HearthStats

Datastructures and Algorithms

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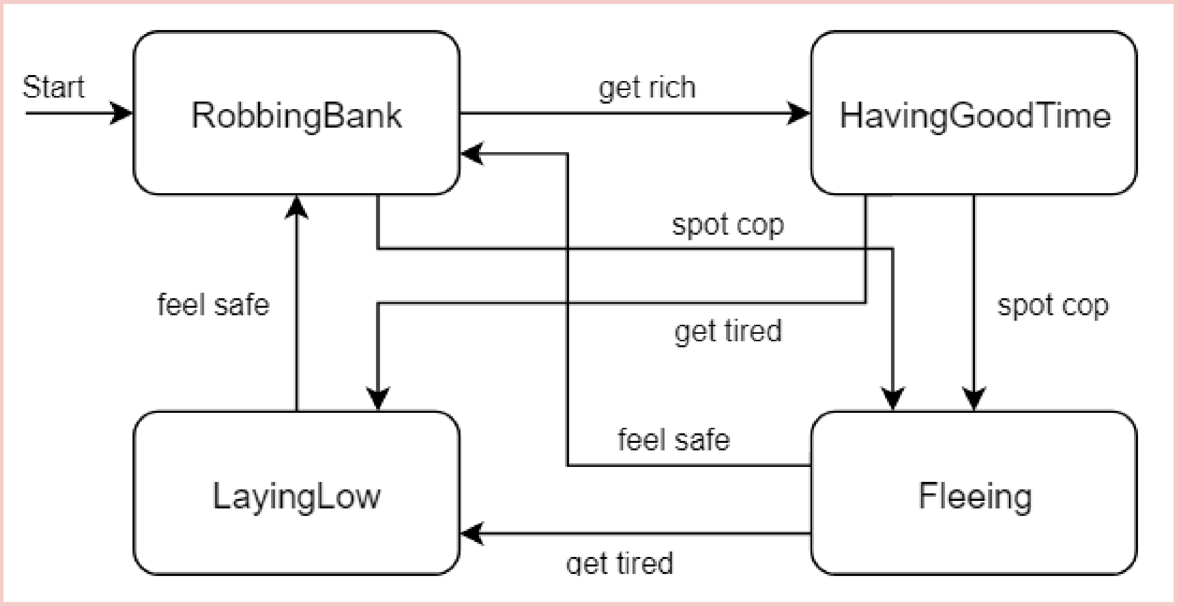
Question 1)

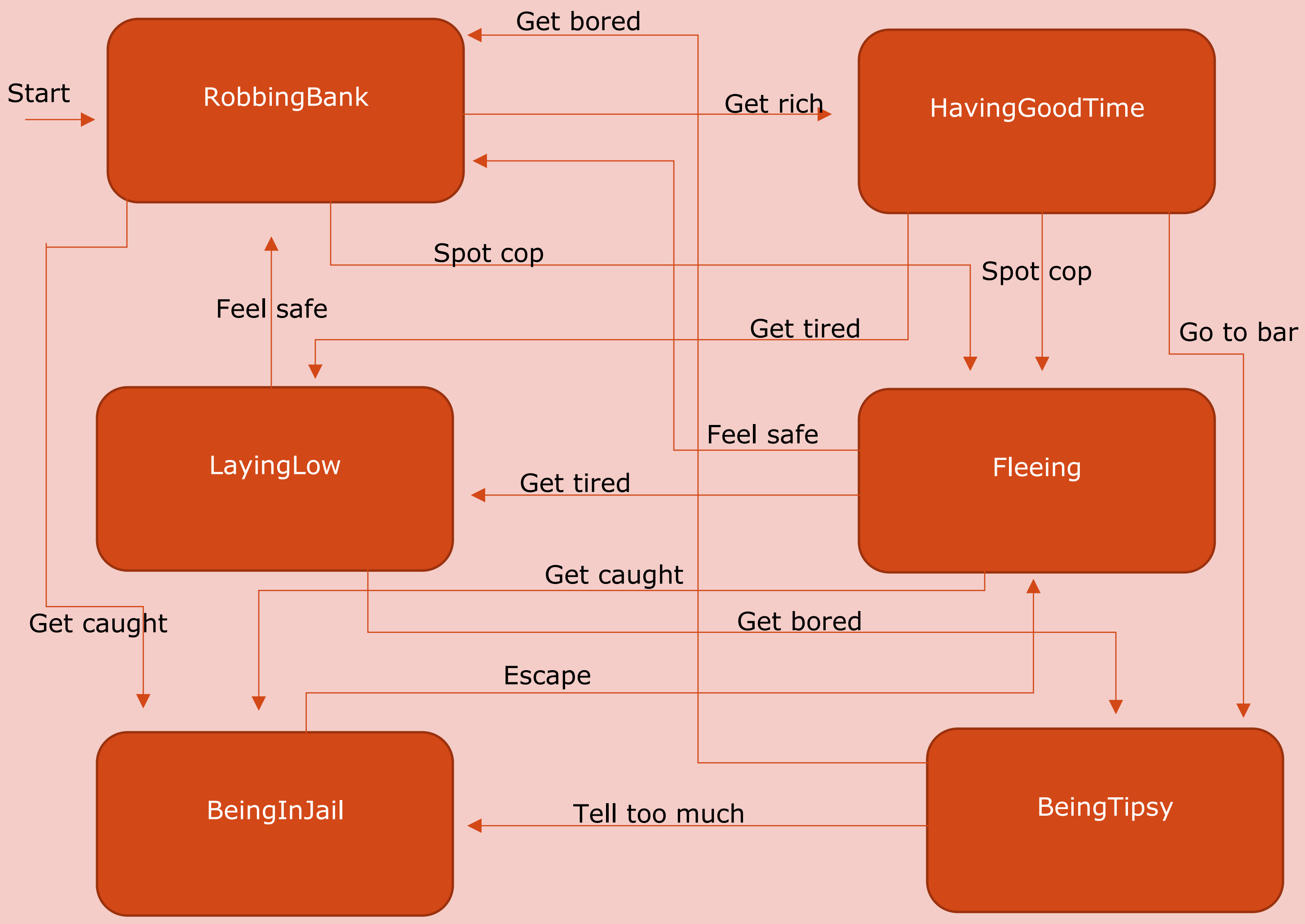
Add two new state transitions to the diagram above. Name these transitions and draw out the new diagram.



