Camera System PRD

Version: v1.1

Status: Locked for Implementation

Notes: Updated to restrict cinematic behavior and clarify camera authority.

Problem

The current prototype lacks defined camera behavior, resulting in a combat experience that:

- lacks immersion
- does not clearly show spacing
- may lose sight of the opponent
- creates disorientation during fast movements
- breaks impact readability

A melee combat game relies on camera clarity for:

- spacing decision-making
- telegraph reading
- dodge timing
- attack anticipation
- combo recognition
- hit reaction satisfaction

Without a designed camera system, combat feels chaotic, unclear, and frustrating.

Goals

1. **Maintain Immersion**

    a. Camera should feel intimate during punches, blocks, and close-range exchanges.
2. **Preserve Spacing Awareness**
    a. Camera must always show enough arena space for the player to judge range.
3. **Keep Both Fighters Visible**
    a. Opponent should never disappear unless intentionally behind the player (edge cases).
4. **Maintain Stability**
    a. Camera should **never** snap, whip, or rotate aggressively.
5. **Support Combat Flow**
    a. Camera behavior must complement movement, dodge, attack, and reaction systems.
6. **Deliver Mobile-Friendly Performance**
    a. Camera must run smoothly at 60 FPS without heavy operations.

Camera Philosophy

The game uses a TPP camera during neutral movement, shifting into:

- Over-the-Shoulder close view during high-impact moments
- Directional tilt during dodges
- Shoulder zoom-in during KO or unstoppable combo sequences

This blends:

- Sifu’s immersive combat framing
- PUBG’s readability
- ARMS’ spatial clarity

Camera behavior should feel:

- grounded

- intimate
- reactive
- smooth
- never distracting

Camera is NOT meant to be cinematic except during KO sequences.

Cinematic camera behavior is strictly restricted to:

- Stagger states
- KO opportunity windows

During neutral combat, movement, light attacks, blocks, and dodges, the camera must remain gameplay-first and non-cinematic.

Camera Rules & Behavior

Camera Positioning Rules

1. Default Position (Neutral Combat)

- Distance: **Medium** (ideal 3.5–4.5 units behind player)
- Offset: **Right shoulder**, +0.5 to +0.7 units
- Height: **1.6–2.0 units**
- Vertical angle: **15°–25° downward**
- Follows player rotation with **fast but smoothed tracking**
- Opponent kept in frame with **mild auto-correct rotation**

2. Dynamic Adjustment

Camera shifts to:

Close Shoulder View when:

- heavy attack lands
- combo finisher triggers
- KO sequence begins

Zoom Out Slightly when:

- opponent and player create distance
- dodge moves take the player wide
- to maintain both characters in frame

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5. Combat-Specific Behavior

5.1 Opponent Tracking

- Camera must attempt to keep both fighters visible at all times.
- If opponent approaches screen edge:
  - Apply slow corrective rotation (no snapping).
  - Apply slight zoom-out only if rotation is insufficient.
- Hard lock-on is not allowed.
- Camera must never aggressively rotate or override player input.

5.2 Attack Interaction

- Light attacks → no shake, no camera shift
- Heavy attacks → **directional shake**, subtle push-in, optional tilt
- Combos → slight shoulder zoom/tilt
- KO → full shoulder cinematic zoom

5.3 Dodge Behavior

- Camera follows player movement with **tiny delay (~50–100 ms)**
- Reinforces directional movement

- Keeps dodge readable and satisfying
- No tilt unless heavy dodge momentum

5.4 Block Behavior

- Camera stays stable
- Slight shake on heavy block
- Do NOT zoom during block
- Maintain clarity for reactions

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6. Zoom & Tilt Rules

Zoom must be **noticeable but controlled**, used only to maintain readability or reinforce advantage moments.

Zoom must never be fast, sudden, or cinematic during neutral combat.

6.1 Zoom Behavior

- Minimum zoom change: **0.3 units**
- Maximum zoom: **0.6 units**
- Smooth transition — never snaps
- Used only for combat readability and combos

6.2 Dynamic Tilt

Triggered by:

- heavy impacts
- dodges
- combo finishers
- KO animations

Tilt amount: **5°–10° max**

NEVER tilt during idle or basic movement.

