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Perfect- *Information* Games

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PRELIMINARIES

A game has perfect information if:

Every player knows all previous actions taken by all players.

There is no hidden information (no face-down cards, no secret moves).

The outcome of actions is deterministic – no random chance involved.

MODEL SETUP

1

Player 1 -
makes the first
move

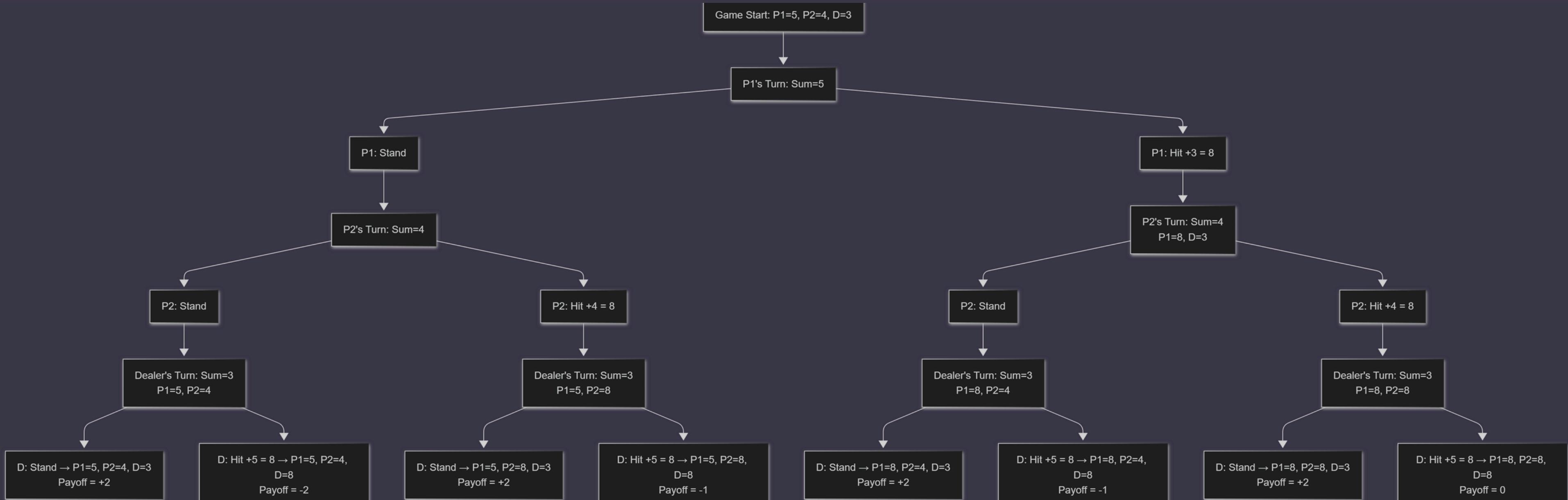
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Dealer –
operates
according to a
fixed rule
(draws cards
until the
amount is < 15)