Aanpak

We hebben twee states bedacht, die niet te veel op de anderen leken en bedacht hoe we ze aan de andere states konden koppelen.

Antwoord



Code

Hier was geen code voor nodig.

Output

Niet van toepassing, omdat er geen code bij nodig was.

Question 2)

Implement your new state machine using switch statements, a state transition table or the state design pattern. Build it in such a way that the user can change the NPC's state by writing a string ("get rich", "spot cop", etc.) in the Console.

Aanpak

We bedachten dat het handig is als je switches gebruikt, zodat er dingen gebeuren op basis van de huidige state. Ook bedachten wij dat het handig is om meerdere functies te gebruiken, zodat je niet dezelfde code tachtig keer opnieuw hoeft te typen.

Antwoord

Op basis van wat we bij Aanpak hebben geschreven hebben wij de code opgebouwd.

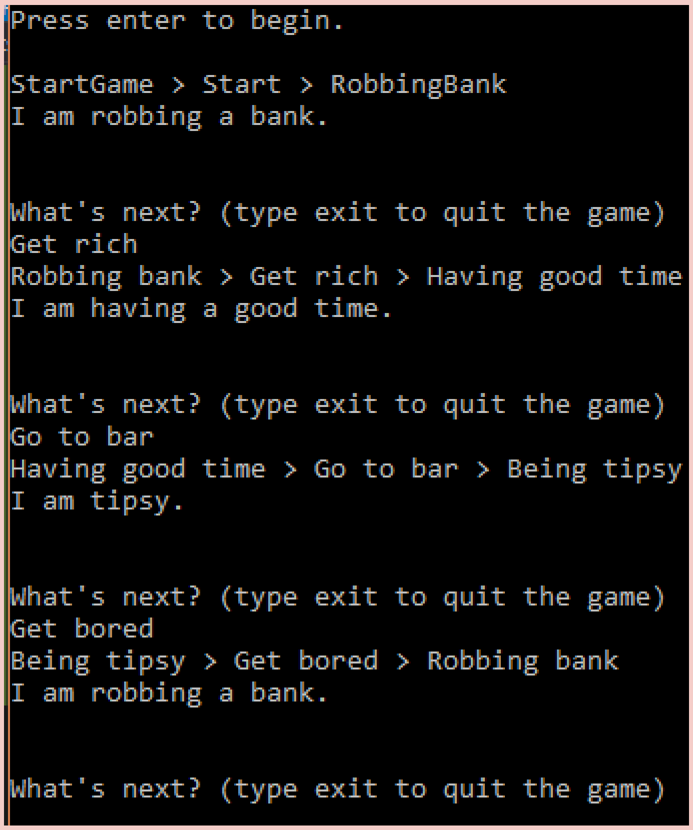
Code

```
#include <iostream>
#include <string>

using namespace std;
using std::ostringstream;

typedef enum StateIDs{
       StartGame,
       RobbingBank,
       HavingGoodTime,
       LayingLow,
       Fleeing,
       BeingInJail,
       BeingTipsy
} State;

typedef enum ActionIDs {
       Start,
       GetRich,
       SpotCop,
       GetCaught,
       GetTired,
       GoToBar,
       FeelSafe,
       GetBored,
       Escape,
       TellTooMuch
} Action;

State currentState = StartGame;
Action currentAction;

string actionInput;
string actionPerformingText;

void playGame();

State stateManager(State beforeState, Action performingAction);
string stateMessage();
Action actionManager(string actionInputGiven);

int main()
```

```
{
       cout << "Press enter to begin." << endl;
       if (cin.get() == '\n') {
              currentAction = actionManager("");
              currentState = stateManager(currentState, currentAction);
              cout << actionPerformingText << endl;
              cout << stateMessage() << endl << endl << endl;
              playGame();
       }
}

void playGame() {
       cout << "What's next? (type exit to quit the game)" << endl;
       getline(cin, actionInput);
       currentAction = actionManager(actionInput);
       currentState = stateManager(currentState, currentAction);
       cout << actionPerformingText << endl;
       cout << stateMessage() << endl << endl << endl;

       /*if (cin.get() == 'exit') {
              return;
       }
       else {*/
              //cout << "What's next? (type exit to quit the game)" << endl;
              playGame();
       //}
}

State stateManager(State beforeState, Action performingAction) {
       State outputState;

       switch(beforeState) {
              case StartGame:
                     if (performingAction == Start) {
                            outputState = RobbingBank;
                            actionPerformingText = "StartGame > Start > RobbingBank";
                     }
                     else {
                            outputState = StartGame;
                            actionPerformingText = "I'm so confused.";
                     }
                     break;
              case RobbingBank:
                     switch (performingAction) {
                            case GetRich:
                                   outputState = HavingGoodTime;
                                   actionPerformingText = "Robbing bank > Get rich > Having good time";
                                   break;
                            case SpotCop:
                                   outputState = Fleeing;
                                   actionPerformingText = "Robbing bank > Spot cop > Fleeing";
                                   break;
                            case GetCaught:
                                   outputState = BeingInJail;
                                   actionPerformingText = "Robbing bank > Get caught > Being in jail";
                                   break;
                            default:
                                   outputState = RobbingBank;
                                   actionPerformingText = "Let's try again";
                     }
                     break;
              case HavingGoodTime:
                     switch (performingAction) {
                            case GetTired:
                                   outputState = LayingLow;
                                   actionPerformingText = "Having good time > Get tired > Laying low";
```

```
                                        break;
                                case SpotCop:
                                        outputState = Fleeing;
                                        actionPerformingText = "Having good time > Spot cop > Fleeing";
                                        break;
                                case GoToBar:
                                        outputState = BeingTipsy;
                                        actionPerformingText = "Having good time > Go to bar > Being tipsy";
                                        break;
                                default:
                                        outputState = HavingGoodTime;
                                        actionPerformingText = "Let's try again";
                        }
                        break;
                case LayingLow:
                        switch (performingAction) {
                                case FeelSafe:
                                        outputState = RobbingBank;
                                        actionPerformingText = "Laying low > Feel safe > Robbing bank";
                                        break;
                                case GetBored:
                                        outputState = BeingTipsy;
                                        actionPerformingText = "Laying low > Get bored > Being tipsy";
                                        break;
                                default:
                                        outputState = LayingLow;
                                        actionPerformingText = "Let's try again";
                        }
                        break;
                case Fleeing:
                        switch (performingAction) {
                                case GetTired:
                                        outputState = LayingLow;
                                        actionPerformingText = "Fleeing > Get tired > Laying low";
                                        break;
                                case FeelSafe:
                                        outputState = RobbingBank;
                                        actionPerformingText = "Fleeing > Feel safe > Robbing bank";
                                        break;
                                case GetCaught:
                                        outputState = BeingInJail;
                                        actionPerformingText = "Fleeing > Get caught > Being in jail";
                                        break;
                                default:
                                        outputState = Fleeing;
                                        actionPerformingText = "Let's try again";
                        }
                        break;
                case BeingInJail:
                        switch (performingAction) {
                                case Escape:
                                        outputState = Fleeing;
                                        actionPerformingText = "Being in jail > Escape > Fleeing";
                                        break;
                                default:
                                        outputState = BeingInJail;
                                        actionPerformingText = "Let's try again";
                        }
                        break;
                case BeingTipsy:
                        switch (performingAction) {
                                case TellTooMuch:
                                        outputState = BeingInJail;
                                        actionPerformingText = "Being tipsy > Tell too much > Being in jail";
                                        break;
                                case GetBored:
                                        outputState = RobbingBank;
                                        actionPerformingText = "Being tipsy > Get bored > Robbing bank";
                                        break;
                                default:
                                        outputState = BeingTipsy;
                                        actionPerformingText = "Let's try again";
                        }
                        break;
                default:
                        outputState = StartGame;
                        actionPerformingText = "Let's start over";
        }

        return outputState;
}

string stateMessage() {
        string outputStateMessage;

        switch (currentState) {
                case RobbingBank:
                        outputStateMessage = "I am robbing a bank.";
                        break;
                case HavingGoodTime:
                        outputStateMessage = "I am having a good time.";
                        break;
                case LayingLow:
                        outputStateMessage = "I am laying low.";
                        break;
                case Fleeing:
                        outputStateMessage = "I am fleeing.";
                        break;
                case BeingInJail:
                        outputStateMessage = "I am in Jail now.";
                        break;
                case BeingTipsy:
                        outputStateMessage = "I am tipsy.";
                        break;
                default:
                        outputStateMessage = "I am so confused.";
        }

        return outputStateMessage;
}

Action actionManager(string actionInputGiven) {
        Action actionOutput;

        if (actionInput == "Get rich") {
                actionOutput = GetRich;
        }
        else if (actionInput == "Spot cop") {
                actionOutput = SpotCop;
        }
        else if (actionInput == "Get caught") {
                actionOutput = GetCaught;
        }
        else if (actionInput == "Get tired") {
                actionOutput = GetTired;
        }
        else if (actionInput == "Go to bar") {
                actionOutput = GoToBar;
        }
        else if (actionInput == "Feel safe") {
                actionOutput = FeelSafe;
        }
        else if (actionInput == "Get bored") {
               actionOutput = GetBored;
        }
        else if (actionInput == "Escape") {
               actionOutput = Escape;
        }
        else if (actionInput == "Tell too much") {
               actionOutput = TellTooMuch;
        }
        else {
               actionOutput = Start;
        }

        return actionOutput;
}
```

