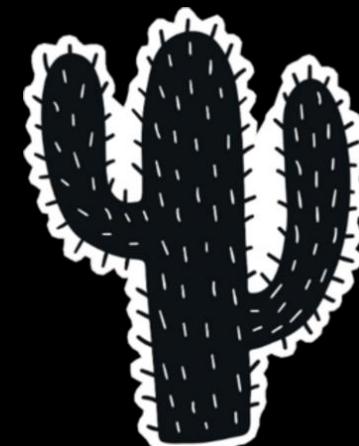


# *Dino Game*

## *Team #8*



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# Team Members



Jakob



Eshan



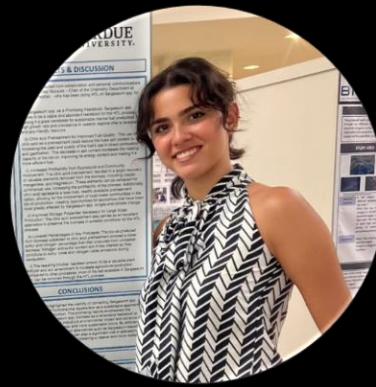
Minghan



Kaden



Creighton



Rebecca



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# *Presentation Timeline*

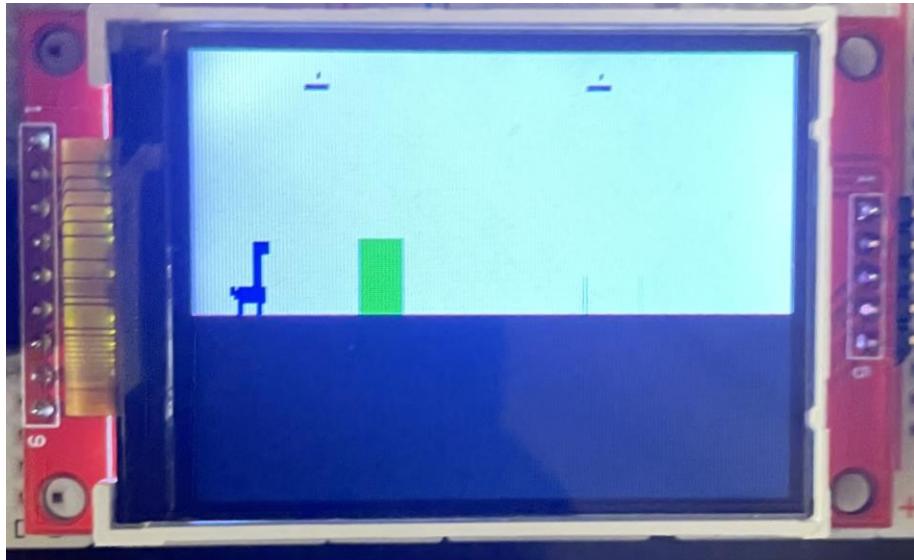
- Top Level Diagram
- Block Diagrams
- Test Benches
- Prototyping
- Component Description
- GPIO Pin Allocation
- Final Demo
- Chip Layout
- Challenges and Future Plans



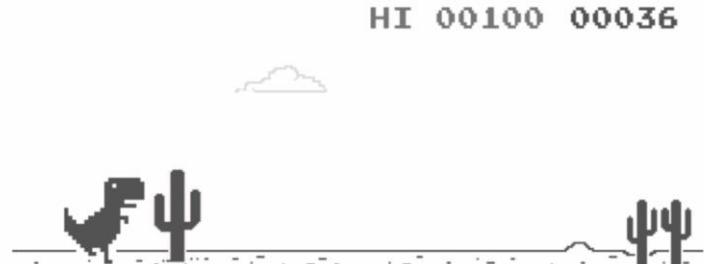
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# *Project Outline*

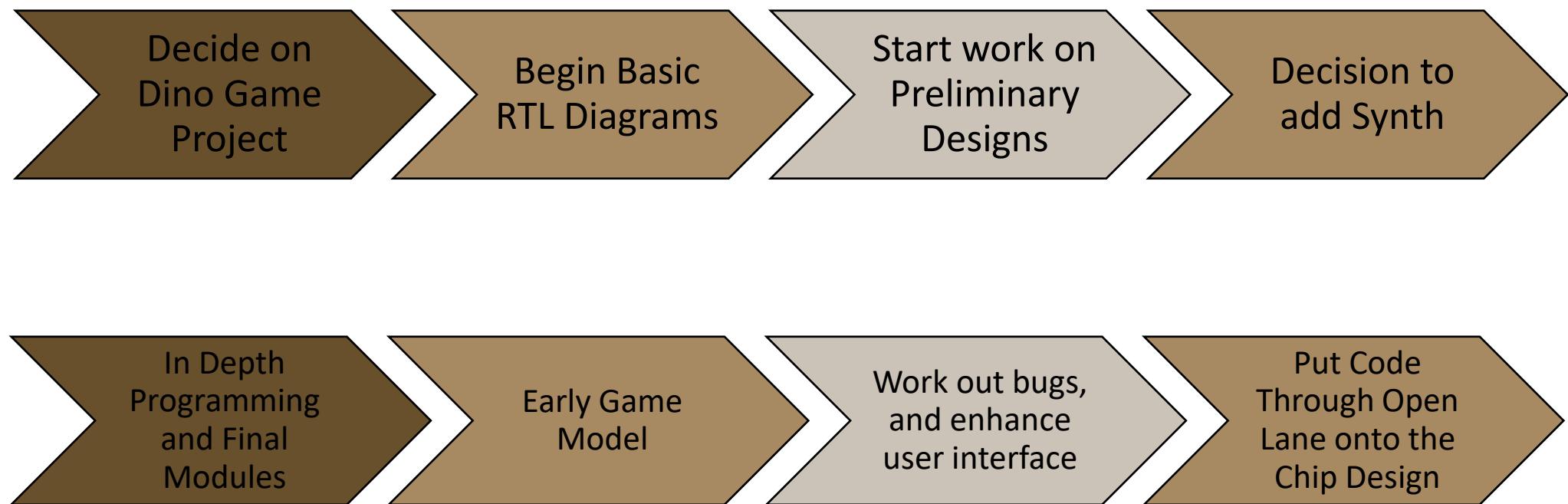


Based on:



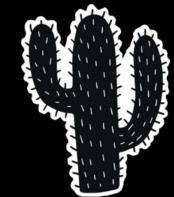
- A unique game-based project
- A shared interest in game design
- Goal of the game:
  - Dino jumps over Cactus
  - As time Goes on score increases
  - Every time dinosaur makes contact with cactus you lose points
  - Win: Score hits 99
  - Lose: Score Hits 0