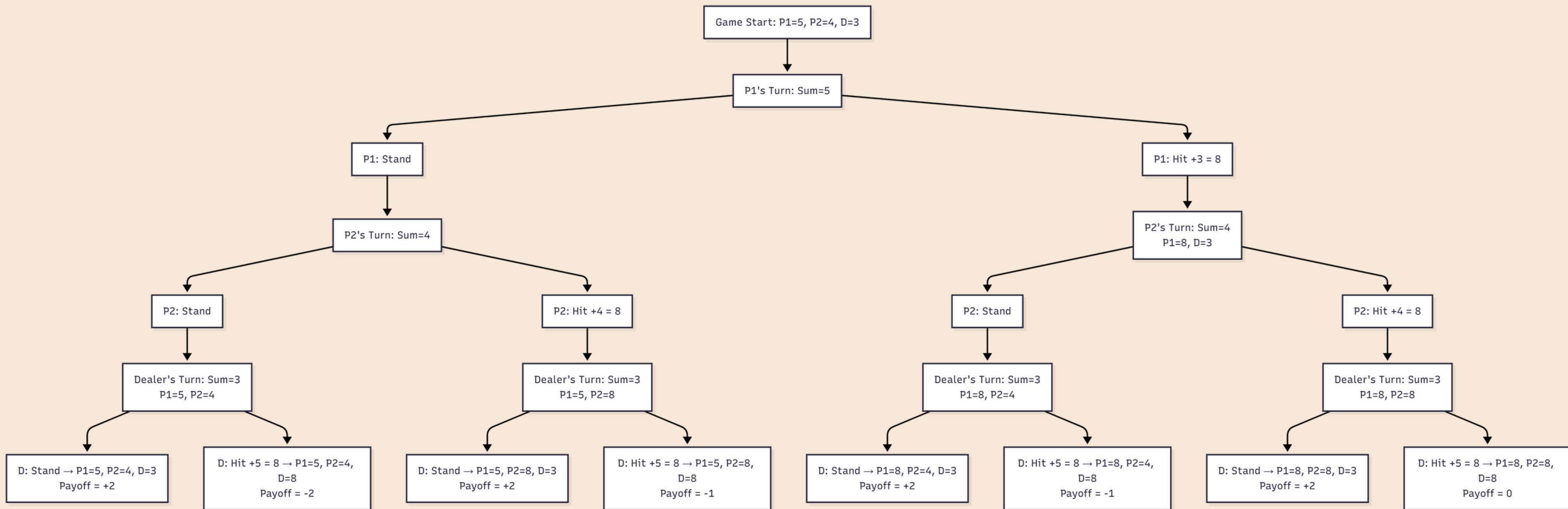
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