Output



```
Press enter to begin.

StartGame > Start > RobbingBank
I am robbing a bank.


What's next? (type exit to quit the game)
Get rich
Robbing bank > Get rich > Having good time
I am having a good time.


What's next? (type exit to quit the game)
Go to bar
Having good time > Go to bar > Being tipsy
I am tipsy.


What's next? (type exit to quit the game)
Get bored
Being tipsy > Get bored > Robbing bank
I am robbing a bank.


What's next? (type exit to quit the game)
```

Question 3)

Add output to your program by showing a line of text that indicates the current state or action. For example, while he is robbing banks he may say:

"I'M ROBBING BANKS AND GETTING LOADS OF MONEY! PEW PEW!"

FOR THE OTHER STATES AND ACTIONS YOU CAN USE THE FOLLOWING LINES:

"I'M RICH ENOUGH TO HAVE A GOOD TIME" (FOR THE 'GET RICH' ACTION)

"I'M HAVING A GOOD TIME SPENDING MY MONEY" (FOR THE HAVINGGOODTIME STATE) "I SEE A COP, SO I HAVE TO START RUNNING"

"I'M GETTING VERY TIRED, SO I BETTER LAY LOW FOR A WHILE"

etc.

Or make up your own lines.

Aanpak

We bedachten tekstregels die ons leuk leken en plaatsten deze op de juiste plekken in de code.

Antwoord

From state	Action	To state	Text line
RobbingBank	Get rich	HavingGoodTime	"I'm rich enough to have a good time"
RobbingBank	Spot cop	Fleeing	"I see a cop, so I have to start running"
RobbingBank	Get caught	BeingInJail	“Oh no, the cops are bringing me to my new home!”
HavingGoodTime	Get tired	LayingLow	"I'm getting very tired, so I better lay low for a while"
HavingGoodTime	Spot cop	Fleeing	"I see a cop, so I have to start running"
HavingGoodTime	Go to bar	BeingTipsy	“All drinks on me!”
Fleeing	Feel safe	RobbingBank	“Let’s get back to what I was doing”
Fleeing	Get tired	LayingLow	"I'm getting very tired, so I better lay low for a while"
Fleeing	Get caught	BeingInJail	“Oh no, the cops are bringing me to my new home!”
LayingLow	Feel safe	RobbingBank	“Let’s get back to what I was doing”
LayingLow	Get bored	BeingTipsy	“A bar is a good safe spot, right? Right??”
BeingInJail	Escape	Fleeing	“RUUUNNN!! RUUUUUUUUNNNN!!!”