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7. Obstruction & Environment Handling

7.1 Wall Obstruction

- Fade walls instantly when camera approaches
- No pushing/teleporting through geometry
- Camera must slightly raise to improve view when wall obstruction occurs

7.2 Camera Limits

- Min height: **1.6**
- Max height: **2.3**
- Prevents camera from going too low or too high
- Ensures stable readability in enclosed arena

7.3 Tight Spaces

- Camera moves slightly closer & higher
- Maintains view of both fighters
- No swinging around corners

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8. Motion Smoothing & Responsiveness

8.1 Rotation Behavior

- Fast follow with mild smoothing
- Max rotation speed capped (PUBG-style)
- Prevent motion sickness on mobile

8.2 Hitstop Integration

- Camera slows with hitstop on heavy impacts
- Light impacts → no slowdown

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9. Combat State Camera Modes

Neutral Combat Mode

- Medium distance
- Shoulder offset
- Mild tracking

Combo Mode

- Slight zoom-in
- Low tilt
- Directional shake on heavy hits

KO Mode

- Close OTS (over-the-shoulder) view
- Camera push-in
- Dramatic but controlled shake
- Cinematic angle shift allowed

Player Comfort Rule

If camera behavior ever conflicts with player control, input clarity, or spatial awareness, **player control must always take priority**.

Camera behavior must back off rather than override player intent.

Acceptance Criteria

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10. Behavior Requirements

1. Camera must keep both fighters visible ≥95% of active combat time, excluding edge cases where the opponent is intentionally behind the player.
2. Camera must maintain stable orientation without sudden snaps.
3. Camera must rotate no faster than **X degrees/second.**
4. Camera shake only triggers on heavy hits.
5. Dynamic zoom must never exceed 0.6 units from base.
6. Camera must fade walls immediately when obstructing view.

11. Performance Requirements

1. Camera updates must run at 60 FPS on mobile.
2. Smooth rotation and position interpolation must not exceed 0.2 ms/frame processing cost.

12. Player Experience Requirements

80% of players should report:

- clear view of action
- good spacing awareness
- no nausea
- easy to read attacks

Camera transitions (zoom, tilt) must feel smooth and never distracting.

Risks & Constraints

13. Design Risks

1. Dynamic zoom may feel disorienting if tuned poorly.
2. Dynamic tilt may cause motion sickness if too strong.
3. If camera keeps too close during neutral, spacing becomes unclear.
4. If auto-rotate is too strong, it may feel like aim-assist.

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14. Technical Risks

1. Wall fading must be optimized to avoid frame drops.
2. Camera may clip if dodge transitions are too fast.
3. Close-range camera may expose animation imperfections.

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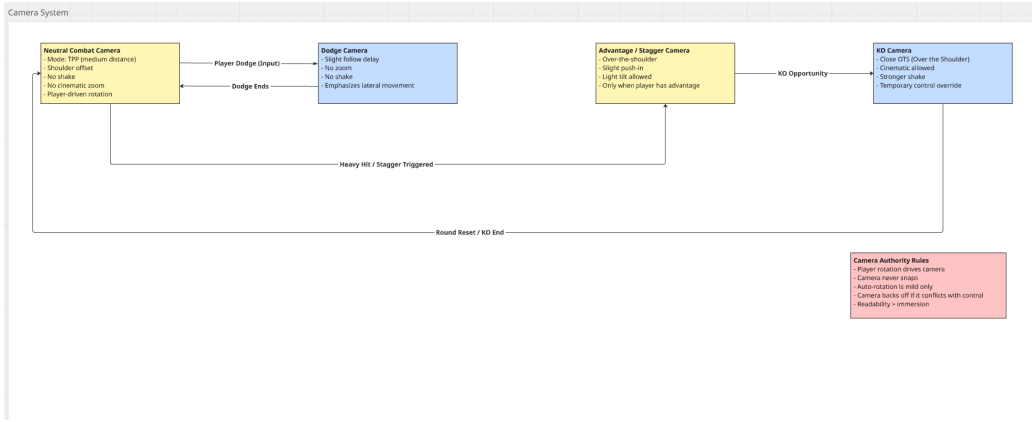
15. Production Constraints

V1 must avoid advanced features like:

- spline-based cinematic paths
- dual cameras
- slow-motion blending
- character silhouette highlighting

Camera must be simple enough to tune in-engine without advanced tools.

Camera Flow Miro Board


Camera System
Neutral Combat Camera
- Mode: TPP (medium distance)
- Shoulder offset
- No shake
- No cinematic zoom
- Player-driven rotation
Player Dodge (Input)
Dodge Ends
Dodge Camera
- Slight follow delay
- No zoom
- No shake
- Emphasizes lateral movement
Advantage / Stagger Camera
- Over-the-shoulder
- Slight push-in
- Light tilt allowed
- Only when player has advantage
KO Opportunity
KO Camera
- Close OTS (Over the Shoulder)
- Cinematic allowed
- Stronger shake
- Temporary control override
Heavy Hit / Stagger Triggered
Round Reset / KO End
Camera Authority Rules
- Player rotation drives camera
- Camera never snaps
- Auto-rotation is mild only
- Camera backs off if it conflicts with control
- Readability > immersion