

CZ4046 Intelligent Agents Assignment II

In this project I have implemented three different strategies, please use any of the following method (consider all if possible) for grading.

1. Generous Tit-for-Tat Strategy

In the generous Tit-for-Tat strategy, the player initially cooperates and then imitates the opponent's previous move, except if the opponent has defected twice in a row, in which case the player defects. This behavior is implemented in the selectAction method by checking the opponent's behavior in the previous round and updating the opponentDefectCount and lastAction variables accordingly. If the opponent defected twice in a row, the player switches to defecting. Otherwise, the player imitates the opponent's previous move.

The motivation for Generous Tit-for-Tat is the desire to encourage cooperation and prevent the emergence of retaliatory cycles in a repeated Prisoner's Dilemma game. It is based on the standard Tit-for-Tat strategy, which involves initially cooperating and then mimicking the opponent's previous move in subsequent rounds.

```
class GT4TPlayer extends Player {
    private int lastAction = 0; // assume cooperate on the first round
    private int opponentDefectCount = 0;

    int selectAction(int n, int[] myHistory, int[] oppHistory1, int[] oppHistory2) {
        if (n == 0) {
            lastAction = 0; // cooperate by default on the first round
            return lastAction;
        }

        // determine if opponent defected in the previous round
        boolean oppDefected = (oppHistory1[n-1] == 1 || oppHistory2[n-1] == 1);

        // update opponentDefectCount based on opponent's behavior
        if (oppDefected) {
            opponentDefectCount++;
        } else {
            opponentDefectCount = 0;
        }

        // update lastAction based on opponent's behavior
        if (opponentDefectCount >= 2) {
            lastAction = 1; // defect if opponent defected twice in a row
        } else {
            lastAction = oppHistory1[n-1]; // imitate opponent's last move
        }

        return lastAction;
    }
}
```

```
(base) KudoXinyueMBP:Assignment huxinyue$ javac HU_Xinyue_Player.java
(base) KudoXinyueMBP:Assignment huxinyue$ java HU_Xinyue_Player.java
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and NicePlayer scored 6.0 points.
NicePlayer scored 3.0 points, NicePlayer scored 3.0 points, and NastyPlayer scored 8.0 points.
NicePlayer scored 4.47 points, NicePlayer scored 4.47 points, and RandomPlayer scored 7.02 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and FreakyPlayer scored 6.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
NicePlayer scored 0.0 points, NastyPlayer scored 5.0 points, and NastyPlayer scored 5.0 points.
NicePlayer scored 1.8165138 points, NastyPlayer scored 6.8165135 points, and RandomPlayer scored 3.7889907 points.
NicePlayer scored 3.0 points, NastyPlayer scored 8.0 points, and TolerantPlayer scored 3.0 points.
NicePlayer scored 0.0 points, NastyPlayer scored 5.0 points, and FreakyPlayer scored 5.0 points.
NicePlayer scored 1.5326087 points, NastyPlayer scored 6.5326085 points, and T4TPlayer scored 3.9782608 points.
NicePlayer scored 0.06382979 points, NastyPlayer scored 5.06383 points, and GT4TPlayer scored 4.9574466 points.
NicePlayer scored 2.9381444 points, RandomPlayer scored 5.6185565 points, and RandomPlayer scored 5.3608246 points.
NicePlayer scored 4.3846154 points, RandomPlayer scored 7.076923 points, and TolerantPlayer scored 4.3846154 points.
NicePlayer scored 1.6736842 points, RandomPlayer scored 3.8842106 points, and FreakyPlayer scored 6.673684 points.
NicePlayer scored 3.3979592 points, RandomPlayer scored 6.408163 points, and T4TPlayer scored 4.7244897 points.
NicePlayer scored 3.728972 points, RandomPlayer scored 6.2990656 points, and GT4TPlayer scored 4.9439254 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
NicePlayer scored 3.0 points, TolerantPlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
NicePlayer scored 0.0 points, FreakyPlayer scored 5.0 points, and FreakyPlayer scored 5.0 points.
NicePlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 0.056603774 points, FreakyPlayer scored 5.056604 points, and GT4TPlayer scored 4.962264 points.
NicePlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, T4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, GT4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
NastyPlayer scored 2.0 points, NastyPlayer scored 2.0 points, and NastyPlayer scored 2.0 points.
NastyPlayer scored 3.8962264 points, NastyPlayer scored 3.8962264 points, and RandomPlayer scored 0.7358491 points.
NastyPlayer scored 2.0277777 points, NastyPlayer scored 2.0277777 points, and TolerantPlayer scored 1.9814814 points.
NastyPlayer scored 5.0 points, NastyPlayer scored 5.0 points, and FreakyPlayer scored 0.0 points.
NastyPlayer scored 2.0294118 points, NastyPlayer scored 2.0294118 points, and T4TPlayer scored 1.9803921 points.
