Combat State Machine

1. Problem Statement

As multiple combat systems exist (Movement, Attack, Block, Dodge, Camera), conflicts can arise when:

- multiple inputs are pressed simultaneously
- player attempts to defend during attacks
- hit reactions interrupt actions
- camera and combat logic desync

Without a centralized state authority, combat becomes unpredictable, buggy, and unfair.

The Combat State Machine defines **who wins, when, and why**.

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2. Goals

1. Establish a single source of truth for combat behavior
2. Define clear state priority and override rules
3. Ensure fairness and responsiveness
4. Prevent conflicting animations and logic
5. Enable consistent camera and hit reaction behavior
6. Support high-skill defensive play

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3. Core Design Principles

- **Defense > Attack > Movement**
- Player intent should be respected whenever possible
- Invalid inputs fail silently (no punishment, no buffering)
- Hit reactions must always be felt

- Combat must feel controlled, not chaotic

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4. Global Combat States

The system consists of the following **exclusive states**:

1. **Idle**
2. **Movement**
3. **Attack**
    - Startup
    - Contact
    - Recovery
4. **Block**
5. **Dodge**
6. **Hit Reaction**
7. **Stagger**
8. **KO**

Only **one primary state** may be active at a time.

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5. State Priority Order (Highest → Lowest)

Priority	State
1	KO
2	Stagger
3	Hit Reaction
4	Block
5	Dodge
6	Attack
7	Movement
8	Idle

If two states are requested simultaneously, the **higher priority state always wins**.

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6. State Entry Rules

6.1 Idle

- Default state
- No input restriction
- Transitions to Movement, Attack, Block, or Dodge

6.2 Movement

- Player-controlled movement
- Transitions:
  - → Attack
  - → Block
  - → Dodge
- Interrupted by Hit Reaction or Stagger

6.3 Attack State

Startup

- Movement locked
- Rotation allowed (limited)
- Cannot be interrupted by defense

Contact

- Hitbox active
- No interrupts allowed

Recovery

- Limited movement drift allowed
- **Block and Dodge allowed**
- Attack input ignored

6.4 Block

- Held input
- Overrides Attack and Dodge requests
- Reduces or negates damage
- Heavy hits may trigger Block Hit Reaction

Block exits when input is released.

6.5 Dodge

- Short invulnerable movement (no i-frames unless defined later)
- Can be requested from:
  - Idle
  - Movement
  - Attack Recovery
  - Block (on release)
- Cannot override Startup or Contact

6.6 Hit Reaction

- Triggered on any successful hit
- **Always overrides current state**
- Severity depends on hit type:
  - Light hit → short reaction
  - Heavy hit → full reaction
- Transitions to:

- Stagger (if conditions met)
- Idle / Movement

6.7 Stagger

- Triggered by heavy hit thresholds
- Attacks disabled
- **Defense allowed with tight timing**
- Movement restricted
- Exits to:
  - KO (if conditions met)
  - Idle

6.8 KO

- Full control locked
- Camera switches to KO mode
- No state transitions allowed
- Exits only via Round Reset

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7. Defense Rules (Critical)

Block

- Overrides:
  - Attack input
  - Dodge input
- Does NOT override:
  - Hit Reaction
  - Stagger

- KO

Dodge

- Always requestable
- Only executable from valid states
- Never overrides Startup or Contact

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8. Hit Reaction Integration

- Hit Reaction always takes priority
- Prevents “armor through hits”
- Guarantees feedback consistency
- Ensures animation clarity

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9. Camera Coordination Rules

- Camera state follows combat state
- No independent camera overrides
- KO state enforces KO Camera
- Camera resets on state reset

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10. Failure Handling Rules

If a player inputs an invalid action:

- Input is ignored silently
- No buffering
- No forced cancel
- No penalty

This prevents confusion and preserves responsiveness.

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11. State Reset Rules

On:

- KO End
- Round Reset

System resets:

- Combat State → Idle
- Camera → Neutral
- Input buffers → Cleared

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12. Acceptance Criteria

- No conflicting states are active simultaneously
- Defense always feels responsive
- Hits always produce reactions
- Camera behavior matches combat state
- No animation deadlocks
- Combat feels fair and predictable