# *Design Procedure*





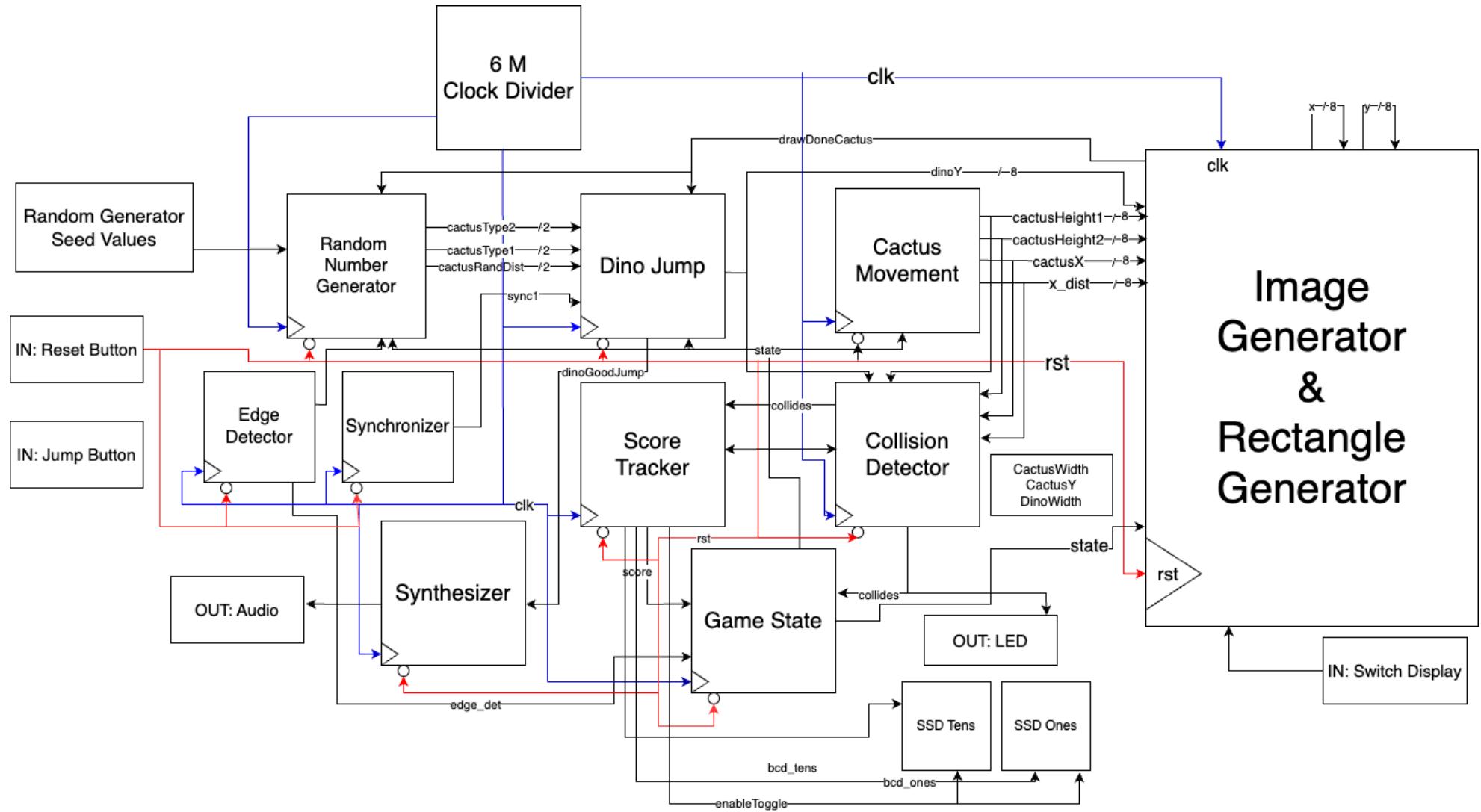
## *Project Description*



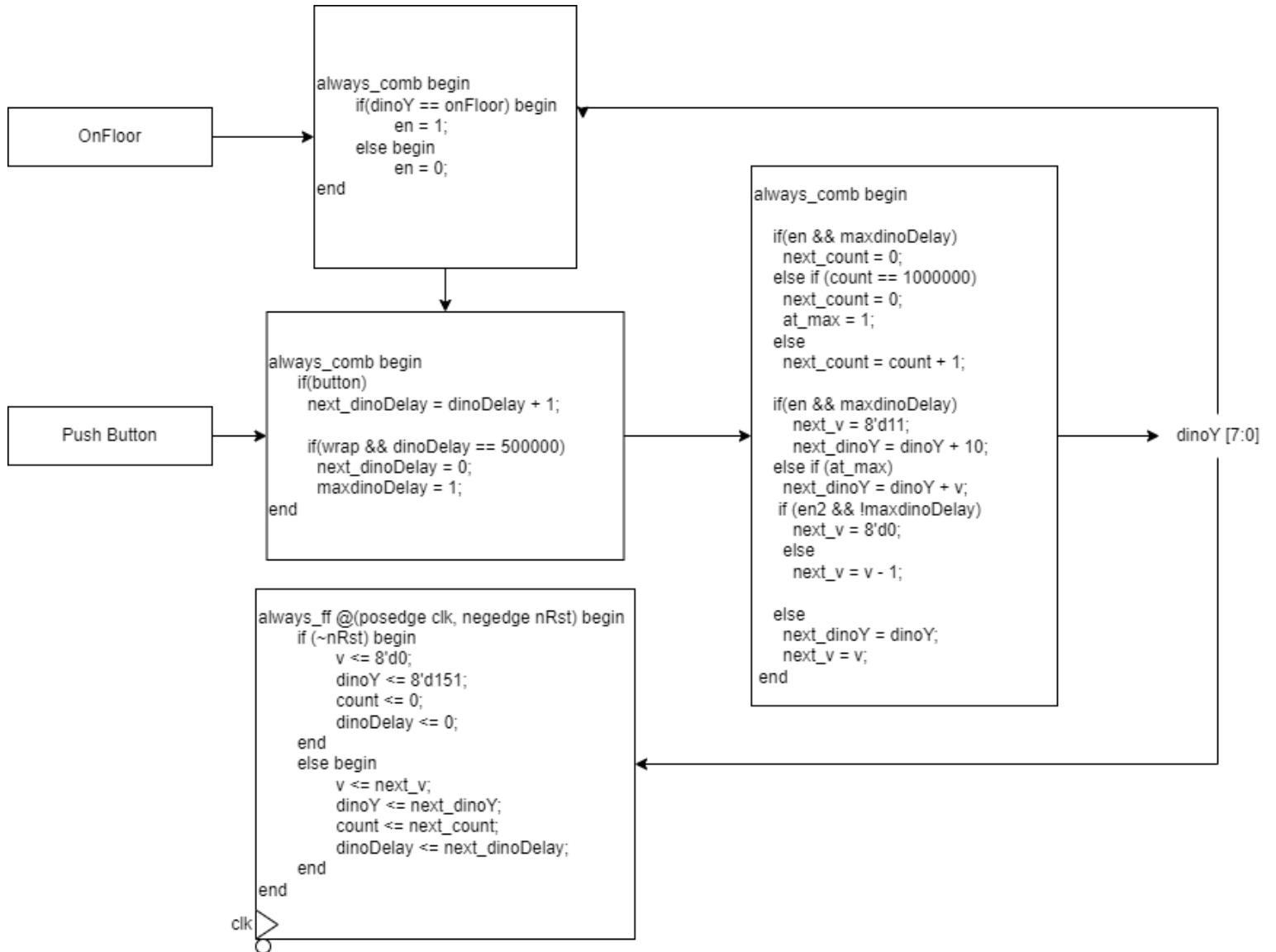
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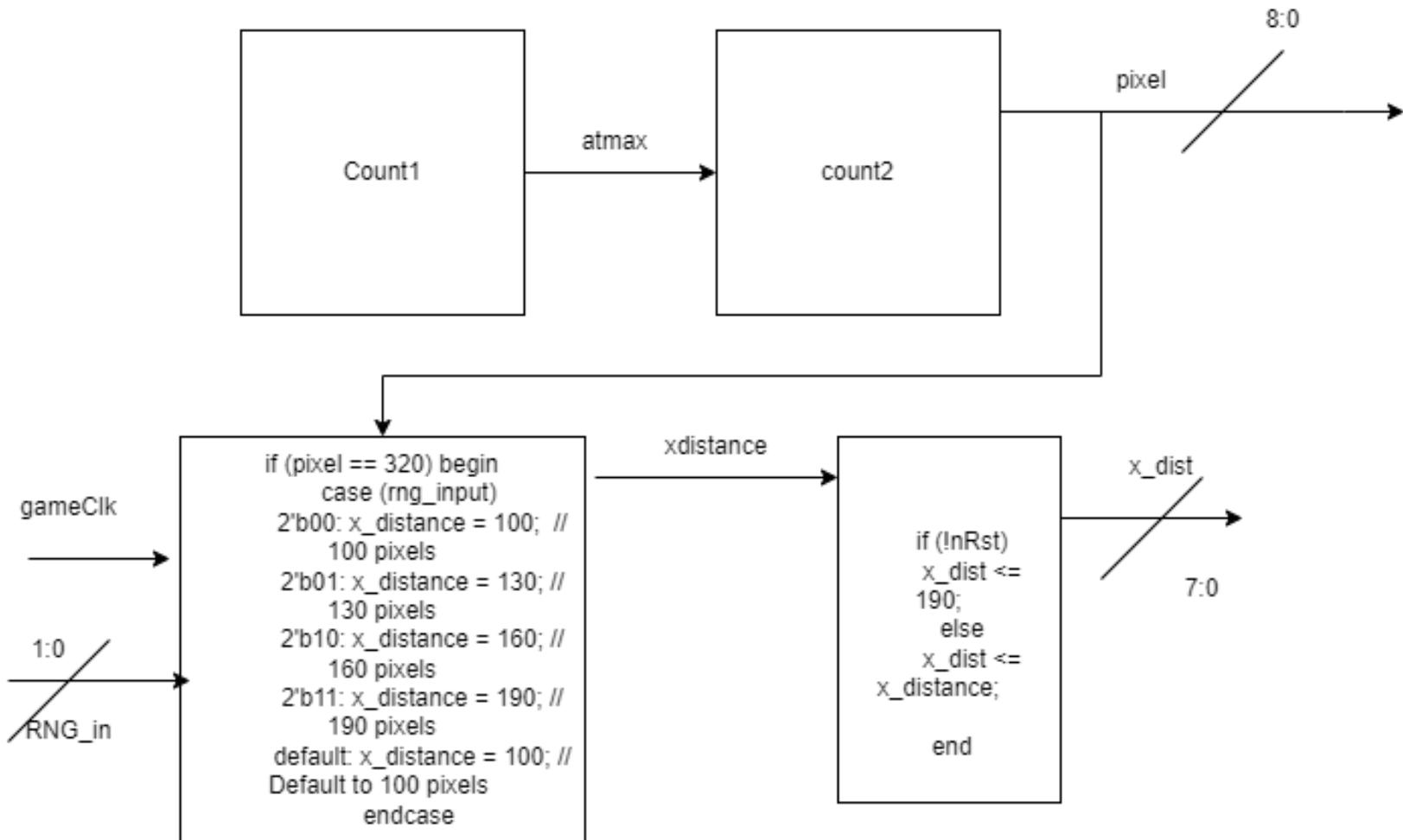
# Top Level



