Cluedo Python Implementation

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Abstract

This project introduces a Python-based implementation of Cluedo, a popular detective-themed board game. The implementation replicates the gameplay where players attempt to solve a murder mystery by deducing cards that are present on the board. The program simulates the game logic, including player turns, card distribution, and accusation resolution. Players can interact with the game through a text-based interface, making moves and responding to accusations. The primary purpose of creating this game is to explore logic-based problem-solving and game mechanics implementation in a programming language.

Introduction

Figure 1. Cluedo

The board game Cluedo, known as Clue in North America, was designed by Anthony E. Pratt, Cluedo in 1949 and combines elements of deduction and mystery, requiring players to solve the murder by determining the murderer, the weapon, and the location. Pratt drew inspiration from the murder mystery dinner parties that were popular in Britain during 1930s. Pratt aimed to translate the experience from these parties into a board game format. Another motivation for the game's development arose as entertainment during times when air raid shelters and blackouts were common. The war had limited people's ability to engage in outdoor activities and board games served as an escapism for families.

Cluedo has had a profound impact on popular culture, influencing many forms of media and entertainment in the mid to late 1900s. An example of this would be the 1985 film "Clue," a film that follows the concepts of the game and offers 3 different endings. Additionally, there have been several TV game shows based on Cluedo, where contestants solve mysteries similar to the board game.

Recreating Cluedo as a Python-based application presents the opportunity for modernization and digital accessibility. Python's libraries allow us to recreate the core gameplay mechanics while enhancing the experience with new features. To elevate the Python-based Cluedo experience, we can integrate artificial intelligence to create intelligent that challenge players with realistic detective behavior and implement multiplayer features to cater to global audiences. Furthermore,

python game engines like Pygame can be used enhance the game experience and web frameworks such as Django could deploy the game for online multiplayer.

Game Rules

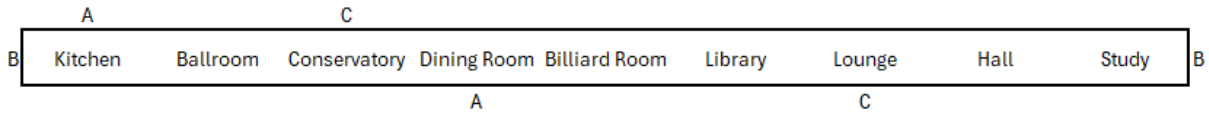

Figure 2. Mansion Map Layout

Name:							
	Card	Player 1	Player 2	Player 3	Player 4	Player 5	Player 6
Suspect	Miss Scarlet Professor Plum Mrs. Peacock Colonel Mustard Dr. Orchid Mr. Green						
Room	Kitchen Ballroom Conservatory Dining Room Billiard Room Library Lounge Hall Study						
Weapon	Candlestick Knife Lead Pipe Revolver Rope Wrench						

Figure 3. Cluedo Game Card

In Cluedo, the objective is to solve a murder mystery by determining three key elements: the murderer, the weapon used, and the location of the crime. At the start, one card from the suspect, weapon, and location category is randomly selected and placed in an envelope. The remaining cards are combined, shuffled and distributed among the players.

Players take turns moving their tokens on the board (Figure 2). Upon entering a room or being present in a room, a player may make a suggestion involving a suspect, a weapon, and the room they occupy. In a clockwise manner, players must refute the suggestion by showing one card that matches the suggestion to the suggesting player. The cards shown can be tracked with the help of the game card to aid with the mystery (Figure 3). This deduction process continues until a player believes they have solved the mystery.

A player may then make an accusation, naming a suspect, weapon, and location (the location will be based on where the player's token is located). If the accusation is correct, the accuser will win the game. If the accusation is incorrect, the accuser is eliminated from further play. However, the

player will still need to be present to provide refutations for suggestions. The game ends when a correct accusation is made, or no players remain eligible to make accusations.

