Of Love and Revenge: A Game Theoretical Study of Major Decisions in Eugene O'Neill's *Desire Under the Elms*

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Abstract

Eugene O'Neil's *Desire Under the Elms* is a play, which has a plot thick with conflict, with every character having emotional and material stakes. Its deliberative nature makes it a rich ground for a game- theoretical analysis. This paper studies major decisions taken by the play's main characters that formulate the thrust of the action. Each choice made is seen to be a negotiation, either with other characters or with the situation at hand in order to achieve some end, often at the expense of others. The paper treats every major decision as a frustration game between two players. These games are examined according to Steven J. Bram's Theory of Moves. Each player's action is taken as a move, and it is seen to be countered by that of the other. This paper studies all possible courses of action that can be taken in each game and then sees which one yields to be most beneficial, and which one is taken by the relevant players. The study brings forth an otherwise forgone aspect of interpretation: rationalization of action. It is seen that not all choices taken are thoroughly calculated or premeditated; sometimes they are more emotionally charged. This game-theoretical analysis reveals the complete range of possible actions, providing a deeper insight into the characters by bringing to light all the variables they have dealt with, and how they react to them under different circumstances.

***Key words**:* Conflict, Desire, Frustration Games, Game Theory, Theory of Moves

Introduction

O'Neill's *Desire Under the Elms* tells the story of a thrice-married, twice-widowed man, living life on his own terms, while his sons slave away on his barren land. Tired of the land yielding nothing, and mesmerised by promises of wealth in California, Simeon and Peter decide to leave in search of a more prosperous future in the West. Eben, the youngest, and only son by his second wife, stays behind to avenge his mother's maltreatment, which he believes ended her life. As the play progresses, battle ensues between Abbie, the third wife, and Eben. Initially bound by rivalry, the two eventually fall in love and have a child together, outside of wedlock. Cabot, enraged at being jeered at and burning with jealousy, plants the seed of doubt in Eben's mind, making him think that the child has been Abbie's ploy to permanently rob him off the farm that Eben believes to be rightfully his. Completely shattered and in a state of hysteria, Eben, without realizing the repercussions, tells Abbie to kill the child.

The plot is driven solely by conflict. Each character is in direct antagonism with at least one other character. In fact, love and revenge make up the substance of the play. This is what makes it a rich ground for its analysis through the lens of Game Theory. In its simplest of forms, game theory is the study of the interaction of agents. This paper does precisely that. It studies the decisions and strategies of the characters. In today's world, literature is much more visual and digital than it used to be; to build interest at classroom level, bringing in elements from the digital has manifold impact. Think of it this way: the play is no longer a plot on paper- it is a game played by players, each with its own offshoots, conflicts, and interests. Game theory opens new avenues for exploration and brings to us intersectional points of literature and the digital.

Game theory is a broad study of rational decision making. When amalgamated with literature, it aids in the rationalization of actions of characters, revealing underlying structures. Michael Wainwright (2016) states in his book *Game Theory and Postwar American Literature* (2017), that psychoanalytical analyses of texts usually “overlook the importance of cognition, ignore the rational thought processes of the human subject, and search exclusively for signs of severe repression” (p. 3). What these theories leave out, a game-theoretical analysis of the play may allow us to bring to light.

Nagastu and Lisciandra (2021) note how the game is “solved” (p.402), when the maximum possible payoff is achieved by the players, which is of course a result of the actions they choose, and are chosen, in the first place, so this desired aim is achieved (p. 402). They now reach a state of equilibrium: “no unilateral deviation from that state yields benefit: the beliefs of each player about the other player’s beliefs and actions are indeed correct” (Nagastu and Lisciandra, 2021, p.402). It is essential to note here that these game theoretical analyses dissect the theoretical foundations of the path taken to this resting point, and not the ‘how’ of the equilibrium. That interest more commonly resides with psychologists more than economists (Nagastu and Lisciandra, 2021, p.402)

This paper will study five crucial plot-driving decisions that major characters take. Each decision acts as a game and will be studied in the light of the Theory of Moves, treating it as a frustration game. The decision-makers will be treated as players of the game, and not only will their actions be analyzed, but all possible strategies will be brought to light. It will then be discerned whether the course of action taken by the character was the most profitable. Rather than giving conclusive opinions, the analysis will aim to dissect the play, its plot and its action through decision making.