BeingTipsy	Get bored	RobbingBank	“You know what would be funny..? If we go ‘borrow’ something from the bank…hehe”
BeingTipsy	Tell too much	BeingInJail	“No! Wait! Those were just stories!”

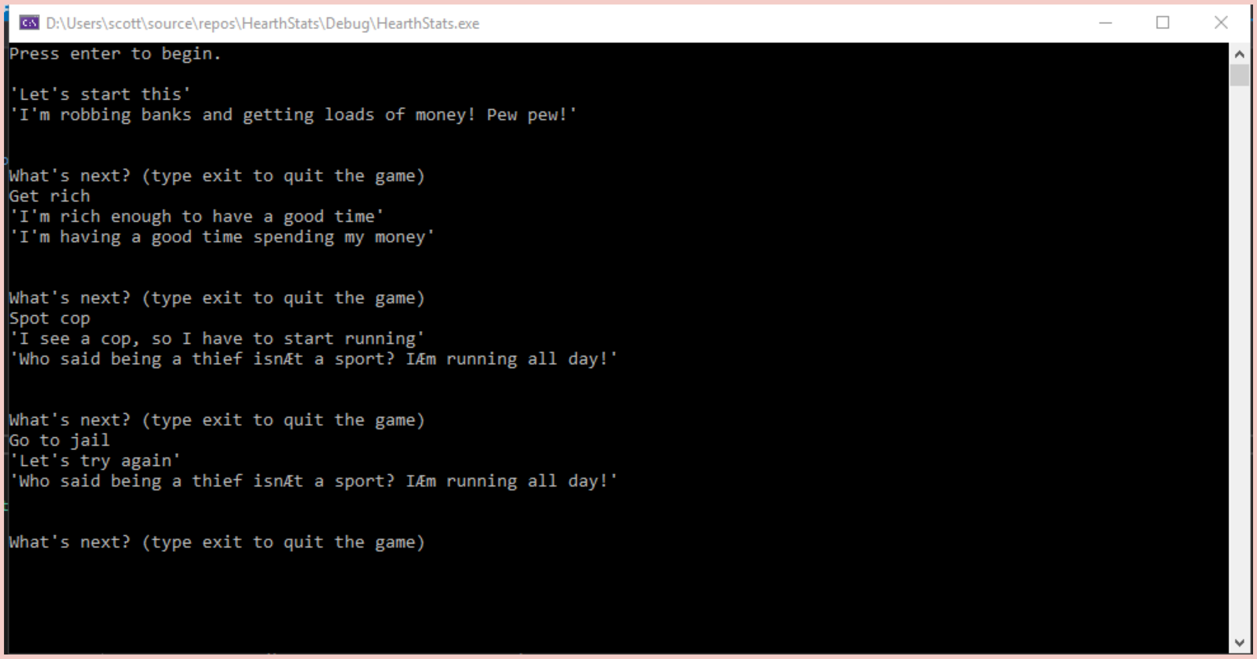
Current state	**Text line**
RobbingBank	"I'm robbing banks and getting loads of money! Pew pew!"
HavingGoodTime	"I'm having a good time spending my money"
Fleeing	“Who said being a thief isn’t a sport? I’m running all day!”
LayingLow	“I’ll just wait a minute..”
BeingInJail	“So when can I go home? Jail is stupid.”
BeingTipsy	“Glug..glug…. hmmmm……. beeeer"

Code

```
State stateManager(State beforeState, Action performingAction) {
        State outputState;

        switch(beforeState) {
                case StartGame:
                        if (performingAction == Start) {
                                outputState = RobbingBank;
                                actionPerformingText = "'Let's start this'";
                        }
                        else {
                                outputState = StartGame;
                                actionPerformingText = "'I'm so confused'";
                        }
                        break;
                case RobbingBank:
                        switch (performingAction) {
                                case GetRich:
                                        outputState = HavingGoodTime;
                                        actionPerformingText = "'I'm rich enough to have a good time'";
                                        break;
                                case SpotCop:
                                        outputState = Fleeing;
                                        actionPerformingText = "'I see a cop, so I have to start running'";
                                        break;
                                case GetCaught:
                                        outputState = BeingInJail;
                                        actionPerformingText = "'Oh no, the cops are bringing me to my new 
home!'";

                                        break;
                                default:
                                        outputState = RobbingBank;
                                        actionPerformingText = "'Let's try again'";
                        }
                        break;
                case HavingGoodTime:
                        switch (performingAction) {
                                case GetTired:
                                        outputState = LayingLow;
                                        actionPerformingText = "'I'm getting very tired, so I better lay low 
for a while'";
                                        break;
                case SpotCop:
                    outputState = Fleeing;
                    actionPerformingText = "'I see a cop, so I have to start running'";
                    break;
                case GoToBar:
                    outputState = BeingTipsy;
                    actionPerformingText = "'All drinks on me!'";
                    break;
                default:
                    outputState = HavingGoodTime;
                    actionPerformingText = "'Let's try again'";
            }
            break;
        case LayingLow:
            switch (performingAction) {
                case FeelSafe:
                    outputState = RobbingBank;
                    actionPerformingText = "'Let’s get back to what I was doing'";
                    break;
                case GetBored:
                    outputState = BeingTipsy;
                    actionPerformingText = "'A bar is a good safe spot, right? Right??'";
                    break;
                default:
                    outputState = LayingLow;
                    actionPerformingText = "'Let's try again'";
            }
            break;
        case Fleeing:
            switch (performingAction) {
                case GetTired:
                    outputState = LayingLow;
                    actionPerformingText = "'I'm getting very tired, so I better lay low
for a while'";

                    break;
                case FeelSafe:
                    outputState = RobbingBank;
                    actionPerformingText = "'Let’s get back to what I was doing'";
                    break;
                case GetCaught:
                    outputState = BeingInJail;
                    actionPerformingText = "'Oh no, the cops are bringing me to my new
home!'";

                    break;
                default:
                    outputState = Fleeing;
                    actionPerformingText = "'Let's try again'";
            }
            break;
        case BeingInJail:
            switch (performingAction) {
                case Escape:
                    outputState = Fleeing;
                    actionPerformingText = "'RUUUNNN!! RUUUUUUUUNNNN!!!'";
                    break;
                default:
                    outputState = BeingInJail;
                    actionPerformingText = "'Let's try again'";
            }
            break;
        case BeingTipsy:
            switch (performingAction) {
                case TellTooMuch:
                    outputState = BeingInJail;
                    actionPerformingText = "'No! Wait! Those were just stories!'";
                    break;
```

```
                                case GetBored:
                                        outputState = RobbingBank;
                                        actionPerformingText = "'You know what would be funny..? If we go
‘borrow’ something from the bank…hehe'";
                                        break;
                                default:
                                        outputState = BeingTipsy;
                                        actionPerformingText = "'Let's try again'";
                        }
                        break;
                default:
                        outputState = StartGame;
                        actionPerformingText = "'Let's start over'";
        }

        return outputState;
}

string stateMessage() {
        string outputStateMessage;

        switch (currentState) {
                case RobbingBank:
                        outputStateMessage = "'I'm robbing banks and getting loads of money! Pew pew!'";
                        break;
                case HavingGoodTime:
                        outputStateMessage = "'I'm having a good time spending my money'";
                        break;
                case LayingLow:
                        outputStateMessage = "'I’ll just wait a minute..'";
                        break;
                case Fleeing:
                        outputStateMessage = "'Who said being a thief isn’t a sport? I’m running all day!'";
                        break;
                case BeingInJail:
                        outputStateMessage = "'So when can I go home? Jail is stupid.'";
                        break;
                case BeingTipsy:
                        outputStateMessage = "'Glug..glug…. hmmmm……. beeeer'";
                        break;
                default:
                        outputStateMessage = "'I am so confused'";
        }

        return outputStateMessage;
}
```