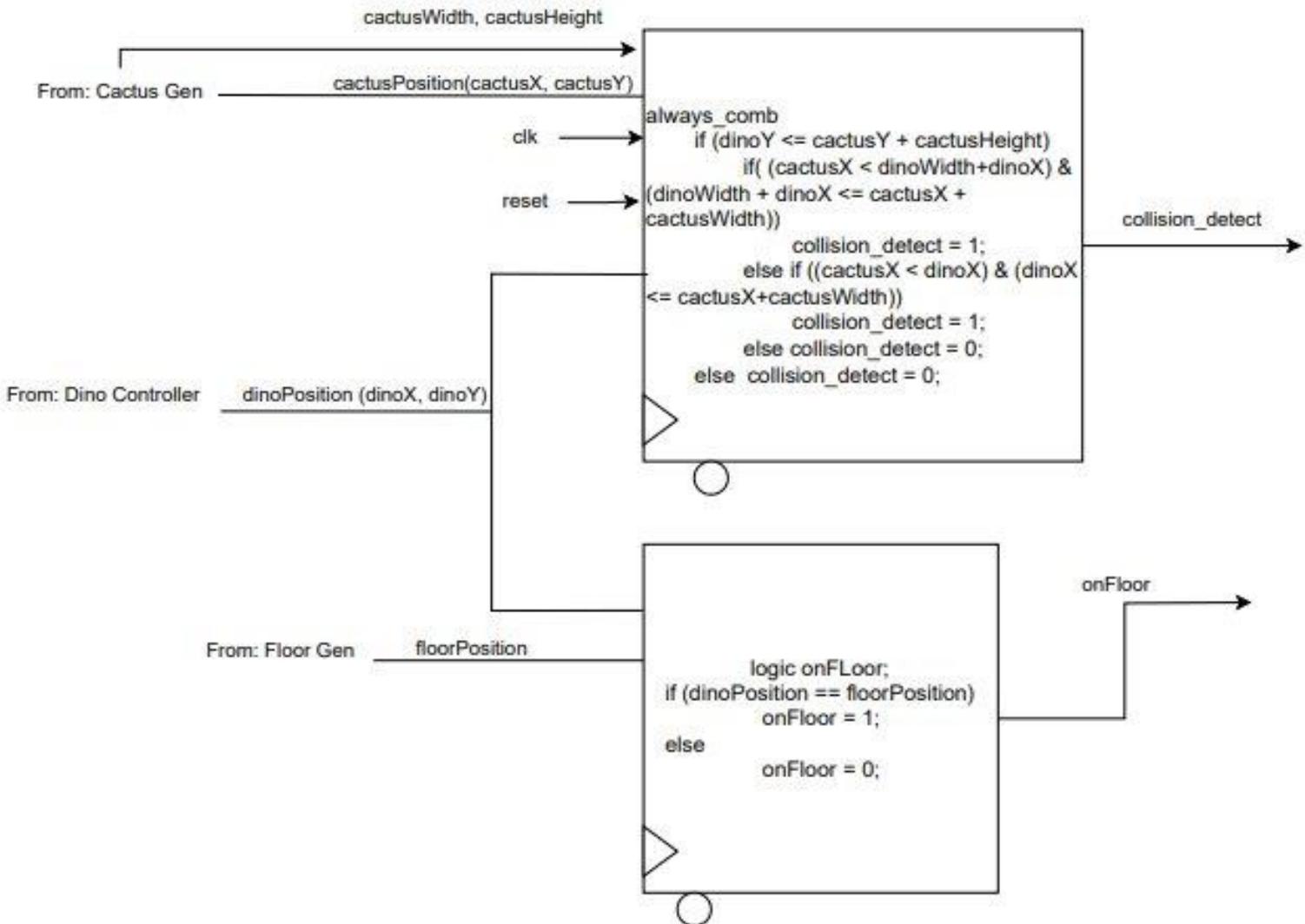
# Dino Jump



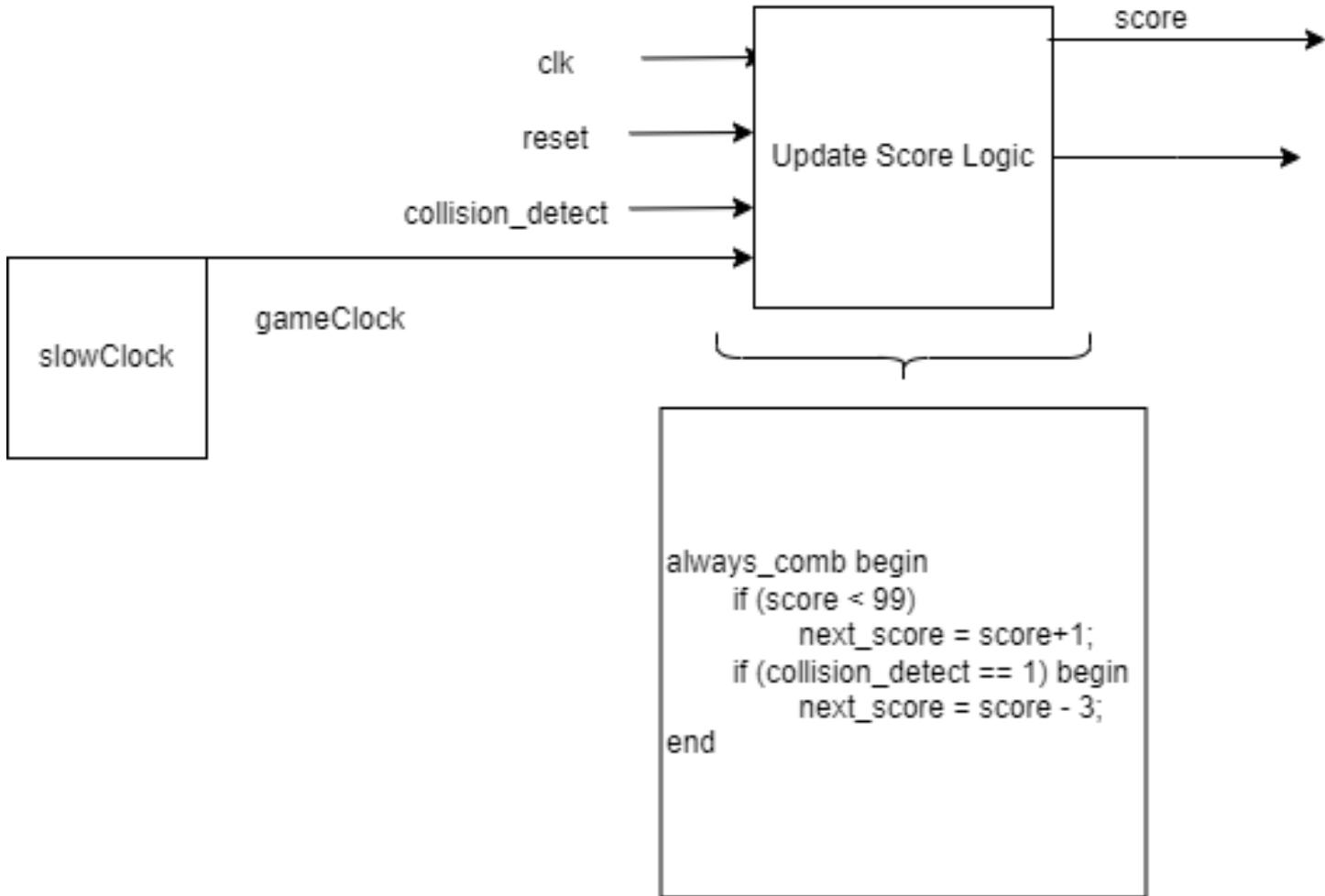
# Cactus Move



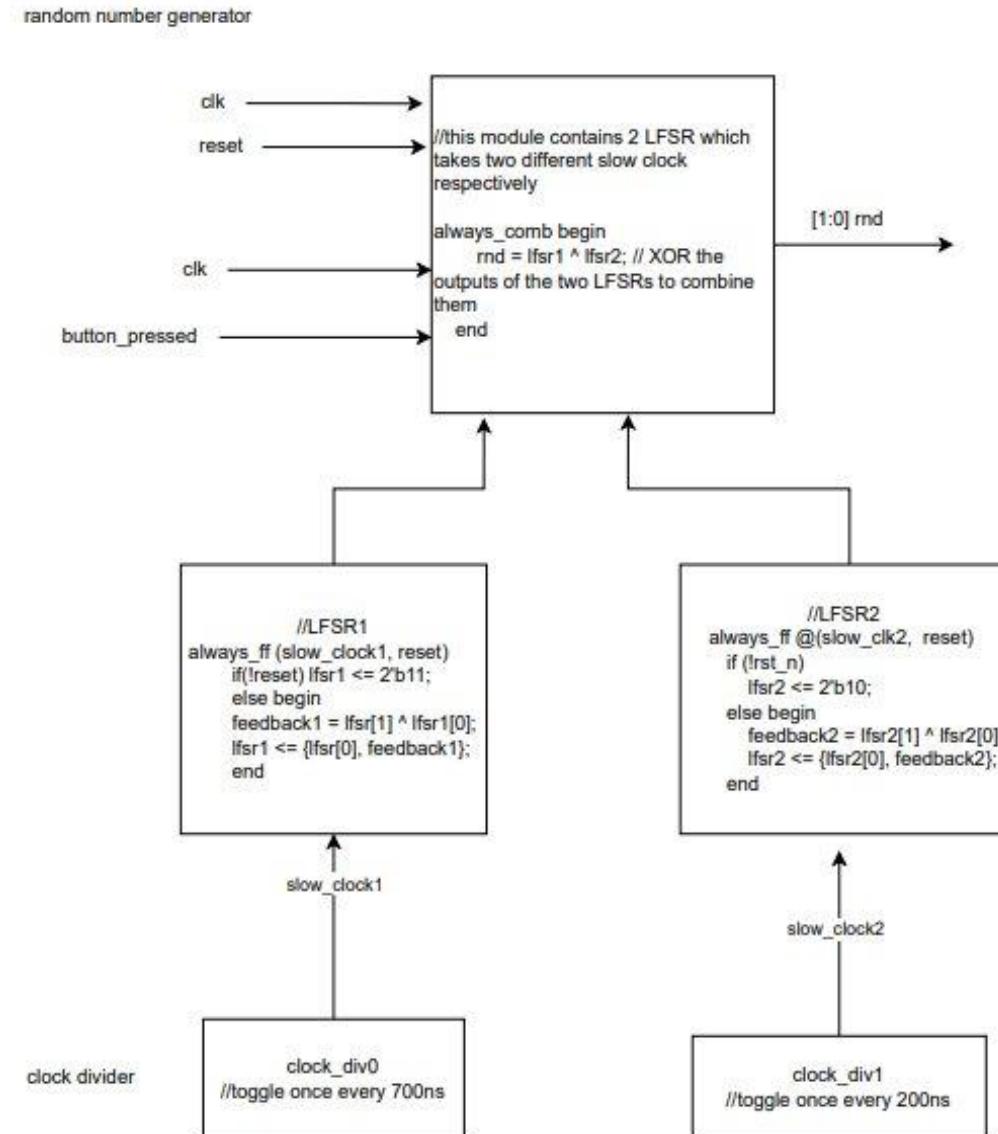
# Collision Detector

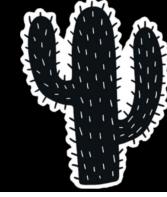


# Score Tracker

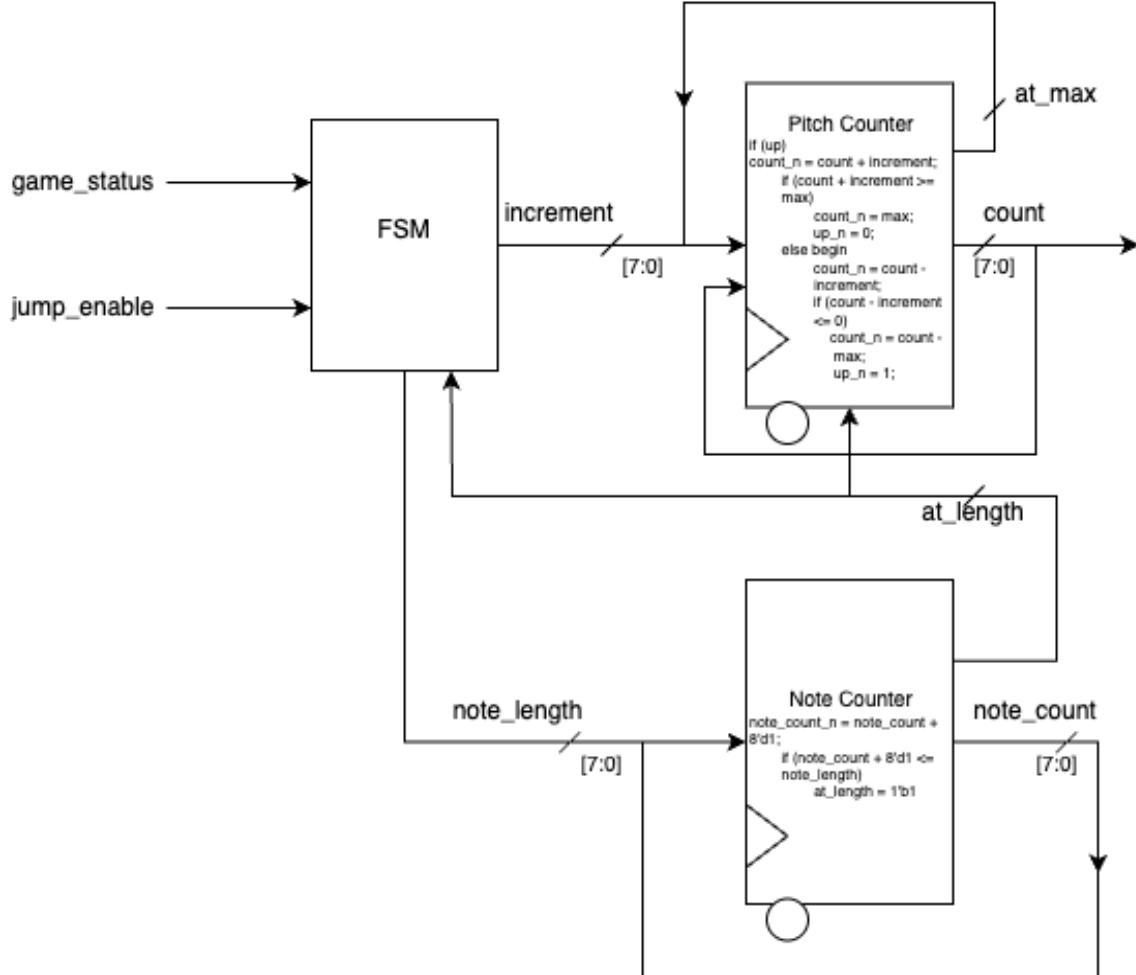


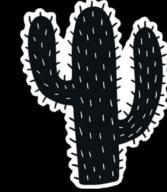