Review of Literature

Iolanda Lulu (1977), writes in her article "Balance and Game in the Study of Theatre", something that may sound very obvious, but is often not thought of during the study of a play:

> What the playwright considers as the optimal strategies are in fact optimal for the tension and the rhythm of the performance, seldom for the "actual life" of the character. A cautious hero would be uninteresting. Paradoxically, the optimal strategy of the character is, more often than not, that of "the mad risk." Therefore, the main characters may seldom be considered as perfectly rational players…The optimal strategies for their destinies of actual human beings will seldom be followed. (pp. 339-350)

It is hence important to note from the get-go, that when characters reach a decision, they may not always choose a path beneficial for themselves. This is because the course selected by the playwright is meant to further the purpose of the plot and not the character. Hence when we analyse a play, it is safe to assume that the character will not choose the move that attains for them the highest pay off.

When analyzed as a game, each character is considered a player. The theatrical play is, after all, a strategic game (Owen, 1968). According to the Theory of Moves, first propounded by American political scientist Steven J. Brams, moves and possible outcomes can be plotted in a payoff matrix, and players move and countermove within it. However, in his book *Game Theory and the Humanities: Bridging Two Worlds* (2011), unlike Iolanda Lulu, he contends that each player evaluates the participants' possible moves when deciding upon their own (p.73).

Wainwright (2016), in his book *Game Theory and Postwar American Literature*, states that a player can be one individual and distinct agent, or a number of agents together. During the study of these games, the Theory of Games breaks down possible moves into a series of pairs. It is seen that although invested in their sole interests, each player inadvertently affects the outcomes of all related players. Gosh and Sen (2012) sum up the basic framework of TOM framework of 2x2 games perfectly in their journal article titled “Theory of Moves Learners: Towards Non-Myopic Equilibria”, explaining that:

> each player has two actions (pure strategies or strategies, in short), moving corresponds to changing the current strategy and not moving corresponds to continue using the current strategy. To make this decision, the player looks three moves ahead and uses backward induction to decide whether moving will be beneficial or not. If both players decide not to move, the starting state is the equilibrium. (p.1)

Strategic games are of many different types. Of 78 2x2 ordinal games, there are twelve frustration and six self-frustration games. In the chapter “Plays: Modelling Frustration and Anger”, Brams (2012) explains how a Frustration game is to be read: being a 2×2 game, each player has two strategies, and the payoffs of each player results from four possible outcomes (pp. 155-184). According to him, “A player’s lack of control takes the form of an “advantaged” player’s having a dominant strategy that inflicts the two worst outcomes on the frustrated player” (Brams, 2012, pp.157). He describes a standard course of change in emotion: players who are initially dissatisfied, are further aggravated, as they explode with anger. This moves to a Non-Myopic Equilibrium (NME). Matters are then stabilized and the initially frustrated player is either appeased or triumphant. Nagutski and Lisciandra (2021) note how “players do not know what the other person will do, but in equilibrium they act as if they did: their beliefs about others’ actions are coordinated in the sense that they are the same and true in equilibrium” (pp.410).

When represented in matrix form, the dominant strategy of a player may emerge. The dominant strategy refers to the course of action that results in the highest payoff for a player regardless of the other player’s move. This means that no matter what the other player does, the dominant strategy will always be beneficial (Brams, 2012; Crisman 2014). However, it is not necessary that the players in a game will have one, but it can safely be assumed that when they do, the dominant strategy can be blindly followed.

As mentioned earlier, there are two possible moves for each player, which results in four possible outcomes. The outcome of each move is rated on a scale of 1-4, one being the least favourable outcome, and 4 being the most favourable. Following is a visual representation of the basic structure of a matrix:

Table 1

The basic structure of an allocated matrix

		Player 2	
		B1	B2
Player 1	A1	(1,2)	(2,3)
	A2	(3,1)	(4,4)

In the table shown above, the outcomes are rated and allocated against the possible moves a player can make. The ratings in the brackets are imagined.

