

DiceClash

A four-player strategy
prototype: flicking dice
across a tavern table

Project 4 · Unreal Engine 5.8
2026.09.24 – 10.07



Contents

01	Overview and Motivation What the game is and why I made it	03 – 06
02	Research, Design Problem and World References and choices; the core problem of dice randomness; the tavern world	07 – 14
03	Core Gameplay Match structure, gameplay flow, core loop, four actions and scoring	15 – 24
04	Level Design, Scene Iteration and Camera Table routes, tavern terrain, scene iteration, visual polish and camera follow	25 – 36
05	Strategy and Play Experience Trading off position, pips, terrain and timing; strategy cases and the scoring show	37 – 45
06	Playtest Iteration and AI Characters 31 playtest notes and their changes; AI decisions, character performance and your hands	46 – 62
07	Verification and Reflection What was verified, reflection and next steps, scope of work	63 – 67
App.	Technical Implementation and Blueprint Rebuild Module layout and 19 Blueprint graphs	68 – 90

01

Overview and Motivation

What kind of game is this?
Why did I want to make it?

In this chapter

- 04 Overview: A Four-Way Dice Duel on a Tavern Table
- 05 Motivation: Luck You Can Work With
- 06 Experience Goals: Three Design Pillars

Overview: A Four-Way Dice Duel on a Tavern Table



In-game, seat view: seated and waiting for the match, the three opponents at their places

In one sentence

Four players sit around a tavern table and take turns flicking dice into a scoring zone. The dice stay on the table, so pips, positions and terrain keep being rewritten over three rounds.

Project info

Genre: physics flicking × turn-based strategy

Match: 1 player + 3 AI opponents

Engine: UE 5.8 (C++ / Slate)

Period: 2026-09-24 to 10-07

Motivation: Luck You Can Work With

Starting point

Dice games are fun because of luck, and frustrating because of it: whatever you roll is what you get, and all you can do is wait. I wanted a table game where luck still matters but judgement decides who wins - like a wager with a few old regulars in a tavern: a steady hand, and a mind on what the others will do.

From a playtest (quote, shortened)

"Make it about playing against each other, not everyone doing their own thing."

① Randomness matters, but doesn't decide the winner

Keep the surprise of physical tumbling, while direction, power, position and later intervention stay in the player's hands.

② Every move affects someone else

Dice stay on the table to block and hit each other; changing pips and pouring both affect opponents.

③ Rules grow out of the scene

Spills, torn felt and wooden boards are the terrain; opponents are regulars with names and tempers. No manual is needed to explain the rules.

Experience Goals: Three Design Pillars

Feel

The throw is in the player's hands

In the design

- Drag distance is power
- 0–65°: along, around or over
- Preview only to first contact
- Hits strong enough to shove

How it is tested

Can you reliably land dice in the zone and knock rivals out?

Trade-offs

Every move has a cost

In the design

- Throw, nudge, card or pour
- Cards once each, one pour
- Rules rotate; old spots fade
- Last move can rewrite scoring

How it is tested

Can players say why they chose this move?

Atmosphere

Sitting at a tavern table

In the design

- Seat view, seated opening
- Three named, tempered rivals
- Patrons react to big moments
- Ambience; a tune per round

How it is tested

Do players notice opponents' reactions and act on them?

02

Research, Design Problem and World

What did I draw on?

What is the core problem to solve?

What world does the game live in?

In this chapter

08 Inspiration: Table Duels and Flicked Dice

09 Inspiration: Positioning and Action Feedback

10 Comparable Games: What to Take, What to Leave

11 The Core Design Problem: Dice Randomness

12 The Answer: Randomness in Four Layers

13 World: DiceClash on a Rainy Tavern Night

14 World Serves Play: Every Tavern Object Is a Rule

Inspiration: Table Duels and Flicked Dice

Black Jacket



Reference: table duels bent by special cards. In DiceClash: a tavern table and distinct rivals set the mood. Four one-use cards change or protect dice and share the move with throws.

Tumblin' Dice board game



Reference: flicked dice, face $\times$ landing zone. In DiceClash: dice stay between rounds, so a spot's value changes with the rule; collisions change both faces and the board.

Inspiration: Positioning and Action Feedback

Curling: position itself has value



Image: Curl Aberdeen official beginners' page

Reference: stones place, guard or hit.
In DiceClash: even a low die blocks a line. The contested centre, side routes and lobbs make players choose: hold or attack.

Into the Breach: read, then act

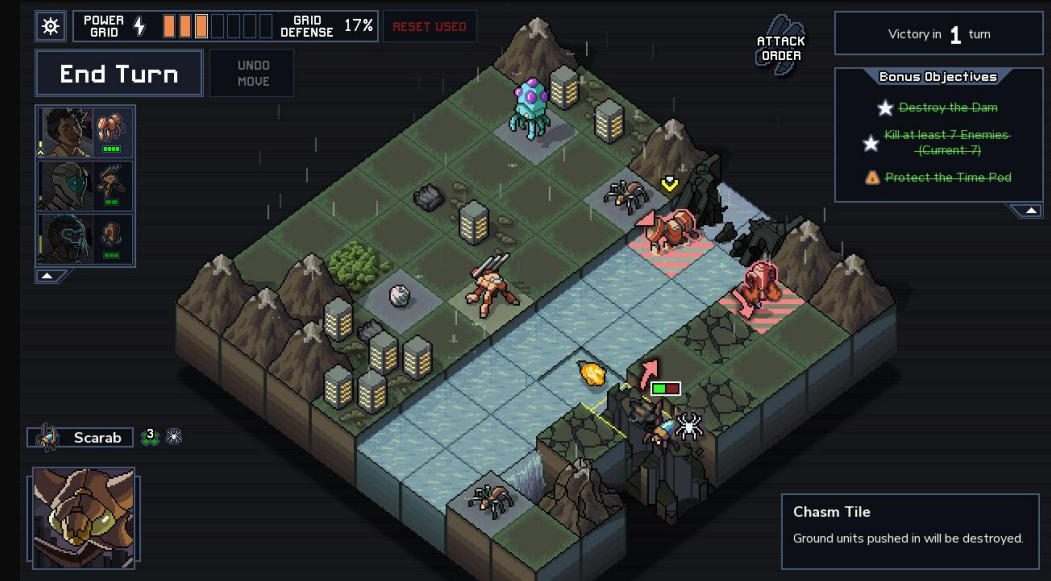
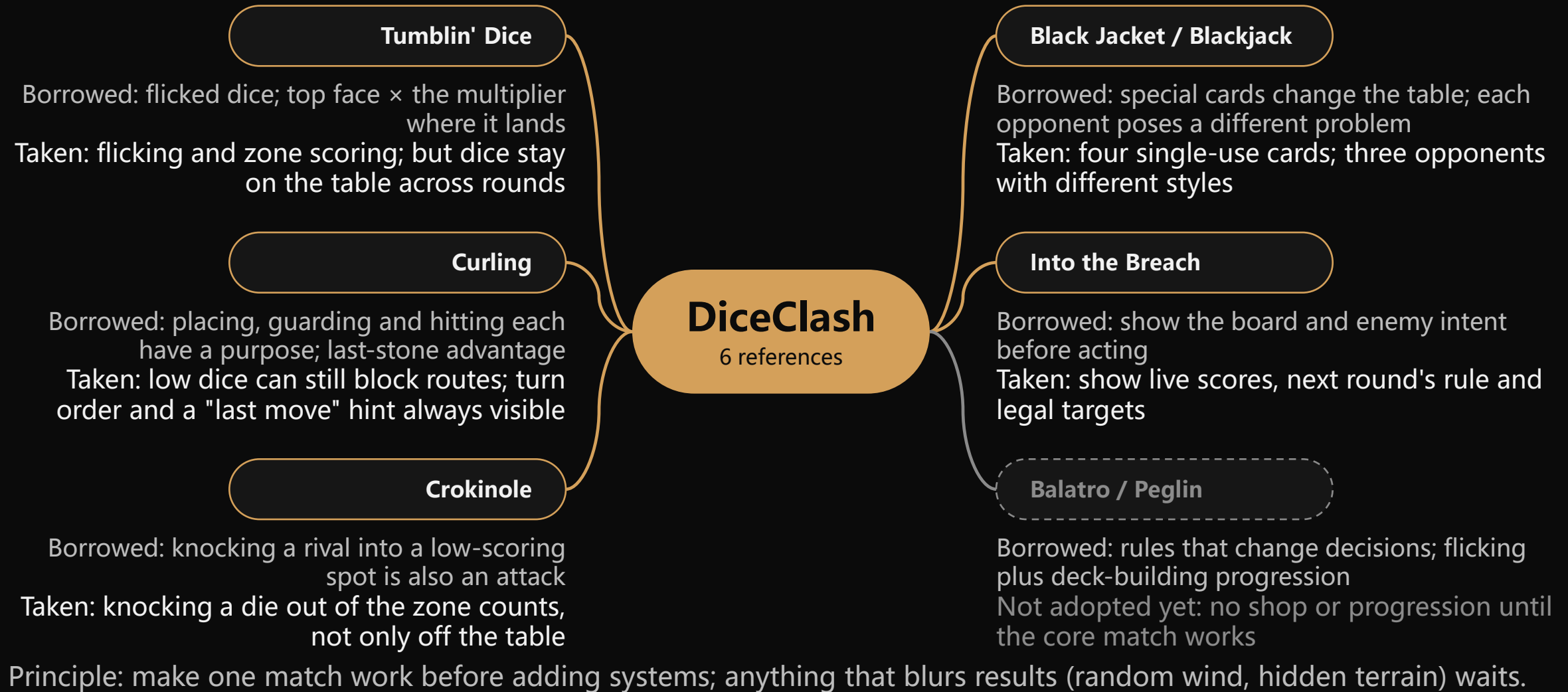


Image: Subset Games official Steam page

Reference: enemy intent shown before acting.
In DiceClash: live score, next rule and legal targets are shown, plus each move's gain or loss. Physics stays uncertain.

Comparable Games: What to Take, What to Leave



The Core Design Problem: Dice Randomness

What playtests exposed

"Whatever it lands on is what you get. Short of picking it up and rethrowing, you can't change it."

Playtest feedback

To keep a high die in the zone, the only way to change pips was to break up your own position.

Playtest feedback: "This is the core conflict"

After a lob bounces a few times you lose track, and the pips seem to change out of nowhere.

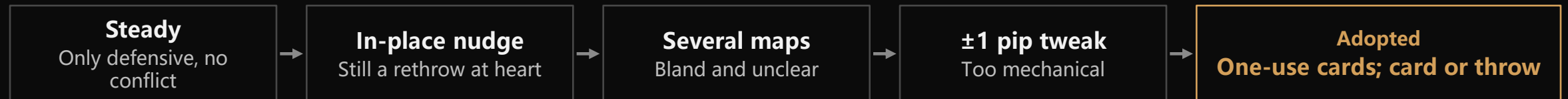
Mechanics research

Design judgement

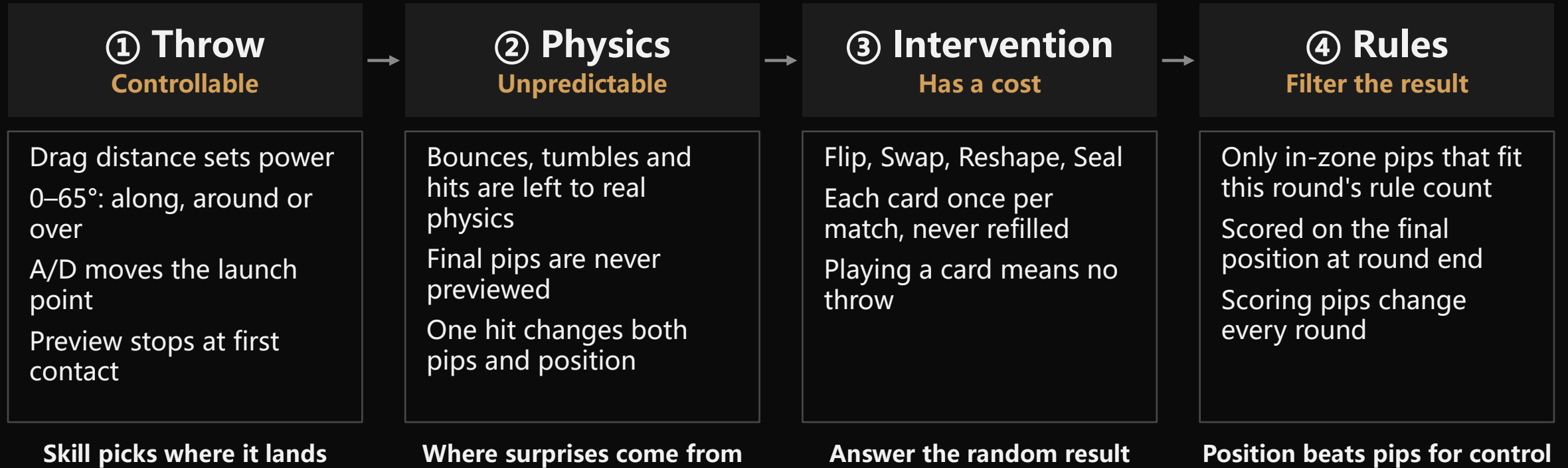
Randomness itself is not the problem - it creates surprises and comebacks. The problem is that players have nothing to do about it.

The goal is not to remove randomness but to give it a structure: control before the throw, intervention after the result, and rules that filter at the end.

Tried, then withdrawn



The Answer: Randomness in Four Layers



Randomness creates the situation; choices decide the winner.

The AI plays by the same structure: unknown tumbles use expected value, Reshape never peeks, real physics is never altered.

World: DiceClash on a Rainy Tavern Night



Art direction: a medieval Nordic tavern with the period feel of The Witcher - candlelight, timber beams, parchment. Current build, top view.

Setting

An old tavern on the northern frontier. On rainy nights the regulars gather round the worn green-felt table to play DiceClash - dice knocking dice. After three rounds, whoever has the most pips left in the lamp-lit zone wins the night's drinking money.

Three regulars at the table

Hob (Orange): an unhurried old regular; once he holds the middle, he won't budge
Aldric (Purple): a cloth merchant who loves big bets; plays aggressively
Brann (Green): a retired mercenary who grumbles and only defends

World Serves Play: Every Tavern Object Is a Rule

Drink spilled on the table

Rule: low-friction area, friction 0.06 (felt 0.45)

Why: dice slide further and leave the table more easily; tests power

Worn-through felt

Rule: high-friction area, friction 1.15; no pouring

Why: a reliable place to stop and land

Wooden boards nailed to the table

Rule: short walls that cut straight routes

Why: forces two routes, around along the felt or a lob

Raising a tankard to pour

Rule: a once-per-match action that makes a spill

Why: terrain becomes the player's choice, not a fixture



Thing in the tavern → what it is in play → why

Three regulars

Rule: three AI styles - zone control / aggressive / defensive

Why: an opponent's temper is a playstyle you can read

Watching patrons

Rule: they clap, gasp and jeer at big moments

Why: tell the player that something big just happened

Placards, coins, hourglass

Rule: score, totals and turn live in the scene

Why: fewer 2D panels; info stays in the world

Turning point (playtest): ice and low walls clashed with the tavern, so they became tavern things with the same function.

03

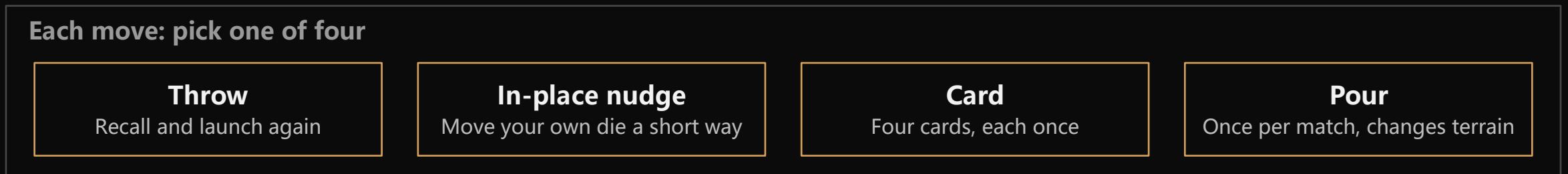
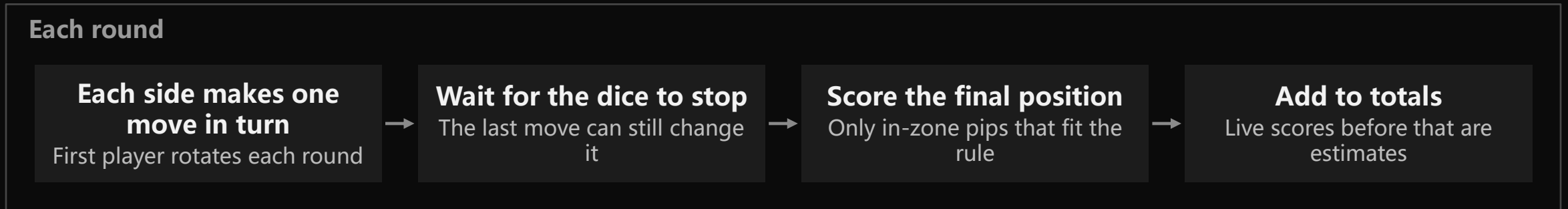
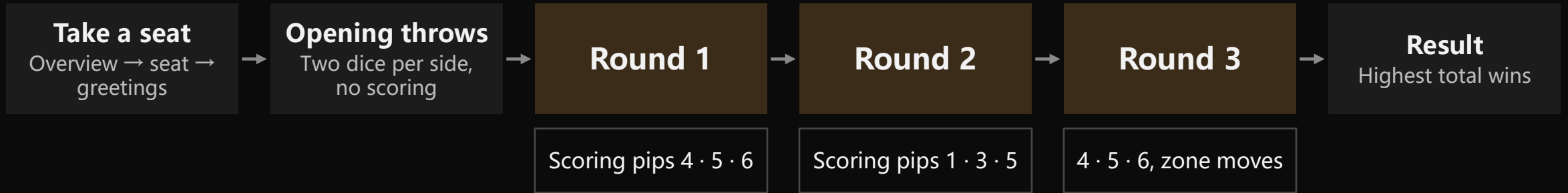
Core Gameplay

How does a match play out?
What does the player decide each move?

In this chapter

- 16 Match Structure: Three Rounds, One Move Each
- 17 Gameplay Flow: One Recorded Match in 16 Steps
- 18 Core Loop: Read → Choose → Throw → See the Result
- 19 Four Actions: Four Ways to Change the Table
- 20 Three-Round Scoring Rules
- 21 Live Score and Total Score
- 22 Drag to Throw: Direction and Power
- 23 Four Limited Cards
- 24 Pouring: Choices and Limits

Match Structure: Three Rounds, One Move Each



Design focus: dice are never cleared, so each move is left for the next player; the rule rotates, so a spot's value changes.

Project 4 • Gameplay Flow

16 steps • 3 rounds • 4 players

DiceClash, one recorded match: take a seat → opening throws → three rounds of moves, cards and scoring → final podium



Take a seat
Tavern overview, push in to the seat; click to begin



Three regulars greet
Hob, Aldric and Brann speak in turn



Opening throw
Drag for direction and power; brass power ring



Opponent throws
Camera turns to the thrower; Brann rolls green



Tavern and table Patrons and onlookers around the table



Flip close-up
Camera pushes in; blue die 1 → 6



Play "Flip"
The card floats to mid-table, then turns to sand



Choose a move
Throw / card / pour; the hand fans up



Opening settles
Two dice each stay on the table; no scoring



The regulars Three opponents, each with a look, temper and idles



Opponents play too
Hob plays Flip with the same show



Round scoring
Points become coins that fly to each stack



Round 1 podium
Four take the podium; idles by rank and temper



Play "Swap"
Pick your own die, then a nearby enemy die



Dice close-up Dyed bone dice, brass zone frame, worn felt



Final podium
You stand on the barrel, arm up, and cheer



Last move
Camera follows the last die and pushes in



Round 3
The zone has moved; placards keep the totals

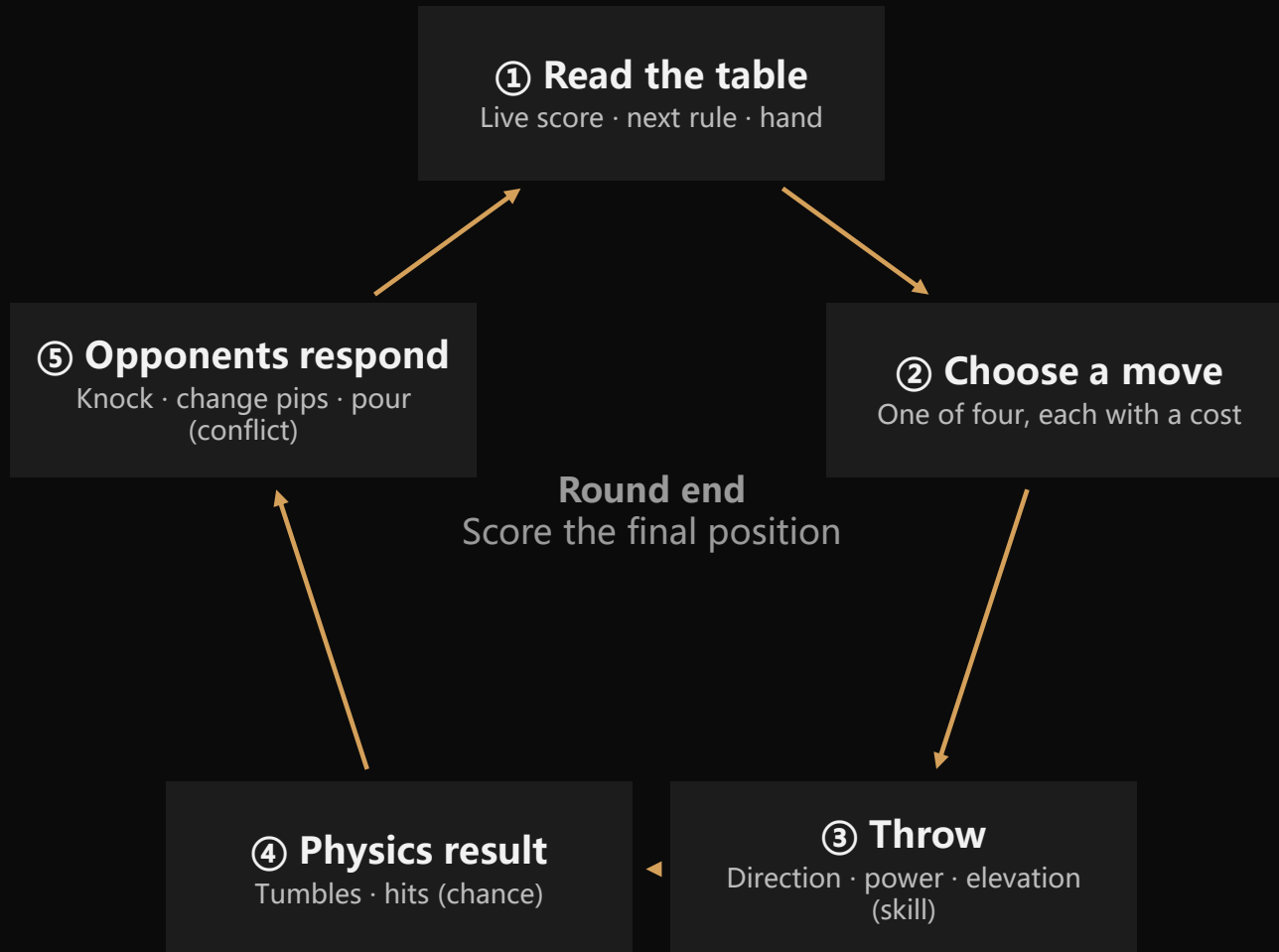


Swap resolves
Blue 1 → 5, Brann 5 → 1



Podium stage A separate stage, rendered live

Core Loop: Read → Choose → Throw → See the Result



What each step is for

Read: information lives on the table - scores on placards, cards face down in front of opponents, the dashed frame of next round's zone.