# Random Number Generator RTL



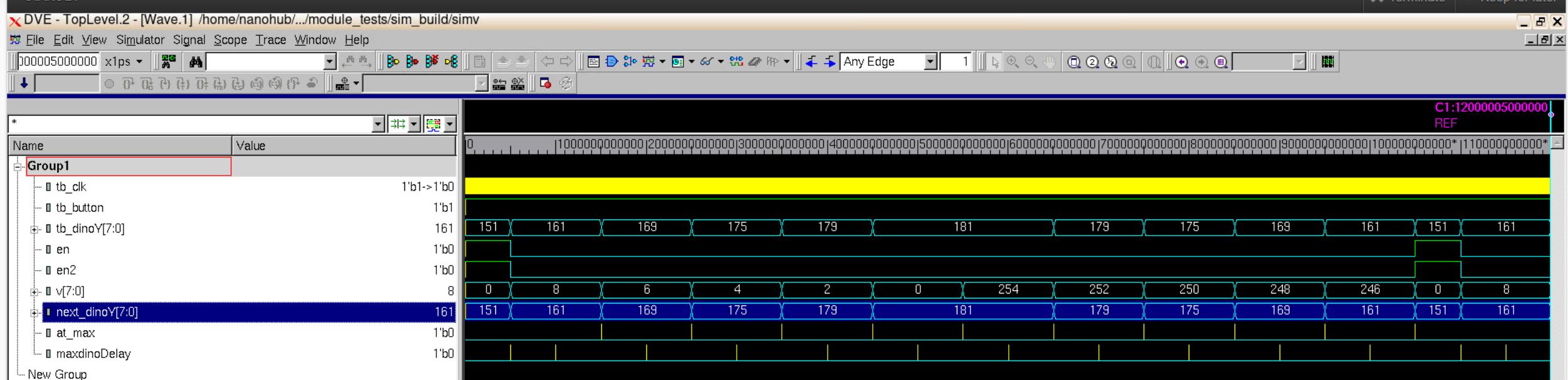


# Synthesizer





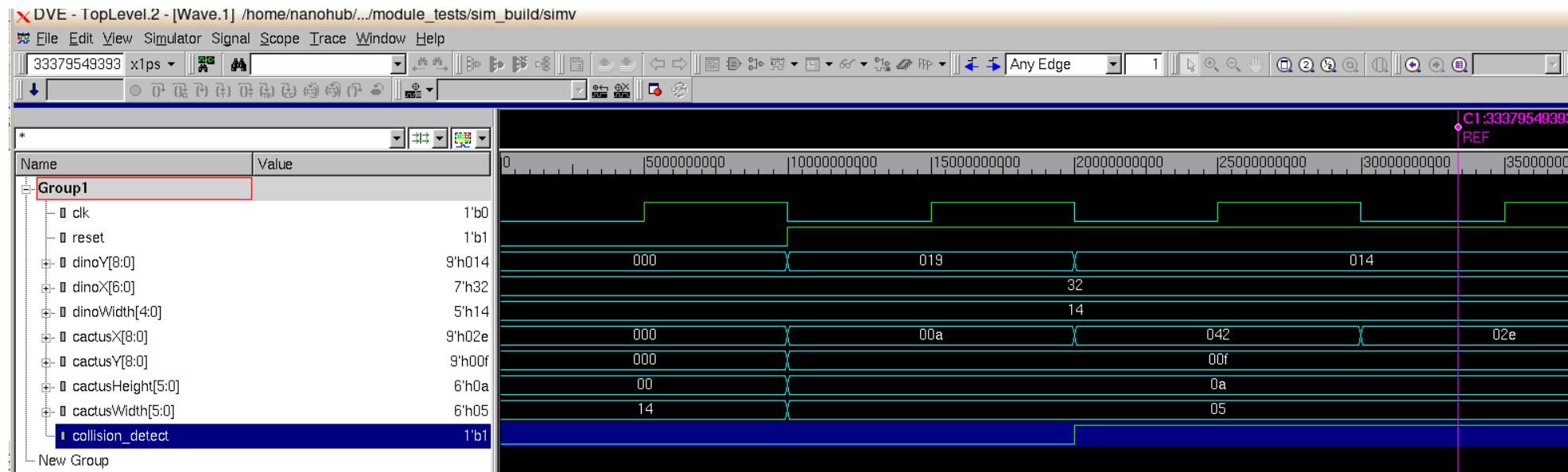
# *Test Bench for Dino Controller*



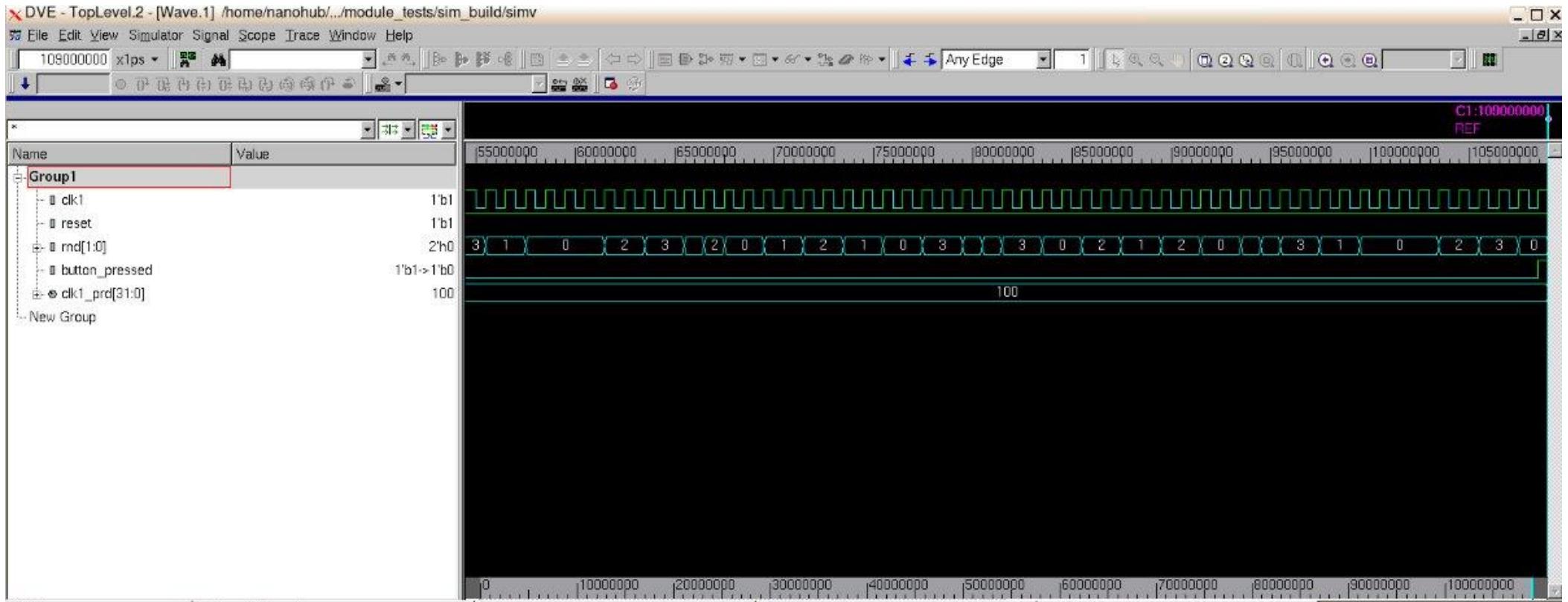


# *Test Bench for Collision Detector*

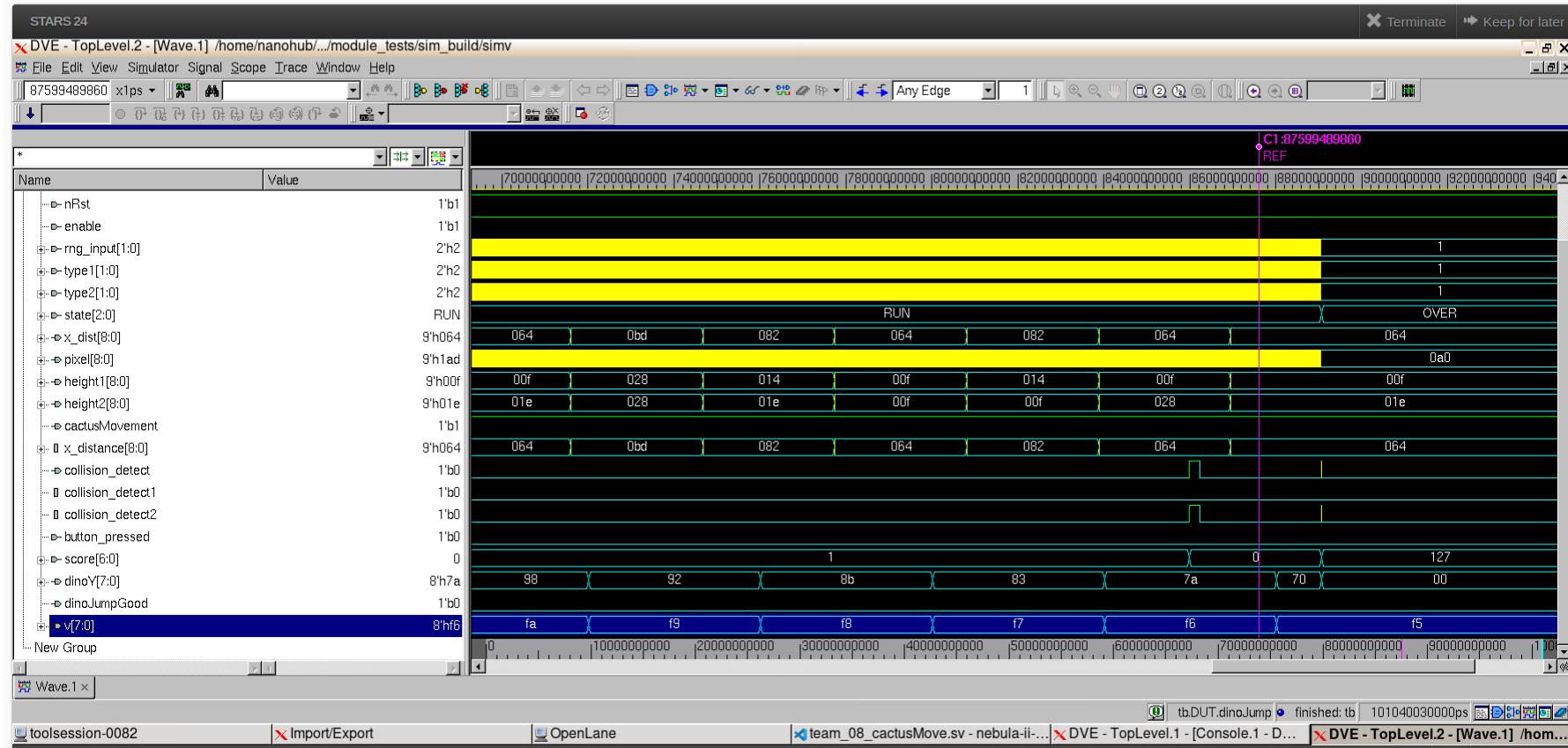
```
dve> run
Test Case 1: No collision    collision_detector = 0
Test Case 2: Collided!!!!    collision_detector = 1
Test Case 3: Collided!!!!    collision_detector = 1
$finish called from file "collision_detector_tb.sv", line 80.
$finish at simulation time 400000000000
Simulation complete, time is 400000000000 ps.
```