The introduction of game theory in criticism of literature and the hybridization of the two is still a fairly recent phenomenon. In his 2011 book *Game Theory and the Humanities: Bridging Two Worlds* Brams makes a comprehensive list of all operas and literary texts which have been analyzed through this lens. The list has a total of thirty-five entries, the first ones being of very obviously game employing texts, initially used as examples of theorists of pure game theory (see table 2).

Table 2

Literary works and operas to which game theory has been applied

1. Arthur Conan Doyle, Sherlock Holmes (several books in a series) (Morgenstern 1935; von Neumann and Morgenstern 1944/1953; Vorob'ev 1968) — mystery
2. William Shakespeare, The Merchant of Venice (Williams 1954/1966) — play
3. William Shakespeare, Othello (Rapoport 1960; Teodorescu-Brinzeu 1977) — p lay
4. William Shakespeare, Measure for Measure (Schelling 1960) — play
5. O. Henry (William Sidney Porter), "The Gift of the Magi" (Rapoport 1960; Vorob'ev 1968; Rasmusen 1989)— short story
6. Giacomo Puccini, Tosca (Rapoport 1962) — opera
7. William Shakespeare, Henry V (Schelling 1966; Dixit and Nalebuff 1991)— play
8. Joseph Conrad, The Secret Agent (Schelling 1966) — novel
9. Alexander Pushkin, Eugene Onegin (Vorob'ev 1968) — novel
10. William Shakespeare, Hamlet (Vorob'ev 1968; Brams 1994; Howard 1996) — play 11. Edgar Allan Poe, "The Purloined Letter" (Davis 1970) — short story
12. Harold Pinter, The Caretaker (Howard 1971) — play
13. William Shakespeare, Richard III (Lalu 1977) — play
14. Agatha Christie, The Mousetrap (Steriadi-Bogdan 1977) — play
15. Homer, The Odyssey (Elster 1979; Mehlmann 2000)— mythology
16. Bible (Brams 1980/2003; Dixit and Nalebuff 2008; Brams and Kilgour 2009) — religious work
17. C. P. Snow, The Masters (Riker 1986) — novel
18. Boris Pasternak, Dr. Zhivago (Howard 1988) — novel
19. Johann Wolfgang von Goethe, Faust (Mehlmann 1990, 2000)— play
20. Sir Gawain and the Green Knight (anonymous) (O' Neill 1991) — medieval poem
21. The Feast of Bricriu (anonymous) (O' Neill 1991) — medieval tale
22. William Faulkner, Light in August (Brams 1994a, 1994b)— novel
23. William Shakespeare, Hamlet (Brams 1994b) — play
24. William Shakespeare, King Lear (Chami 1996; Dixit and Nalebuff 2008)— play
25. Aristophanes, Lysistrata (Brams 1997a) — play
26. William Shakespeare, Macbeth (Brams 1997a) — play
27. Joseph Heller, Catch-22 (Brams and Jones 1999; Dixit and Nalebuff 2008)— novel 28. William Goldman, The Princess Bride (Dixit and Nalebuff 2008)— novel
29. Giuseppe Verdi, Rigoletto (Dixit and Nalebuff 2008)— opera

30.	Friedrich von Schiller, Wallenstein (Holler and Klose-Ullman 2008)— play
31.	Richard Wagner, Lohengrin (Huck 2008) — opera
32.	Richard Wagner, Tannh äuser (Harmgart, Huck, and Müller 2008, 2009)— opera
33.	William Shakespeare, Much Ado about Nothing (Chwe 2009) — play
34.	Richard Wright, Black Boy (Chwe 2009) — novel

Note: This table was taken from Bram's (2011) *Game Theory and the Humanities: Bridging Two Worlds*, table 1.1.

A game-theoretical approach applied to modern texts is rare. Most research in this field has been done on texts from the medieval to Shakespearean eras. This paper tackles Eugene O'Neill's *Desire Under the Elms*, a modern drama.

Discussion and Analysis

As the play opens, Simeon, Peter, and Eben talk about Cabot, their now-absent father, whom they know will probably come back with a new bride. Already full of despise for his dictatorial nature and submission to whims, this third marriage is the last straw. Cabot and Simeon decide that it is time they leave in search of the gold that is promised in the West. This is the first game that the reader comes across. Played between Cabot and the two sons, it is to be decided what Cabot's higher payoff will be.