Choose: only one of four actions; the choice itself is the strategy.

Throw: dragging sets direction and power; the preview stops at the first contact.

Physics: tumbles and final pips are not previewed; the surprise lives here.

Respond: the three opponents rewrite the table in character, and the patrons cheer along.

Dice stay on the table, so every move is attack, defence, and the position you leave to the next player.

Four Actions: Four Ways to Change the Table



Throw / rethrow

Changes

Position and pips, by physics

Cost and limits

Breaks up your position; dice off the table must be recalled first

Purpose

Main way to score; skill and luck together



In-place nudge

Changes

Move your own die a short way

Cost and limits

Also costs a move, and still tumbles

Purpose

Fine-tuning without breaking position



Card

Changes

Changes pips only, not position

Cost and limits

Four cards, once each, never refilled; playing one ends the move

Purpose

An answer to the random result



Pour

Changes

Terrain: makes a low-friction spill

Cost and limits

Once per match; can't cover torn felt, boards or off-table

Purpose

Changes everyone's routes from then on

Hard rule (set during playtests): one thing per move - a card or a throw, never both, no free actions. Cards and the pour are limited, so when to use them is the strategy.

Three-Round Scoring Rules

Opening

Valid faces in the zone

No scoring

Scoring

Placement only

Round 1

Valid faces in the zone



Scoring

Top face × 2

Round 2

Valid faces in the zone



Scoring

Top face × 2

Round 3

Valid faces in the zone



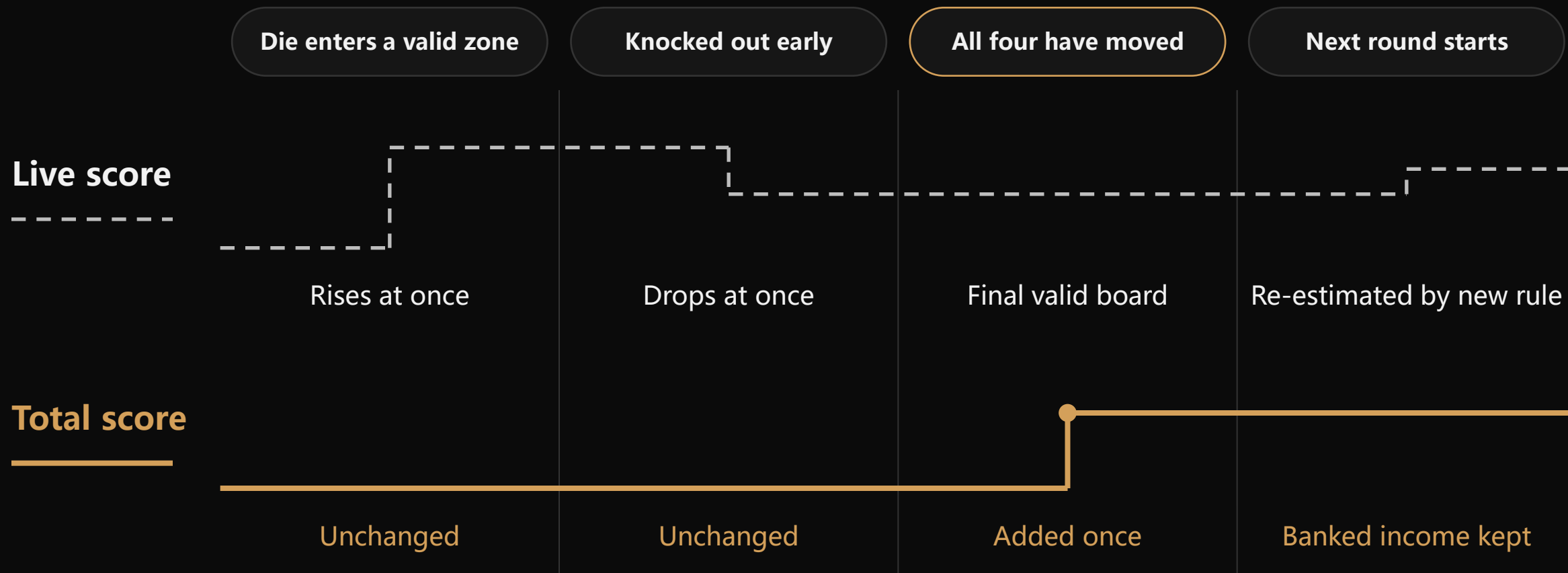
Scoring

Top face × 2

Outside the zone / not fitting the rule • all • 0 points, no bonus for knock-outs

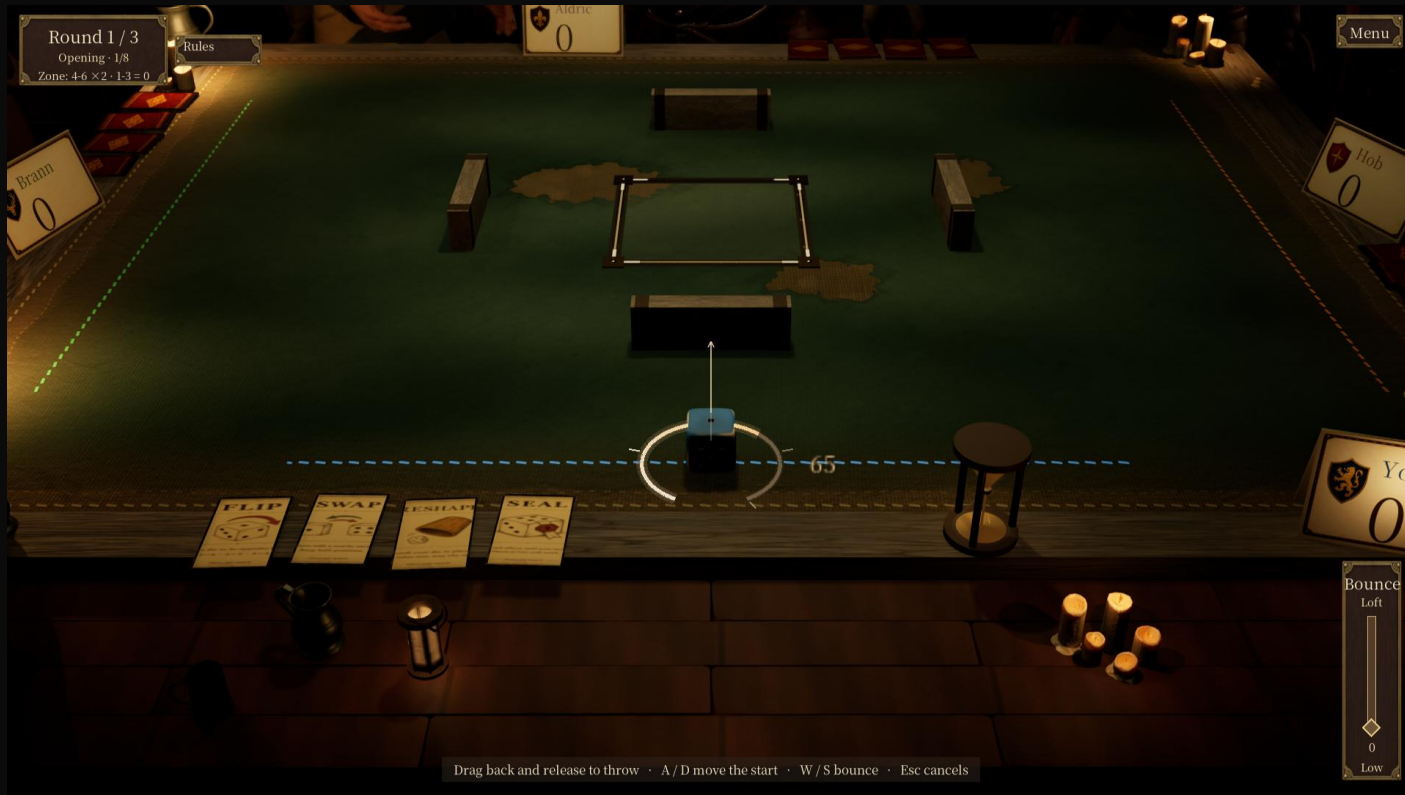
A die is in the zone when its centre is inside the border. Unplaced, out-of-bounds and in-hand dice don't score.

Live Score and Total Score



Intent: being in a zone is a temporary edge; it becomes income only at the end of the round.

Drag to Throw: Direction and Power



In-game, seat view: aim camera, brass power ring under the die

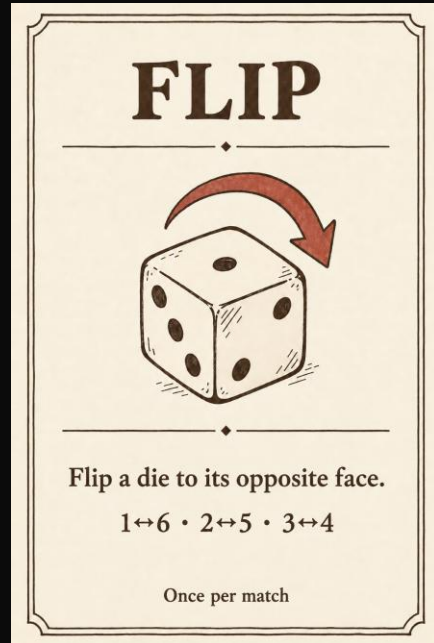
Drag sets direction and power

Hold the launch die, drag back, release. A perspective brass dial and number under the die show power; the bottom bar is faded to a backup.

Adjustable start and bounce

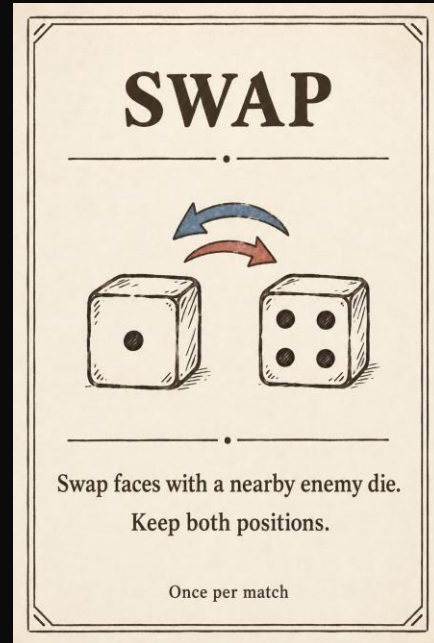
A/D moves the start, the side slider sets bounce; cancelling is free. Aiming drops the camera behind the die, your side table at the bottom; it freezes while you drag.

Four Limited Cards



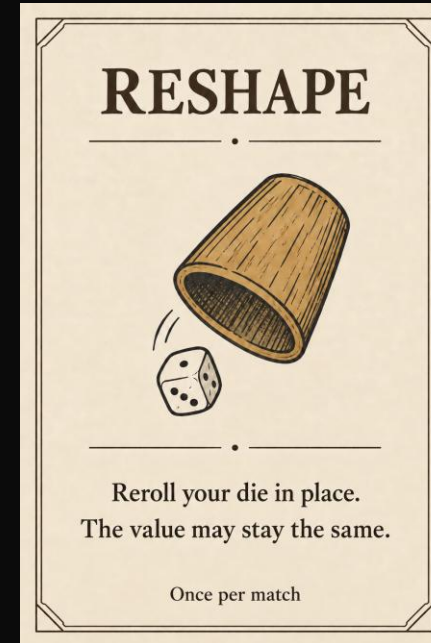
Flip

Any unsealed die turns to its opposite face



Swap

Swap faces with an enemy die within 220 units



Reshape

Your die rerolls to 1–6 in place



Seal

Immune to card changes until your next move

One of each per side, never refilled. A card ends your move; no throw after it.

Pouring: Choices and Limits



One move changes the surface

Click the near tankard or press E to pick a spot.
Once per side per match; the spill stays to the end.

Feedback says if it's legal

A spill can't cover torn felt, walls or off-table. Illegal clicks and cancels cost neither the charge nor the move.

Early build: choosing a pour spot

04

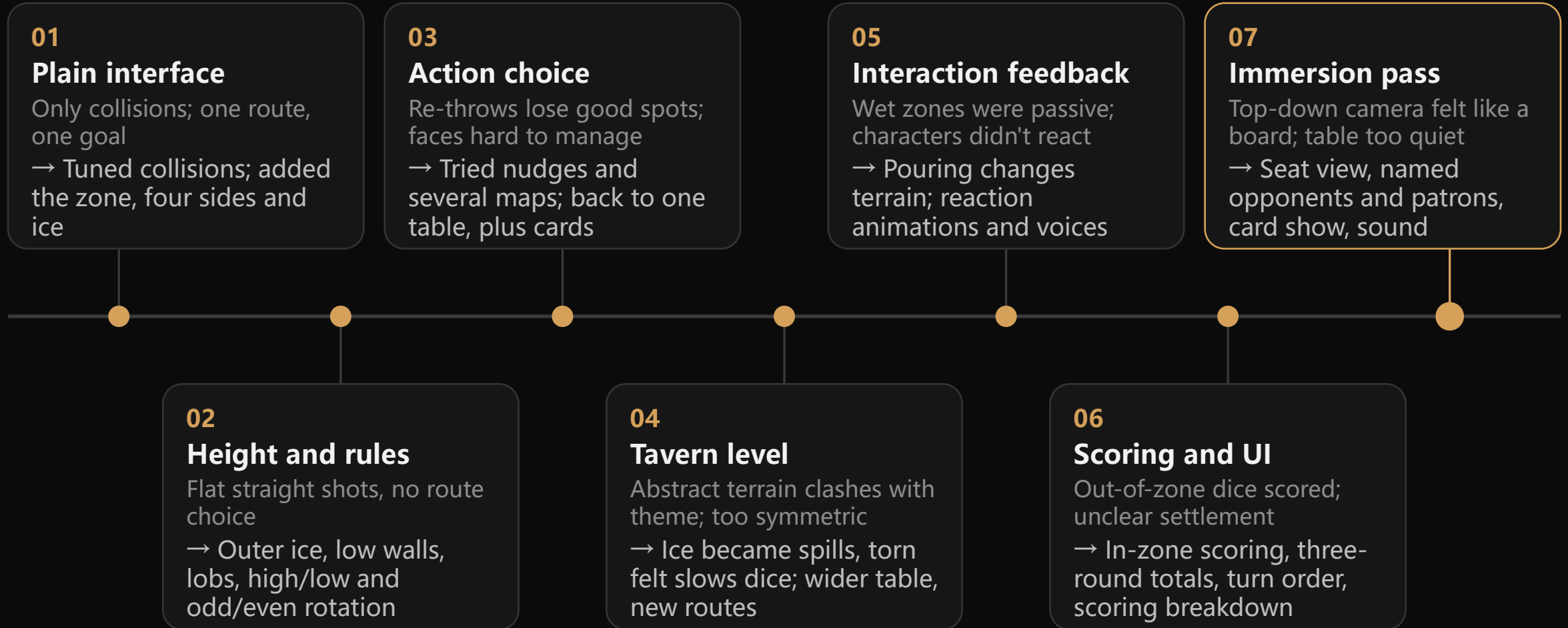
Level Design, Scene Iteration and Camera

How does the table offer route choices?
How did the scene go from abstract to tavern?
How does the camera serve aiming and the whole table?

In this chapter

- 26 Level and Gameplay Iterations
- 27 First Iteration on the Basic UI
- 28 Height and Obstacles: More Routes to Choose
- 29 How the Tavern Theme Reshaped the Level
- 30 Table Layout: From Rule Placement to Routes
- 31 Pouring: Fixed Terrain Becomes a Player Action
- 32 Level Layout: How Each Area Shapes Choices
- 33 Tavern Environment Iterations
- 34 Visual Polish: From Debug Lines to Tavern Objects
- 35 Seat View: Seated Intro and Four Camera Shots
- 36 Camera Follow: When to Move, and How Much

Level and Gameplay Iterations



Coasters, out-of-zone points and knock-out bonuses were early rules, not final. The immersion pass changed presentation only.

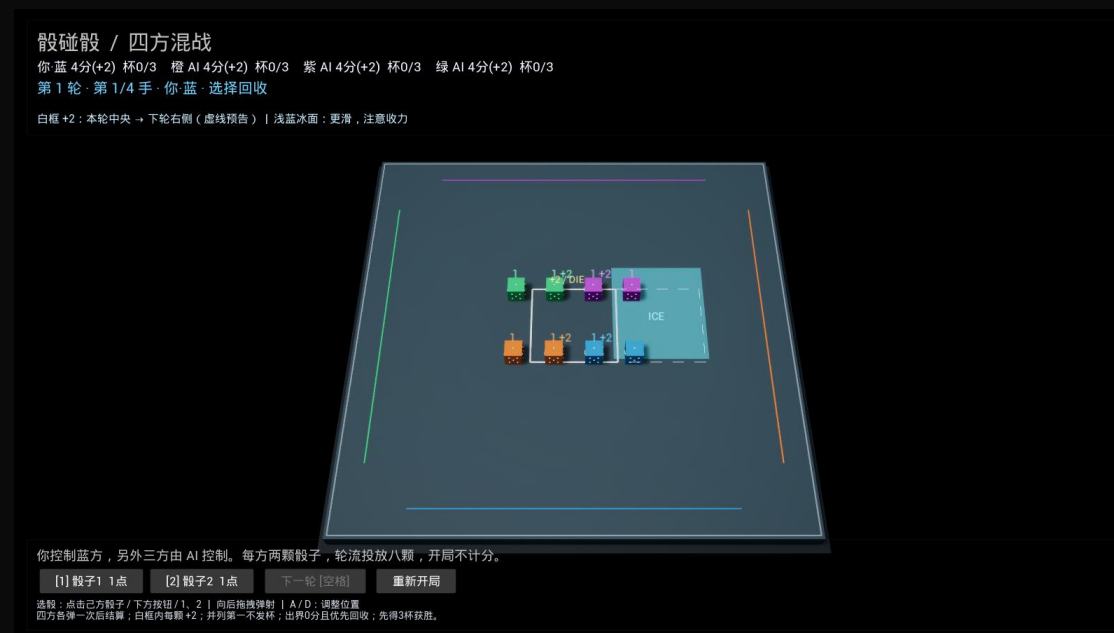
First Iteration on the Basic UI

Two players: physics loop first



Two sides + central bonus zone, re-run from an early backup

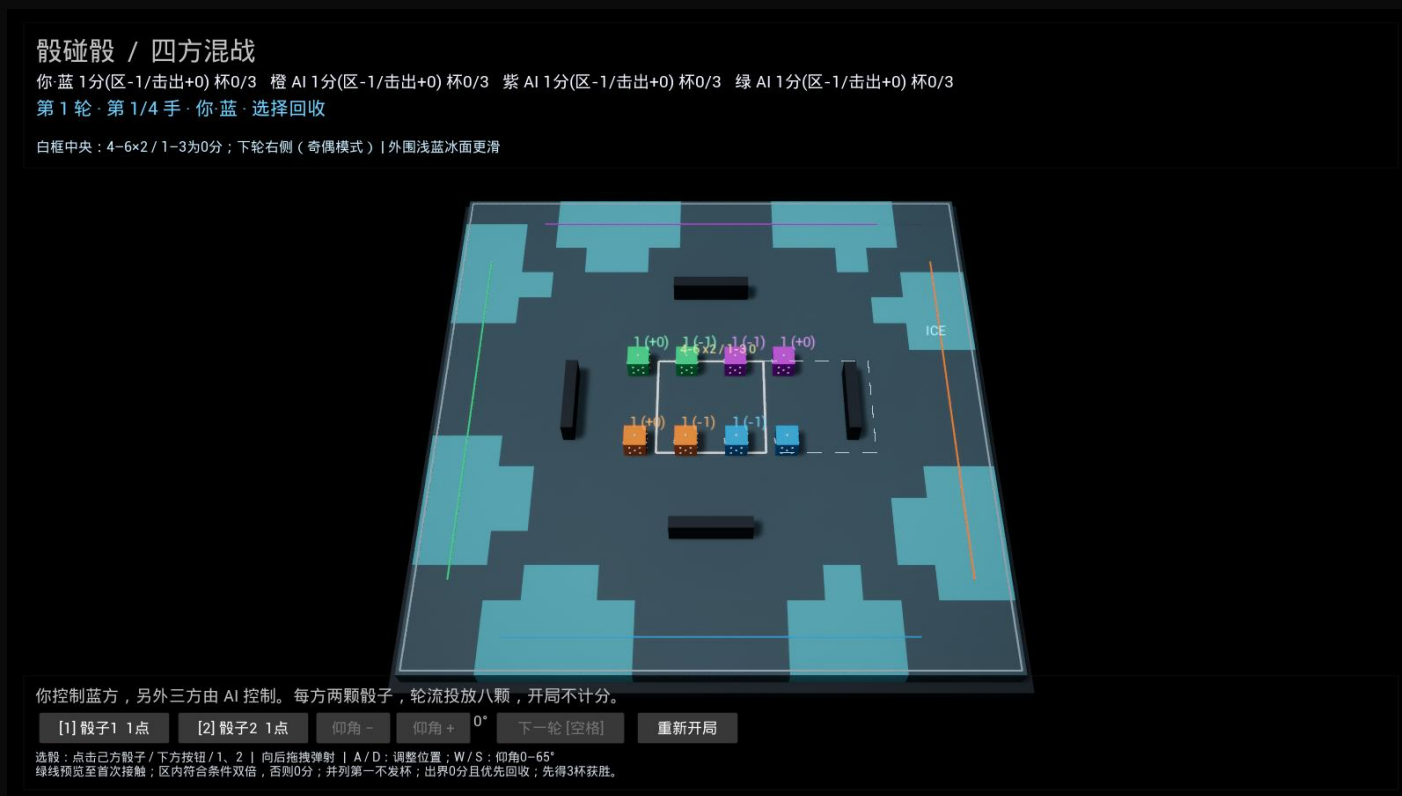
Four players: fight for position



Four sides + fixed ice, re-run from an early backup

No tavern yet: throw, recall, score at rest, keep dice between rounds. Feedback said "one-note, AI too dumb", so zones, three opponents and low-friction ice followed.

Height and Obstacles: More Routes to Choose



Problem: flat routes repeat

Dice mostly collided along straight lines. The owner asked for an "anti-aircraft gun" mechanic so dice could clear obstacles.

Change: ground, around, or lob

Added 0–65° pitch and a first-arc preview. Ice moved to the edges, the centre stays contested, and high/low and odd/even rules alternate.