NastyPlayer scored 2.031915 points, NastyPlayer scored 2.031915 points, and GT4TPlayer scored 1.9787234 points.
NicePlayer scored 4.9680853 points, RandomPlayer scored 2.5212767 points, and RandomPlayer scored 2.468085 points.
NastyPlayer scored 3.3263159 points, RandomPlayer scored 1.3263158 points, and TolerantPlayer scored 3.1157894 points.
NicePlayer scored 6.5 points, RandomPlayer scored 4.0 points, and FreakyPlayer scored 1.5 points.
NastyPlayer scored 4.3454547 points, RandomPlayer scored 1.7545455 points, and T4TPlayer scored 3.0272727 points.
NastyPlayer scored 3.65625 points, RandomPlayer scored 0.9479167 points, and GT4TPlayer scored 3.6041667 points.
NastyPlayer scored 8.0 points, TolerantPlayer scored 3.0 points, and TolerantPlayer scored 3.0 points.
NicePlayer scored 2.0291262 points, TolerantPlayer scored 1.9805825 points, and FreakyPlayer scored 2.0291262 points.
NastyPlayer scored 2.1388888 points, TolerantPlayer scored 2.0 points, and T4TPlayer scored 2.0462964 points.
NastyPlayer scored 2.0947368 points, TolerantPlayer scored 1.9894737 points, and GT4TPlayer scored 2.0421052 points.
NicePlayer scored 2.0 points, FreakyPlayer scored 2.0 points, and FreakyPlayer scored 2.0 points.
NastyPlayer scored 2.0291262 points, FreakyPlayer scored 2.0291262 points, and T4TPlayer scored 1.9805825 points.
NastyPlayer scored 2.030928 points, FreakyPlayer scored 2.030928 points, and GT4TPlayer scored 1.9793814 points.
NastyPlayer scored 2.1485147 points, T4TPlayer scored 2.0 points, and T4TPlayer scored 2.049505 points.
NicePlayer scored 2.0927835 points, T4TPlayer scored 1.9896908 points, and GT4TPlayer scored 2.041237 points.
NastyPlayer scored 2.1 points, GT4TPlayer scored 1.9888889 points, and GT4TPlayer scored 2.0444446 points.
RandomPlayer scored 3.7641509 points, RandomPlayer scored 4.188679 points, and RandomPlayer scored 4.235849 points.
RandomPlayer scored 3.868687 points, RandomPlayer scored 4.020202 points, and TolerantPlayer scored 3.969697 points.
RandomPlayer scored 2.1458333 points, RandomPlayer scored 2.8229167 points, and FreakyPlayer scored 4.90625 points.
RandomPlayer scored 3.6509433 points, RandomPlayer scored 4.311321 points, and T4TPlayer scored 3.8867924 points.
RandomPlayer scored 3.0777779 points, RandomPlayer scored 3.5222223 points, and GT4TPlayer scored 4.2444444 points.
RandomPlayer scored 6.985263 points, TolerantPlayer scored 4.642105 points, and TolerantPlayer scored 4.642105 points.
```

```
RandomPlayer scored 1.1078432 points, TolerantPlayer scored 3.4607842 points, and FreakyPlayer scored 3.7058823 points.
RandomPlayer scored 6.317757 points, TolerantPlayer scored 3.7009346 points, and T4TPlayer scored 4.915888 points.
RandomPlayer scored 1.58 points, TolerantPlayer scored 3.38 points, and GT4TPlayer scored 3.68 points.
RandomPlayer scored 0.80851066 points, FreakyPlayer scored 3.787234 points, and FreakyPlayer scored 3.787234 points.
RandomPlayer scored 6.2285714 points, FreakyPlayer scored 3.6571429 points, and T4TPlayer scored 4.990476 points.
RandomPlayer scored 5.53271 points, FreakyPlayer scored 3.0560749 points, and GT4TPlayer scored 5.4859815 points.
RandomPlayer scored 4.5612245 points, T4TPlayer scored 4.255102 points, and T4TPlayer scored 4.408163 points.
RandomPlayer scored 2.2747252 points, T4TPlayer scored 3.3186812 points, and GT4TPlayer scored 4.142857 points.
RandomPlayer scored 1.175926 points, GT4TPlayer scored 3.5370371 points, and GT4TPlayer scored 3.5833333 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
TolerantPlayer scored 3.0 points, TolerantPlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and FreakyPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 2.0 points, FreakyPlayer scored 2.1388888 points, and GT4TPlayer scored 2.0462964 points.
TolerantPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, GT4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, GT4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
FreakyPlayer scored 3.0 points, FreakyPlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
FreakyPlayer scored 2.03 points, FreakyPlayer scored 2.03 points, and T4TPlayer scored 1.98 points.
FreakyPlayer scored 0.06 points, FreakyPlayer scored 5.06 points, and GT4TPlayer scored 4.96 points.
FreakyPlayer scored 2.1914895 points, T4TPlayer scored 2.031915 points, and T4TPlayer scored 2.031915 points.
FreakyPlayer scored 2.1 points, T4TPlayer scored 1.9888889 points, and GT4TPlayer scored 2.0444446 points.
FreakyPlayer scored 6.0 points, GT4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, GT4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
GT4TPlayer scored 6.0 points, GT4TPlayer scored 6.0 points, and GT4TPlayer scored 6.0 points.
```

```
Tournament Results
GT4TPlayer: 166.26698 points.
TolerantPlayer: 161.24756 points.
T4TPlayer: 159.58432 points.
NicePlayer: 148.53293 points.
FreakyPlayer: 142.82965 points.
RandomPlayer: 135.31183 points.
NastyPlayer: 134.84383 points.
```