Simeon and Peter need money to travel and start afresh. Eben, on the other hand, believes that the farmland is rightfully his property, and has been wrongly robbed by Cabot from his late mother, whom he worked to death. However, he does know that regardless of whom the rightful owner is, it does legally belong to Cabot, and will be distributed between the three brothers after his death. Hence, he hatches a plan to buy their share from them, leaving how Cabot is to be dealt with for later. Here the second game launches. It is played between Eben and his brothers, the stakes being the sale and purchase of the farmland.

With the brothers out of the way, Eben's next rival is Abbie, who claims to now own the farm. Cabot, it appears, has tempted her into marriage with the promise of a home. Abbie is attracted to Eben, and he resents her. With her ego at stake for two reasons now, she decides to seduce him, while Eben tries not to give in. This is the third game that ensues.

Eventually, Eben gives in. Abbie falls in love with her too. The two have a child in secret, but it is apparent to the entire village that the child is not Cabot's, as they would like for everyone to believe. Enraged, Cabot decides to tell Eben that initially the child had been Abbie's idea to ensure that the farm goes to the child and not to him. This is the fourth game of the play. With its players being Cabot and Eben, the outcomes set into action the last and final disaster of the play.

Heartbroken, infuriated and almost out of his mind, Eben tells Abbie he hates the baby, and that to prove her loyalty she is to kill it. He does not, at the time, realize the instability of his own state of mind. This is the final game of the play, its players being Abbie and Eben, and the moves being killing or not killing the baby, and leaving the farm or staying. With the outcome of this game, the play ends; the baby is dead and Eben realizes that Abbie alone cannot be punished for the deeds that have been committed.

I now study each game as a frustration game individually, working through possible moves and outcomes, working out what the dominant strategy and resolutions may be each time. I also attempt to see what the motivation behind each move has been. Aumann and other game theorists iterate that within the game being played, "rationality whatever its meaning cannot be considered as common knowledge between the players" (Schmidt, 2021, p.389). As the plot progresses, we see that the connection between the players' "self" and "the others" is dynamic and not static, and is hence enhanced with new information brought in with each development (Schmidt, 2021, p.389)

As mentioned earlier, the first game is Cabot vs sons: marry a third time or retain his sons. It is to be noted here once again, that a player can be one distinct agent or consist of multiple distinct agents. In the game under study, Cabot is player one, while Simeon, Peter and Eben are player two. As the play begins, the reader sees that for Eben “each day is a cage in which he finds himself trapped but inwardly unsubdued” (O’Neil, 1925, p. 5). Simeon and Peter too, are unhappily slaving around on the farm while their father is away.

SIMEON. He’s been gone two months--with no word.

PETER. Left us in the fields an evenin’ like this. Hitched up an’ druv off into the West.

That's plumb onnateral. He hain't never been off this farm 'ceptin' t' the village in thirty year or more, not since he married Eben's maw. (A pause. Shrewdly) I calc'late we might git him declared crazy by the court.
SIMEON. He skinned 'em too slick. He got the best o' all on 'em. They'd never b'lieve him crazy. (a pause) We got t' wait--till he's underground. (O’Neil, 1925, p. 5)

Already jokingly planning about getting rid of their father, either by declaring him mad, or having to wait till he’s “underground”, it is clear that a third marriage will cost Cabot his sons (O’Neil, 1925, p. 5). Marriage takes away the only thing that binds his sons to him: the hope that they will get a share of the farm when he dies. When Eben breaks the news of his remarrying, Peter vocalizes this thought, saying:

PETER: (after a pause) Everythin'll go t' her now. (O’Neil, 1925, p. 13).

It is at this point that they finally decide to leave:

PETER. It's done us. (pause--then persuasively) They's gold in the fields o' Californi-a, Sim. No good a-stayin' here now.
SIMEON. Jest what I was a-thinkin'. (then with decision) S'well fust's last! Let's light out and git this mornin'. (O'Neil, 1925, p. 13)

It is clear then that both players have two possible moves, which will each be labelled with a letter. For Cabot, they marry, labelled M and don't marry, labelled as $\bar{M}$. For player two, the two possible moves are leave, labelled as L, and don't leave, labelled as $\bar{L}$. Seeing as the moves are divided into two pairs, there will be four possible outcomes which will be rated on a scale of 1-4 based on their payoffs for the players.