Outer ice and four low walls, re-run from a backup of the time

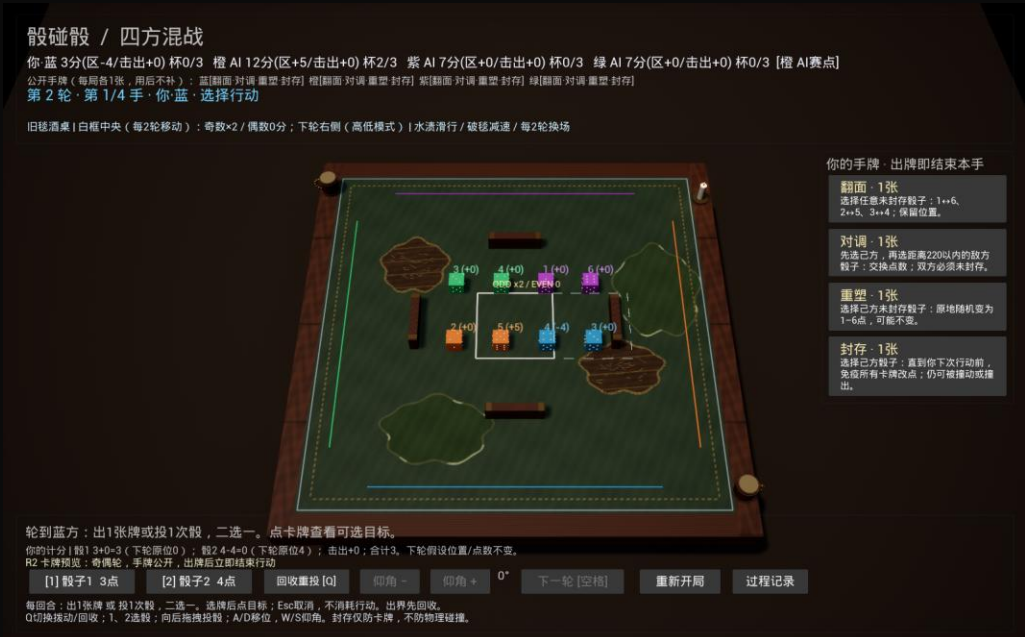
How the Tavern Theme Reshaped the Level

Abstract terrain: ice and low walls



Re-run from the same historical rules backup

Tavern: spills, torn felt, boards

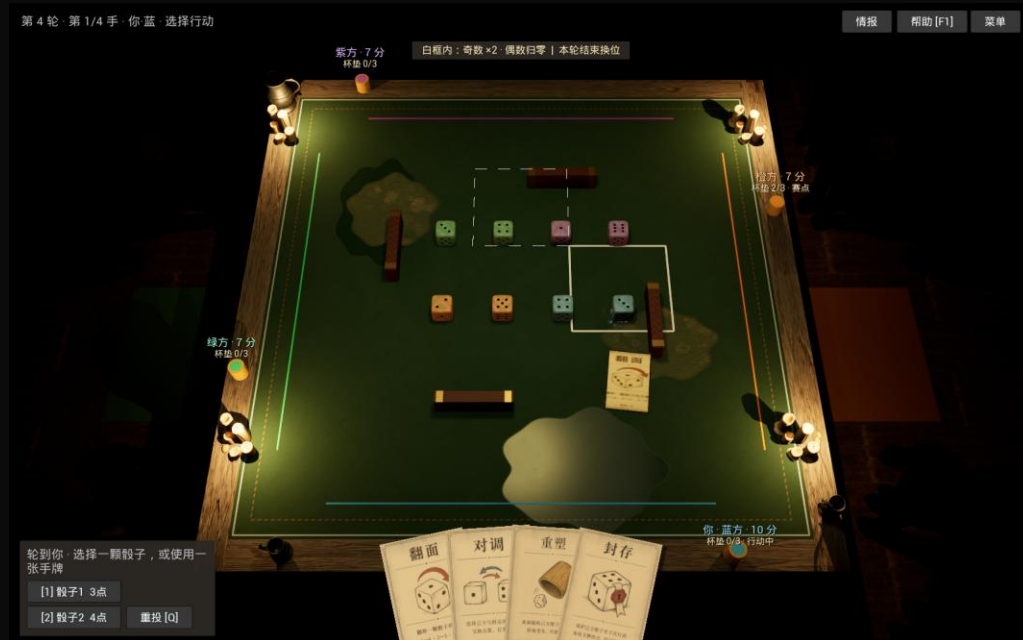


First tavern table, original historical screenshot

The gameplay roles (low friction, slowing, blocking) stay, now as readable tavern objects. Zones move only after two rounds, so players relearn the board less often.

Table Layout: From Rule Placement to Routes

Early wet and torn zones



Historical screenshot: still too regular

Wider table, asymmetric zones

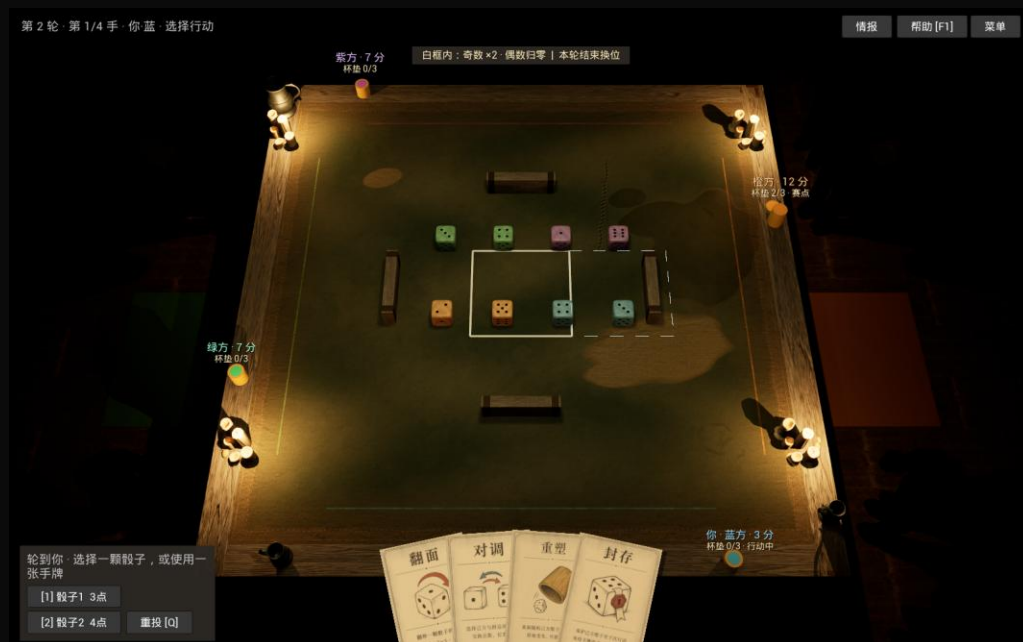


Historical screenshot: rearranged for bank shots, hits, stops and holds

Per feedback the table grew a third wider, zones got varied sizes and outlines, and plain felt lanes remain. The layout is built around shot routes and risk; worn materials carry the tavern mood.

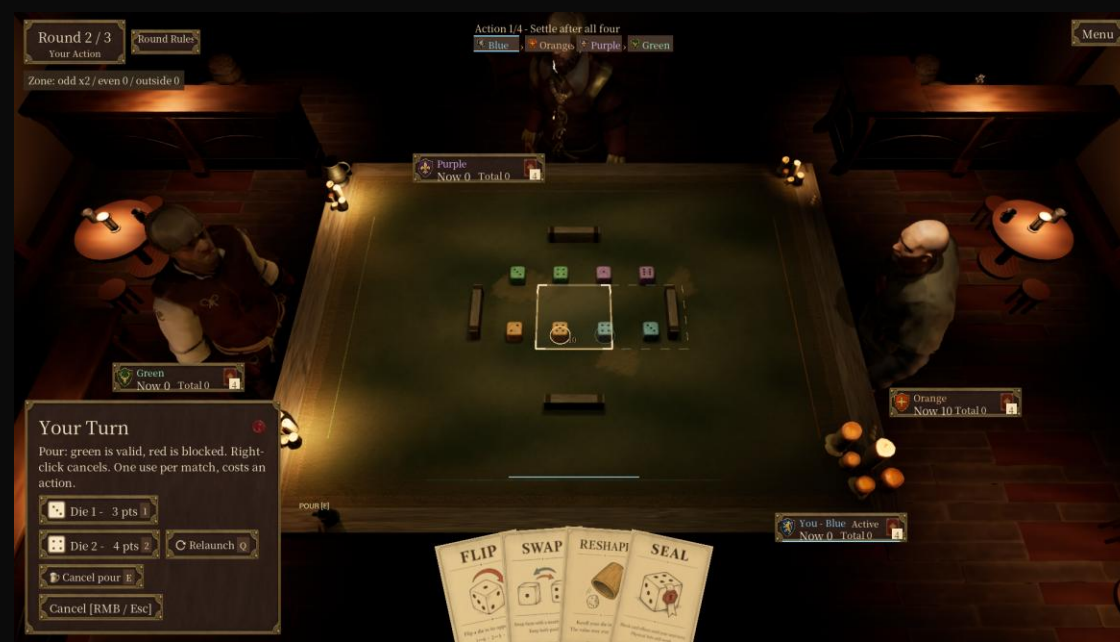
Pouring: Fixed Terrain Becomes a Player Action

Before: preset slippery zones



Historical screenshot: wet areas preset by the level

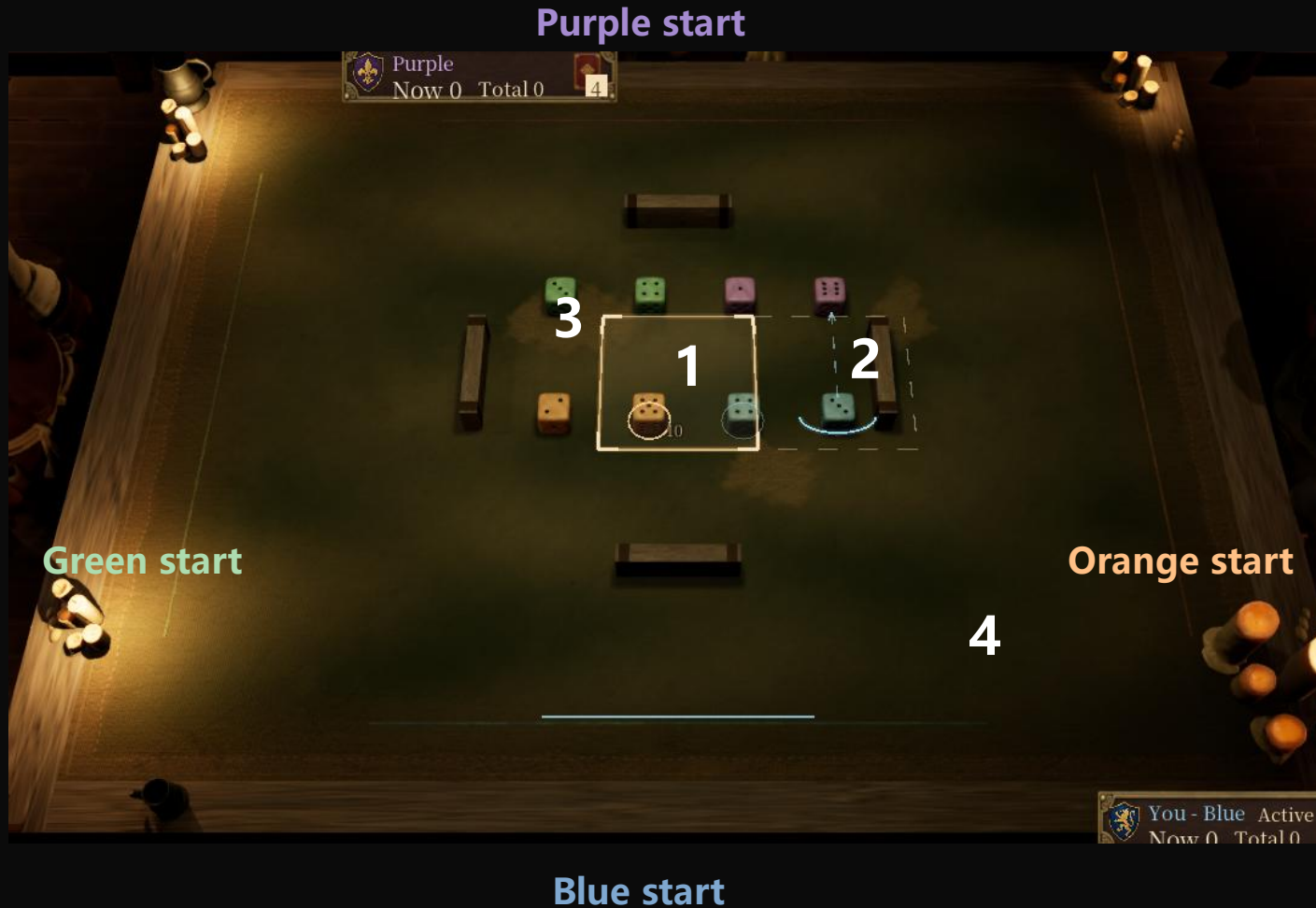
After: the player picks the spot



Current English build: spot preview, costs one move

Fixed wet areas were removed; each side may pour once per match instead. The spill lasts the match, can't cover torn felt, boards or off-table, and costs the move.

Level Layout: How Each Area Shapes Choices



1 Contested centre zone

Rule-matching faces only. Central for two rounds, moves in round three.

2 Short walls

Block the direct line; go around or lob, each with its own power.

3 Torn slow patch

Shortens slides and lets dice stop; no pouring here.

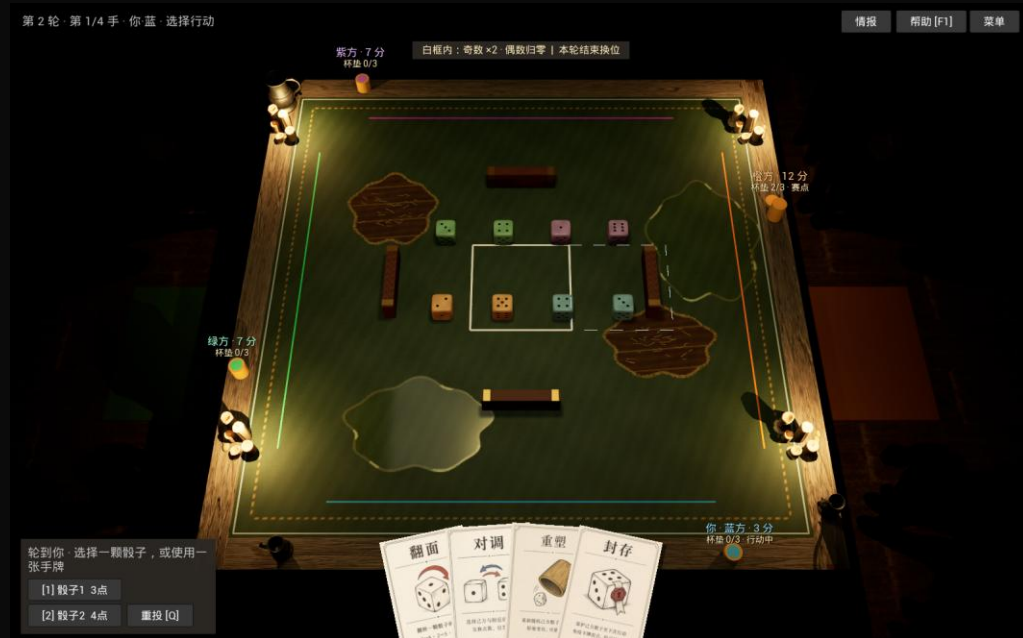
4 Plain side lane

Entry and side-attack routes; can be poured on, spills last the match.

Numbers mark the current in-game terrain; each side throws from its own edge.

Tavern Environment Iterations

Early table and background



Historical build-out stage

Tavern open: patrons and sound



Current in-game overhead: 12 patrons at the bar, side tables and main table, each busy

The play layout stayed while floors, bar, tankards, characters and lights came in; then mocap patrons, 7 ambience layers and a tune per round. The main table stays the focus.

Visual Polish: From Debug Lines to Tavern Objects



Problem: zone frame, launch line and rings were screen lines that dice couldn't hide; the bottom third was black when aiming.
Change: brass frame, stitching, bone dice; marks on the table, hidden by dice; a side table below the aim view; face light, grading, DOF, haze.

Seat View: Seated Intro and Four Camera Shots

Intro: overlooking the tavern



Seated intro, opening frames, current build

Push in to the seat, wait for the start



Camera settles at the seat; aiming starts after a click

Seat (framed to the farthest head), Aim (low behind the die), Follow (fastest die, stops at the centre), Result (top-down). Frozen while dragging, as aiming un-projects the mouse onto the table.

Camera Follow: When to Move, and How Much



01 Choose, wait

Seat view, framed from your edge to the farthest head
Like sitting there, all three rivals in view



02 Aim

Behind the die; the 260 drag range stays in frame
Drag distance is power, so it must show

Frozen

Follow

03 Dragging

Holds still
Aiming projects the mouse onto the table; a moving camera would make it drift

04 After the throw

Follows the fastest die partway, never past the table centre
See the hits without losing the whole table

Hold 1 s



05 Dice stop

Holds 1 s to "see the result", then turns to the next player
Added after "the pace is too fast" feedback

06 Opponent's turn

Stays in your seat, turning a little toward the thrower
You know who is throwing without leaving your seat



07 Card

Pushes in to watch the target die turn, then back to the seat
See what was done to which die



08 Round scoring

After the show ends, cuts to the top camera
Whole table: coins fly to each stack, then the podium pops up

Every parameter can be tuned live with dc.Cam.*; automated checks don't use the new camera, so rule results are unaffected.

05

Strategy and Play Experience

What does the player weigh up?
How is a good move made readable?

In this chapter

- 38 Strategy Space: Position, Pips, Terrain, Timing
- 39 Dropped Ideas and the Arrival of Cards
- 40 Card Selection and Target Feedback
- 41 Turn Order and the Last Move
- 42 Strategy Case: Last Move, Hold or Hit?
- 43 Strategy Case: Flip, Settle, Look Ahead
- 44 Round Scoring: Wait for the Show, Then Pay Out
- 45 UI on the Table: Placards, Piles, Hourglass, Ring

Strategy Space: Position, Pips, Terrain, Timing

Position • take, block, hit

Options: get into the zone; block routes with low dice; knock rivals out of the zone

Cost: attacking can scatter your own dice; the zone moves in round 3

Pips • rewrite with cards

Options: Flip, Swap, Reshape, Seal

Cost: each card once; a card means no throw; Seal doesn't stop physical hits

Terrain • pour a drink

Option: make a spill on a rival's route

Cost: once per match; the spill affects you too; can't cover torn felt or boards

Timing • who moves last

Option: the last move can rewrite the table before scoring

Cost: first player rotates; an early setup must survive three moves

The rule changes each round (4–6 → odd → 4–6 with the zone moved): last round's good spot may score nothing next round, so dice left on the table need new work.

Dropped Ideas and the Arrival of Cards

Tried

Three maps and in-place nudges

The owner wanted one table that changes live, not new maps. Nudges still move dice and add randomness, so they don't solve "keep a good spot, change the face".



Withdrawn

Several maps and direct pip tweaks

Back to polishing a single table. A " ± 1 face edit" never left discussion: the owner found it too blunt, so it did not ship.



Adopted

Limited cards; card or throw

Flip, Swap, Reshape and Seal each intervene differently. Each is once per match; a card and a throw share the same move, with no free actions.

Design focus: manage faces while keeping position, and give "move" versus "change face" a real opportunity cost.

Card Selection and Target Feedback



In-game, seat view: on your turn, the card fan rises from the table edge

Cards on the edge and the card fan

Your cards normally lie face up on the table edge; on your turn they rise as a fan and move forward on hover. After you pick a card, legal targets and limits are shown.

Faces change, positions don't

Flip, Swap and Reshape change faces only, never position. A sealed die can still be bumped, tumbled or knocked out.

Turn Order and the Last Move



In-game, seat view: an opponent's turn; the camera turns slightly toward him, and the hourglass has been passed to his place

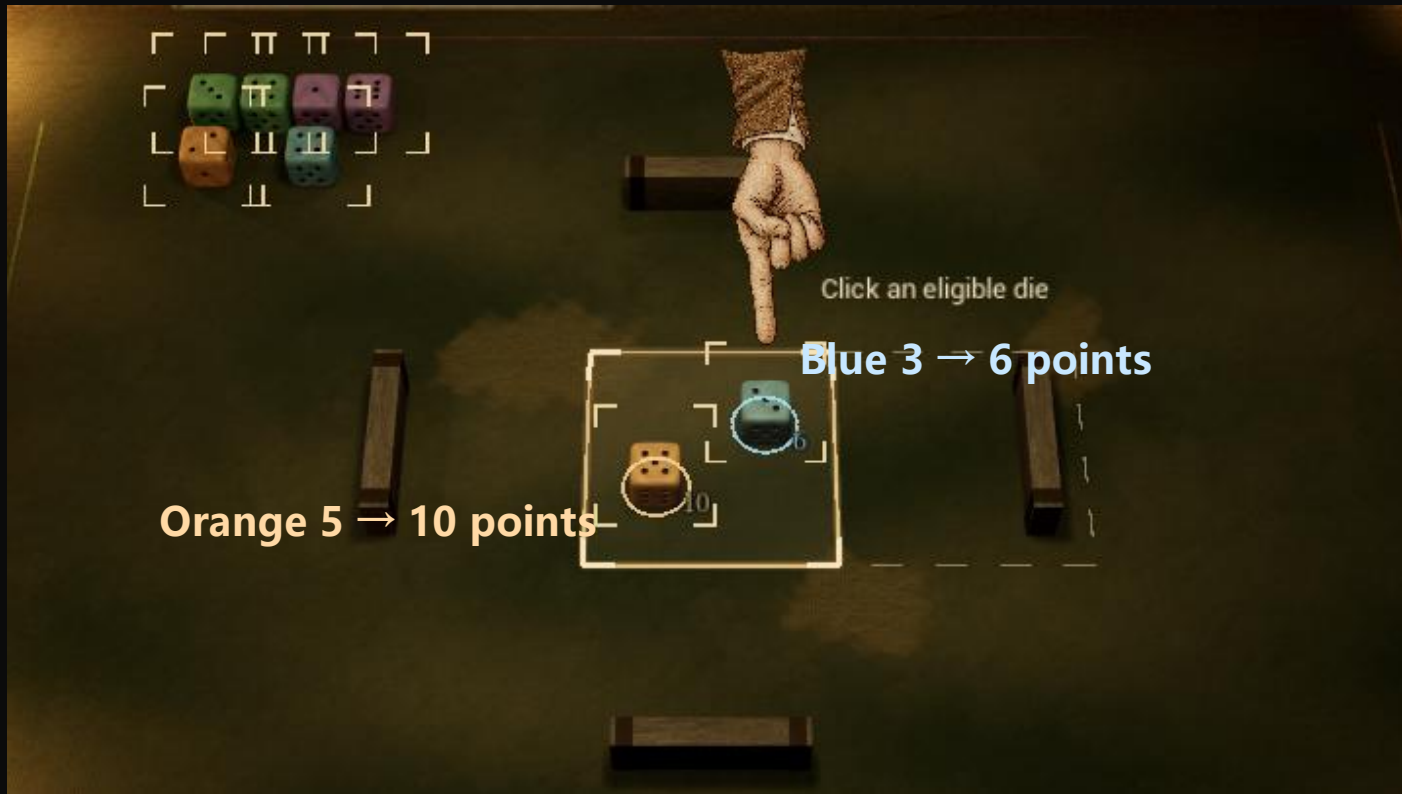
Whose turn? The hourglass

Each turn the hourglass is passed to the next player and turned over (about 30 s; it times, never limits). The round tag shows the move and the rule.

The last move decides income

The last move can still knock a rival out of the zone. Scoring waits until the card show ends and the camera is back on the table.

Strategy Case: Last Move, Hold or Hit?



Last move of round 2. Detail from an early build, fixed showcase state.

Read the board: you 6, rival 10

Zone: Blue's 3 = 6, Orange's 5 = 10 (odd $\times 2$, even 0). Blue moves last; the round settles right after.

Compare: hit, or change a face

Hit: may knock Orange out, or break up your own position.

Flip: Orange's 5 becomes 2 in place; 10 points become 0.

Seal: Orange keeps 10, and the die can still be hit.

Choose Flip and keep your 6.
Cost: a move and your one Flip.

Strategy Case: Flip, Settle, Look Ahead



Flip actually played and the round scored (early ledger UI), fixed showcase state.

