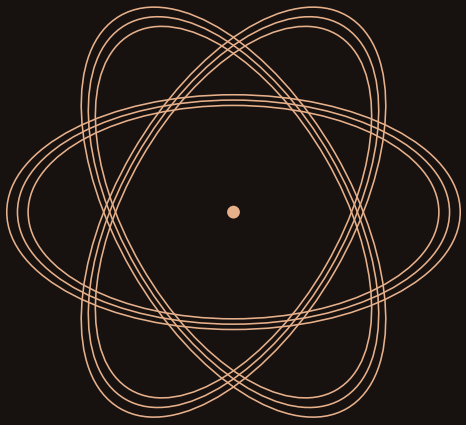
CLEANCODER EDITIONS / NO. 01

Systems in motion

A field guide to game engines, frame pacing and two qubits.



NOVEMBER 2026

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01 / GAME ENGINES

A city is a scheduling problem

What the footage establishes

Rockstar says its extended look was captured on PlayStation 5. That identifies the capture platform. Edited footage cannot establish a stable frame rate, internal render resolution or the cost of running an uninterrupted route.

What the engine has to do

A fast-moving player changes which world data will be needed next. Storage reads, decompression, memory and GPU uploads all have deadlines. A cheaper representation can cover a late asset, but a visible hitch may come from any stage of the pipeline.

What to measure

A useful launch comparison holds the route, mode and build constant. Record continuous footage, separate cold and warmed runs, and report frame-time percentiles with the raw sequence.

Read the full GTA VI engine analysis

02 / MEASUREMENT

The average that hid five hitches

The comparison

Both traces contain 100 intervals and total 1,600 milliseconds. In one, every interval is 16 ms. In the other, 95 intervals are 14 ms and five are 54 ms. Both average 62.5 fps.

Look at the tail

With nearest-rank percentiles, p95 in the uneven trace is 14 ms, while p99 is 54 ms. A single percentile can miss exactly the frames the reader needs to see.

Keep the time axis

Report the count above budget as well as more than one tail percentile. A timeline shows whether hitches cluster around loading, a camera cut or a specific stretch of the route.

Reproduce the frame-pacing experiment

03 / QUANTUM SIMULATION

Change the basis

An experiment you can run

A laptop can simulate a two-qubit Bell circuit with four amplitudes. Apply a Hadamard followed by a controlled-NOT. Flip the relative sign to make a second state and compare their probabilities.

What changed

Both states yield 00 and 11 with equal probability in the computational basis. When both qubits are measured in the X basis, the plus state gives matching outcomes and the minus state gives opposite outcomes.

What the result supports

This is a numerical demonstration of phase and basis choice. A physical experiment would need controlled qubits and calibrated measurement, with its own noise, uncertainty and limits.

Run the two-qubit Python simulator