2. Grim Player Strategy

The Grim Player object keeps track of whether it is currently defecting or not using the `isDefecting` Boolean variable. On the first move, it cooperates by default. On all subsequent moves, it checks whether the opponent has defected in the previous round, and switches to defecting if so. Once it starts defecting, it will continue to do so for the rest of the game.

The motivation behind Grim Player is to deter an opponent from betraying. It is designed to cooperate as long as the opponent cooperates, but if the opponent betrays even once, Grim Player will always betray in all future rounds regardless of the opponent's action. In a word, betraying once should have severe consequences and discourage the opponent from betraying again. It is also a retaliatory strategy that aims to punish opponents for uncooperative behavior.

```
class GrimPlayer extends Player {
    private boolean isDefecting; // true if the player is defecting, false otherwise

    GrimPlayer() {
        this.isDefecting = false; // start off cooperating
    }

    int selectAction(int n, int[] myHistory, int[] oppHistory1, int[] oppHistory2) {
        if (n == 0) {
            // cooperate on the first move
            return 0;
        } else {
            if (isDefecting) {
                // defect for the rest of the game if the opponent has defected
                return 1;
            } else if (oppHistory1[n-1] == 1 || oppHistory2[n-1] == 1) {
                // switch to defecting if the opponent defects
                isDefecting = true;
                return 1;
            } else {
                // cooperate otherwise
                return 0;
            }
        }
    }
}
```

```
(base) KudoXinyueMBP:Assignment huxinyue$ javac HU.Xinyue.Player.java
(base) KudoXinyueMBP:Assignment huxinyue$ java HU.Xinyue.Player.java
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and NicePlayer scored 6.0 points.
NicePlayer scored 3.0 points, NicePlayer scored 3.0 points, and NastyPlayer scored 8.0 points.
NicePlayer scored 4.6019416 points, NicePlayer scored 4.6019416 points, and RandomPlayer scored 6.932039 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
NicePlayer scored 3.0 points, NicePlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
NicePlayer scored 0.0 points, NastyPlayer scored 5.0 points, and NastyPlayer scored 5.0 points.
NicePlayer scored 1.2 points, NastyPlayer scored 6.2 points, and RandomPlayer scored 4.2 points.
NicePlayer scored 3.0 points, NastyPlayer scored 8.0 points, and TolerantPlayer scored 3.0 points.
NicePlayer scored 3.0 points, NastyPlayer scored 8.0 points, and FreakyPlayer scored 3.0 points.
NicePlayer scored 1.6153846 points, NastyPlayer scored 6.6153846 points, and T4TPlayer scored 3.9230769 points.
NicePlayer scored 0.028301887 points, NastyPlayer scored 5.0283017 points, and GrimPlayer scored 4.981132 points.
NicePlayer scored 2.88 points, RandomPlayer scored 5.48 points, and RandomPlayer scored 5.48 points.
NicePlayer scored 4.455446 points, RandomPlayer scored 7.029703 points, and TolerantPlayer scored 4.455446 points.
NicePlayer scored 4.4505496 points, RandomPlayer scored 7.032967 points, and FreakyPlayer scored 4.4505496 points.
NicePlayer scored 3.357798 points, RandomPlayer scored 6.2477064 points, and T4TPlayer scored 4.8715596 points.
NicePlayer scored 1.6421052 points, RandomPlayer scored 4.010526 points, and GrimPlayer scored 6.536842 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