Result: spot kept, rival at 0

Orange's 5 became 2; Blue still shows 3. Neither die moved: Blue banks 6 this round, Orange 0.

This round	Blue	Orange
Total before	8	12
Round income	+6	+0
Total after	14	12

Next round: plan again

Blue moved last, so the 6 banks now. Round three moves the zone and counts only 4–6.

Round Scoring: Wait for the Show, Then Pay Out



Scoring dice turn points into coins that arc to each stack



Winner's moment: placard lifts, face lit; then others react

Problem: the ledger popped up mid card show; scoring was just a table.

Change: wait for the show, the camera, then 1.4 s; points book on the same frame - the show only sets when they appear.



Podium: the stage goes dark, then spotlights pick out 4th to 1st; the four stand on a barrel, crates and the floor; 1st cheers with a victory line, last place sulks.

UI on the Table: Placards, Piles, Hourglass, Ring

Placards, card piles and hourglass



Placards follow the edge; opponents' cards face down, yours face up

Information lives in the scene: scores on placards, hands as cards on the table, the turn as a passed hourglass, power at the die, greetings as bubbles. Only the round tag and rule hints stay 2D.

Power ring while aiming



A perspective brass dial under the die replaces the small blue arc

06

Playtest Iteration and AI Characters

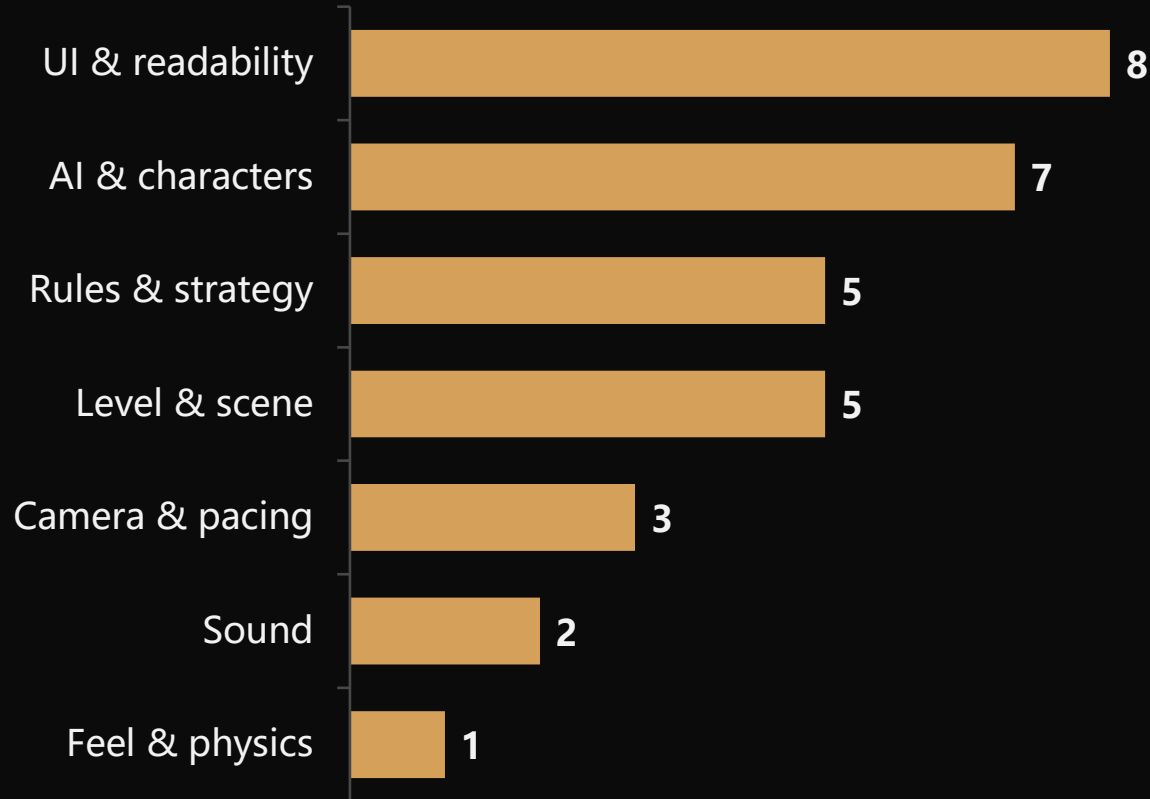
How did playtest feedback become changes?
How can AI opponents play well and feel human?

In this chapter

- 47 Playtest Iteration: 31 Notes, Each Led to a Change
- 48 Playtest Notes ①: Gameplay and Rules
- 49 Playtest Notes ②: Scene, UI and Feedback
- 50 Playtest Notes ③: UI, Camera and Characters
- 51 Playtest Notes ④: Visuals, Scoring, the Player
- 52 A Data-Driven Fix: Why the AI Hardly Played Cards
- 53 AI Candidate Decisions
- 54 AI Styles and Prediction Limits
- 55 Immersion Pass: From Board View to Table Seat
- 56 Named Opponents: Personality and Greetings
- 57 Opponent Throw Beats and Gaze
- 58 Card Show: Rise, Dissolve, Close-up, Turn
- 59 Table Reactions to Others' Key Moments
- 60 Idles: Score-Based Moods and Fidgets
- 61 Opponent Outfits: Patrons Invited to the Table
- 62 You Sit at the Table Too: Hands and Voice

Playtest Iteration: 31 Notes, Each Led to a Change

Feedback by category (notes)



31

playtest notes, from the development record

3

iterations: core gameplay → immersion pass → visual and scoring polish

5

ideas withdrawn or replaced: several maps, ± 1 pips, Steady, coaster win, knock-out bonus

11

automated checks: line-by-line regression after presentation changes; rule results unchanged

Source: the project owner's playtest feedback in the development chats, and the documents under Docs. There is no outside playtest data yet; see "Next steps" in chapter 7.

Playtest Notes ①: Gameplay and Rules

Feel & physics

"A hard hit won't knock them out - my own die flies off"

Problem: the attacker kept most of the momentum
Change: less lift and spin, own die-to-die bounce; 85% power knocks the target out and stays

Rules & strategy

"Too one-note, and the AI is dumb"

Problem: only collisions, no goals or different routes
Change: added the zone, four players and low-friction ice

Level & scene

Wanted dice to arc over obstacles "like flak"

Problem: flat straight throws, a single route
Change: 0–65° elevation, first-segment preview and short walls

Rules & strategy

"The coasters do almost nothing"

Problem: the win marker created no decisions
Change: first a knock-out bonus, later three-round total scoring

Rules & strategy

"Whatever it lands on is it - you can only pick it up and rethrow"

Problem: the only way to change pips broke up your own position
Change: after trying Steady, nudges and several maps, four single-use cards

Rules & strategy

"Make it about playing against each other, not everyone on their own"

Problem: moves barely affected each other
Change: hard rule - card or throw; cards can change rivals' pips

Level & scene

"The new maps are bland; I didn't get them"

Problem: adding content instead of making the table change
Change: maps withdrawn; the one table changes zone and terrain by round

Level & scene

"The zone changes too fast"

Problem: it moved every round, no time to build
Change: it moves only after two full rounds

Level & scene

"Make the ice spilled drink, and slow dice where the felt is torn"

Problem: abstract terrain clashed with the tavern theme
Change: spills / torn felt / wooden boards, same function

Playtest Notes ②: Scene, UI and Feedback

Level & scene

"Too neat and symmetrical, like a casino table"

Problem: terrain placed for wear, not mechanics
Change: placed by route and risk, varied sizes; aged look; table 1/3 wider

UI & readability

"Why can the AI move its launch point and I can't?"

Problem: the control was invisible
Change: A/D for the launch point added to the hint; extra buttons removed

Sound

"That's not what dice sound like" "Too quiet"

Problem: synthesised sounds lacked texture
Change: CC0 real recordings; mix raised about 3×

UI & readability

"The cards don't fit the tavern; not aged enough"

Problem: inconsistent visual language
Change: yellowed parchment faces; a card fan that moves forward on hover

AI & characters

"Winning or losing points needs sound and character reactions, not just UI"

Problem: feedback stopped at the UI
Change: opponent reaction animations + three distinct voices

AI & characters

"Reactions are too short; snapping back to idle is stiff"

Problem: too short, poor transitions
Change: animations about a third longer with cross-fades; two idles alternate

UI & readability

"Too much UI, and it covers the AI at the top"

Problem: permanent and temporary info not layered
Change: only turn order and rules stay; the rest appears on demand

UI & readability

"I have no idea which card the opponent played"

Problem: the card display was too small and too quick
Change: bigger and longer, later a full card show on the table

Rules & strategy

"No dice in the zone, yet 6 points?"

Problem: base points outside the zone; unclear when scoring happens
Change: in-zone only, scored at round end, three-round totals

Playtest Notes ③: UI, Camera and Characters

UI & readability

"These five UI boxes are too big"

Problem: info boxes crowd the table

Change: a third smaller; type sizes and spacing reworked

Camera & pacing

"Jumping straight into aiming at the start is abrupt"

Problem: no transition into the setting

Change: take-a-seat opening - overview → push in → greetings → click to start

Camera & pacing

"Thinking, throwing and camera tracking are too fast"

Problem: no pause after the dice stop

Change: 1 s to "see the result" before thinking; pace ×1.2; slower camera turns

AI & characters

"At the start the opponents stare at the ceiling and look all over"

Problem: gaze targets included other people's heads

Change: they only look at the dice and the zone

AI & characters

"The AI hardly ever plays cards"

Problem: throws delivered only about 27% of their predicted gain

Change: discount by a confidence of 0.45 before comparing - cards 8/54 → 24/54

Sound

"I can't hear the ambience"

Problem: quiet source files plus distance falloff

Change: gains re-set per layer from measured loudness

AI & characters

"The tankards and hands don't line up"

Problem: mocap hand shapes didn't match the cups

Change: each frame the grip is fitted to the finger curl

AI & characters

"The old opponents' outfits are ugly"

Problem: the characters weren't distinctive

Change: switched to the most distinctive patron looks in the scene

Playtest Notes ④: Visuals, Scoring, the Player

UI & readability

"Dice should properly hide the zone edges"

Problem: the zone frame and rings were screen overlays

Change: glowing objects on the table that dice naturally hide

UI & readability

"Make the hourglass really run sand as a timer"

Problem: turn order was just a 2D bar at the top

Change: edge hourglass - sand drains and piles; flipped and passed each turn

Camera & pacing

"The scoring window appears too early"

Problem: the ledger popped up during the last card show

Change: it appears after the show, the camera, and 1.4 s more

UI & readability

"Add a scoring animation after each round"

Problem: scoring was only a ledger table

Change: coins fly from scoring dice to each stack, then the podium

AI & characters

"Stand them on a real podium; the player shows just hands"

Problem: you had no body or voice at the table

Change: live podium popup; your hands on the edge react, with a voice

A Data-Driven Fix: Why the AI Hardly Played Cards

Symptom

In a real match, opponents made 8 moves and played 0 cards; across 6 automated matches, only 8 of 54 opponent turns used a card.

0 / 8

Before: in a real match, 8 opponent moves, 0 cards

Diagnosis

The AI compared its "best throw" prediction with cards. Logging showed 46 throws predicted an average gain of 16.8 but delivered 4.5, about 27% - the optimistic prediction always beat the certain card effect.

27%

Share of predicted throw gain actually realised (46 throws)

Fix

Before comparing, the predicted throw gain is multiplied by a confidence of 0.45; aggressive Aldric $\times 1.25$, cautious Brann $\times 0.85$. Rules and the scoring formula are unchanged.

8 → 24

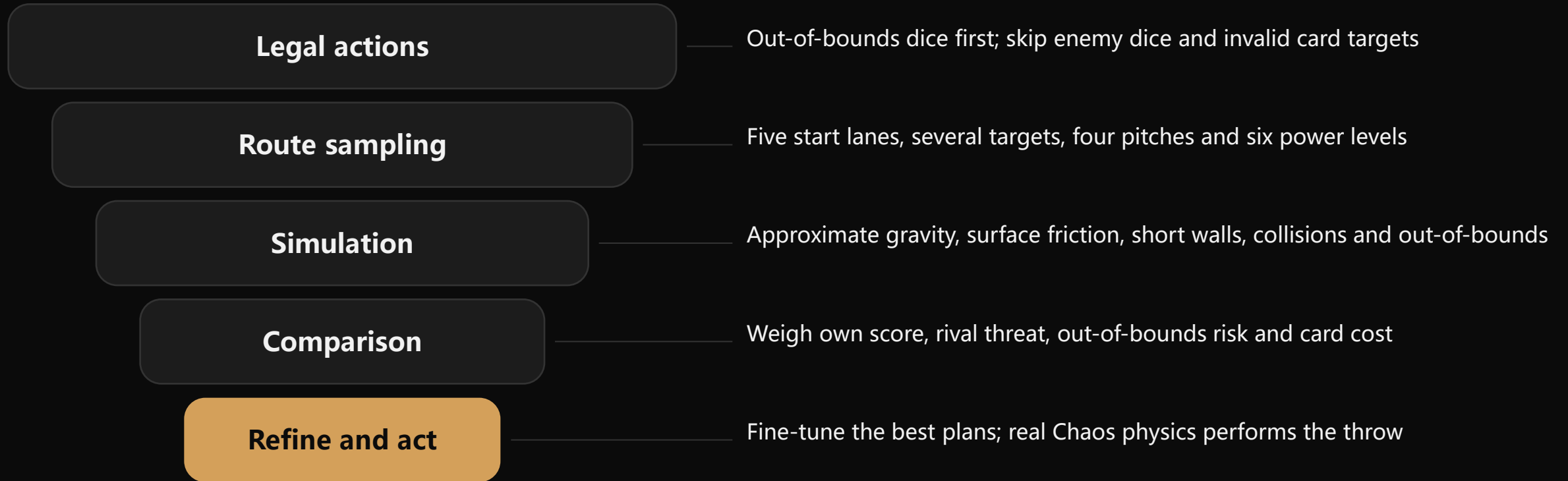
Cards played in 54 opponent turns over 6 automated matches (15% → 44%)

Result

In 6 automated matches opponents played cards on 24 of 54 turns, all three of them; Reshape and Seal are still rare and left for later.

This was the only deliberate change to AI decisions in the immersion pass; card frequency can be tuned live with `dc.AI.ShotConfidence`.

AI Candidate Decisions



Card decision

Predicted shot gains realise only ~27%, so they are scaled by confidence 0.45 (Purple $\times 1.25$, Green $\times 0.85$) before comparing with cards

Candidates are evaluated across frames, about 4 ms per frame. Card frequency is the only deliberate AI decision change this pass (opponent cards in six matches: 8/54 $\rightarrow$ 24/54).

AI Styles and Prediction Limits



Hob (Orange) holds the middle



Aldric (Purple) takes more risks



Brann (Green) plays safer

Side differences: names and tempers change only display and performance

Game-state bias

Ahead: protect points.
Trailing and last-round
threats raise risk-taking

Random outcomes

Unknown tumbles use
expected value; Reshape
doesn't foresee the roll

Physics limits

The simplified model has
no exact cube contact or
full angular velocity

Pour strategy

Predictions read spills; the
AI does not pour yet

The AI never alters real dice motion. Difficulty, win rate and four-way balance still need human playtests.

Immersion Pass: From Board View to Table Seat



Presentation only: no line of scoring, physics or AI decisions changed; every item can be switched off. See Docs.

Named Opponents: Personality and Greetings



In-game, seat view: once you are seated, the opponents greet you in turn, their lines in parchment bubbles beside their heads

Three people, three styles

Hob (Orange): patient regular, zoner.
Aldric (Purple): high-stakes merchant.
Brann (Green): cautious ex-mercenary.
Written to the existing AI styles; the AI is unchanged.

Opening greetings

One line each, in the original voice actors' recordings: "You needa relax." "Coin favours the bold." "Held worse lines than this." Then you raise a hand and answer "Well met, friend." Click any time to skip.

Opponent Throw Beats and Gaze



In-game, seat view: on an opponent's turn the camera turns slightly toward them

Think, ready, throw

Opponents watch the result for 1 s, then think for 1.3–3.3 s by personality; the die arcs to the launch spot in 0.5 s, they lean in, look down the line and throw on the gesture beat.

Eyes stay on the table

Neck 40%, head 60%: card target > rolling dice > zone > own dice. Different reaction delays, so heads never turn in sync. A deterministic check proves beats never change AI decisions.

Card Show: Rise, Dissolve, Close-up, Turn



Rises from the pile to the centre; a subtitle names the player



It crumbles into drifting sand along a glowing edge



Close-up on the target die as it turns to its new face (5 → 4)



Back to the seat; next side's turn

Same show for opponents and player, about 5.1 s (dc.Card.Pace). Only the visible VisualShell turns; the scoring PipRoot already holds the new face. Four sound layers: slide, chime, sand, die settling.

Table Reactions to Others' Key Moments

Knock-out · Aldric leans in, points, laughs



Knock-out · Hob throws up both hands



Big score · Aldric waves it off, sour



Round won · onlookers on the left clap



Big score · Brann claps twice, grudgingly



You win the match · Aldric shrugs



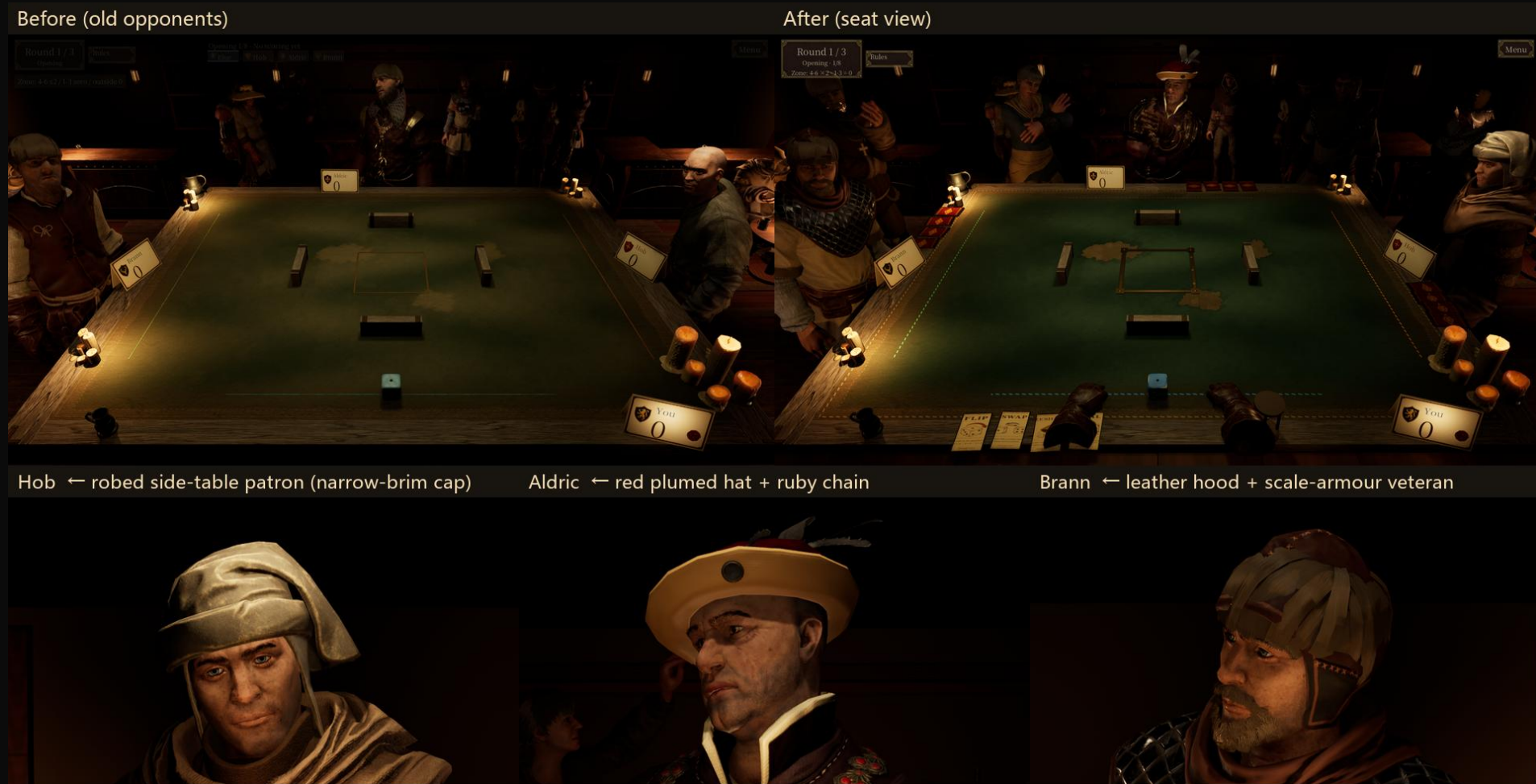
After each move, one moment by priority (match win > round win > knock-out > ≥ 4 points); others react by personality odds, slightly staggered; at most one voice line, only in silence. All motion is crowd mocap.

Idles: Score-Based Moods and Fidgets



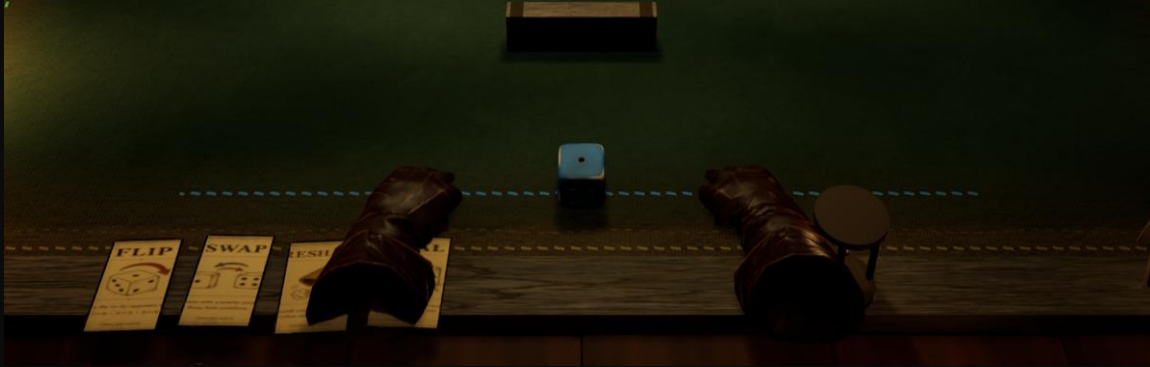
Moods: level / ahead (≥ 4) / behind (≥ 6), 1–2 long idles each, cross-faded in random 12–20 s slices. Off-turn, an occasional fidget (scratch, gesture, look around), dropped in 0.35 s when something happens.

Opponent Outfits: Patrons Invited to the Table



Top: seat view before / after. Bottom: Hob ← robed patron (cloth cap; the straw hat hid his face), Aldric ← plumed hat + ruby chain, Brann ← hooded scale-armour veteran. New clothes follow the original skeleton, so animation and voice stay.

You Sit at the Table Too: Hands and Voice



At rest: hands on the edge, fingers curled, moving with breath



Round won: you clap and shout "YEAH!"



Opening: you raise a hand - "Well met, friend."



Top camera: you stand at the table like the others

The seat camera is your eyes, so only your hands show: a full-size body draws just its arms, two-bone IK sets the hands on the edge, elbows below it. Hands leave the frame when aiming; the voice is a fourth actor.

07

Verification and Reflection

In this chapter

- 64 Self-Testing and Verification Scope
- 65 Reflection: What Worked, What Is Missing
- 66 Scope of Work and Asset Sources
- 67 Outcome

What was verified?

What is missing? What comes next?