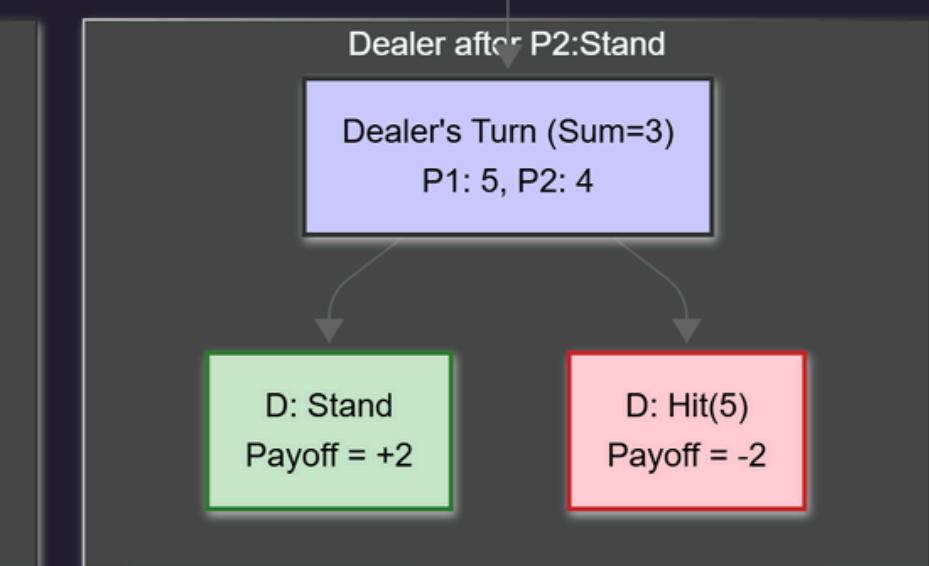
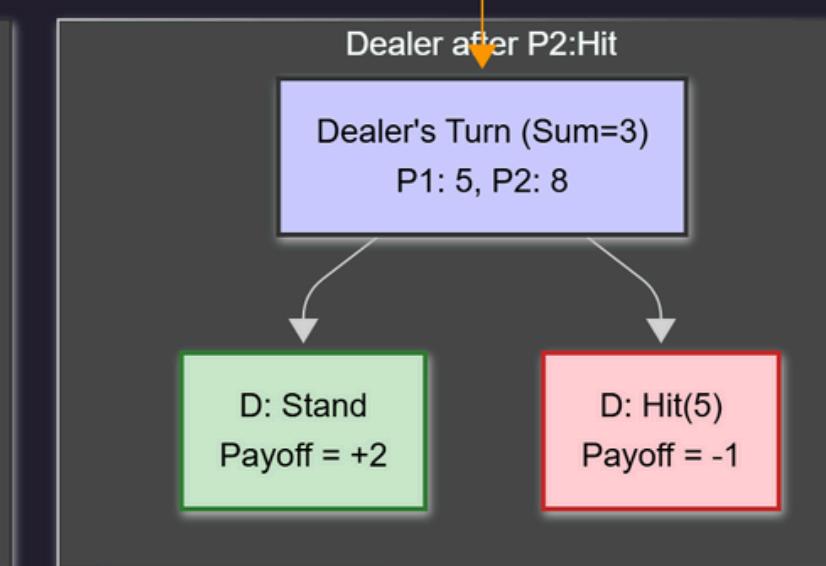
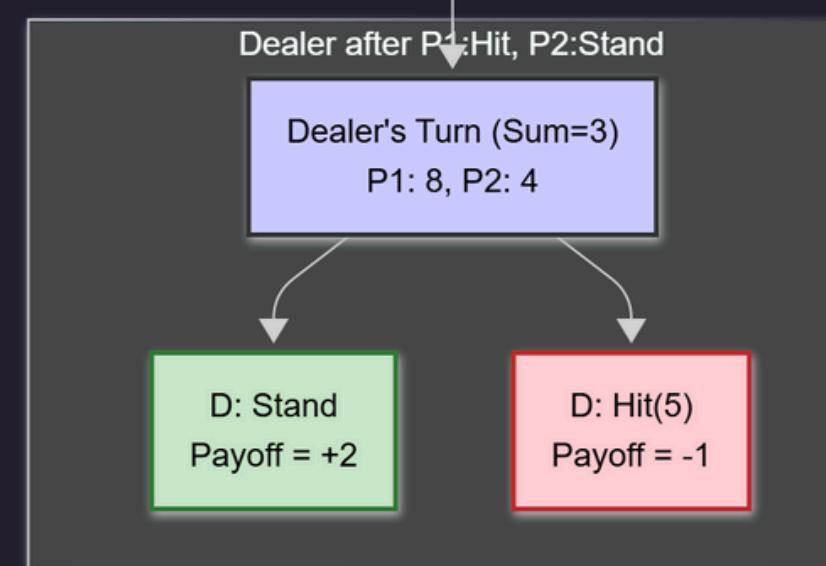
