Velocity-Entropy Independence: The Demon's Category Error

A. Entropy Counts Arrangements

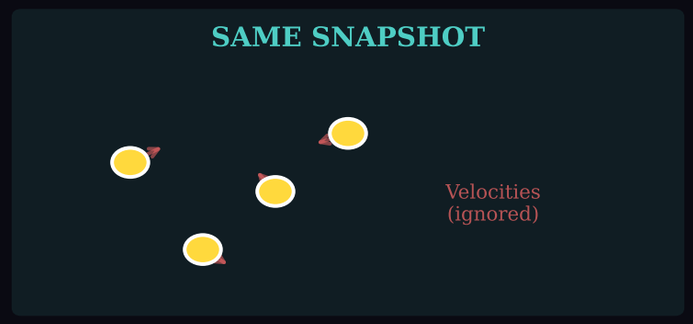
$$S = k_B \ln(\Omega)$$

Ω = number of spatial arrangements

Different positions = different arrangements

Velocity NOT in the count!

B. Snapshot = Positions Only



Snapshot records POSITIONS

Not velocities, not temperatures

Same snapshot at 100K or 1000K!

C. Elastic Collision

Positions: SAME (collision point)

Velocities: CHANGED

Temperature: CAN CHANGE

Entropy: UNCHANGED!

D. Orthogonality

E. Demon's Category Error

Different categories!

Manipulating kinetic properties

cannot affect configurational properties

F. What Changes Entropy

CHANGES S	NO CHANGE
Mixing	Elastic collision
Expansion	Velocity sorting
Chemical rxn	Adiabatic T change
Phase change	

Spatial rearrangement = entropy change

Velocity redistribution = NO entropy change

Demon does velocity sorting!

G. Demon's Broken Chain

EVERY STEP BROKEN

H. The Mathematical Proof

Ω = f(positions only)

$$\partial\Omega/\partial v_i = 0$$

$$\Rightarrow \partial S/\partial v_i = 0$$

Arrangement count is velocity-independent

Therefore entropy is velocity-independent

Velocity sorting has ZERO effect on entropy

I. The Final Defeat

VELOCITY and ENTROPY
are ORTHOGONAL

Velocity: rate of position change (kinetic)

Entropy: count of arrangements (config)

Demon sorts: velocities

2nd Law protects: entropy

The demon operates in the WRONG CATEGORY

Category error = fundamental defeat