Self-Testing and Verification Scope

Three-round scoring

252

passed

Zones, final board, double settlement, ties, reset

Readability states

175

passed

Move progress, hover reasons, snapshot, ranking

Score feedback

38

passed

Live vs total kept apart, change feedback, cleanup

Cards and layout

passed

Card checks pass; 720p / 1080p visual check

Rule paths and screen layout

NPC beat consistency

6

passed

AI card and throw decisions identical with beats on / off

Presentation regression

11

checks identical line by line

Every effect has a toggle; off, results match the old build; Smoke passes

Automated checks cannot prove feel, difficulty or balance. Standalone packaging and a dedicated performance pass are not done yet.

Reflection: What Worked, What Is Missing

What worked

- Treating randomness as design material: four layers, not removal
- Starting from playtest problems with the smallest version; withdrawing maps, ± 1 pips and Steady when they didn't fit
- World and rules from one source: tavern objects are terrain, tempers are AI styles
- Every show has a switch; 11 automated checks match line by line; presentation never changes rules

What is missing

- Only the designer's own playtests: no outside data on difficulty, win rate or four-way balance
- In a four-way game, "I attack, a third player profits" is not yet measured
- The AI never pours; Reshape and Seal are rarely used
- The shows lengthen each move and each round's scoring; pacing needs real players

Next steps

- Classmate playtests: do they get "scoring after four moves", recognise opponents' cards, explain card-or-throw choices; first-match time
- Record turn position and win rate before changing first player or scoring
- Add an AI pour strategy; retune Reshape and Seal scoring
- Return dice to their owners; packaging and performance sign-off (the podium adds a scene render)

Biggest lesson: find the root cause of why players are frustrated, then answer it with the smallest rule change - not by piling on content.

Scope of Work and Asset Sources

Design and iteration

Defined play goals, table routes, card trade-offs, scoring rules and readability fixes. The project owner set the design direction; AI tools assisted with implementation and documentation.

Art and sound

Environment and characters use existing assets such as Nordic Tavern and Modular Medieval NPC (the podium's barrel, crates and torch stands are Nordic Tavern too); patrons and reactions use Anderson Rohr's free mocap, opponent idles a dialogue mocap pack. Cards and UI decoration include ImageGen output.

Verifiable sources

ambientCG textures, RandomMind music, Kenney and Freesound sound effects (including coin drops); ambience and card sounds are CC0. VoiceBosch is CC BY-SA 4.0, the player voice by theuncertainman is CC BY 4.0, other recorded voices are CC0.

Purchase records and publishing rights for model assets must be completed before a public portfolio or demo release. Not all assets are claimed as original.

Outcome



In-game, seat view: current build

A playable prototype

Four-way throws, limited cards, pouring, three-round totals and the scoring show run in one match flow; the seat view, your hands, named opponents, patrons and sound make it feel like a game in a tavern.

App.

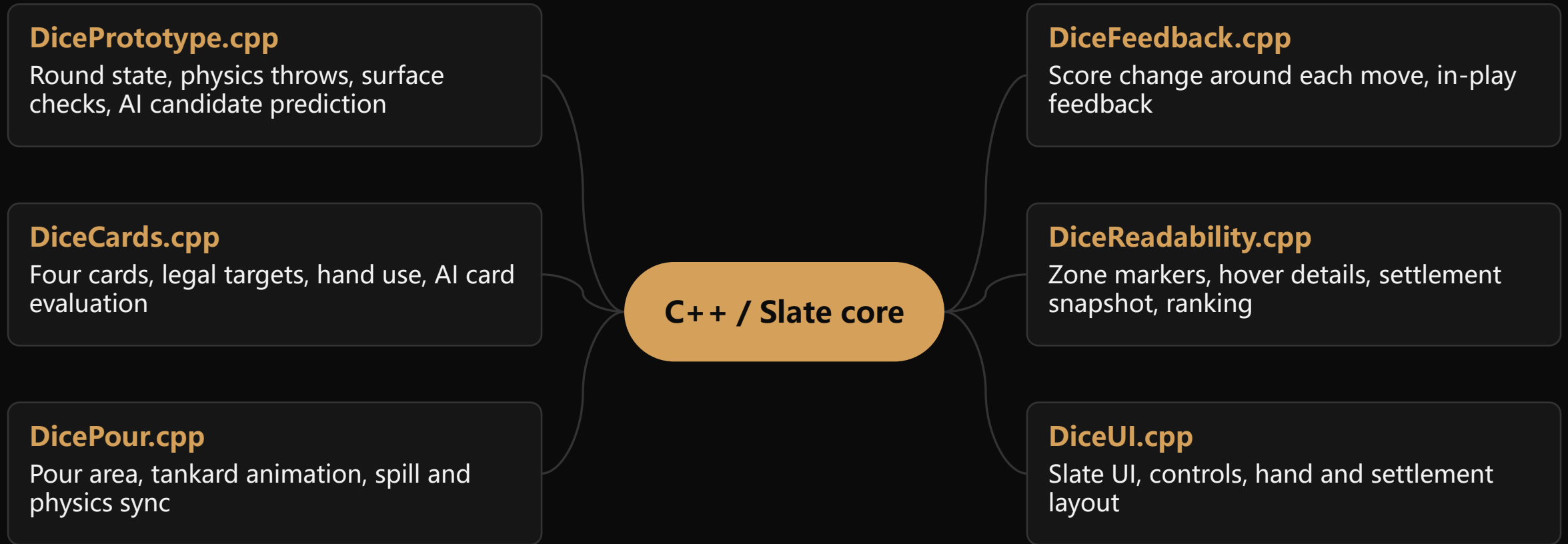
Technical Implementation and Blueprint Rebuild

How the core logic is organised in C++;
rebuilt once more in Blueprint nodes
for readers who don't read code.

In this chapter

- 69 Core Implementation and Modules
- 70 Modules Added in the Immersion Pass
- 71 Blueprint Implementation: Core Logic in Nodes
- 72 Blueprint graphs ×19: dice rules, throwing, AI decisions, camera, card show, outfits, idles, table reactions

Core Implementation and Modules



The core is C++ and Slate; modules added in the immersion pass are on the next page. The Blueprint graphs after that rebuild the core logic in nodes for side-by-side reading; the runtime is still C++.

Modules Added in the Immersion Pass

DiceCameraRig / DiceIntro

Seat-view shots and smoothing, seated-intro push-in, drag freeze

DiceNPCBeats

Opponent think / ready / throw beats, gaze and lean, beat-consistency check

DiceAudioRoom

Sound-class mix, room reverb, ambience layers, music rotation and ducking

DiceCardShow / DiceCardPiles

Card show (rise, sand, turn) and opponent card piles

DiceSeatPlacards / DiceCharacters

Table placards; opponent names, personalities, greetings

DiceSpectators / DiceOpponentLooks

Patron assembly, mocap offset fix, tankard grip; opponent outfits (follower parts)

DiceNPCIdles / DiceAudience

Score-based idles and fidgets; table reactions and voice for key moments

DiceTableLook / DiceTurnGlass

Table materials, side table, glowing marks on the table; the passed sand hourglass

DiceAtmosphere / DiceSettleShow

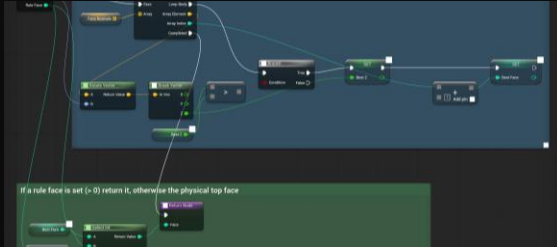
Face light, grading, depth of field, haze; coins flying to stacks at scoring

DicePodiumStage / DicePlayerHands

Live podium popup (scene capture); your hands (IK), reactions and voice

All ACashGameMode members, one .cpp per topic; presentation calls only, off in automated checks.

Blueprint Implementation: Core Logic in Nodes



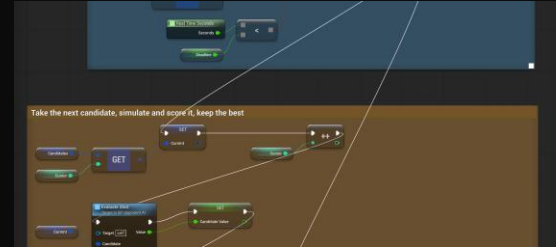
BP_DiceRules

DicePrototype.cpp · dice rules
TopFace, DieContribution



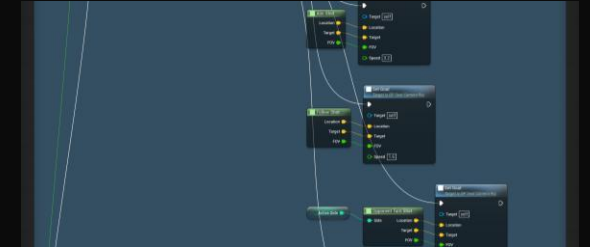
BP_DiceLauncher

DicePrototype.cpp · throwing
ShotVelocity, Launch, trajectory
preview



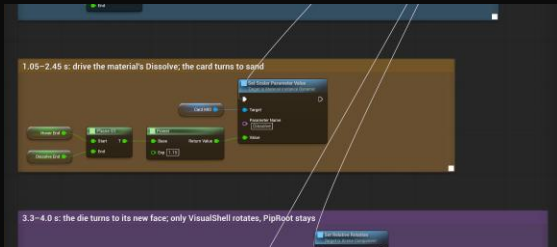
BP_OpponentAI, S_ShotCandidate

DicePrototype.cpp · AI (+ DiceCards)
Candidates, budgeted evaluation,
card decision



BP_SeatCameraRig, E_CameraShot

DiceCameraRig.cpp
Shot switching, BlendToGoal,
AimShot



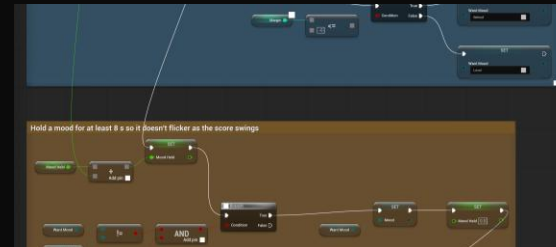
BP_CardShow

DiceCardShow.cpp
Card show clock



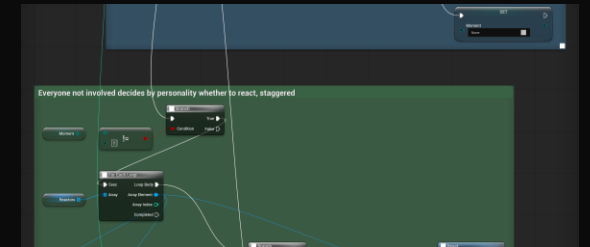
BP_OpponentLooks

DiceOpponentLooks.cpp
ApplyOutfit



BP_NPCIdleDirector, E_IdleMood

DiceNPCIdles.cpp
UpdateMood, fidgets and
interrupts

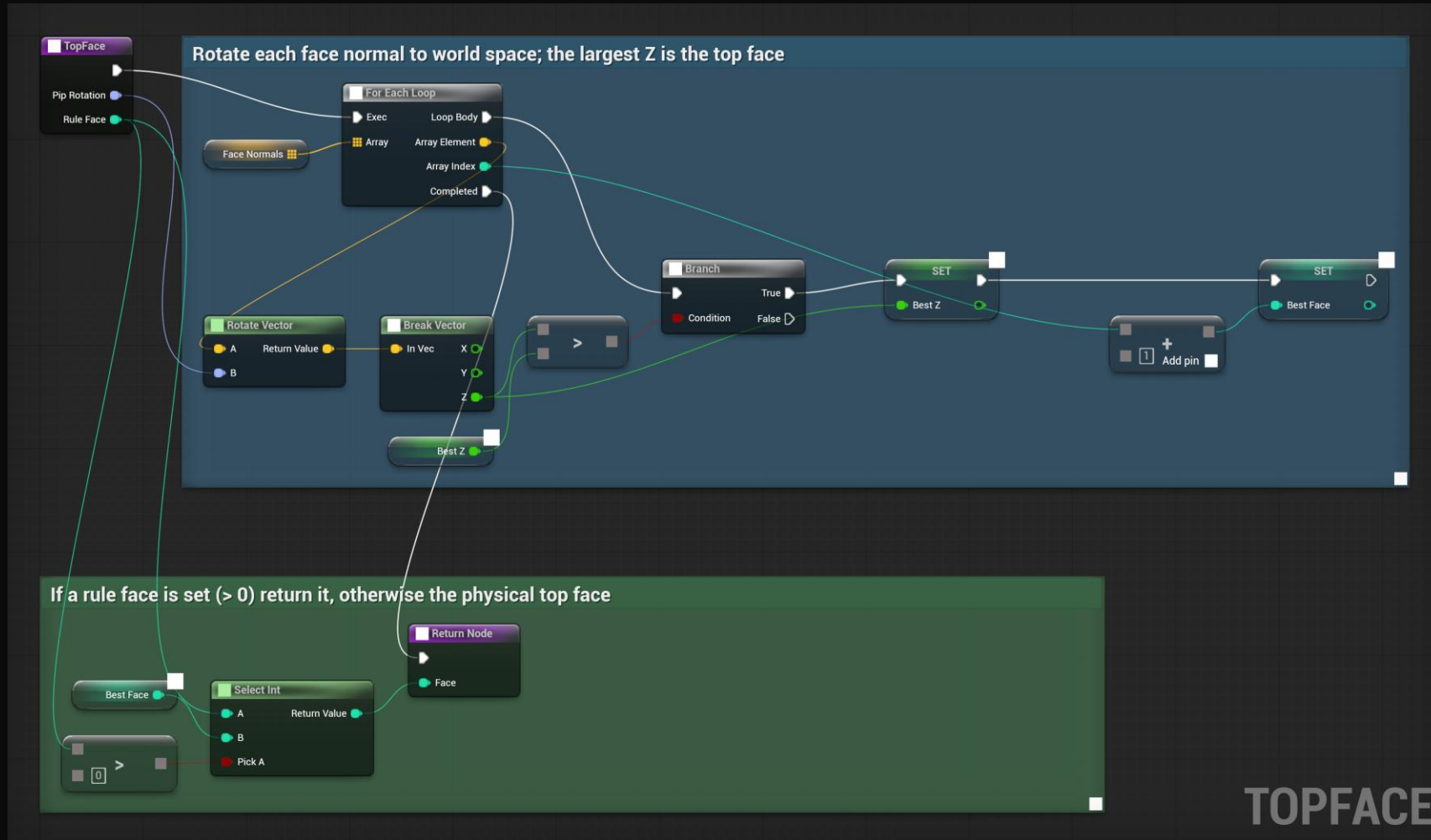


BP_TableReactor, BP_TableAudience

DiceAudience.cpp
OnActionSettled, CanReact, React

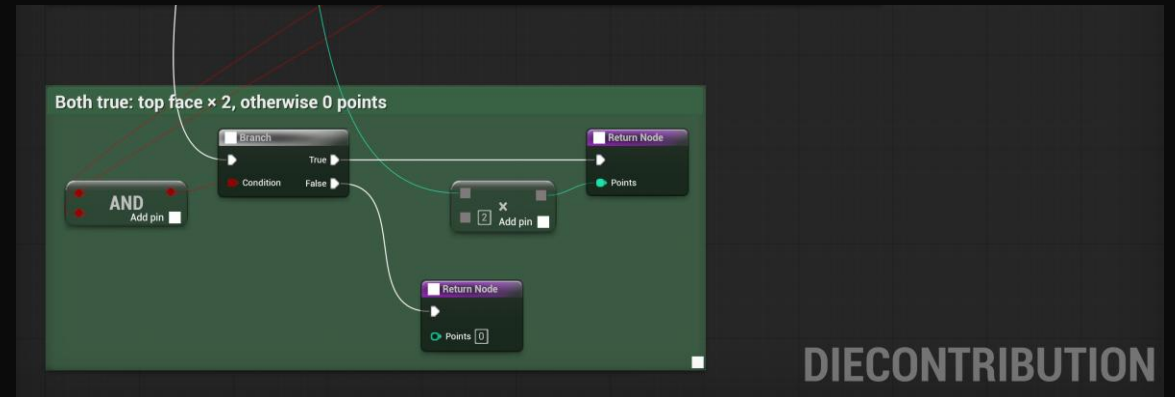
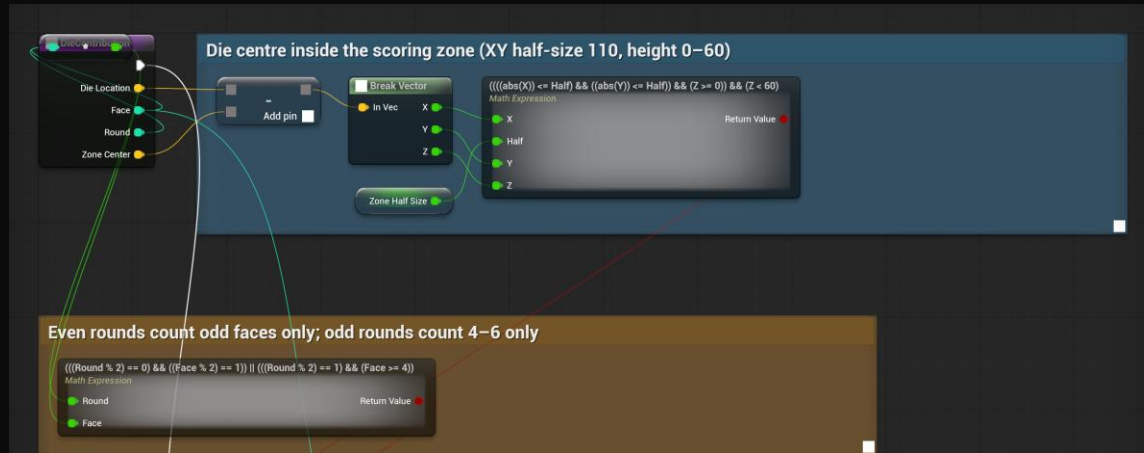
Script-generated, compiled Blueprints in /Game/DiceClash/BlueprintShowcase_EN; the game still runs the C++.

Blueprint: Which Face Is Up (TopFace)



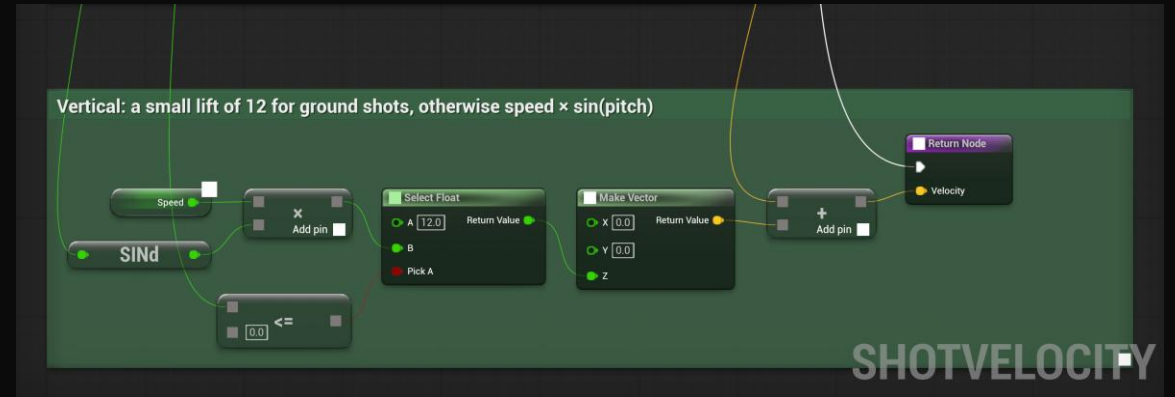
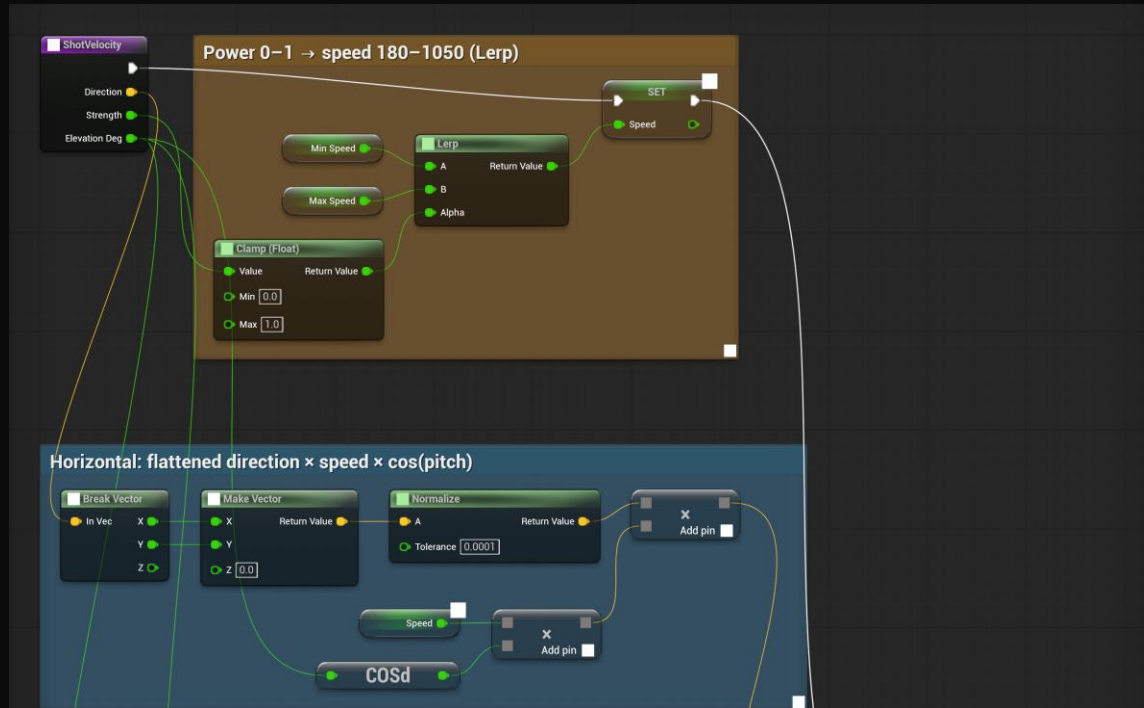
C++: DicePrototype.cpp · ACashDie::TopFace. The six face normals are rotated to world space and the largest Z is up; odd/even rounds can lock a rule face.