Output


D:\Users\scott\source\repos\HearthStats\Debug\HearthStats.exe

```
Press enter to begin.

'Let's start this'
'I'm robbing banks and getting loads of money! Pew pew!'


What's next? (type exit to quit the game)
Get rich
'I'm rich enough to have a good time'
'I'm having a good time spending my money'


What's next? (type exit to quit the game)
Spot cop
'I see a cop, so I have to start running'
'Who said being a thief isnÆt a sport? IÆm running all day!'


What's next? (type exit to quit the game)
Go to jail
'Let's try again'
'Who said being a thief isnÆt a sport? IÆm running all day!'


What's next? (type exit to quit the game)
```

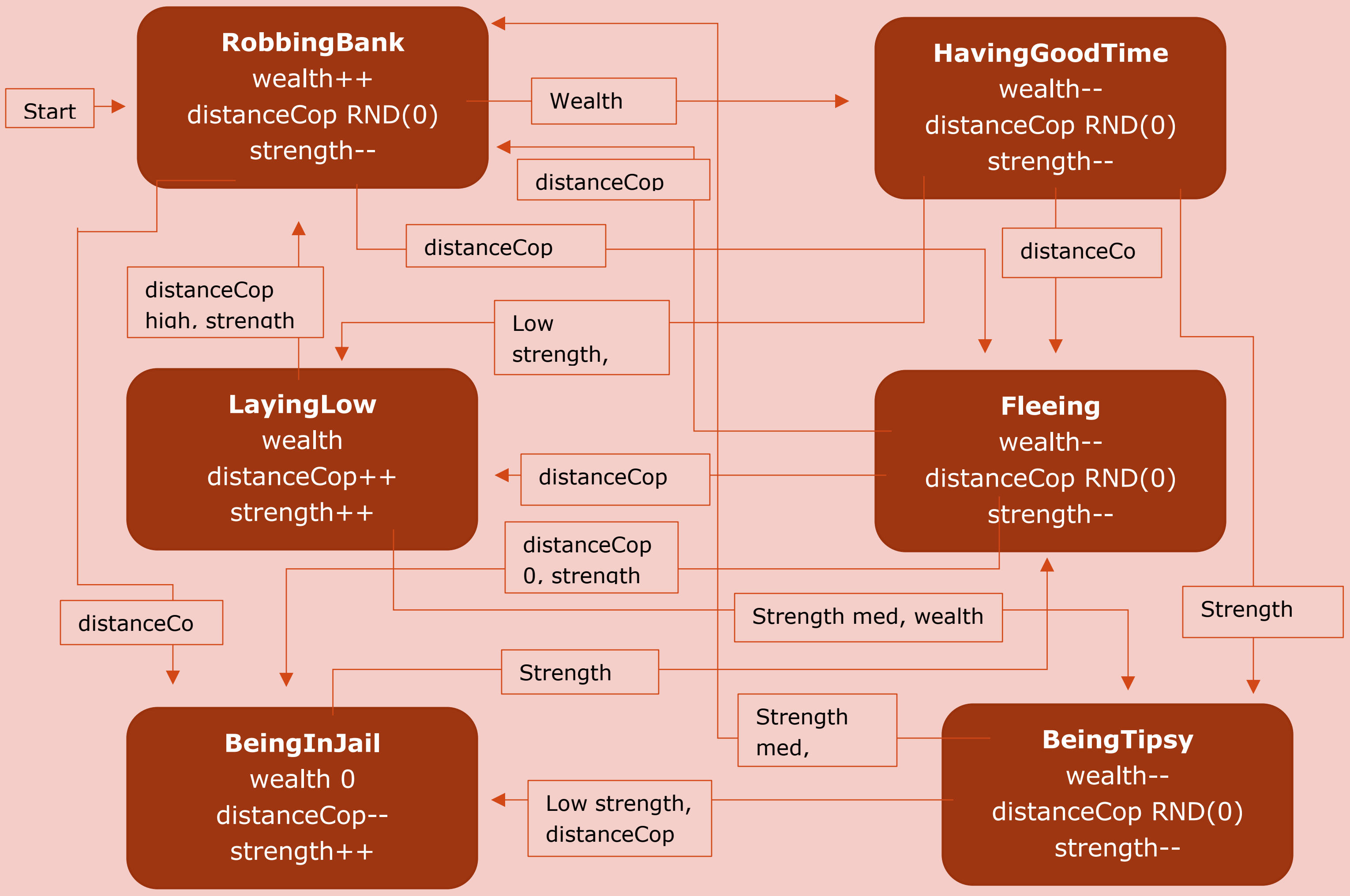
Question 4)

