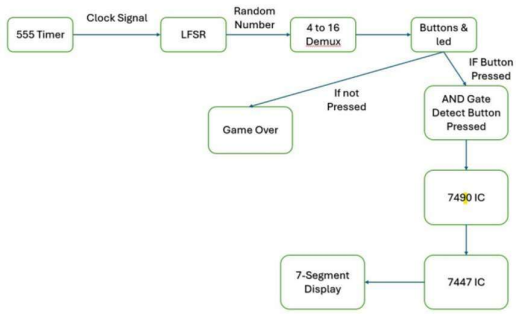
2. Push Button Responses: Verified the detection of correct button presses.
3. Scoring Mechanism: Simulated the increment of scores on the 7-segment display based on inputs.



1. LED Matrix:
   - LEDs arranged in a matrix configuration to represent the "moles."
   - Each LED is connected to a random activation mechanism controlled by logic ICs.
2. Push Buttons:
   - Corresponding to each LED, the push buttons act as inputs for the player to "whack" the lit LED.
3. Logic and Randomization:
   - Logic gates and counters (e.g., 555 timer ICs and 7474 flipflops) are used to generate random LED activations.
4. Scoring System:
   - Players' scores are updated on a 7segment display using BCD counters.
     - Correct button presses increment the score, while incorrect presses result in no action.
5. Timers and Control:
   - The game's timing mechanism is controlled by a 555 timer IC, setting the activation interval for LEDs and buttons.
6. Output Display:
   - 7-segment displays show the current score, providing feedback to the player.

Flowchart:

Game Logic Flowchart:

1. Start: Power on the circuit.
2. LED Activation: Randomly light up one LED at a time.
3. Player Input: Detect button press.
   - If the button matches the lit LED: Increment score.
   - If not: No action or penalty.
4. Repeat: Continue until the timer runs out or the game is manually reset.
5. End: Display final score and reset the game.

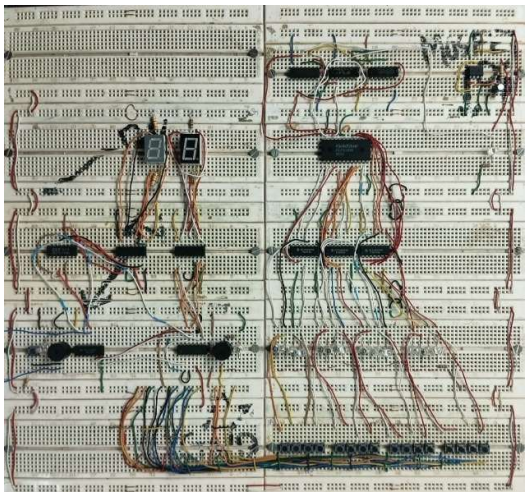
III. Methodology

Materials Used

1. Logic ICs: 7474 flipflop, 7486 gates for randomization and control.
2. 555 Timer: Generates clock pulses for random LED activation.
3. LEDs: Indicate the mole positions.
4. Push Buttons: For user input.
5. Resistors and Capacitors: For biasing, timing, and stabilization.
6. 7-Segment Displays and Drivers: Show the player's score.
7. Power Source: 5V DC battery.

Circuit Implementation:

Hardware:



1. LED Activation Mechanism:
   - A 555 timer generates clock pulses to drive 7474 flipflop,

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which activates LEDs in a random sequence.

2. Input Buttons:
    - Each LED is paired with a push button. When the LED lights up, pressing the corresponding button sends a signal to the scoring system.
3. Scoring Mechanism:
    - A BCD counter tracks correct button presses and drives the 7segment display.
4. Randomization:
    - Logic gates combine signals from the 7474 and timer IC to create unpredictable LED activation.
5. Gameplay Control:
    - The system automatically resets after a set duration, allowing for multiple rounds of play.

IV. Results and Discussion

Results

- Random Activation: LEDs lit up in random sequences, simulating the mole appearance effectively.
- Score Tracking: The 7-segment display accurately recorded the player's score based on correct button presses.
- Gameplay: The game operated smoothly, with all components functioning as intended.

Challenges

1. Signal Timing:
    - Issue: Timing mismatches between LED activation and button detection.
    - Solution: Adjusted resistor and capacitor values in the timer circuit to sync the intervals.
2. Randomization Accuracy:
    - Issue: Predictable patterns emerged during gameplay. o Solution: Enhanced randomization by adding more complex logic gating.
3. Power Consumption:
    - Issue: Rapid LED activation drained the battery quickly. o Solution: Used low-power LEDs and optimized the timer circuit for efficiency.

V. Conclusion

This project successfully demonstrated the design and implementation of an interactive Whack-a-Mole game circuit. The system combines logic ICs, timers, and displays to create an engaging and functional gaming experience. It serves as an educational tool to understand timing, randomization, and basic electronics.

Future improvements include expanding the LED matrix, adding difficulty levels, and incorporating sound effects for a more immersive gaming experience.

Acknowledgement

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References:

o M. Morris Mano, "Combinational logic circuits," in Digital Design, 5th ed. Upper Saddle River, NJ, USA: Pearson, 2013, pp. 35–72 o www.edaboard.com/threads/whack-a-mole-gameprototype-using-fpga.325776
o www.tinkercad.com/things/jWek3wph12L-whack-amole
o https://makezine.com/projects/whack-a-mole-game/