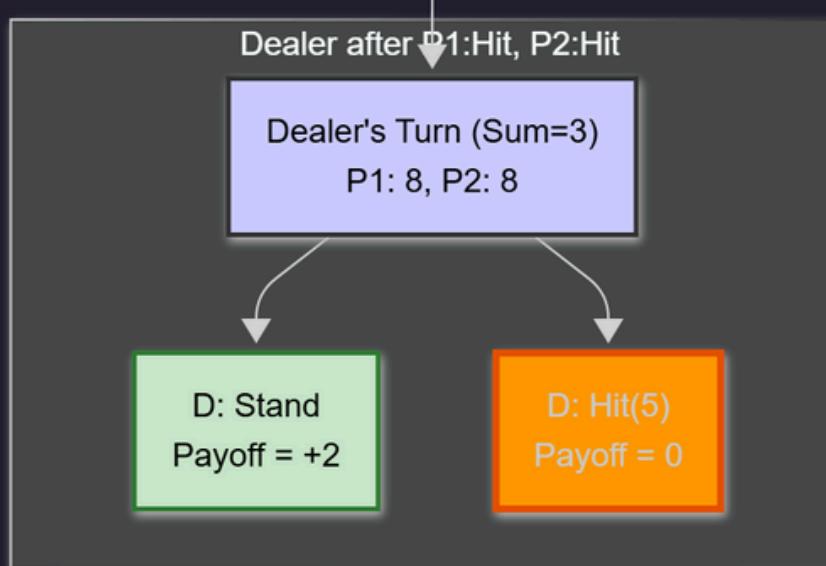
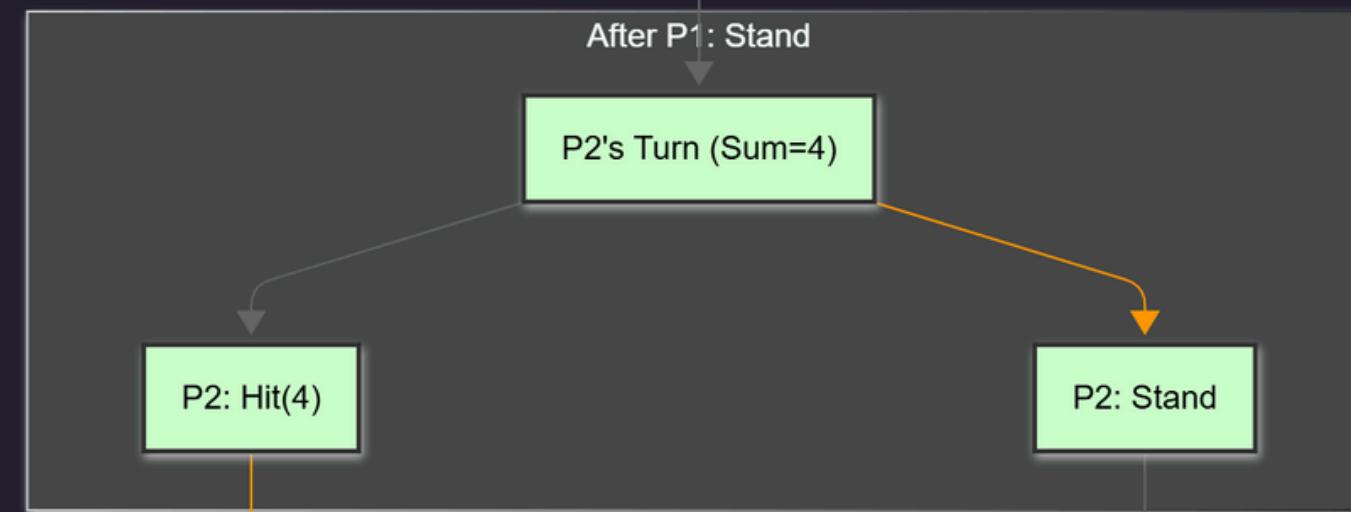
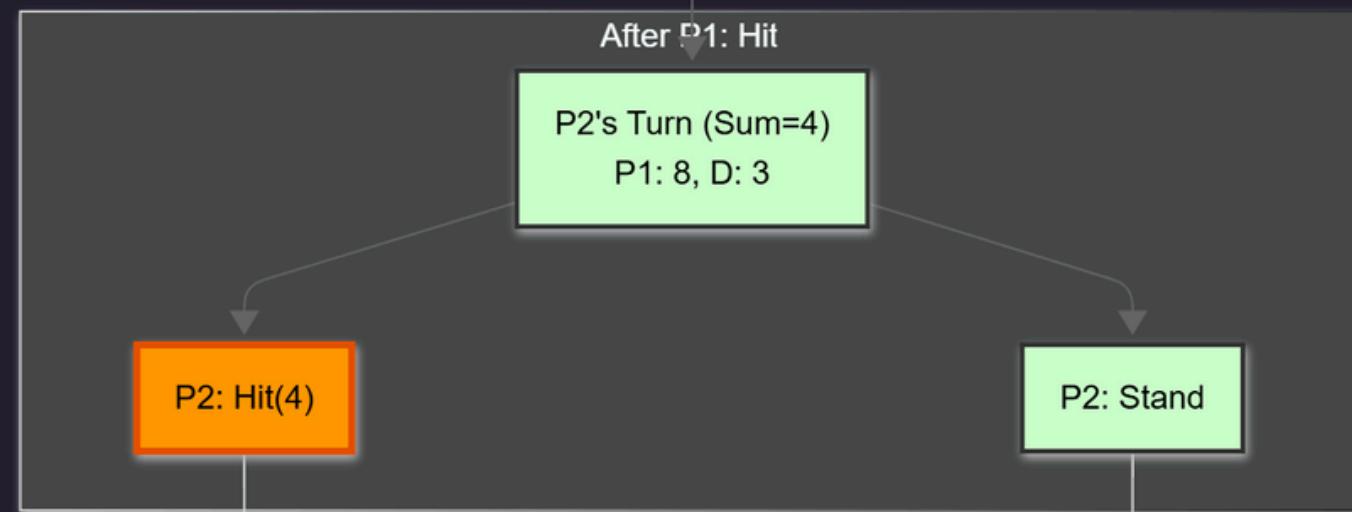