Blueprint: One Die's Points (DieContribution)



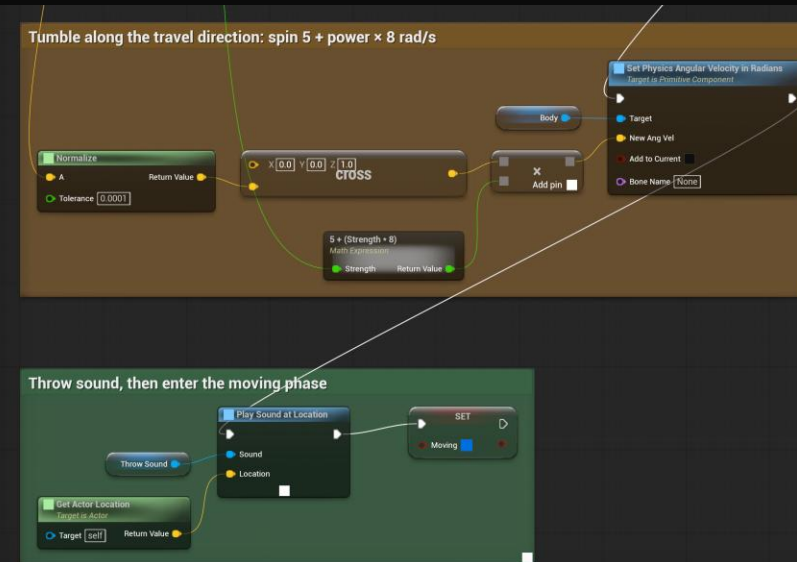
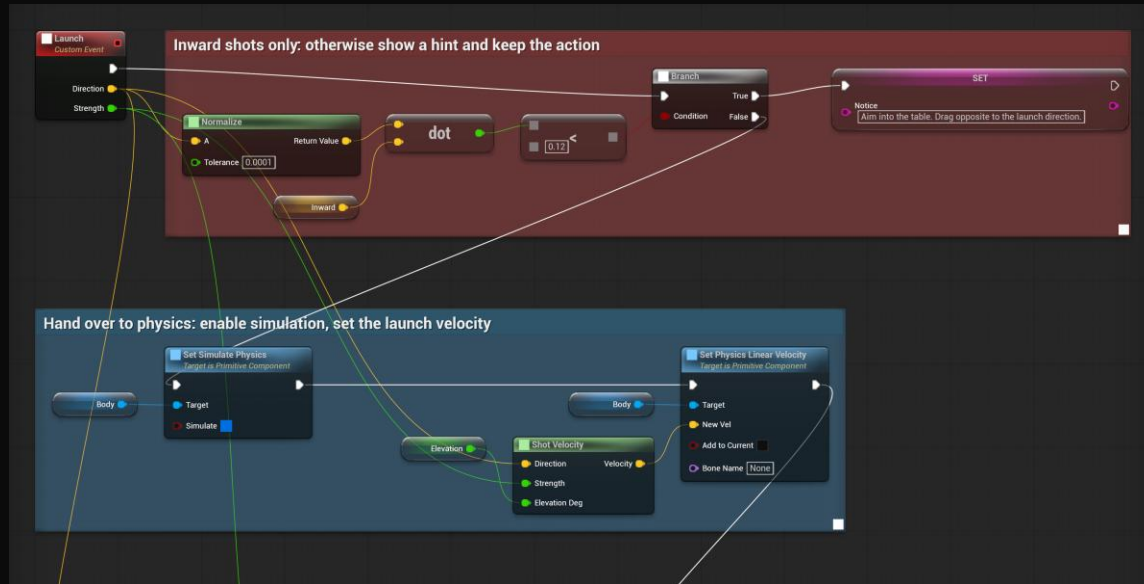
C++: DicePrototype.cpp · AClashGameMode::DieContribution. Scores top face $\times 2$ only if the die's centre is in the zone and the face fits the round's rule.

Blueprint: Launch Velocity (ShotVelocity)



C++: DicePrototype.cpp · AClashGameMode::ShotVelocity. Power 0-1 maps to speed 180-1050, then splits into horizontal and vertical parts by pitch.

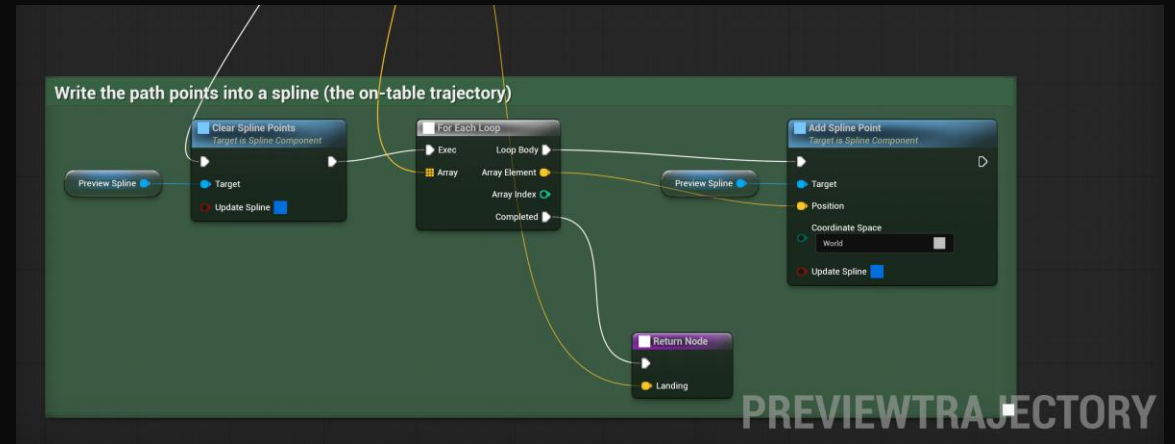
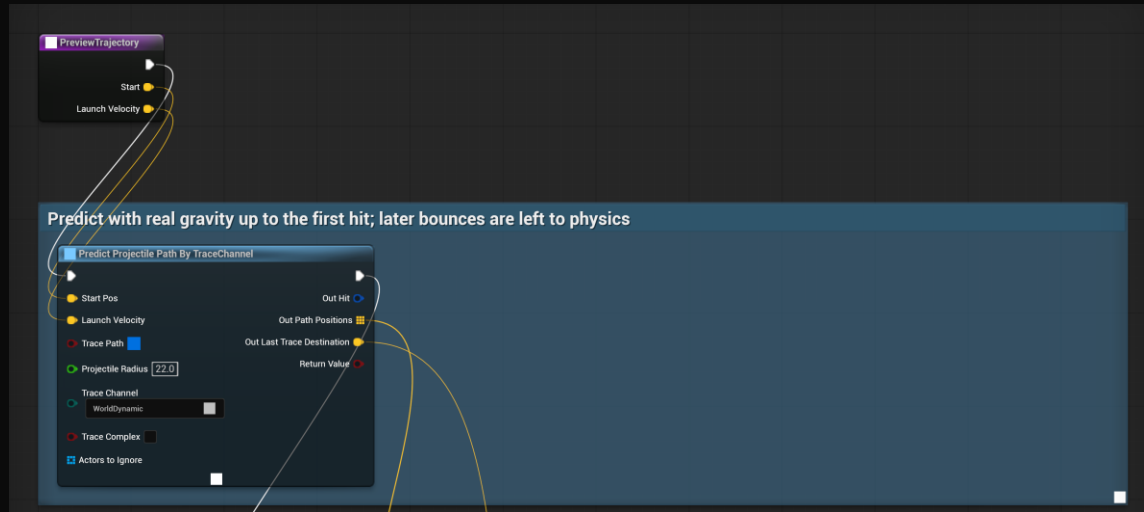
Blueprint: Launch Event (Launch)



EVENT GRAPH

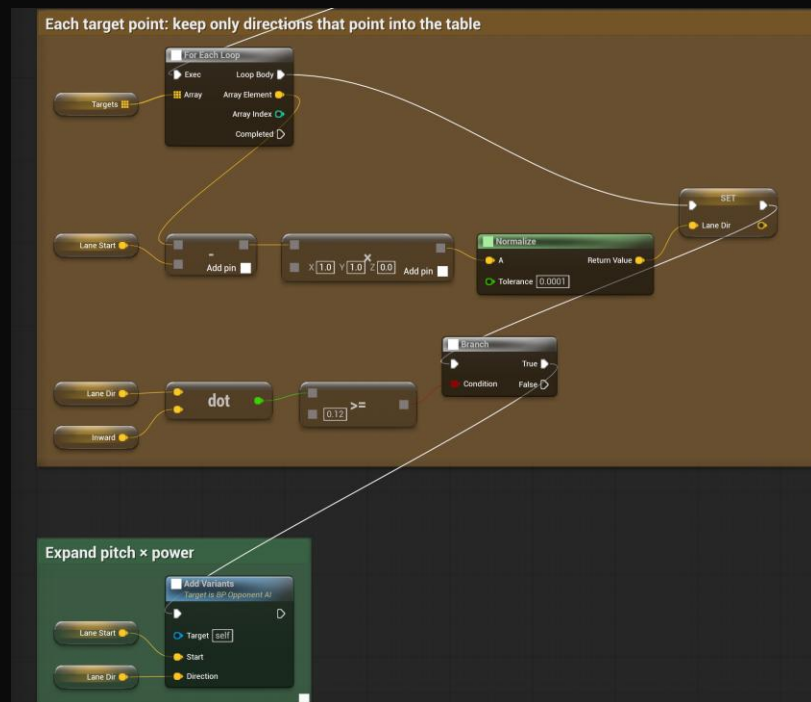
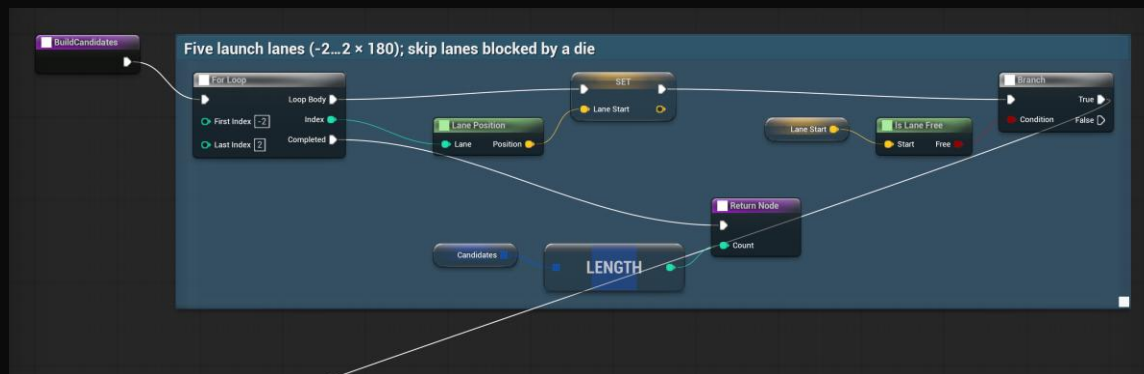
C++: DicePrototype.cpp · AClashGameMode::Launch. Must point into the table; physics takes over with a tumble along the travel direction; throw sound, then the moving phase.

Blueprint: First-Arc Preview (PreviewTrajectory)



C++: DiceUI.cpp, aim HUD trajectory preview. Predicted with real gravity up to the first contact; later bounces are left to physics.

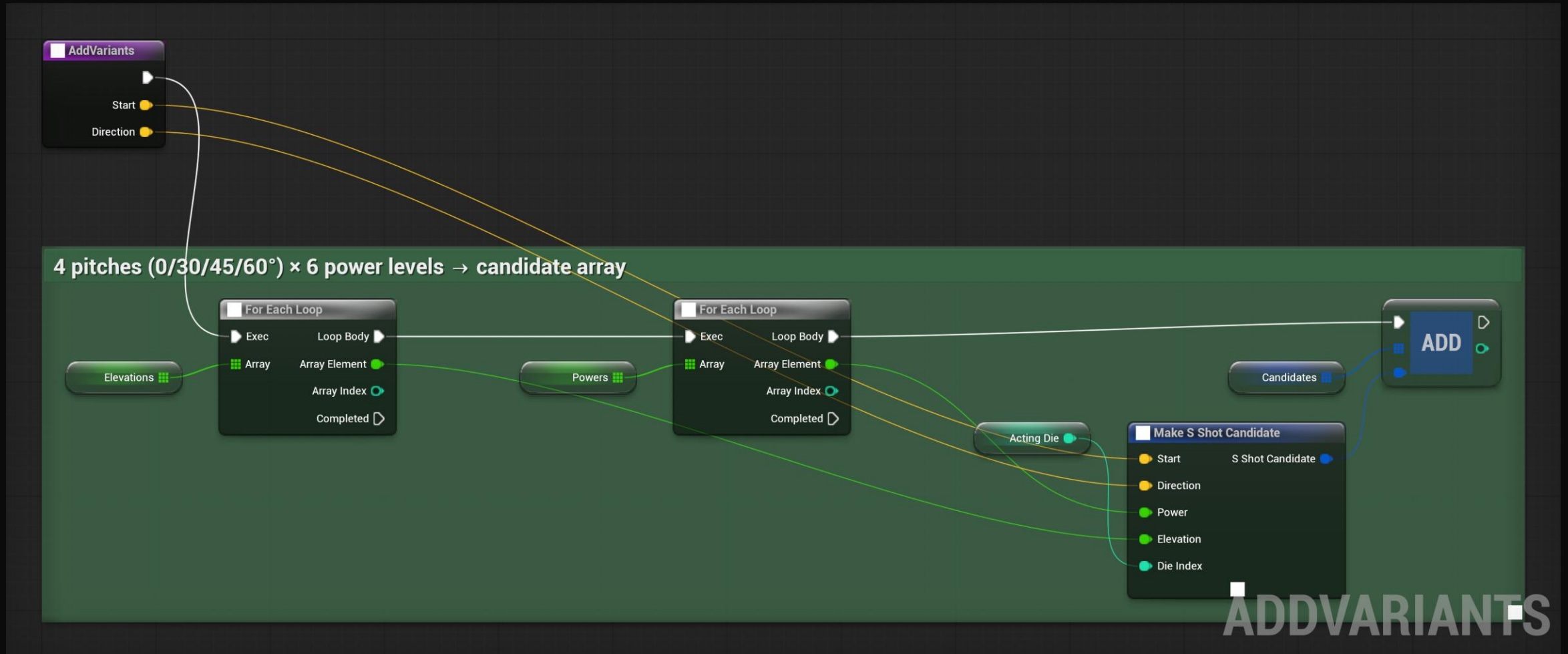
Blueprint: AI Candidates (BuildCandidates)



BUILDCANDIDATES

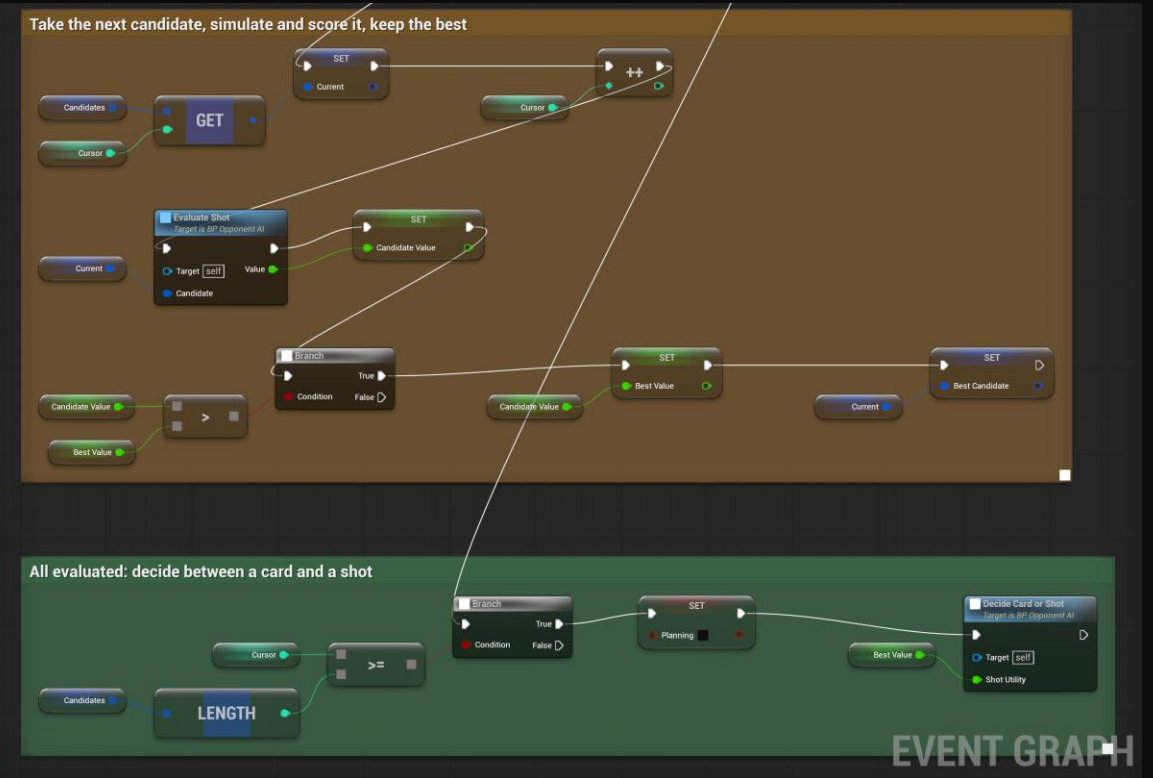
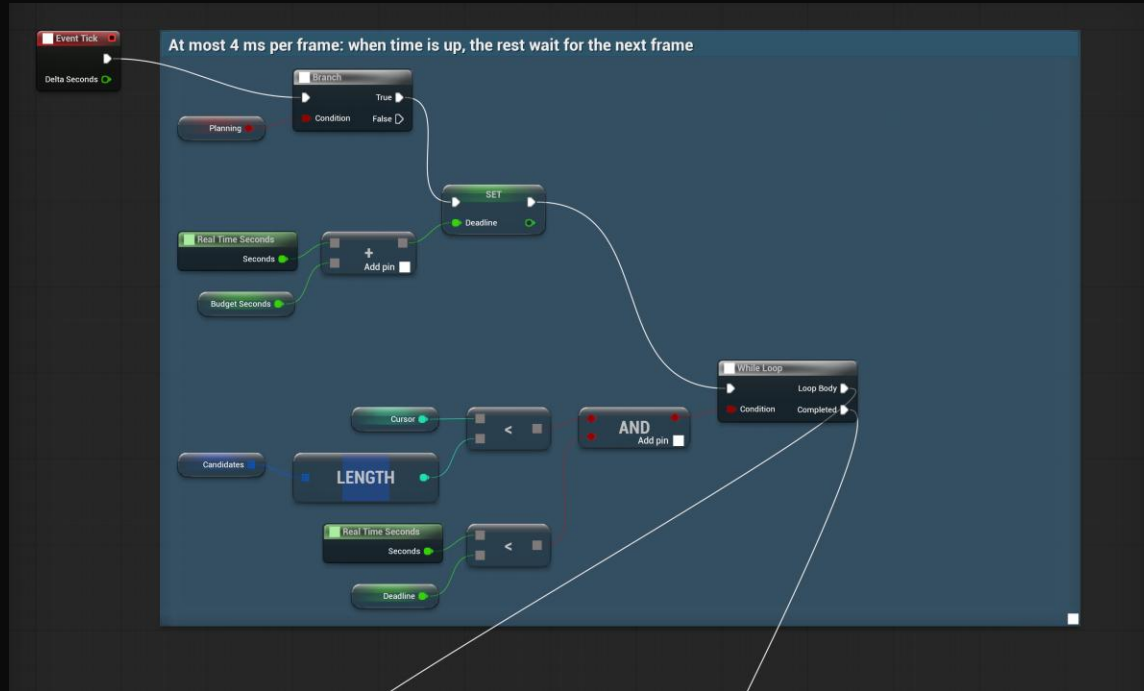
C++: DicePrototype.cpp · PlanOpponentShot. Five launch lanes × several target points, keeping only directions into the table.

Blueprint: AI Shot Variants (AddVariants)



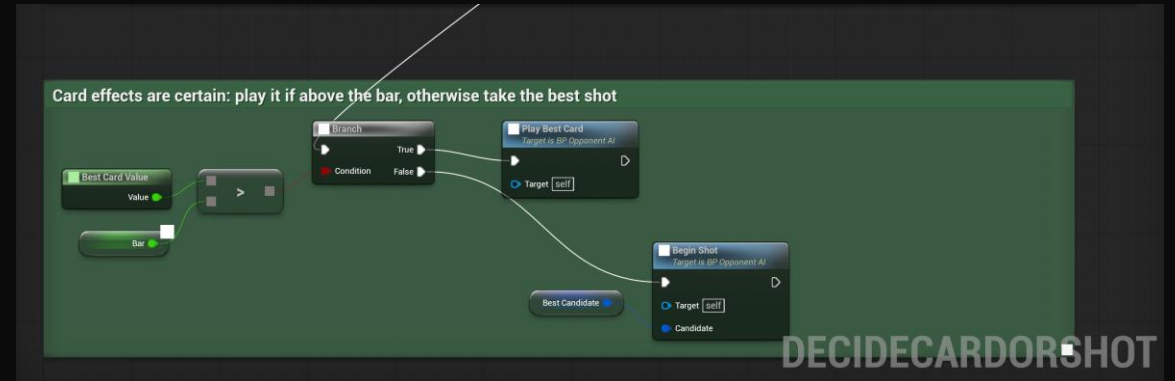
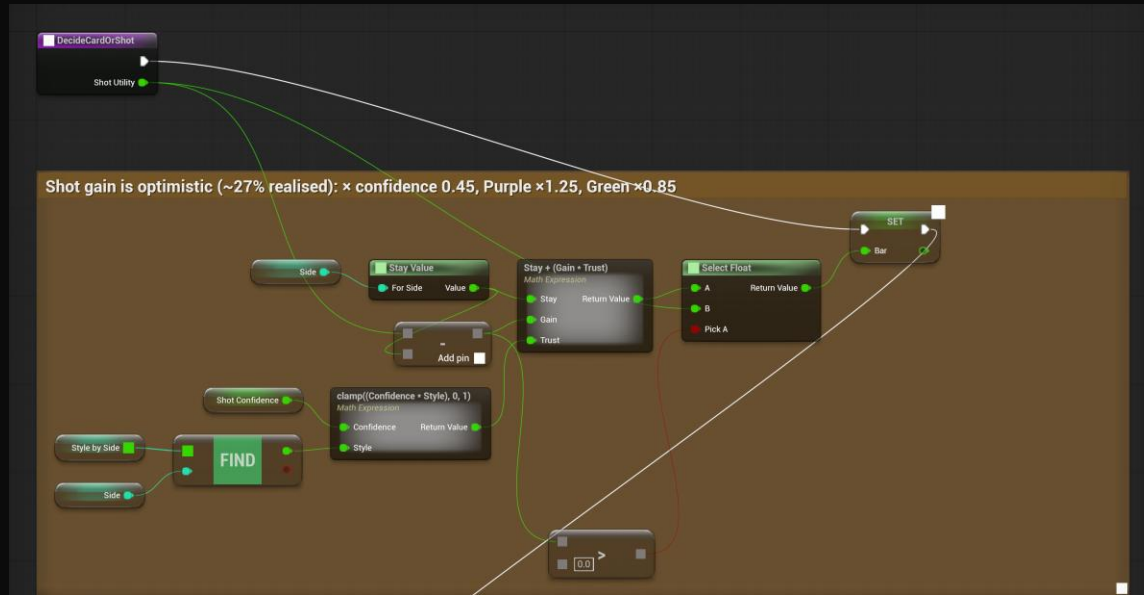
C++: DicePrototype.cpp · PlanOpponentShot. Each direction expands into 4 pitches × 6 power levels in the candidate array.