Add variables to your NPC for wealth, distanceToCop and strength. Wealth increases while the NPC is robbing banks, but decreases while he is having a good time or fleeing. distanceToCop can suddenly change to 0 during robbing a bank or having a good time, which causes the NPC to start fleeing. strength decreases during robbery, having a good time and fleeing, but increases during laying low. Continue this way and make sure that each state transition depends on one or more of these variables, and draw out your new diagram.

Aanpak

We hebben per lijn bedacht wat er ongeveer qua variabele-waarden bij passen en ervoor gezorgd dat er per state niet twee lijnen bij dezelfde waardes horen. Ook hebben we per blokje verder bedacht wat wij logisch vonden dat deze state met de variabelen zou doen.

Antwoord



Code

```
int wealth;
int distanceCop;
int strength;
```

Output

Deze code geeft nog geen output.

Question 5)

Implement the variables and conditions state transitions that you chose in your NPC.

Add a loop to the program, such state it updates the variables and looks at the current state at each iteration; it then determines whether a state transition should occur.

Also implement a one second pause at each iteration to your program. You can now remove the user input function, as the new states is set only by the variable's values which are updated at each iteration. Adjust your program so that this works and show the output of an example run.

This loop could go on indefinitely. We are going to add a Cop NPC to the HearthStats game that can catch the first NPC, such that the program can end.

Aanpak

We hebben eerst bedacht hoe we ervoor konden zorgen dat de output van een state steeds anders is, zodat er een random transitie naar een volgende state kon gebeuren. Daarna bedachten we dat het slim was om het hele action-gedeelte uit de code te halen en gewoon het programma te laten kijken wat de variabelen momenteel zijn en wat er op basis daarvan moet gebeuren.

Antwoord

We hebben als eerste een for-loop gemaakt die in 60x ervoor zorgt dat de variabele willekeurig genoeg verandert worden op basis van de huidige state. Daarna hebben we ook ervoor gezorgd dat er 1 seconde pauze is voordat alles op het scherm wordt weergegeven. Hierna hebben we in plaats van de methode die checkte wat de huidige state was en wat de huidige action was, hebben we gecheckt op de huidige state en de huidige variabele-waardes.