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13. Risks & Mitigations

Risk: Dodge spam

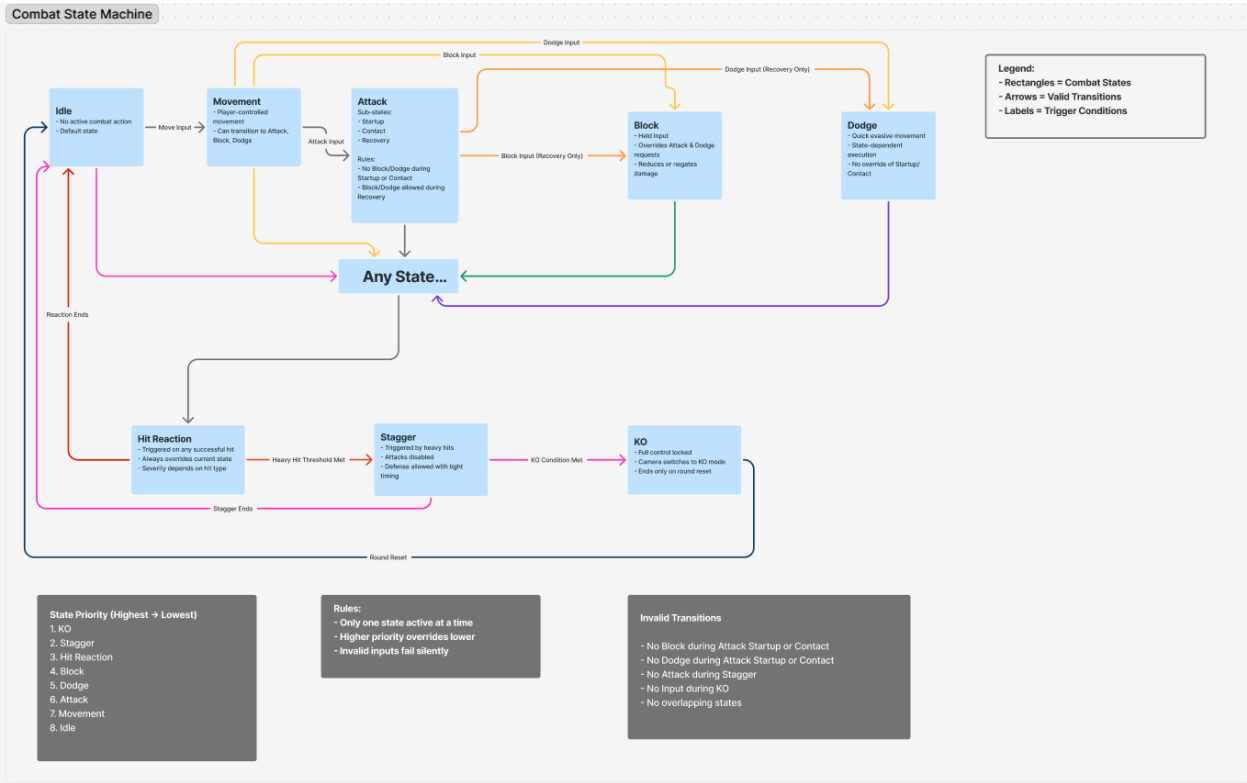
Mitigation: State-based execution limits

Risk: Overly defensive play

Mitigation: Tight stagger defense windows

Risk: Animation conflicts

Mitigation: Single active state enforcement


Combat State Machine
Dodge Input
Block Input
Dodge Input (Recovery Only)
Idle
- No active combat action
- Default state
Move Input
Movement
- Player-controlled movement
- Can transition to Attack, Block, Dodge
Attack Input
Attack
Sub-states:
- Startup
- Contact
- Recovery
Rules:
- No Block/Dodge during Startup or Contact
- Block/Dodge allowed during Recovery
Block Input (Recovery Only)
Block
- Held input
- Overrides Attack & Dodge requests
- Reduces or negates damage
Dodge
- Quick evasive movement
- State-dependant execution
- No override of Startup/ Contact
Any State...
Reaction Ends
Hit Reaction
- Triggered on any successful hit
- Always overrides current state
- Severity depends on hit type
Heavy Hit Threshold Met
Stagger
- Triggered by heavy hits
- Attacks disabled
- Defense allowed with tight timing
KO Condition Met
KO
- Full control locked
- Camera switches to KO mode
- Ends only on round reset
Stagger Ends
Round Reset
Legend:
- Rectangles = Combat States
- Arrows = Valid Transitions
- Labels = Trigger Conditions
State Priority (Highest → Lowest)
1. KO
2. Stagger
3. Hit Reaction
4. Block
5. Dodge
6. Attack
7. Movement
8. Idle
Rules:
- Only one state active at a time
- Higher priority overrides lower
- Invalid inputs fail silently
Invalid Transitions
- No Block during Attack Startup or Contact
- No Dodge during Attack Startup or Contact
- No Attack during Stagger
- No Input during KO
- No overlapping states