The first possible outcome is $\bar{M}L$, which denotes that Cabot does not marry again, but that Simeon and Peter leave, nevertheless. Cabot remains frustrated at having to give up his whim and hence does not achieve a high payoff, rated at 1. The sons, on the other hand, leave for California, chasing their dreams, resulting in a high pay off, rated at three. Hence the final outcome is (1, 3).

The second possible outcome is a success for Cabot. This is $M\bar{L}$, which means that Cabot marries and the sons stay regardless. While this is Cabot's highest success, with his marriage as he desires, and the retention of free labour that he derives from his sons, it is the worst possible outcome for the sons, who slave away despite having their share of the farm denied to them. Hence this outcome attains a score of (4, 1).

The third possible outcome is a partial success for the sons; $\bar{M}\bar{L}$ i.e. Cabot does not marry, and Simeon and Peter do not leave. Cabot is frustrated at being denied what he had perhaps spent three months chasing. Despite the fact that the sons are not denied a share in the farm, they continue despising him, as they did before, and only further detest their lives, the dream of a gold-filled California constantly reminding them of what they could have had, but do not. This outcome is rated (1, 2).

The final possible outcome is a resolution. *ML* denotes that Cabot marries a third time and his sons leave. While Cabot may in the future be unhappy at losing his free labour, it is the last thing he would be thinking of, at the moment. In the heat of the moment, he would be ecstatic at achieving what he desires. On the other hand, the sons leave, just as they had wanted to. This outcome scores (4, 3).

Following is the resultant matrix of the first frustration game:

Table 2

Matrix for the first game

		Simeon and Peter	
		L	$\bar{L}$
Cabot	M	(4,3)	(4,1)
	$\bar{M}$	(1,3)	(1,2)

It is evident that Cabot's dominant strategy is to marry Abbie. Although his move does not seem to be rationally and strategically thought through, coupled with that of the sons, this course of action is the resolution

The second game is played between Eben and his brothers. They contest over their shares of the farm, which Eben wants to purchase from them. He reasons with them, pointing out that they would not be able to get far without money:

> EBEN. Ye'd like ridin' better--on a boat, wouldn't ye? (*fumbles in his pocket and takes out a crumpled sheet of foolscap*) Waal, if ye sign this ye kin ride on a boat. I've had it writ out an' ready in case ye'd ever go. It says fur three hundred dollars t' each ye agree yewr shares o' the farm is sold t' me. (*They look suspiciously at the paper. A pause*.) (O'Neil, 1925, p. 13)

The game that ensues then has two players, player one being Eben, and player two Simeon and Peter. The two possible moves for player one are buy (B) and do not buy ($\bar{B}$), while those of player two are leave (L) and do not leave ($\bar{L}$).

This first possible outcome is frustration. This results from $\bar{B}\bar{L}$, which means that Eben does not buy the shares that belong to his brothers. The brothers' strategy is not to leave the farm. As a result, Eben remains unhappy without the land he believes to be rightfully his, while the brothers remain in their current situation. This outcome has a score of (1, 3).

The second possible outcome is $B\bar{L}$, which is a partial success for Eben. While the brothers do not leave, they do sell their share to him. Seeing as they are an obstacle to his plans only, as long as he has to share ownership with them, he is impartial to their departure. The brothers, on the other hand, have no reason to stay, having sold their share, neither do they pursue their dream of gaining wealth in the West. This is hence the worst possible outcome for them. The overall score of this outcome is (4, 1).

The third possible outcome provides partial success for the brothers. Eben does not buy his share, but the brothers leave nevertheless ($\bar{B}\bar{L}$). Although they leave, they do so without getting the money they need for travel. This means that upon departure, they were either completely void of any means of sustenance, or in debt. On the other hand, Eben's task of attainment of sole ownership of the farm fails. With both players unhappy, the rating of this outcome is the lowest possible of the four i.e. (1, 2).