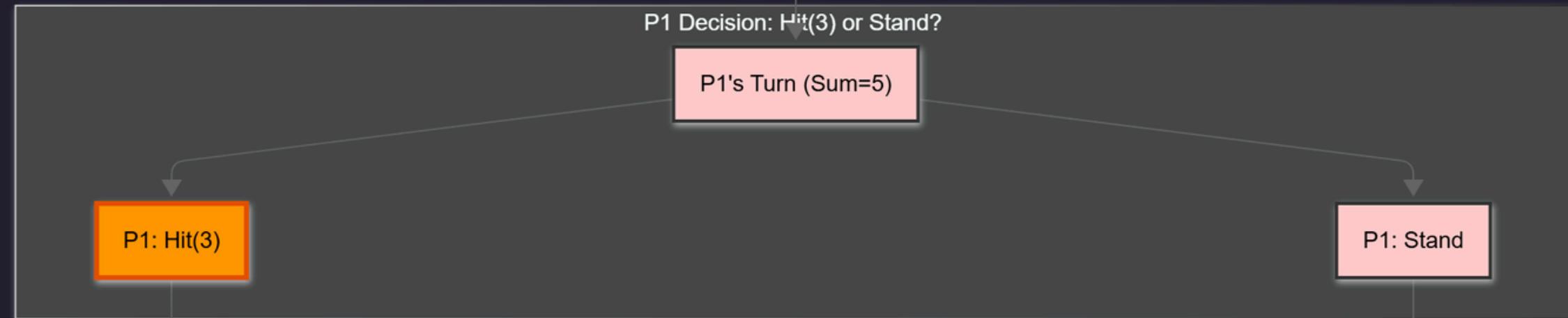
Player 2 –
reacts to the
decision of the
first player