# *Test Bench for Random Generator*

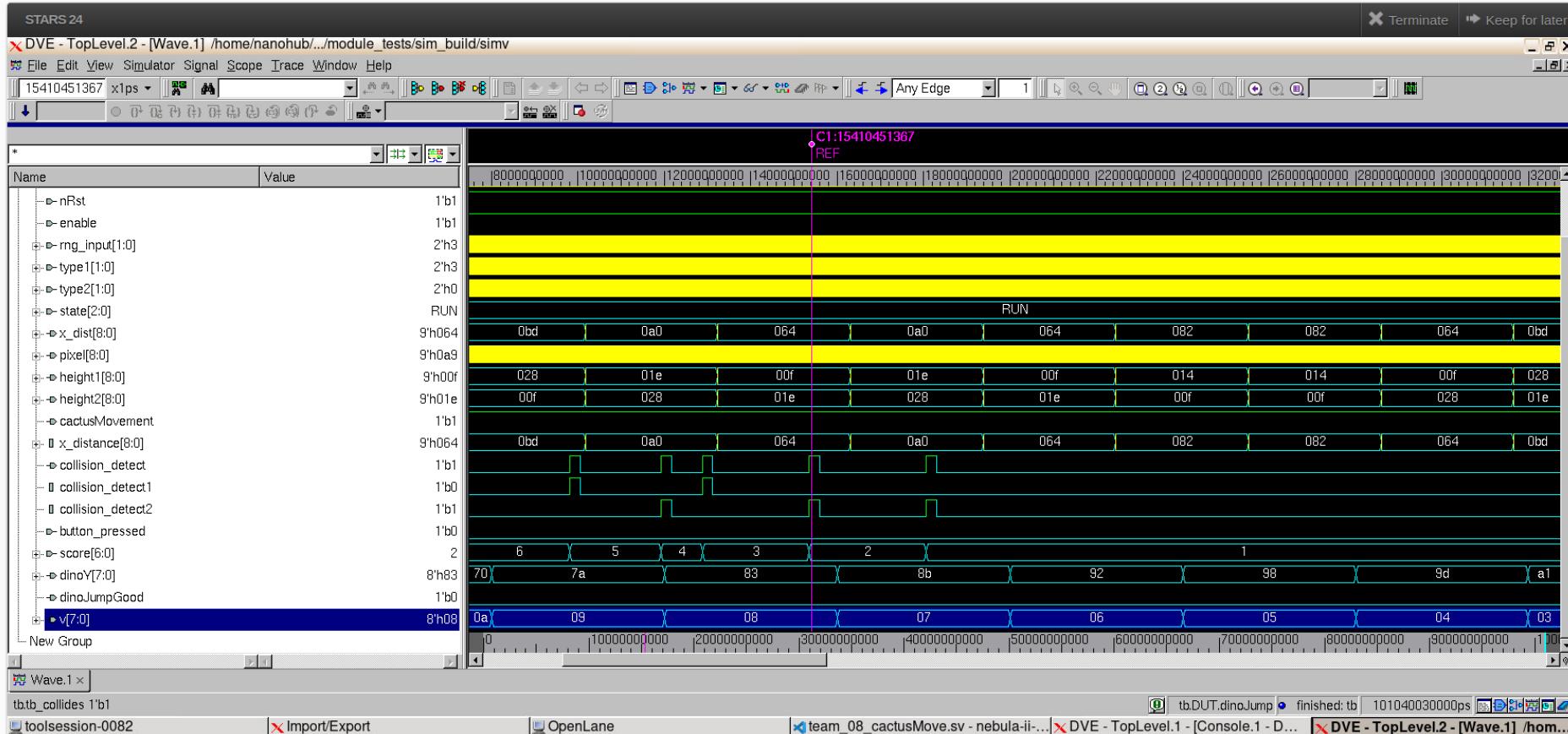


# Top-Level Testbench Testing



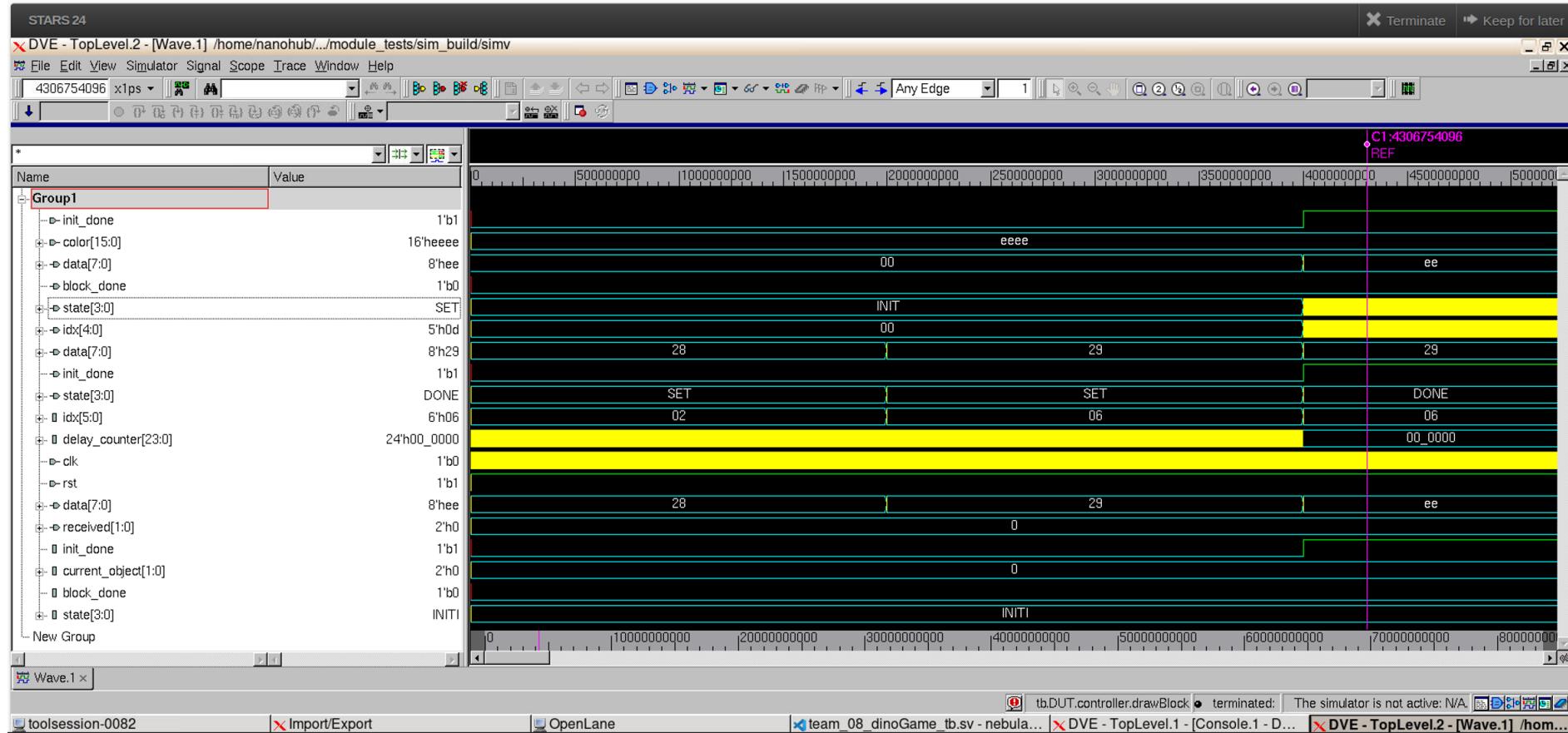
# *Top-Level Testbench*

# Parallel Display



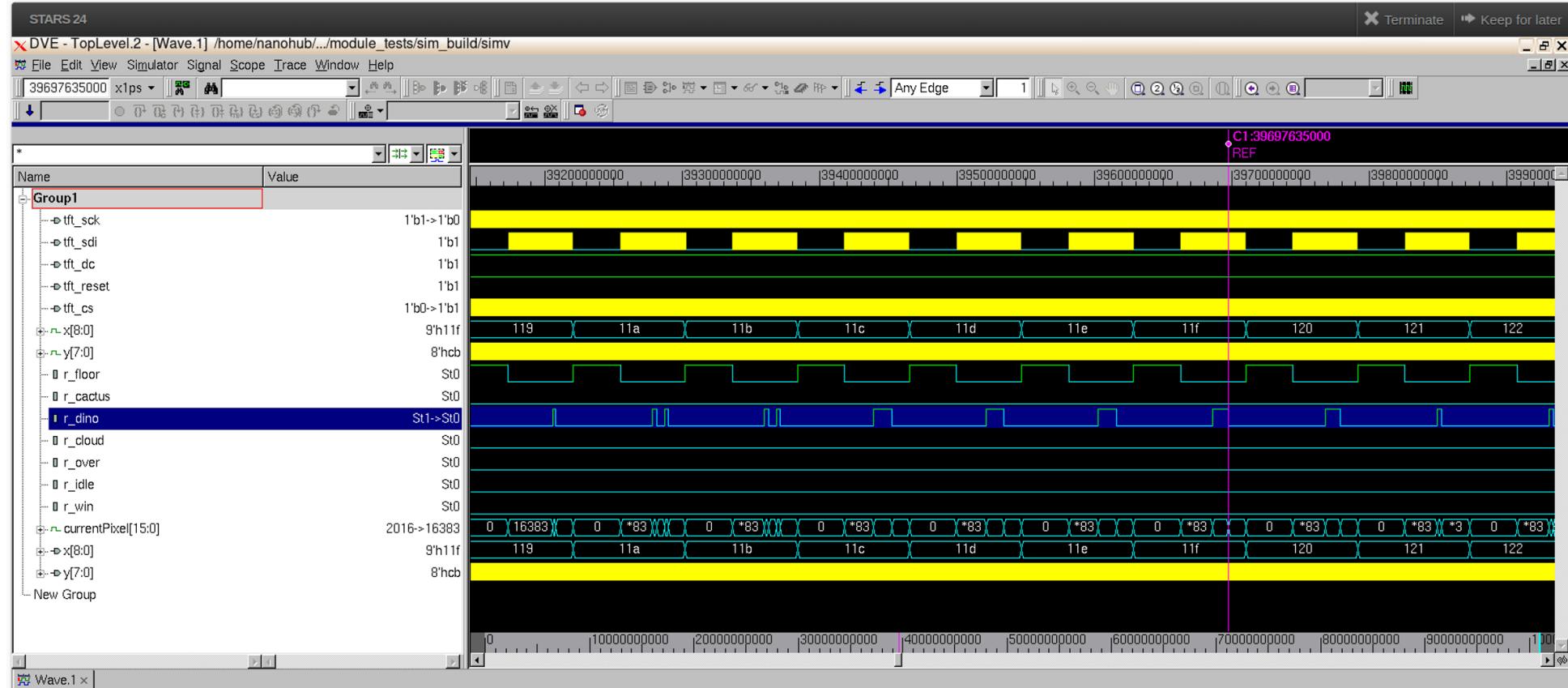
# Top-Level Testbench

## Parallel Display



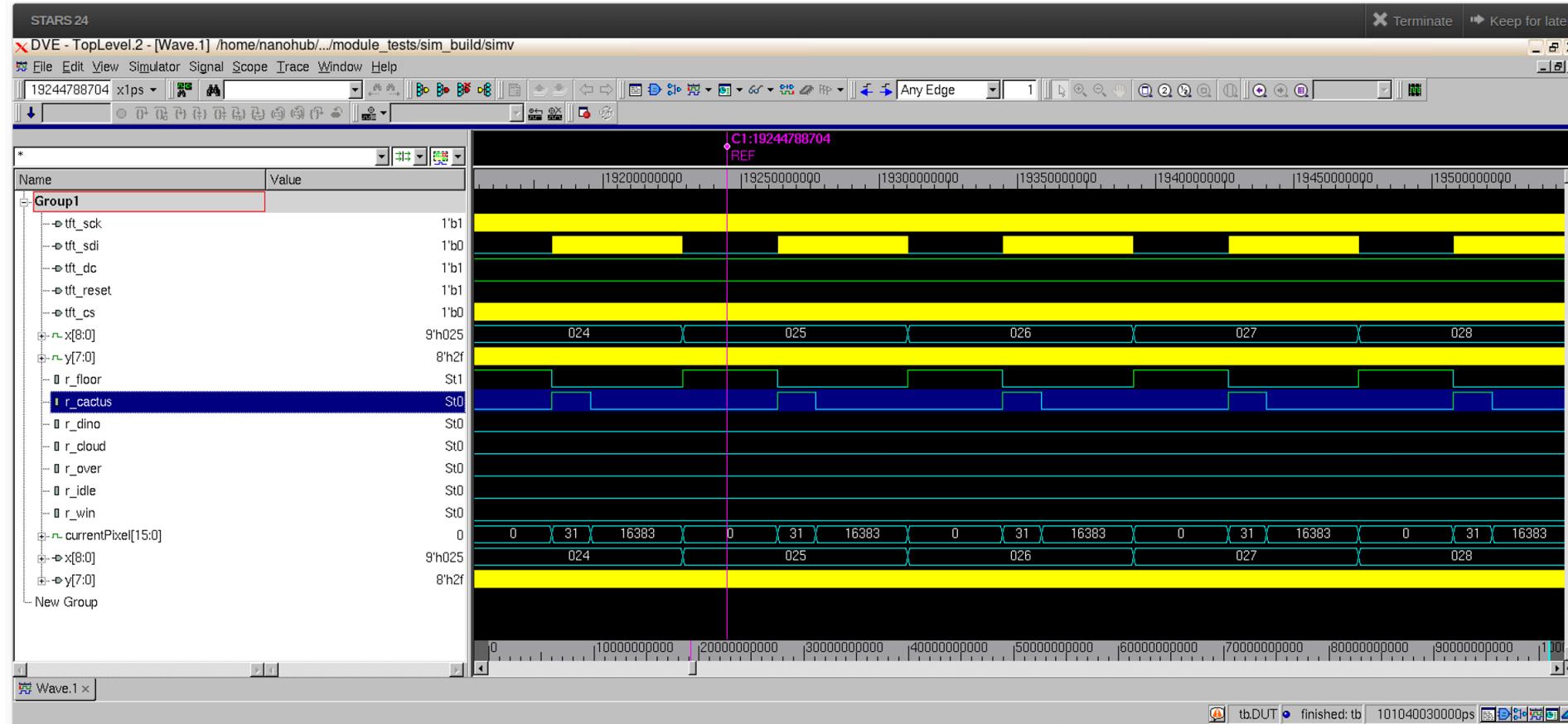
# *Top-Level Testbench*

# Serial Display

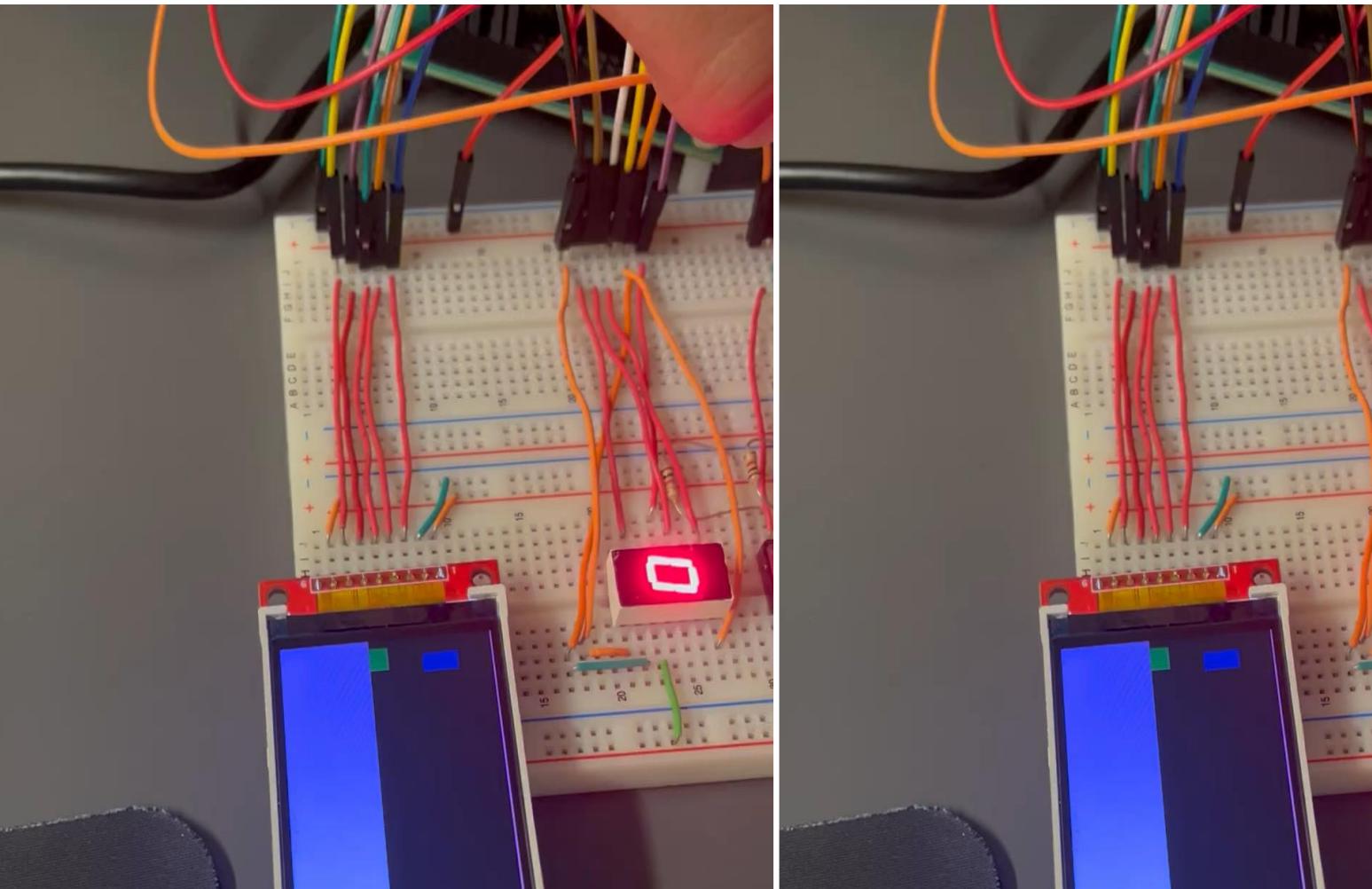


# Top-Level Testbench

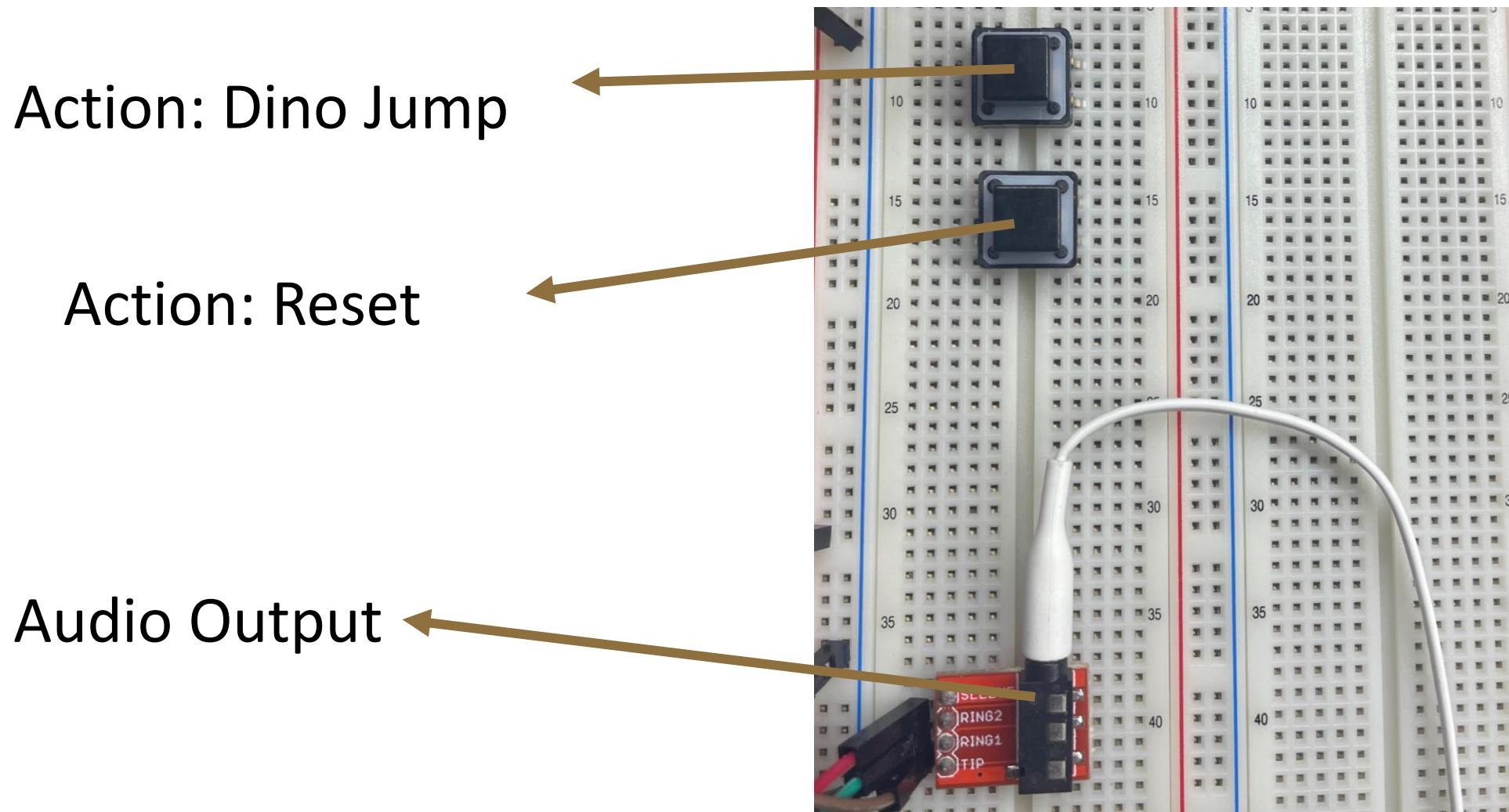
## Serial Display



# *FPGA Prototype*

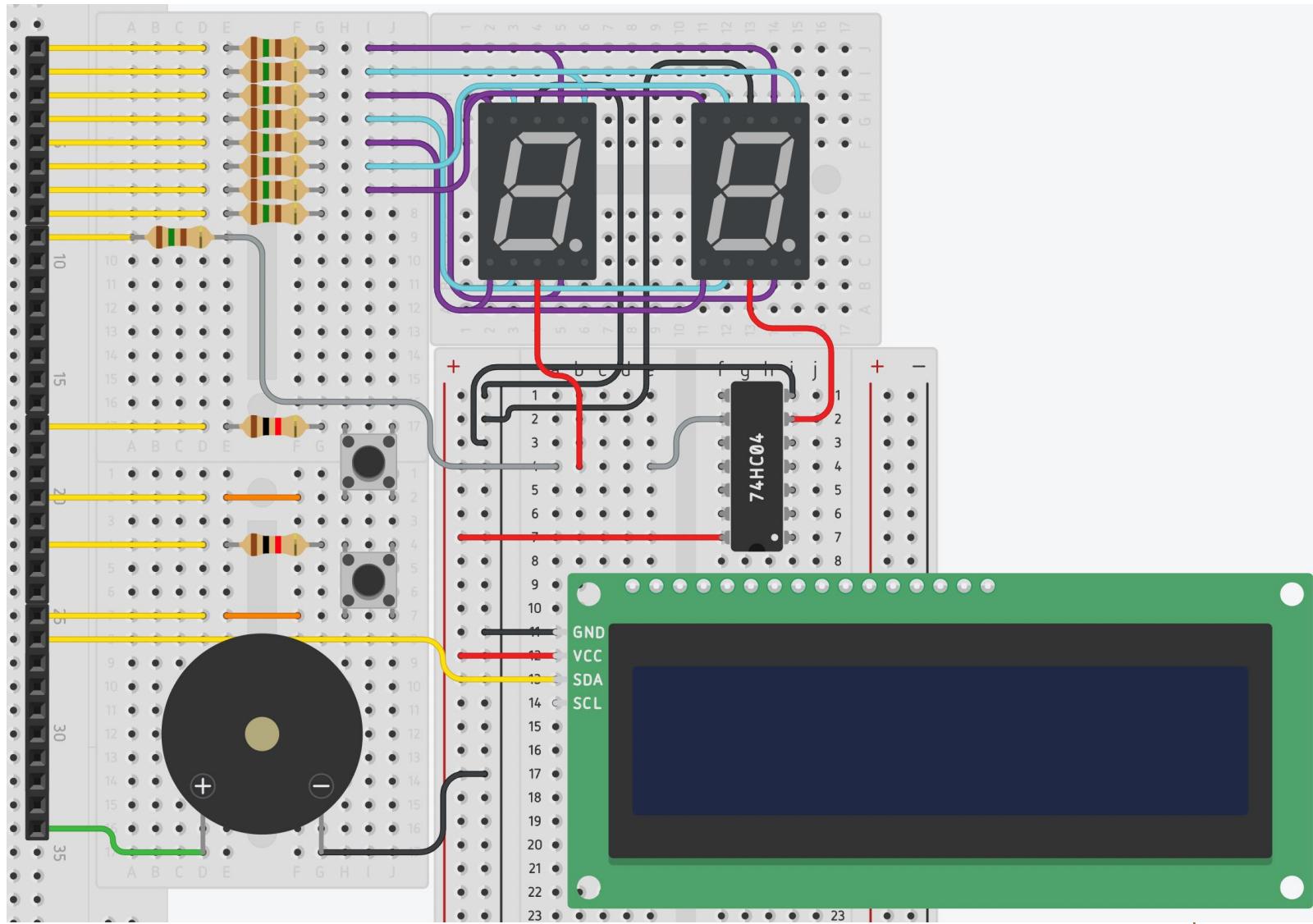


# *Components for Interfacing*

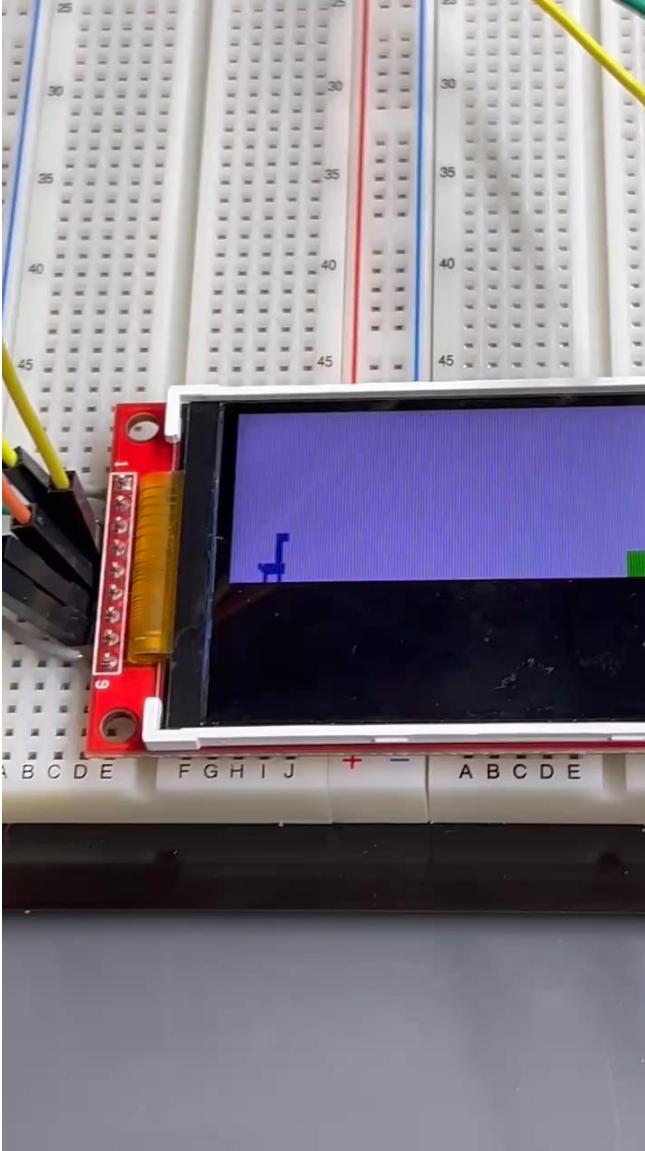