The final possible outcome is the resolution of this game: *BL*. This also happens to be the course of action that the two players take. Eben buys Simeon and Peter's shares, and they depart happily. With a score of (4, 4), the resolution results in equilibrium.

When mapped on a matrix, the results are as follows:

Table 3

Matrix for the second game

		Simeon and Peter	
		L	$\bar{L}$
Eben	B	(4,4)	(4,1)
	$\bar{B}$	(1,2)	(1,3)

As is evident from the matrix, Eben's dominant strategy is to buy the land each time. The brothers, on the other hand, do not have a dominant strategy. It is clear that the moves taken by both players are thought through very strategically. Eben starts dropping hints of his wish for Simeon and Peter to sell their share and leave when they first mention the metaphoric gold in California. They take their time to reach a final decision, as Peter says:

EBEN. (with excited joy) Ye mean ye'll sign the paper?

SIMEON. (dryly) Mebbe.

PETER. Mebbe.

SIMEON. We're considerin'. (peremptorily) Ye better git t' wuk. (O'Neil, 1925, p. 17)

It is at this point that Abbie first perceives him to be his rival, as she says

ABBIE. (mouthing the name) Eben. (then quietly) I'll tell Eben (O'Neil, 1925, p. 23).

Once she sees him, she finds herself attracted to him. Her advances however are thwarted. Her rivalry now doubled; she decides she will seduce him. It is then a game between Abbie and Eben. The two possible moves that Abbie then has are seduce, denoted by S and do not seduce, denoted by $\bar{S}$, while Eben's moves are to give in, denoted by G and to not give in, denoted by $\bar{G}$.

As the game ensues, the first of the four possible outcomes, is frustration. Denoted by $S\bar{G}$, this is the outcome in case Eben does not give in to Abbie's seduction, and as a result, she is enraged by defeat. Eben on the other hand remains motivated by revenge. The outcome is rated as (1, 4).

The second possible outcome is one with success for Abbie: SG. In this case, Eben gives in. She succeeds in achieving her goal, while Eben is led away from his. We may rate this outcome as (4, 1). The third possible outcome is a partial success for Abbie ($\bar{S}G$). In this case, Abbie will not seduce him, but Eben will develop feelings for her, nevertheless. As a result, Abbie's threat is eliminated without any effort, while Eben's purchase of the land goes to waste. His plan to avenge his mother's death gets derailed, or finds another direction. We may rate this outcome as (3, 2).

The final possible outcome is success for Eben. In this case, Abbies makes no attempts to seduce Eben, and he does not feel any attraction towards her. This is symbolically represented with $\bar{S}\bar{G}$. In this case, Abbie is impartial, as she never attempts to seduce Eben in the first place.

On the other hand, Eben sticks to the task at hand, which gives him purpose. This outcome has the highest rating for both of them, which is (3, 4).

The matrix of outcomes for this game is as follows:

Table 4

Matrix for the third game

		Eben	
		G	$\bar{G}$
Abbie	S	(4,1)	(1,4)
	$\bar{S}$	(3,2)	(3,4)

Neither Abbie, nor Eben has dominant strategies. While it seems like an extremely charged game, with both players being of ambitious nature, it is apparent that emotions rather than rationality end up being the driving force.

Brams and Fishburn (2000) note that "divisions that are envy-free, Pareto-optimal, and ensure that the less-well off person does as well as possible (i.e. are equitable) can often be achieved" (p. 247). However, the brothers do not sit to resolve conflict with maximum or even relevant benefit for each player. Rather, each competes to get what they desire. Brams and Hesssel (1984) note that in 2x2 ordinal games,

> after an initial outcome is chosen…(there can be a repeated) play of these games in which one player has 'threat power'…[t]his power enables this player to threaten the other player with a mutually disadvantageous outcome in order to deter certain moves in the future play of the game. (p. 23)

The fourth game played is between Cabot and Eben. As the villagers' jeers start to get to Cabot, a fight ensues, and he tells Eben that the child was Abbie's idea to secure the farm for herself. Here, Cabot is player one, and Eben is player two. The two possible moves for each are to tell (*T*) and not to tell ($\bar{T}$), and react (*R*) and not to react ($\bar{R}$), for Cabot and Eben respectively. Eben's reaction here is a violent one, bringing the play to its end. As the game begins, there are four possible outcomes.