Game tree



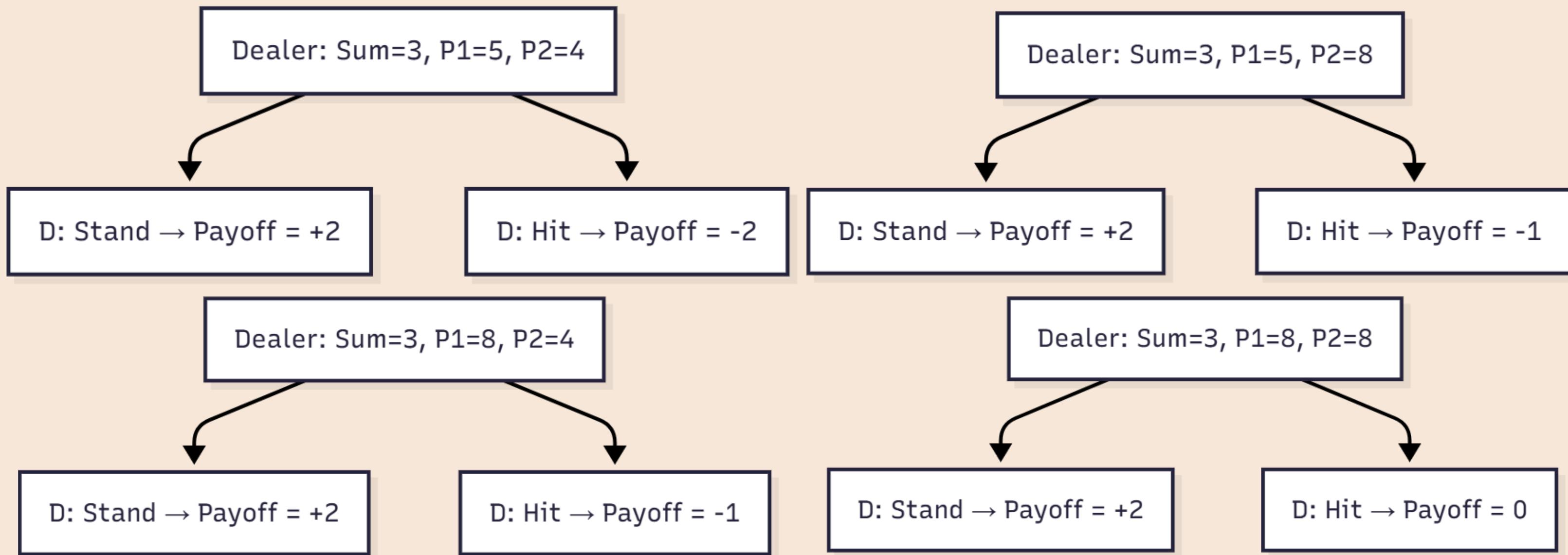
Game tree





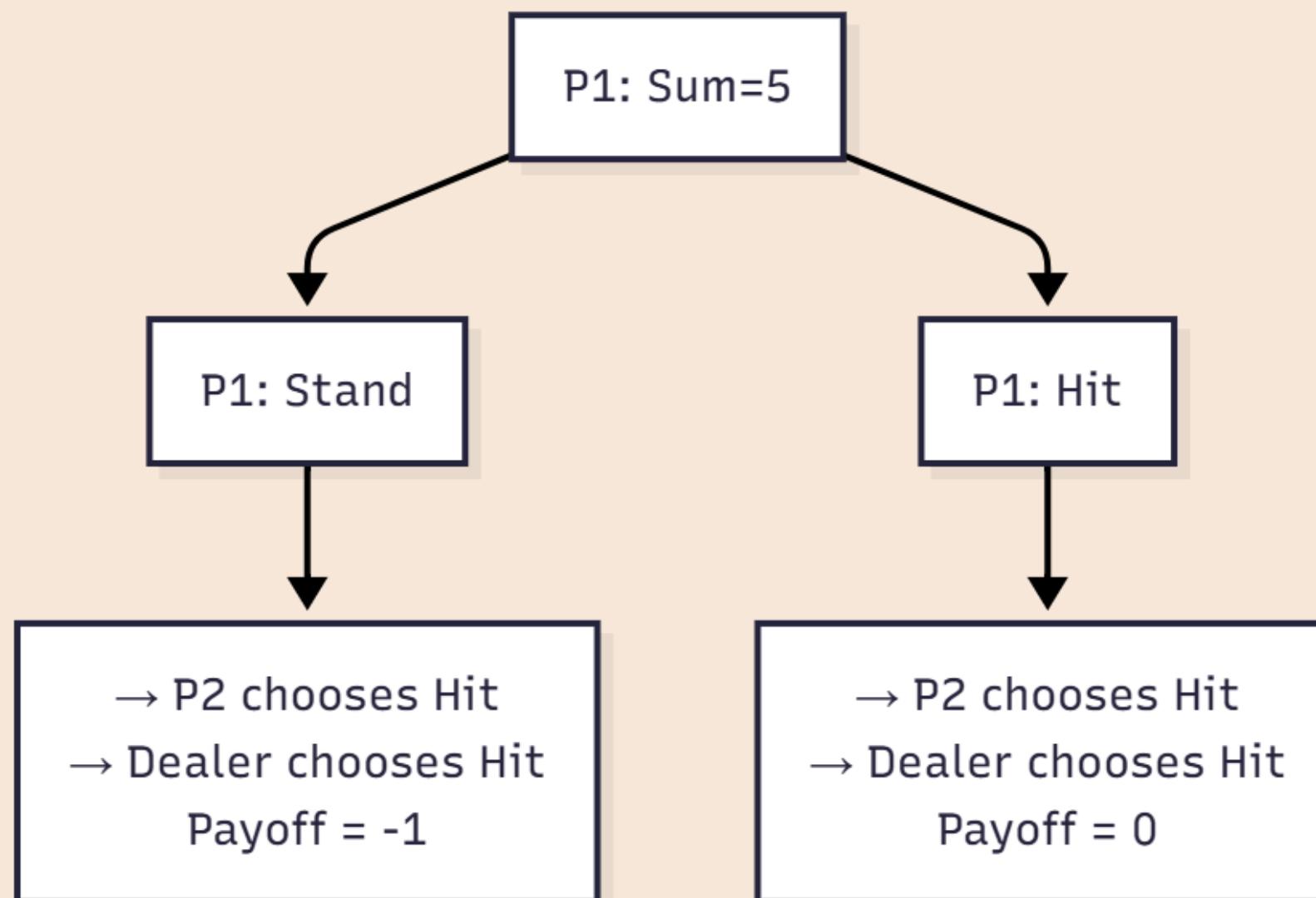
BI ANALYSIS

Step 1: Dealer Level (Minimizes Payoff)