# GPIO Pin Assignment

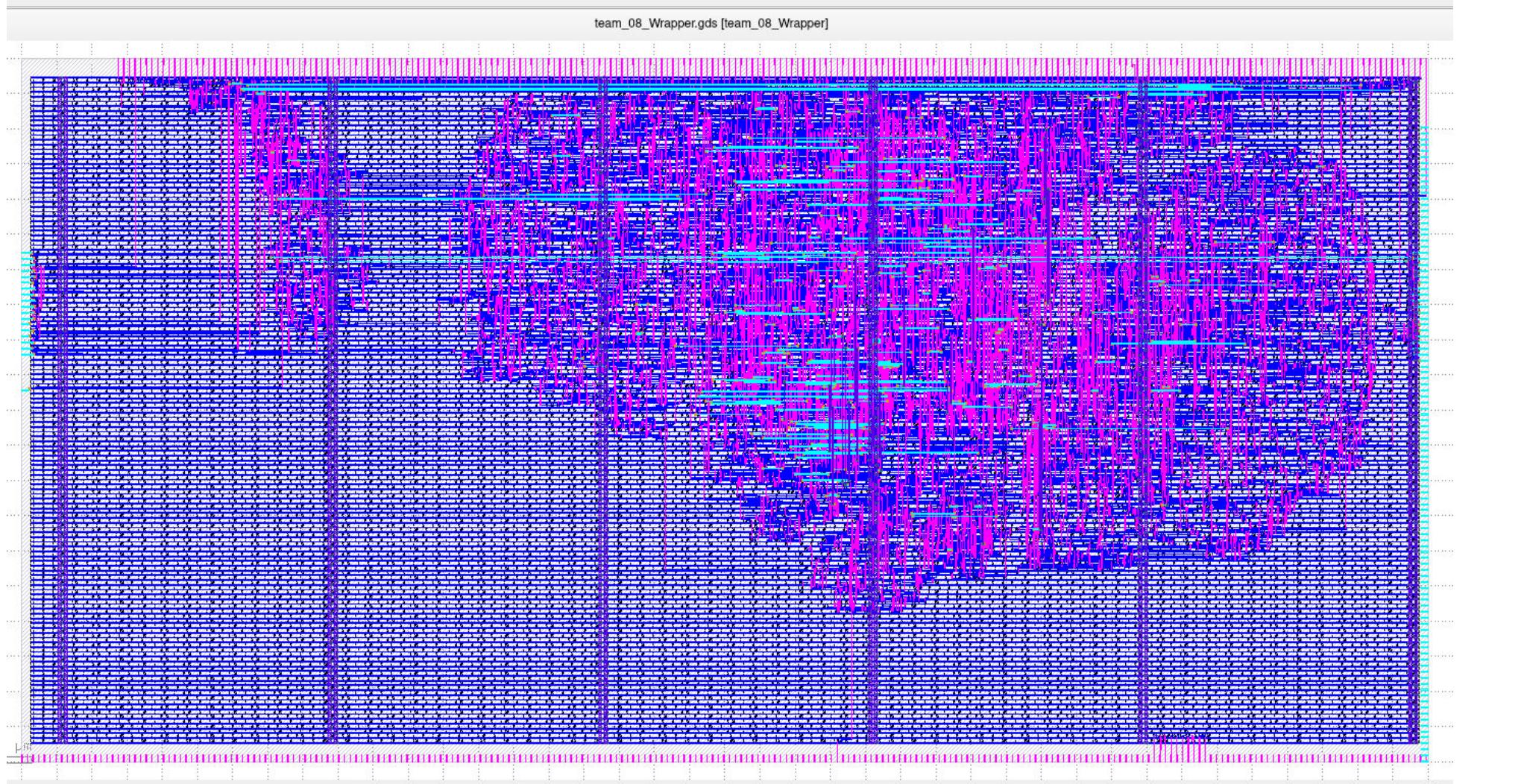
Pin #	Usage
0-4	SPI/Parallel Display
5-18	SSD
19-26	Data Bits for Parallel Display
20	Reset Button
21	Jump Button
22	Screen Toggle Button
32	Synthesizer
23	Collision Detector LED



# *Results, final demo*



# *Chip layout*



~13,000 Cells

# *Improvements and future plans*

- Difficulties:
  - Interfacing with the displays - both SPI and parallel display
  - Timing dinosaur jumping movements and cactus generation movement
  - Clock speed limitations with the for the synth
  
- Further plans to improve your design if you had more time
  - Add "flying" obstacles and a dino ducking function
  - Better sprites
  - Increasing game speed
  - Better interfacing with parallel display

# *Summary*

- Created a game similar to the Google Chrome Dino Game
- Designed RTL diagrams to map out different parts of the game
- Created modules to run the game
- Accurately simulated the game in terms of its fundamental functions on FPGA
- Added our own features to the game to make it unique
- Interfaced with multiple displays and audio generation
- Successfully simulated top level test-bench and verified its functionality on chip
- Left room for continued improvement and optimization

# *Jakob Appreciation*

# THANK YOU

*Questions?*



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