The first possible outcome is $T\bar{R}$, which means that Cabot tells Eben about Abbie's initial plans but Eben does not take his words, and does not react. Cabot gets his catharsis and Eben saves himself from the infanticide his reaction results in. This outcome is rated at (4, 3).

The second possible outcome is one with success for Cabot. At *TR*, which means that Cabot tells Eben and he reacts, Cabot gets his catharsis while Eben's child meets a horrible end. This is the worst possible outcome for Eben, and the best possible one for Cabot and is rated at (4, 1).

The third possible outcome ensures success for Eben: $\bar{T}\bar{R}$. This means that Cabot does not reveal anything to Eben, and things remain the same for him. Cabot does not get his catharsis, but with danger averted for Eben, the rating is (1, 4).

The final possible outcome is that of frustration. At $\bar{T}R$, which means that Cabot tells nothing, but Eben reacts out of his already festering anger. The conflict remains unresolved, and catharsis unreached. The score is (1, 2).

Following is the matrix for this game:

Table 5
Matrix for the fourth game

		Eben	
		R	$\bar{R}$
Cabot	T	(4,1)	(4,3)
	$\bar{T}$	(1,2)	(1,4)

The dominant strategy for Cabot is *T* every time, and it is his move in the game too. He says to Eben,

> CABOT. …It's his'n, I tell ye--his'n arter I die--but I'll live a hundred jest t' fool ye all— an' he'll be growed then--yewr age a'most! (Eben laughs again his sardonic Ha. This drives Cabot into a fury.) Ha? Ye think ye kin git 'round that someways, do ye? Waal, it'll be her'n, too--Abbie's--ye won't git 'round her--she knows yer tricks-- she'll be too much fur ye--she wants the farm her'n--she was afeerd o' ye--she told me ye was sneakin' 'round tryin' t' make love t' her t' git her on yer side . . . ye . . . ye mad fool, ye! (He raises his clenched fists threateningly. (O'Neil, 1925, p. 52)

The move is not made after rational contemplation, but is fuelled by hatred and jealousy. The final game, and perhaps the most dramatic of the play, is played between Eben and Abbie. Abbie, who is player 1, desperately wants Eben to stay, while Eben, who is player 2, is maddened by the results of the previous game, and in a state of hysteria, asks her to kill their child to prove her innocence. He does not, of course, mean that and it is a misinterpretation at the end of an equally maddened Abbie, who exclaims, "Remember ye've promised! (then with strange intensity) Mebbe I kin take back one thin' God does!" (O'Neil, 1925, p. 55).

Their possible moves are to kill (*K*), or not to kill the child ($\bar{K}$), and to stay (*S*), or not to stay ($\bar{S}$) for Abbie and Eben respectively.

The first possible outcome of this game is frustration, resulting from $K\bar{S}$, which means that Abbie kills the baby but Eben does not stay. While Abbey suffers greatly, Eben is disturbed at the murder of his child, one he insinuated himself in the heat of the moment. Neither player is happy, and the outcome rates at (1, 2).

The second possible outcome is a success for Abbie: $\bar{K}S$, which means that Abbie does not kill the baby but Eben stays. Abbey is spared the suffering, and Eben stays too, perhaps out of attachment to the farm, or another revenge he might plan. He might even do so out of love. This outcome is rated at (3, 2).

The third and fourth possible outcomes are both resolutions. The third is KS i.e. Abbie kills the baby but Eben stays. Abbie suffers but is content at Eben staying. Eben stays, realizing that Abbie alone must not be punished for all that has happened. This has an outcome of (3, 3), resulting in equilibrium. A similar outcome is seen in the fourth set of moves. This resolution stems from $\bar{K}\bar{S}$, which means that neither does Abbie murder her child, nor does Eben stay. Abbie, while content at keeping the child alive, is devastated at her loss of the man she loves, perhaps more devastated than she would have been about the baby's death. Eben, on the other hand, is thoroughly traumatized. This is the worst possible outcome for both, rated at (1, 1). However, it does result in equilibrium.