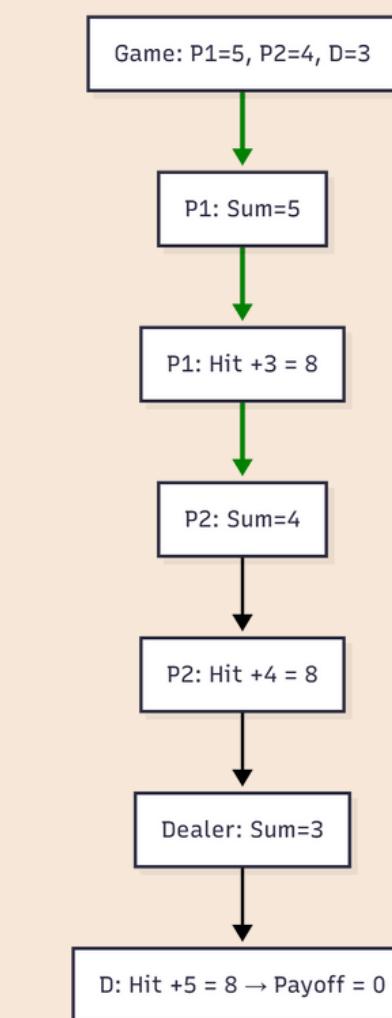


BI ANALYSIS

Step 2: P2 Level (Maximizes Payoff)



Step 3: P1 Level (Maximizes Payoff)



Modified Game: "Cooperative Bonus" Blackjack

Change: Introduce a cooperative bonus where if BOTH players beat the dealer, they each get an additional +0.5 payoff.

Step 1: Recalculate Final Payoffs with Cooperative Bonus

D: Stand → P1=5, P2=4, D=3
P1>D: YES, P2>D: YES
Base: +2, Bonus: +1
Total Payoff = +3

D: Hit → P1=5, P2=4, D=8
P1>D: NO, P2>D: NO
Base: -2, Bonus: 0
Total Payoff = -2

D: Stand → P1=5, P2=8, D=3
P1>D: YES, P2>D: YES
Base: -2, Bonus: 0
Total Payoff = +3

D: Hit → P1=5, P2=8, D=8
P1>D: NO, P2>D: TIE
Base: +2, Bonus: +1
Total Payoff = -1

D: Stand → P1=8, P2=4, D=3
P1>D: YES, P2>D: YES
Base: +2, Bonus: +1
Total Payoff = +3

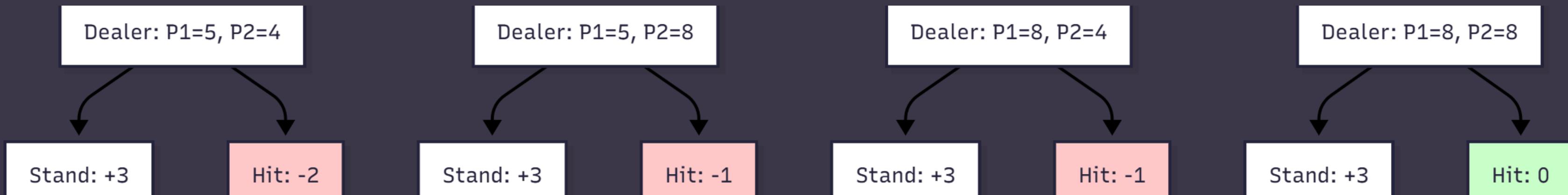
D: Hit → P1=8, P2=4, D=8
P1>D: TIE, P2>D: NO
Base: -1, Bonus: 0
Total Payoff = -1