Thorough Testing

Upon running the python Cluedo program, the user is prompted with the mystery murder solution (Figure 4). The solution should not be displayed when playing the productionized python program, but the solution is shown below for testing purposes.

```
Welcome to Cluedo!
Here is solution:  {'murderer': 'Professor Plum', 'weapon': 'Knife', 'room': 'Hall'}
```

Figure 4. Mystery Murder Solution

```
Player 1's (Miss Scarlet) turn. You are currently in the Ballroom.

Your hand:  ['Kitchen', 'Miss Scarlet', 'Lounge']
Would you like to move to another room? (yes/no): yes

Where would you like to move?
Possible Destinations: Kitchen, Conservatory
Enter desired destination: Kitchen
You moved to the Kitchen.
Would you like to make a suggestion or accusation? (suggestion/accusation/none): suggestion

You are in Kitchen.
Make a suggestion!
Choose a murderer (Miss Scarlet, Professor Plum, Mrs. Peacock, Colonel Mustard, Dr. Orchid, Mr. Green): Mr.Green
Choose a weapon (Candlestick, Knife, Lead Pipe, Revolver, Rope, Wrench): Candlestick
Player 1 suggests: Mr.Green with the Candlestick in the Kitchen
['Candlestick']
Player 2 shows Candlestick to you
Suggestion Cards:  ['Candlestick']
```

Figure 5. Player 1's Input and Actions

In this test example, the solution is determined to be Professor Plum, Knife, and Hall. Hence, these cards are not expected to appear in the hands of any other players (as illustrated in Figures 5 and 6).

On each player's turn, the player is prompted with the player's current hand and suggestion card hand. The current hand is the hand that the player was dealt with, and the suggestion card hand is a tracker of the cards that was shown to the player.

The player can traverse to any appropriate room in the mansion, as defined by the mansion's layout created during development. After completing the traverse step, the player chooses to either make a suggestion, an accusation, or take no action. For example, in Figure 5, Player 1 makes a suggestion that Mr. Green committed the murder with a Candlestick in the Kitchen. Since Player 2 holds one of the cards mentioned in the suggestion, they refute it by showing the Candlestick card to Player 1. Player 1 then adds this card to their suggestion pile as a mental note, aiding their deduction process.

Now we explore the logic when a suggestion is not refuted. In Figure 7, Player 1 makes a suggestion that Professor Plum committed murder with a Knife in the Hall. Since no other players possess these cards, the suggestion cannot be refuted, strongly hinting at the solution.

If a player makes an incorrect accusation, as shown in Figure 8, they are eliminated from active gameplay. Their turns are skipped for the remainder of the game, as depicted in Figure 9.

Finally, when a player makes a correct accusation, as illustrated in Figure 10, the game concludes immediately, declaring that player the winner.

```
Player 2's (Professor Plum) turn. You are currently in the Billiard Room.

Your hand:  ['Dining Room', 'Candlestick', 'Wrench']
Would you like to move to another room? (yes/no): no
Would you like to make a suggestion or accusation? (suggestion/accusation/none): no

Player 3's (Mrs. Peacock) turn. You are currently in the Dining Room.

Your hand:  ['Mrs. Peacock', 'Study', 'Billiard Room']
Would you like to move to another room? (yes/no): no
Would you like to make a suggestion or accusation? (suggestion/accusation/none): no

Player 4's (Colonel Mustard) turn. You are currently in the Kitchen.

Your hand:  ['Library', 'Lead Pipe', 'Rope']
Would you like to move to another room? (yes/no): no
Would you like to make a suggestion or accusation? (suggestion/accusation/none): no

Player 5's (Dr. Orchid) turn. You are currently in the Ballroom.

Your hand:  ['Dr. Orchid', 'Revolver', 'Conservatory']
Would you like to move to another room? (yes/no): no
Would you like to make a suggestion or accusation? (suggestion/accusation/none): no

Player 6's (Mr. Green) turn. You are currently in the Conservatory.

Your hand:  ['Ballroom', 'Mr. Green', 'Colonel Mustard']
Would you like to move to another room? (yes/no):
```