Code

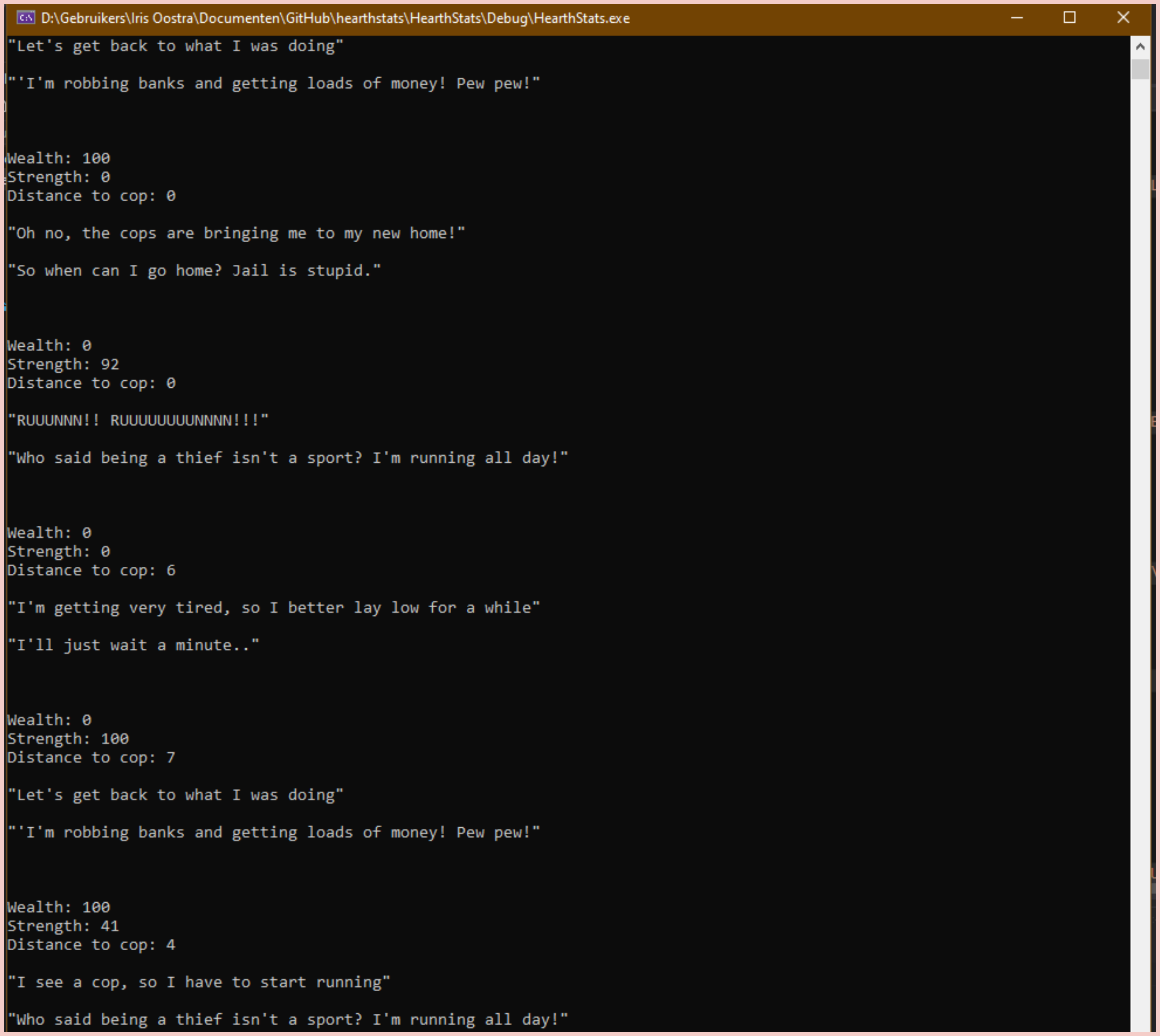
```
#include <iostream>
#include <string>
#include <stdlib.h>
#include <stdlib.h>
#include <time.h>
#include <chrono>
#include <thread>

using namespace std;
using namespace std::this_thread;
using namespace std::chrono_literals;
using std::chrono::system_clock;

typedef enum StateIDs{
       StartGame,
       RobbingBank,
       HavingGoodTime,
       LayingLow,
       Fleeing,
       BeingInJail,
       BeingTipsy
} State;

//Max value = 100 for wealth and strength, 10 for distanceCop
```

```cpp
int wealth;
int distanceCop;
int strength;

int fps = 60;

State currentState = StartGame;

string actionInput;
string actionPerformingText;

void playGame();

void checkMax();
void varChangeByState();
State stateManager(State beforeState, int currentWealth, int currentStrength, int currentDistanceCop);
string stateMessage();

int main() {
	srand(time(NULL));

	cout << "Press enter to begin." << endl;
	if (cin.get() == '\n') {
		varChangeByState();
		checkMax(); //Check whether the variables haven't exceeded their maximum and minimum values

		currentState = stateManager(currentState, wealth, strength, distanceCop);
		cout << actionPerformingText << endl;
		cout << stateMessage() << endl << endl << endl;
		playGame();
	}


}

void playGame() {
	for (int i = 1; i < fps; i++) {
		varChangeByState();
		checkMax(); //Check whether the variables haven't exceeded their maximum and minimum values
	}

	sleep_until(system_clock::now() + 1s);

	currentState = stateManager(currentState, wealth, strength, distanceCop);
	cout << "Wealth: " << wealth << endl << "Strength: " << strength << endl << "Distance to cop: " <<
distanceCop << endl << endl;
	cout << actionPerformingText << endl << endl;
	cout << stateMessage() << endl << endl << endl << endl;

	/*if (cin.get() == 'exit') {
		return;
	}
	else {*/
		//cout << "What's next? (type exit to quit the game)" << endl;
		playGame();
	//}
}

void checkMax() {
	if(strength > 100) {
		strength = 100;
	} else if(strength < 0) {
		strength = 0;
	}

	if(distanceCop > 10) {
			distanceCop = 10;
		} else if(distanceCop < 0) {
			distanceCop = 0;
		}

		if(wealth > 100) {
			wealth = 100;
		} else if(wealth < 0) {
			wealth = 0;
		}
}

void varChangeByState(){
		switch(currentState) {
			case StartGame:
				wealth = 0;
				strength = 100;
				distanceCop = rand() % 9;

				break;
			case RobbingBank:
				wealth += rand() % 10 + 1;
				strength--;
				distanceCop = rand() % 9;

				break;
			case HavingGoodTime:
				wealth -= rand() % 8 + 1;
				strength -= rand() % 8 + 1;
				distanceCop = rand() % 9;

				break;
			case LayingLow:
				wealth = wealth;
				strength += rand() % 10 + 1;
				distanceCop = rand() % 4 + 7;

				break;
			case Fleeing:
				wealth--;
				strength -= rand() % 8 + 1;
				distanceCop = rand() % 9;

				break;
			case BeingInJail:
				wealth = 0;
				strength += rand() % 2 + 1;
				distanceCop = 0;

				break;
			case BeingTipsy:
				wealth -= rand() % 2 + 1;
				strength -= rand() % 2 + 1;
				distanceCop = rand() % 4;

				break;
			default:
				wealth = 0;
				strength = 100;
				distanceCop = rand() % 9;
		}
}

State stateManager(State beforeState, int currentWealth, int currentStrength, int currentDistanceCop) {
		State outputState;
```

```
	switch (beforeState) {
		case StartGame:
			if (currentWealth == 0 && currentStrength == 100) {
				outputState = RobbingBank;
				actionPerformingText = "\"Let\'s start this\"";
			}
			else {
				outputState = beforeState;
				actionPerformingText = "\"I\'m so confused\" + ERROR CHECK STARTGAME";
			}
			break;
		case RobbingBank:
			if (currentWealth >= 60 && currentDistanceCop > 5) {
				//GetRich
				outputState = HavingGoodTime;
				actionPerformingText = "\"I\'m rich enough to have a good time\"";
			}
			else if (currentDistanceCop > 0 && currentDistanceCop <= 5) {
				//SpotCop
				outputState = Fleeing;
				actionPerformingText = "\"I see a cop, so I have to start running\"";
			}
			else if (currentDistanceCop == 0) {
				//GetCaught
				outputState = BeingInJail;
				actionPerformingText = "\"Oh no, the cops are bringing me to my new home!\"";
			}
			else {
				outputState = beforeState;
				actionPerformingText = "\"Let\'s try again\" + ERROR CHECK ROBBINGBANK";
			}
			break;
		case HavingGoodTime:
			if (currentWealth >= 40 && currentWealth <= 70 && currentStrength < 40) {
				//GetTired
				outputState = LayingLow;
				actionPerformingText = "\"I\'m getting very tired, so I better lay low for a 
while\"";
			}
			else if (currentDistanceCop == 0) {
				//SpotCop
				outputState = Fleeing;
				actionPerformingText = "\"I see a cop, so I have to start running\"";
			}
			else if (currentStrength < 40) {
				//GoToBar
				outputState = BeingTipsy;
				actionPerformingText = "\"All drinks on me!\"";
			}
			else {
				outputState = beforeState;
				actionPerformingText = "\"Let\'s try again\" + ERRO CHECK HAVINGGOODTIME";
			}
			break;
		case LayingLow:
			if (currentStrength >= 65 && currentDistanceCop >= 7) {
				//FeelSafe
				outputState = RobbingBank;
				actionPerformingText = "\"Let\'s get back to what I was doing\"";
			}
			else if (currentStrength < 65 && currentWealth >= 40 && currentWealth <= 70) {
				//GetBored
				outputState = BeingTipsy;
				actionPerformingText = "\"A bar is a good safe spot, right? Right??\"";
			}
			else {
```

```
                                outputState = beforeState;
                                actionPerformingText = "\"Let\'s try again\" + ERROR CHECK LAYINGLOW";
                        }
                        break;
                case Fleeing:
                        if (currentDistanceCop < 7 && currentDistanceCop > 0) {
                                //GetTired
                                outputState = LayingLow;
                                actionPerformingText = "\"I\'m getting very tired, so I better lay low for a
while\"";
                        }
                        else if (currentDistanceCop >= 7) {
                                //FeelSafe
                                outputState = RobbingBank;
                                actionPerformingText = "\"Let\'s get back to what I was doing\"";
                        }
                        else if (currentDistanceCop == 0 && currentStrength < 50) {
                                //GetCaught
                                outputState = BeingInJail;
                                actionPerformingText = "\"Oh no, the cops are bringing me to my new home!\"";
                        }
                        else {
                                outputState = beforeState;
                                actionPerformingText = "\"Let\'s try again\" + ERROR CHECK FLEEING";
                        }
                        break;
                case BeingInJail:
                        if (currentStrength >= 70) {
                                //Escape
                                outputState = Fleeing;
                                actionPerformingText = "\"RUUUNNN!! RUUUUUUUUNNNN!!!\"";
                        }
                        else {
                                outputState = beforeState;
                                actionPerformingText = "\"Let\'s try again\" + ERROR CHECK BEINGINJAIL";
                        }
                        break;
                case BeingTipsy:
                        if (currentStrength < 40) {
                                //Tell too much
                                outputState = BeingInJail;
                                actionPerformingText = "\"No! Wait! Those were just stories!\"";
                        }
                        else if (currentStrength >= 40 && currentWealth < 40) {
                                //Get bored
                                outputState = RobbingBank;
                                actionPerformingText = "\"You know what would be funny..? If we go \'borrow\'
something from the bank…hehe\"";
                        }
                        else {
                                outputState = beforeState;
                                actionPerformingText = "\"Let\'s try again\"";
                        }
                        break;
                default:
                        outputState = StartGame;
                        actionPerformingText = "\"Let\'s start over\" + ERROR CHECK DEFAULTSTATE";
        }

        return outputState;
}

string stateMessage() {
        string outputStateMessage;

        switch (currentState) {
            case RobbingBank:
                outputStateMessage = "\"'I\'m robbing banks and getting loads of money! Pew pew!\"";
                break;
            case HavingGoodTime:
                outputStateMessage = "\"I\'m having a good time spending my money\"";
                break;
            case LayingLow:
                outputStateMessage = "\"I\'ll just wait a minute..\"";
                break;
            case Fleeing:
                outputStateMessage = "\"Who said being a thief isn\'t a sport? I\'m running all
day!\"";
                break;
            case BeingInJail:
                outputStateMessage = "\"So when can I go home? Jail is stupid.\"";
                break;
            case BeingTipsy:
                outputStateMessage = "\"Glug..glug.... hmmmm..... beeeer\"";
                break;
            default:
                outputStateMessage = "\"I am so confused\" + ERROR CHECK DEFAULTMESSAGE";
        }

        return outputStateMessage;
}
```