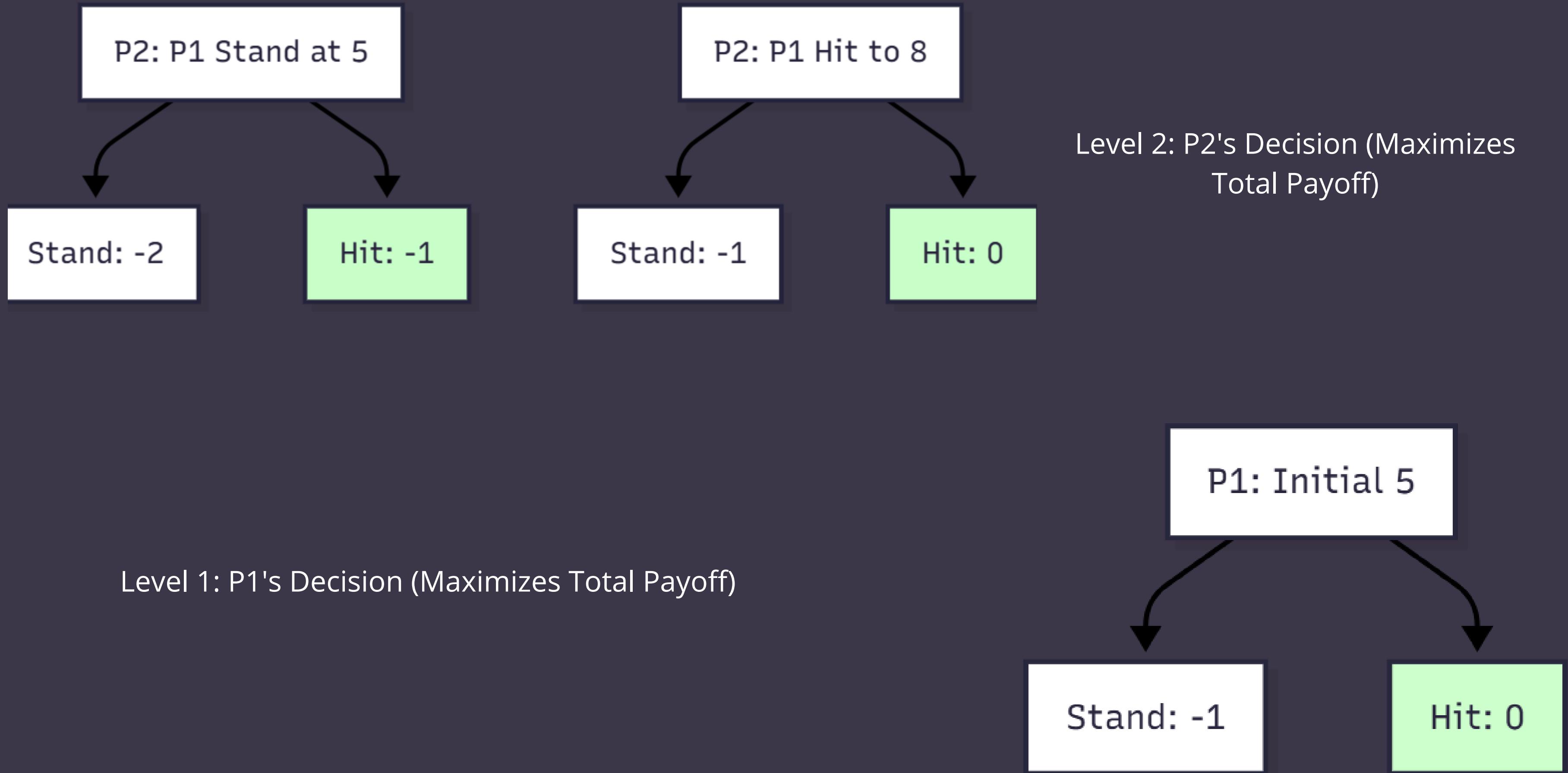
D: Stand → P1=8, P2=8, D=3
P1>D: YES, P2>D: YES
Base: +2, Bonus: +1
Total Payoff = +3

D: Hit → P1=8, P2=8, D=8
P1>D: TIE, P2>D: TIE
Base: 0, Bonus: 0
Total Payoff = 0

Step 2: Backward Induction with Modified Payoffs

Level 3: Dealer's Decision (Minimizes Total Payoff)





CONCLUSION

This extended Blackjack version with two players demonstrates:
How backward induction solves complex multi-player sequential games
The importance of anticipating opponent responses in strategic decision-making
That perfect information doesn't guarantee positive outcomes against optimal opponents
The methodology can be extended to more players and complex card distributions, providing a framework for analyzing strategic interactions in perfect information environments.





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