Following is the matrix formulated by the outcomes:

Table 6

Matrix for the fifth game

	Eben	
	S	$\bar{S}$

Abbie	K	(4,4)	(1,2)
	$\overline{K}$	(3,2)	(1,1)

It is evident that Abbie's dominant strategy is to kill the child (*K).* While two resolutions or equilibria emerge, it is *KS* that provides a higher payoff for both players. Clearly, this game is played in the heat of emotions, rendering Abbie unable to even think of a very obvious alternative:

> ABBIE. (wildly) No! No! Not him! (laughing distractedly) But that's what I ought t' done, hain't it? I oughter killed him instead! Why didn't ye tell me? (O'Neil, 1925, p. 57)

She now sees that killing Cabot was the better move strategically.

Conclusion

It is obvious that not all games have moves made premeditatively. Perhaps some were so emotionally charged that the players did not even comprehend the possibility of other moves and possible outcomes. However, a game-theoretical analysis has given a panoramic view of the play to us, both as readers and as critics.

Upon a closer game-theoretical dissection of the driving decisions of the play, a dominant pattern is revealed: people act upon emotions more readily, even in the process of making calculated moves. All four games are evident of it. While the second game appears to have the most deliberate calculation, the first game exhibits Cabot's move made without any rational deliberation, and yet when coupled with the counter-moves of the sons, a resolution is reached. The third game too, reveals that neither player has a dominant strategy. Perhaps emotions are not always equivalent to impulse and do often pave the path to equilibrium and resolution.

Similarly, the fourth game proves to be a battle and an endgame, which becomes so intense that neither party benefits from the moves they make; and yet, an equilibrium is reached.

Keeping in view the entire spectrum of possible actions and the results they yield, has provided a deeper insight into the characters and the way they react under different circumstances. Analysing the play from a game-theoretical perspective brings us to the intersectional points of literature and the digital, enabling the study to inhabit a considerable space within the digital humanities. It is no longer a site of drama being performed, but drama being strategized, navigated, and executed.

Works Cited

Brams, S. J., & Fishburn, P. C. (2000). Fair division of indivisible items between two people with identical preferences: Envy-freeness, Pareto-optimality, and equity. *Social Choice and Welfare*, *17*(2), 247–267. http://www.jstor.org/stable/41106355

Brams, S. J., & Hessel, M. P. (1984). Threat power in sequential games. *International Studies Quarterly*, *28*(1), 23–44. https://doi.org/10.2307/2600396

Christian, S. (2021). The "Self" and the "Others": From Game Theory to Behavioral and Neuroeconomics. In S. Egashira, M. Taishido, D. W. Hands, & U. Mäki (Eds.), *A Genealogy of Self-Interest in Economics* (1st ed., pp. 373–393). essay, Springer.

Crisman, K.-D. (2014). Game theory meets the humanities and both win. *Journal of Humanistic Mathematics*, *4*(1), 166–170. https://doi.org/10.5642/jhummath.201401.11

Ghosh, A., & Sen, S. (2005). Theory of Moves Learners: Towards Non-Myopic Equilibria. In *ACMDL*. https://doi.org/https://doi.org/10.1145/1082473.1082485

Iolanda, L. (1977). Balance and Game in the Study of Theatre. Poetics, 6(3-4), 339–350. https://doi.org/https://doi.org/10.1016/0304-422X (77)90012-2 O'Neill, Eugene. *Desire Under the Elms*. Seconded. Boni and Liveright, 1925.

Nagatsu, M., & Lisciandra, C. (2021). Why Is Behavioral Game Theory a Game for Economists? The Concept of Beliefs in Equilibrium. In S. Egashira, M. Taishido, D. W. Hands, & U. Mäki (Eds.), *A Genealogy of Self-Interest in Economics* (1st ed., pp. 394–421). essay, Springer.

Owens, G. (1968). *Game Theory*. Saunders.

Stevens, B. J. (2012). Plays: Modelling Frustration and Anger. In B. J. Stevens (Ed.), In Game Theory and the Humanities: Bridging Two Worlds (pp. 155–184). essay, MIT Press. Stevens, B. J. (2012). *Game Theory and the Humanities: Bridging Two Worlds*. MIT Press.

Wainwright, M. (2017). *Game Theory and Postwar American Literature*. Palgrave Macmillan.