Output



```
D:\Gebruikers\Iris Oostra\Documenten\GitHub\hearthstats\HearthStats\Debug\HearthStats.exe
"Let's get back to what I was doing"

"'I'm robbing banks and getting loads of money! Pew pew!"


Wealth: 100
Strength: 0
Distance to cop: 0

"Oh no, the cops are bringing me to my new home!"

"So when can I go home? Jail is stupid."


Wealth: 0
Strength: 92
Distance to cop: 0

"RUUUNNN!! RUUUUUUUUNNNN!!!"

"Who said being a thief isn't a sport? I'm running all day!"


Wealth: 0
Strength: 0
Distance to cop: 6

"I'm getting very tired, so I better lay low for a while"

"I'll just wait a minute.."


Wealth: 0
Strength: 100
Distance to cop: 7

"Let's get back to what I was doing"

"'I'm robbing banks and getting loads of money! Pew pew!"


Wealth: 100
Strength: 41
Distance to cop: 4

"I see a cop, so I have to start running"

"Who said being a thief isn't a sport? I'm running all day!"
```

Question 6)

Design a state diagram for a second NPC (Cop) with three possible states: OffDuty, OnStakeOut and Chasing.

Design logical state transitions that depend on the variable dutyTime: the value of this variable increases during OnStakeOut and Chasing until it reaches a certain value, at which point the state transitions to OffDuty, when it starts decreasing again until 0.

The Cop initially starts in the OnStakeOut state. When the former NPC starts robbing banks, the Cop will at some point start Chasing. The first NPC then starts fleeing, which changes the distanceToCop value.

Draw out the full Cop state diagram and design logical transitions between states such that he is able to catch the first NPC and the program terminates.

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Code

Output

Question 7)

Implement the Cop NPC in your existing program loop. Make sure the Cop also outputs a line indicating its current state or actions, for example:

"Duty time's over, I'm headed home"

"Relaxing on the sofa, watching Crime Scene Investigation" "Hold it right there buddy" etc.

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Code

Output

Question 8)

Show the output of an example run that terminates by itself, and showing alternating lines said by both NPC's.

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Code

Output