Blueprint: AI Budgeted Evaluation (Event Tick)



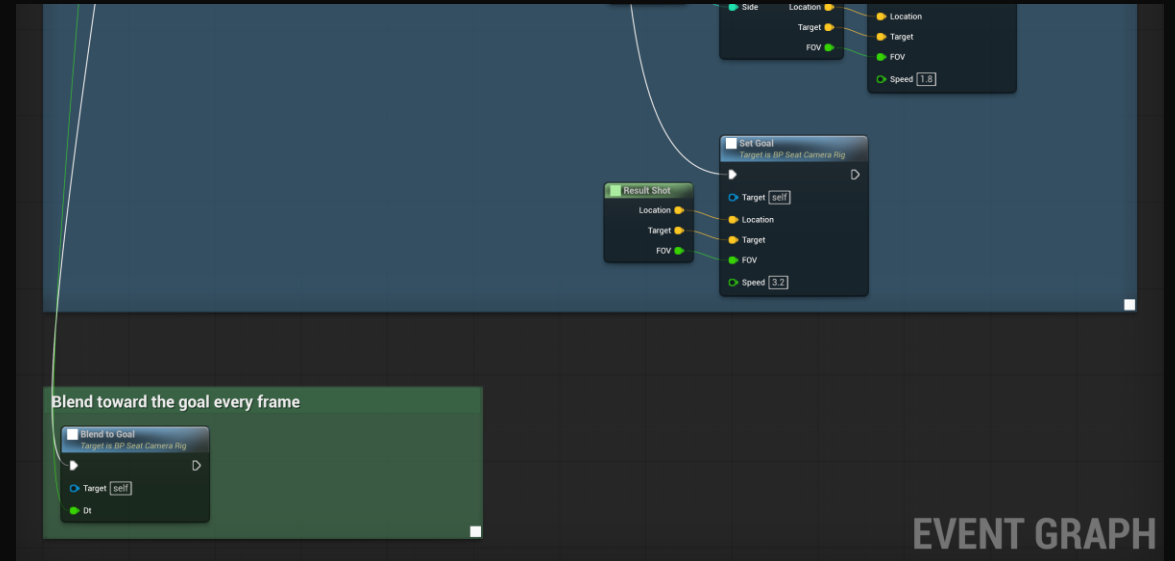
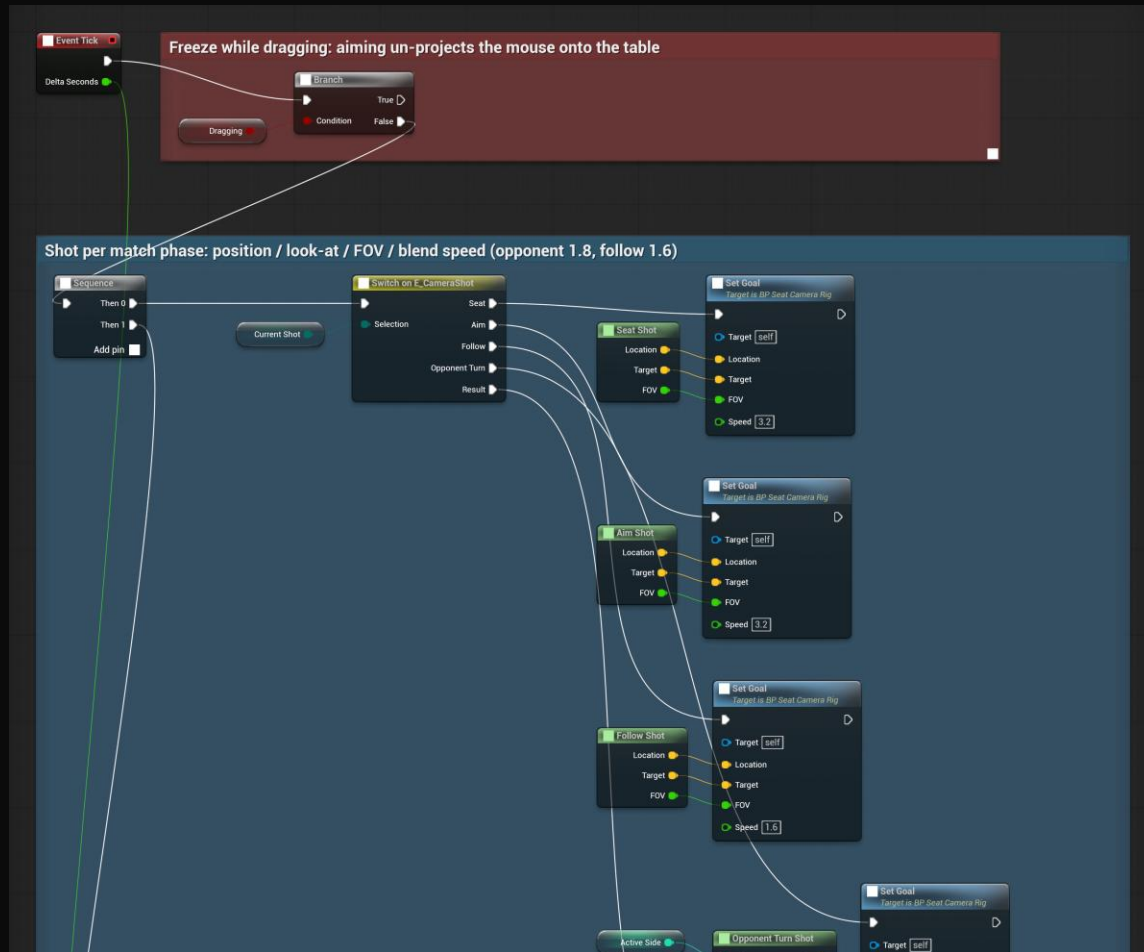
C++: DicePrototype.cpp · PlanOpponentShot / EvaluateShot. At most 4 ms per frame, the rest wait for the next frame; the best score is kept.

Blueprint: AI Card or Shot (DecideCardOrShot)



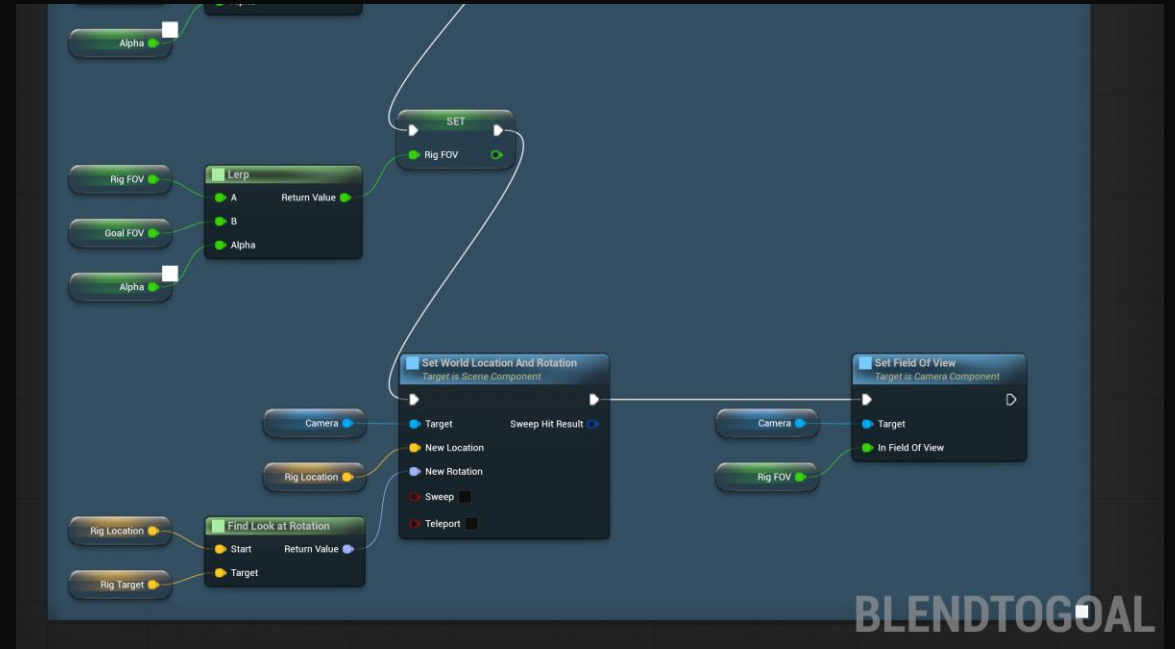
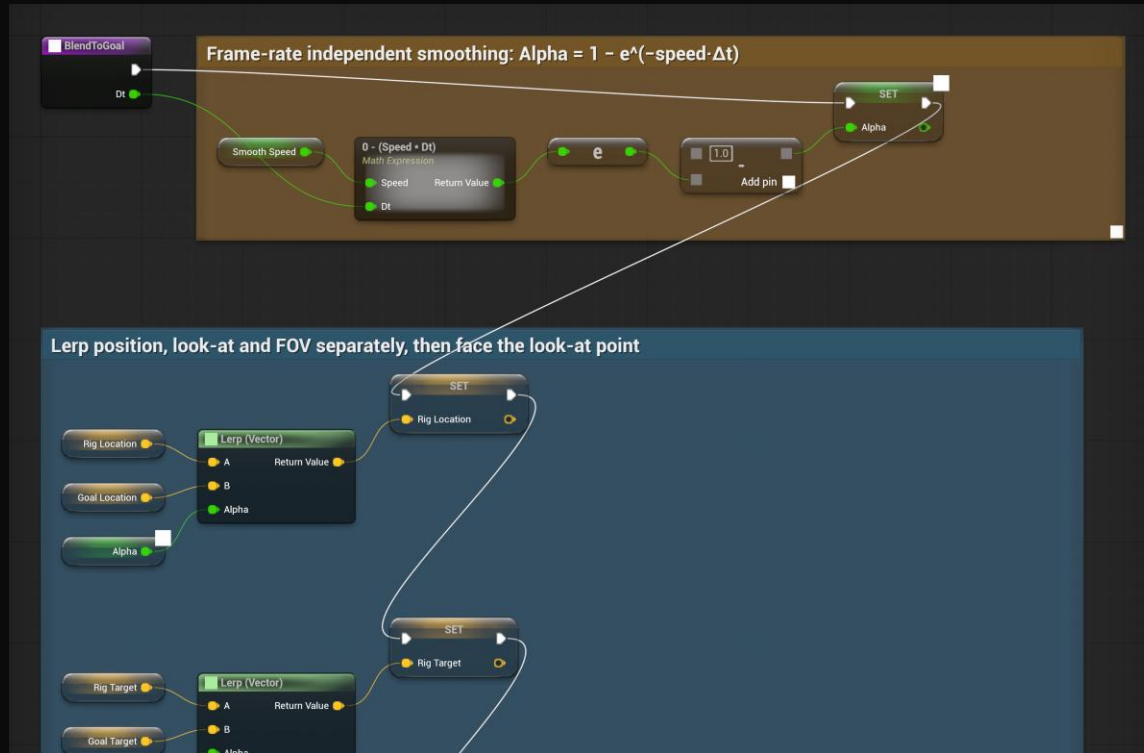
C++: DiceCards.cpp · AICardBar / TryAICard. Predicted shot gain is scaled by confidence 0.45 (Purple $\times 1.25$, Green $\times 0.85$) before the card comparison.

Blueprint: Seat Camera Shots (Event Tick)



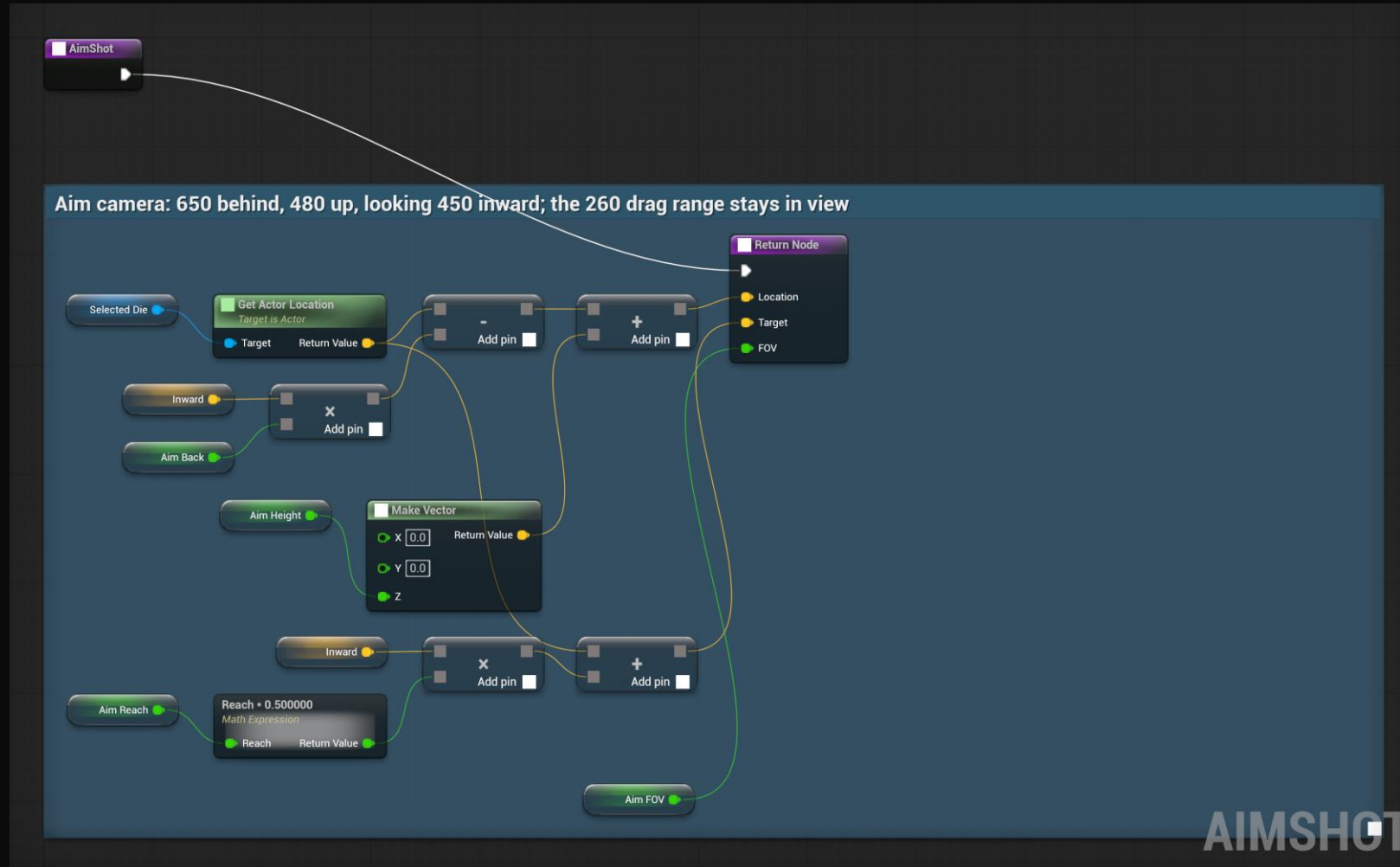
C++: DiceCameraRig.cpp · TickCameraRig. Frozen while dragging; the shot follows the match phase, each with position, look-at, FOV and blend speed.

Blueprint: Camera Smoothing (BlendToGoal)



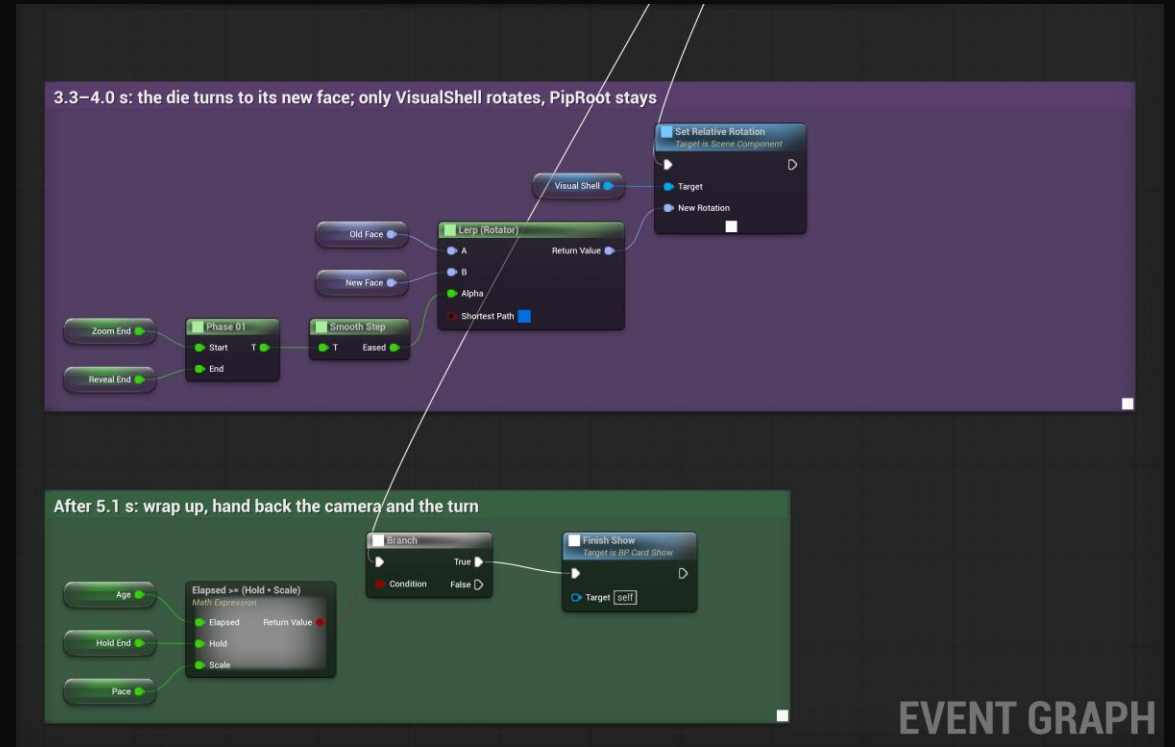
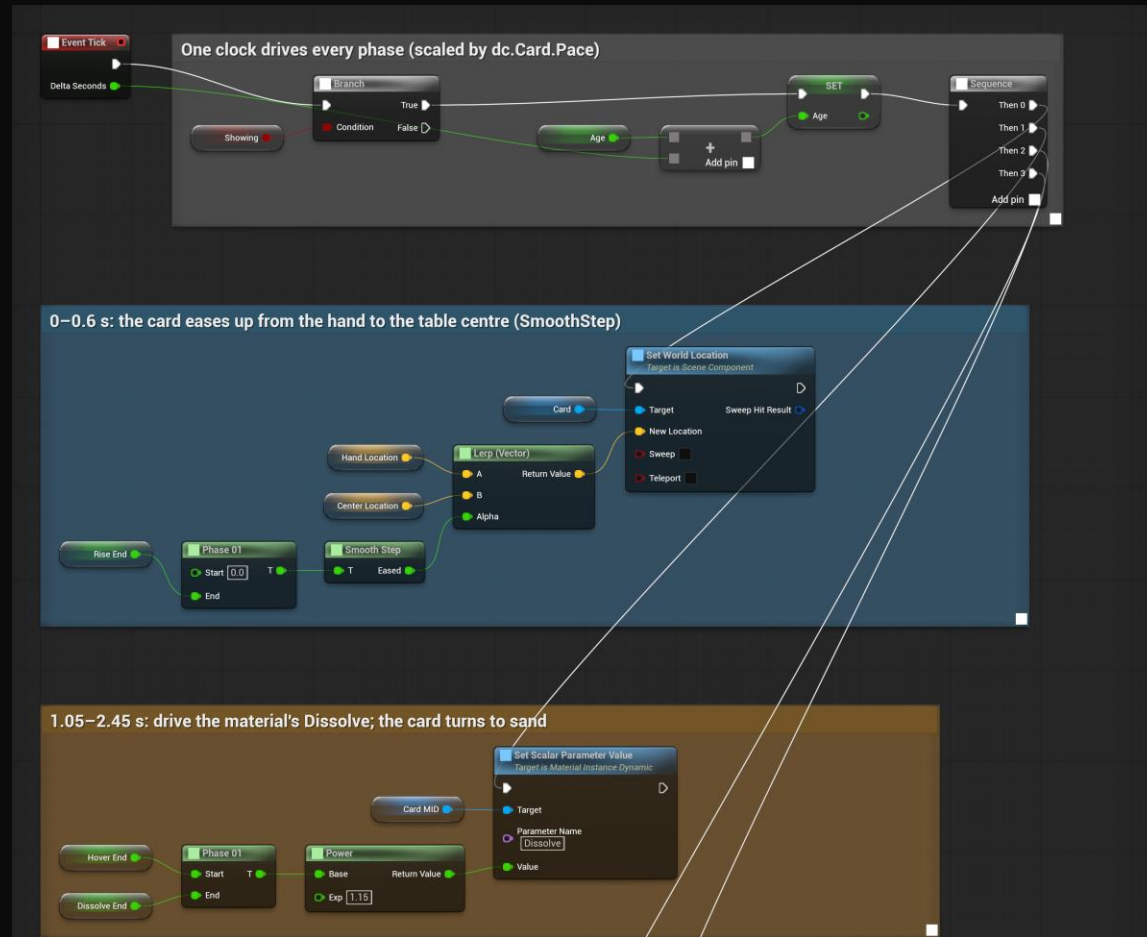
C++: DiceCameraRig.cpp · TickCameraRig. $\text{Alpha} = 1 - e^{(-\text{speed} \cdot \Delta t)}$, independent of frame rate; position, look-at and FOV blend separately.

Blueprint: Aim Camera (AimShot)

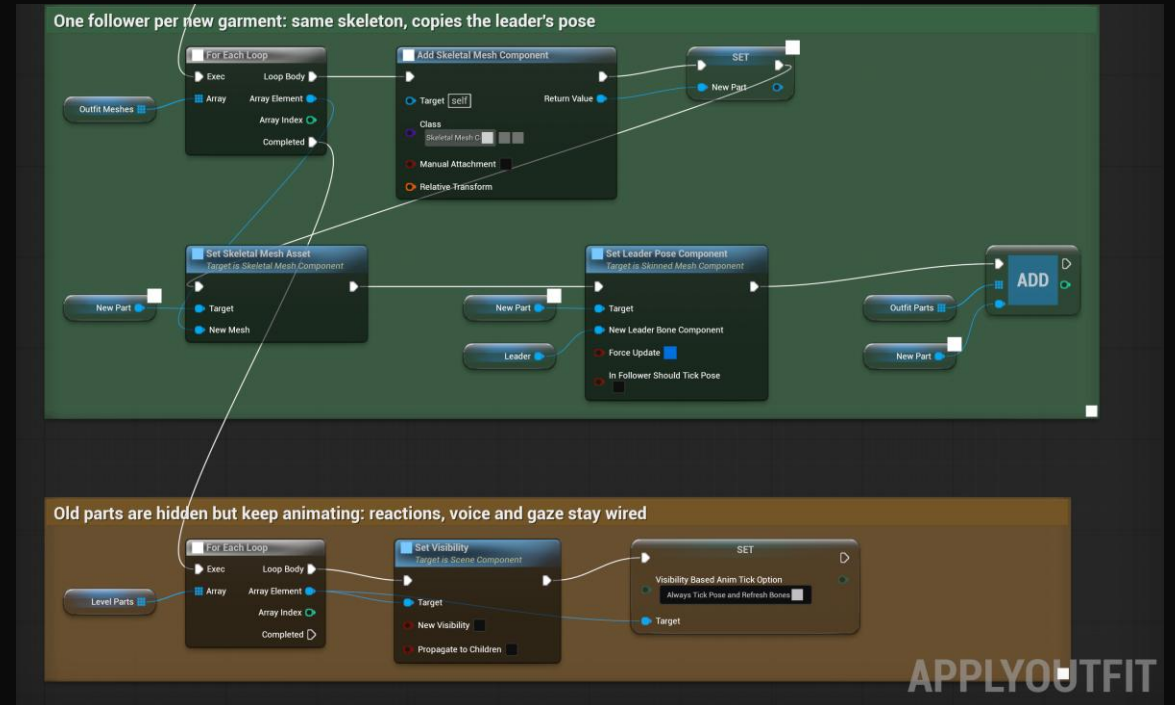
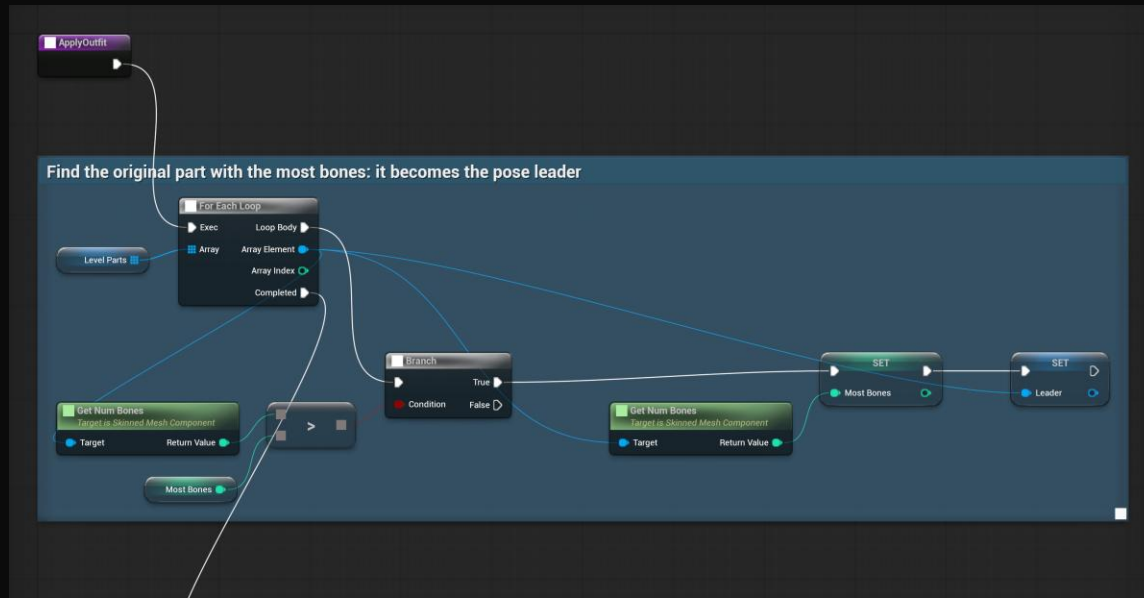


C++: DiceCameraRig.cpp · AimShot. 650 behind and 480 above the die, looking into the table, so the 260 drag range stays in view.

