FTM — Finite Turing Machine (Parity Fugue)

This repository contains a small **finite Turing machine** that you can **watch** and **listen to** while it runs.

It is not a music program.
It is not a visualization demo.
It is a machine.

What it is

- A **finite tape Turing machine** (FTM)
- A minimal **read / write / move / next-state** rule table
- One machine cycle → one audio sample
- Two audio channels:
  - **Left** = R (read register)
  - **Right** = W (write register)
- Optional delay between R and W creates audible structure

The machine executes deterministically.
No randomness. No AI. No score.

What you'll notice

- The machine produces **audible structure** on its own.
- Long runs of stability create low-frequency "pedal tones."
- Recurrence creates stereo motion and spatial effects.
- Small changes (tape length, delay, decay) matter a lot.

If you've ever listened to logic probes, delay lines, or feedback systems, this will feel familiar.

How to run

Requirements:

- Python 3.10+

- pygame

```
pip install pygame
python FTM.py --N 1024 --audio_hz 22000
```

Adjust parameters from the keyboard while it runs.

Controls (typical)

- `+ / -` Adjust R↔W delay (coarse)
- `[ / ]` Adjust delay (fine)
- `, / .` Decay rate (visual persistence)
- `; / '` Ink brightness
- `r` Reset machine
- `q / ESC` Quit

(Exact mappings are in the source.)

Files

- `program.csv`
  The state table. This *is* the machine.
- `FTM*.py`
  The runtime: tape, clock, audio, and rendering.

Nothing is hidden.

What this is for

This is for people who like:

- minimal machines
- feedback and delay
- deterministic systems with emergent behavior
- understanding something by letting it run

If you want a “result,” record it.
If you want a picture, render it.
If you want a different behavior, change the rule table.

What it is not

- Not optimized
- Not polished
- Not interactive in a musical sense
- Not intended to be “performed”

It’s closer to a **bench instrument** than a composition.

Provenance

This machine descends from hand-built FTMs and logic experiments dating back decades.
It is presented here as-is, without claims.

Trade it like a recipe.