Figure 6. Hands of Other Players

```
Player 1's (Miss Scarlet) turn. You are currently in the Hall.

Your hand:  ['Kitchen', 'Miss Scarlet', 'Lounge']
Would you like to move to another room? (yes/no): no
Would you like to make a suggestion or accusation? (suggestion/accusation/none): suggestion

You are in Hall.
Make a suggestion!
Choose a murderer (Miss Scarlet, Professor Plum, Mrs. Peacock, Colonel Mustard, Dr. Orchid, Mr. Green): Professor Plum
Choose a weapon (Candlestick, Knife, Lead Pipe, Revolver, Rope, Wrench): Knife
Player 1 suggests: Professor Plum with the Knife in the Hall
[]
[]
[]
[]
[]
No one has cards for the suggestion
```

Figure 7. Suggestion that could not be refuted

```
Player 2's (Professor Plum) turn. You are currently in the Hall.

Your hand:  ['Dining Room', 'Candlestick', 'Wrench']
Would you like to move to another room? (yes/no): no
Would you like to make a suggestion or accusation? (suggestion/accusation/none): accusation

You are in Hall.
Make an accusation!
Choose a murderer (Miss Scarlet, Professor Plum, Mrs. Peacock, Colonel Mustard, Dr. Orchid, Mr. Green): Miss Scarlet
Choose a weapon (Candlestick, Knife, Lead Pipe, Revolver, Rope, Wrench): Knife
Your accusation was incorrect. You're out of the game!
```

Figure 8. Incorrect Accusation

```
Player 1's (Miss Scarlet) turn. You are currently in the Hall.

Your hand:  ['Kitchen', 'Miss Scarlet', 'Lounge']
Would you like to move to another room? (yes/no): non
Would you like to make a suggestion or accusation? (suggestion/accusation/none): none

Player 3's (Mrs. Peacock) turn. You are currently in the Dining Room.

Your hand:  ['Mrs. Peacock', 'Study', 'Billiard Room']
Would you like to move to another room? (yes/no):
```

Figure 9. Player 2 Skipped

```
Player 1's (Miss Scarlet) turn. You are currently in the Hall.

Your hand:  ['Kitchen', 'Miss Scarlet', 'Lounge']
Would you like to move to another room? (yes/no): no
Would you like to make a suggestion or accusation? (suggestion/accusation/none): accusation

You are in Hall.
Make an accusation!
Choose a murderer (Miss Scarlet, Professor Plum, Mrs. Peacock, Colonel Mustard, Dr. Orchid, Mr. Green): Professor Plum
Choose a weapon (Candlestick, Knife, Lead Pipe, Revolver, Rope, Wrench): Knife

You solved the solution!
The case was: Professor Plum in the Hall with the Knife.
```

Figure 10. Correct Accusation

Challenges Faced

Developing a Python-based implementation of *Cluedo* presented several challenges, particularly in replicating the a few mechanics of the physical game. One major challenge was creating a map that allowed characters to traverse through non-room blocks. In the current setup, players are only allowed to traverse between 1 room (adjacent rooms or rooms connected by tunnel) per turn. Hence a dice-based movement system was excluded from this implementation. Implementing the map similar to the actual game would be complex as it involved designing a grid-based structure with clearly defined rooms, boundaries, and collision detection. Another challenge was integrating bonus clue cards, which players can draw for additional effects or no effect at all. The reason for the exclusion of bonus cards stems from the lack of a dice-based movement system where players

will need to evaluate whether to enter a room for a suggestion or pass through a square that grants a bonus clue card.

Stability and Reliability

The stability and reliability of the Python *Cluedo* implementation depend on several factors, including the handling of game mechanics and the user interface. The stability is influenced by how the program handles edge cases, such as invalid player inputs, unexpected movements, or conflicts during clue card interactions. The script attempts to handle these edge cases by checking user inputs against the possible actions and nudging players if the desired action is not within scope.

Next Steps

For the next steps, a few features mentioned earlier could be implemented for *Cluedo*. A key priority is to refine map mechanics, introducing graphical interfaces to improve the user experience. Another focus is on implementing and enhancing the logic of the bonus clue cards by expanding their variety, such as temporary advantages (for example, allowing 2 suggestions for a turn, shortcut, safe accusation) or penalties (for example, skip turn and no suggestions for a turn), to increase the complexity and variance of the game. Adding AI-controlled players with varying difficulty levels could also be interesting to implement as it allows solo gameplay and AI based decision making.