Blueprint: Card Show Clock (Event Tick)

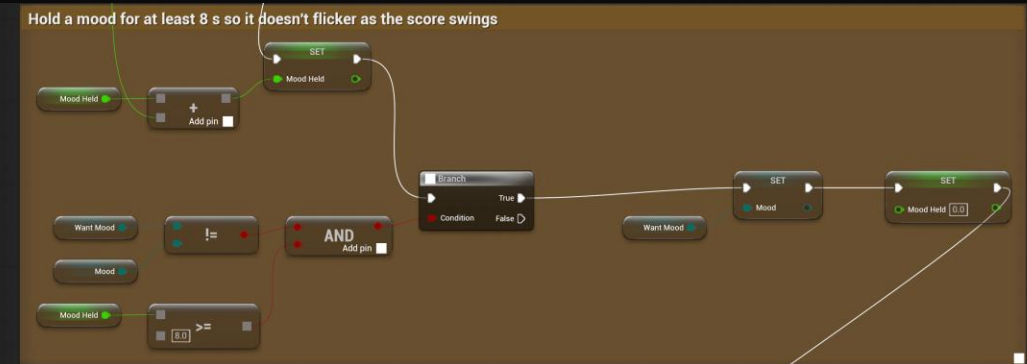
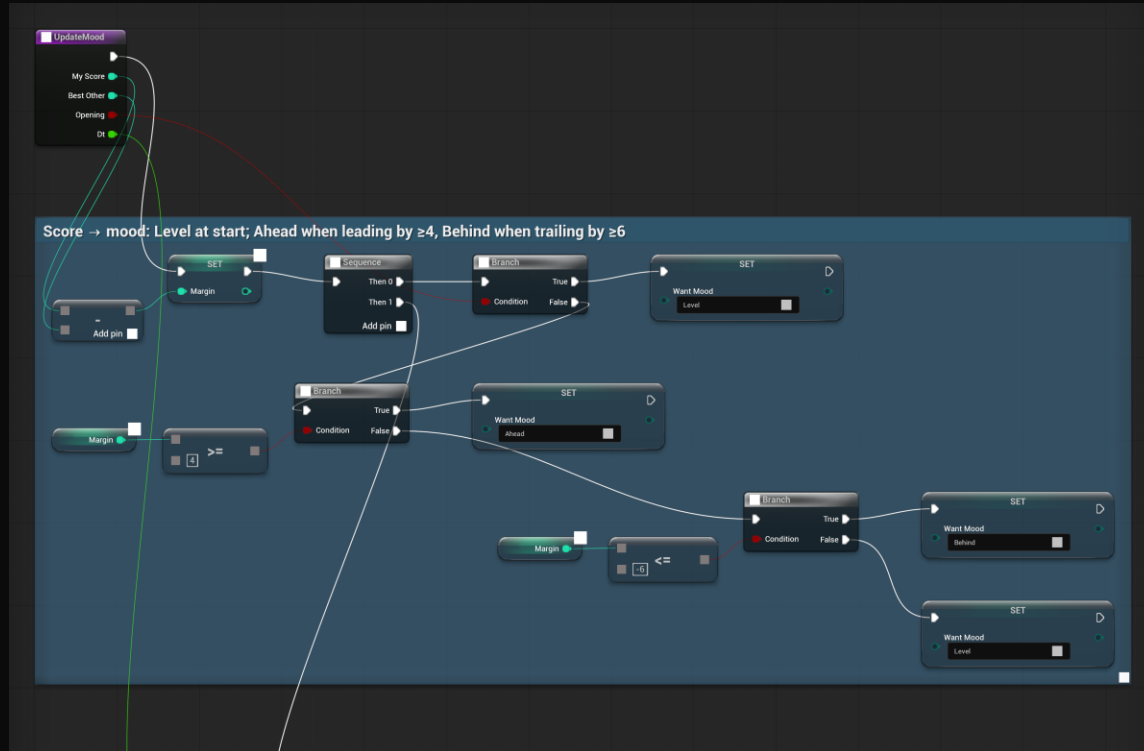


Blueprint: Opponent Outfits (ApplyOutfit)



C++: DiceOpponentLooks.cpp · TickOpponentLooks. The original part with the most bones leads; new clothes follow its pose; old parts are only hidden.

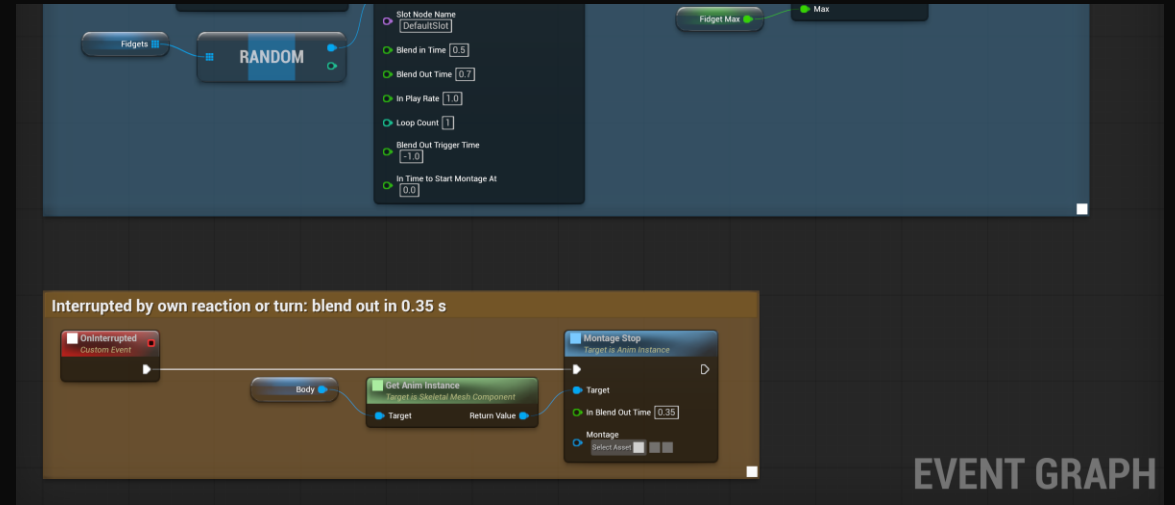
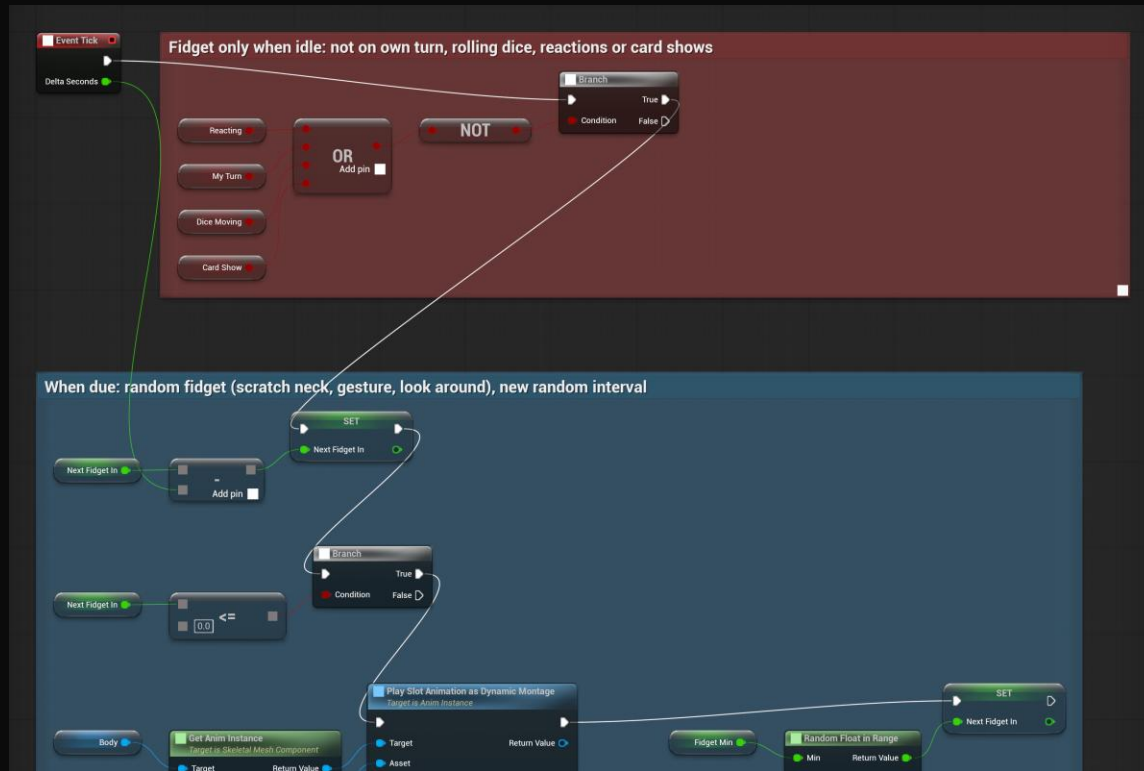
Blueprint: Idle Mood (UpdateMood)



UPDATEMOOD

C++: DiceNPCIdles.cpp · TickNPCIdles. Smug when ahead by ≥ 4 , glum when behind by ≥ 6 , held at least 8 s; random clips from the pool cross-fade in.

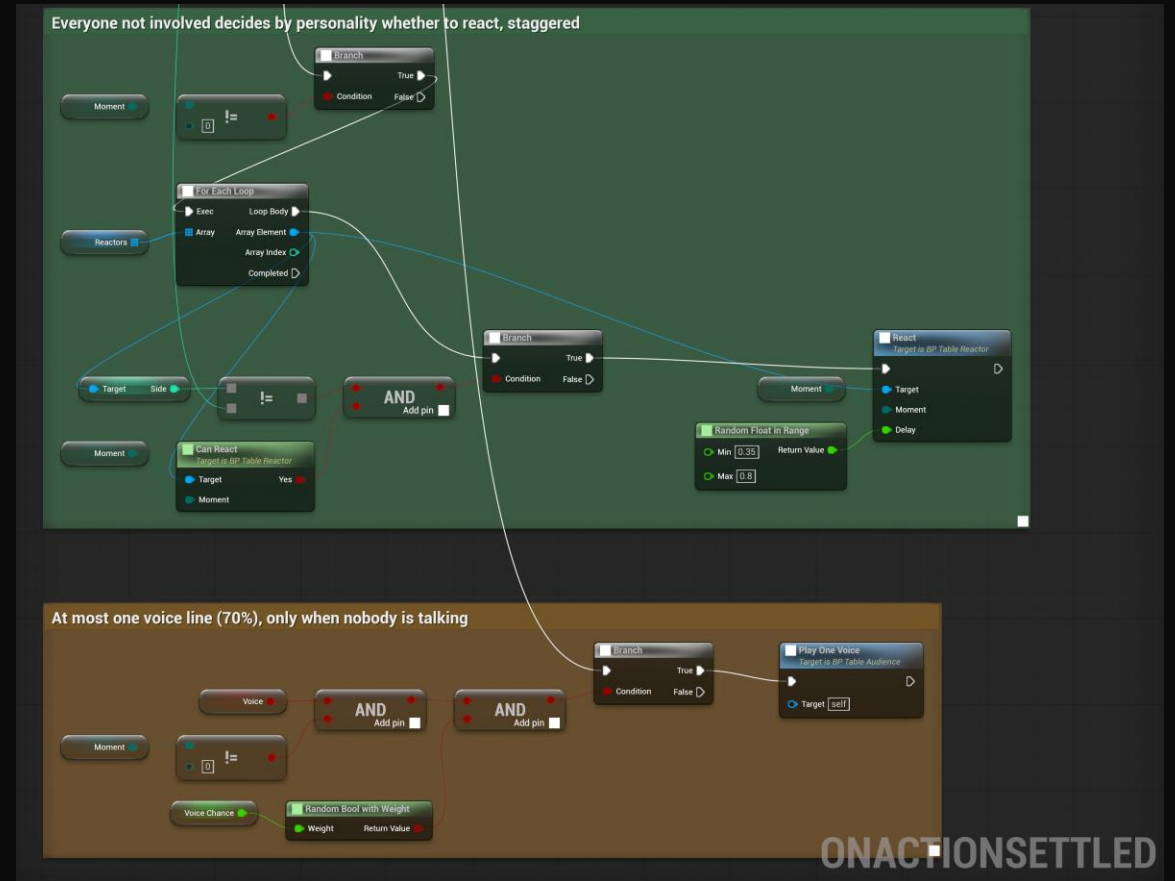
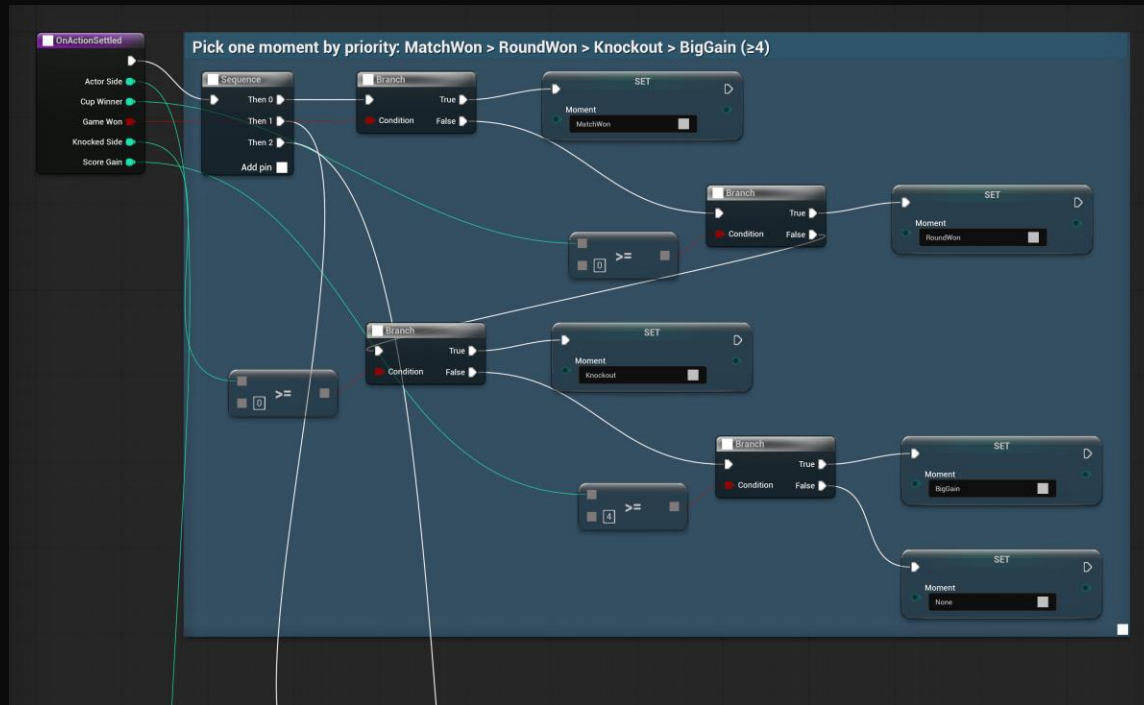
Blueprint: Fidgets and Interrupts (Event Tick)



EVENT GRAPH

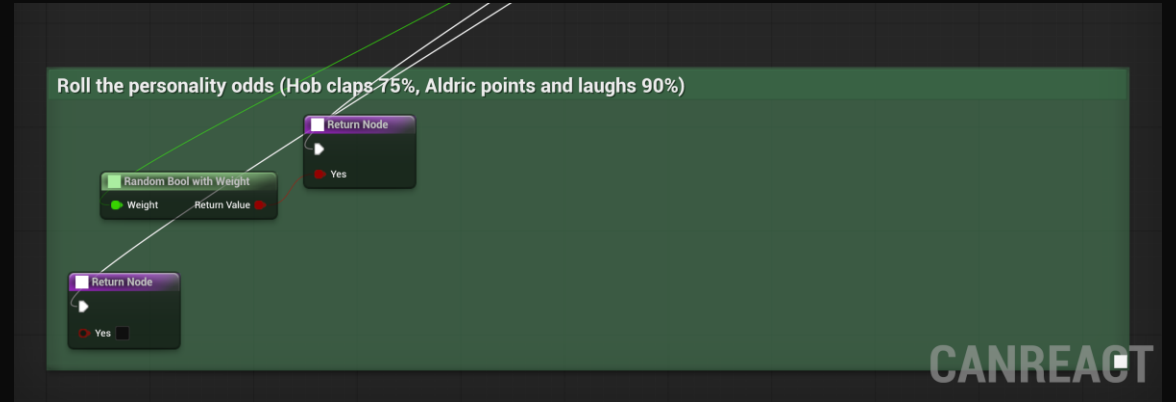
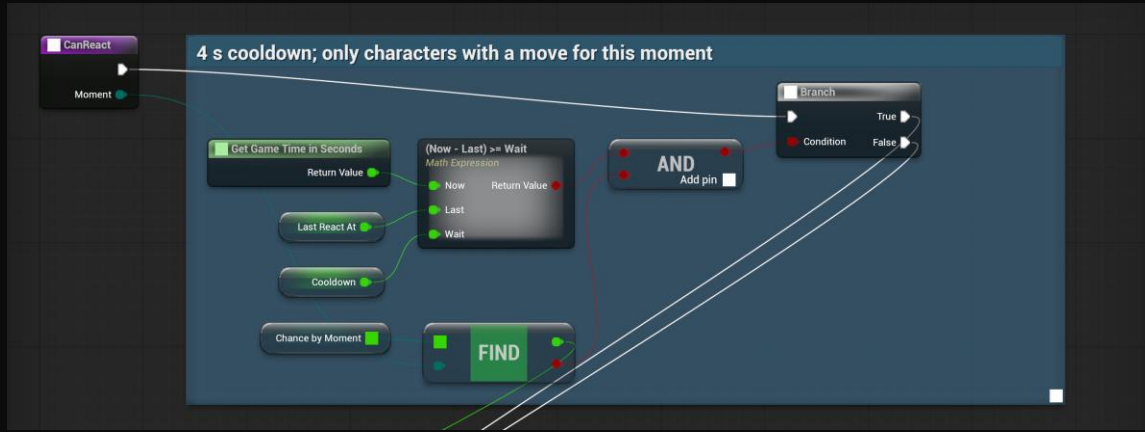
C++: DiceNPCIdles.cpp · TickNPCIdles. Fidgets only when idle, a random one when due; a reaction or turn pulls it back in 0.35 s.

Blueprint: Key Table Moments (OnActionSettled)

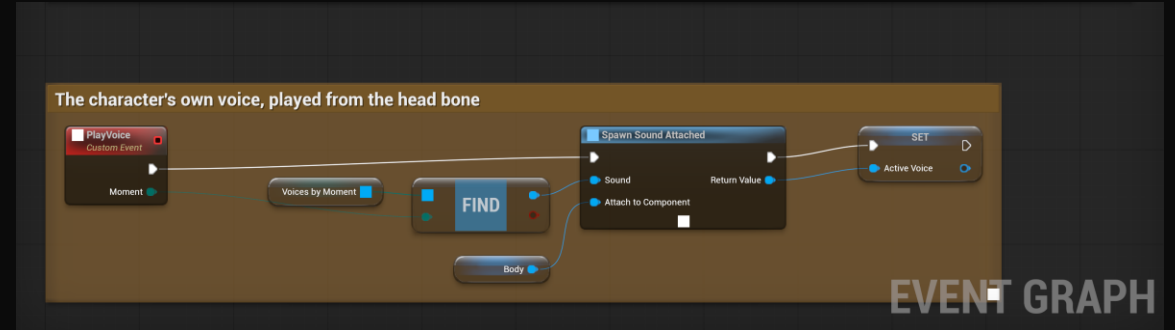
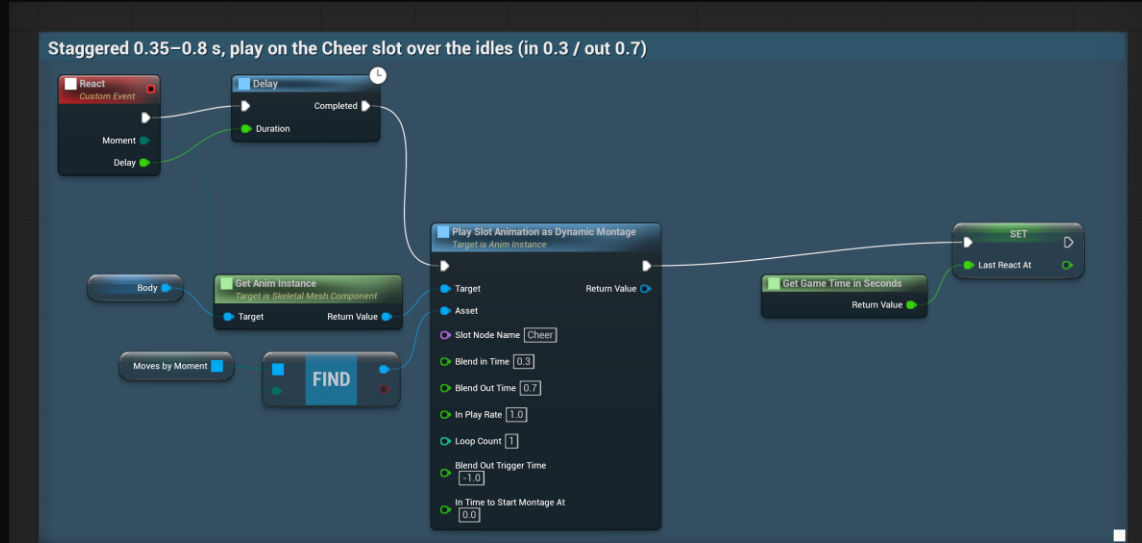


C++: DiceAudience.cpp · DispatchAudienceReactions. One moment is picked by priority; everyone not involved decides whether to react.

Blueprint: Whether to React (CanReact)



Blueprint: Reactions (React / PlayVoice)



C++: DiceAudience.cpp · TickAudience. After a 0.35–0.8 s stagger the motion plays on the reaction layer; the character's own voice plays from the head bone.