NicePlayer scored 3.0 points, TolerantPlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
NicePlayer scored 3.0 points, FreakyPlayer scored 8.0 points, and FreakyPlayer scored 3.0 points.
NicePlayer scored 1.5833334 points, FreakyPlayer scored 6.5833335 points, and T4TPlayer scored 3.9444444 points.
NicePlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
NicePlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, T4TPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
NicePlayer scored 6.0 points, GrimPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
NastyPlayer scored 2.0 points, NastyPlayer scored 2.0 points, and NastyPlayer scored 2.0 points.
NastyPlayer scored 3.5140188 points, NastyPlayer scored 3.5140188 points, and RandomPlayer scored 0.99065423 points.
NastyPlayer scored 2.03 points, NastyPlayer scored 2.03 points, and TolerantPlayer scored 1.98 points.
NastyPlayer scored 2.0 points, NastyPlayer scored 2.0 points, and FreakyPlayer scored 2.0 points.
NastyPlayer scored 2.03125 points, NastyPlayer scored 2.03125 points, and T4TPlayer scored 1.9791666 points.
NastyPlayer scored 2.031579 points, NastyPlayer scored 2.031579 points, and GrimPlayer scored 1.9789474 points.
NastyPlayer scored 5.0 points, RandomPlayer scored 2.287234 points, and RandomPlayer scored 2.712766 points.
NastyPlayer scored 3.5 points, RandomPlayer scored 1.0488769 points, and TolerantPlayer scored 3.4519231 points.
NastyPlayer scored 3.4571428 points, RandomPlayer scored 1.0285715 points, and FreakyPlayer scored 3.4571428 points.
NastyPlayer scored 4.242424 points, RandomPlayer scored 1.8686869 points, and T4TPlayer scored 2.878788 points.
NastyPlayer scored 3.6285715 points, RandomPlayer scored 0.96190476 points, and GrimPlayer scored 3.5809524 points.
NastyPlayer scored 8.0 points, TolerantPlayer scored 3.0 points, and TolerantPlayer scored 3.0 points.
NastyPlayer scored 8.0 points, TolerantPlayer scored 3.0 points, and FreakyPlayer scored 3.0 points.
NastyPlayer scored 2.1530612 points, TolerantPlayer scored 2.0 points, and T4TPlayer scored 2.0510204 points.
NastyPlayer scored 2.0882354 points, TolerantPlayer scored 1.9901961 points, and GrimPlayer scored 2.0392158 points.
NastyPlayer scored 5.0 points, FreakyPlayer scored 5.0 points, and FreakyPlayer scored 0.0 points.
NastyPlayer scored 6.6944447 points, FreakyPlayer scored 1.6944444 points, and T4TPlayer scored 3.8703704 points.
NastyPlayer scored 2.03125 points, FreakyPlayer scored 2.03125 points, and GrimPlayer scored 1.9791666 points.
NastyPlayer scored 2.1132076 points, T4TPlayer scored 2.018868 points, and T4TPlayer scored 2.018868 points.
NastyPlayer scored 2.0849056 points, T4TPlayer scored 1.990566 points, and GrimPlayer scored 2.037736 points.
NastyPlayer scored 2.0612245 points, GrimPlayer scored 2.010204 points, and GrimPlayer scored 2.010204 points.
RandomPlayer scored 4.071429 points, RandomPlayer scored 4.020408 points, and RandomPlayer scored 4.071429 points.
RandomPlayer scored 5.411111 points, RandomPlayer scored 5.133333 points, and TolerantPlayer scored 3.1888888 points.
RandomPlayer scored 2.2083333 points, RandomPlayer scored 2.8333333 points, and FreakyPlayer scored 5.125 points.
RandomPlayer scored 4.0961537 points, RandomPlayer scored 4.480769 points, and T4TPlayer scored 4.0 points.
RandomPlayer scored 2.3486238 points, RandomPlayer scored 2.761468 points, and GrimPlayer scored 5.146789 points.
RandomPlayer scored 6.9908257 points, TolerantPlayer scored 4.5137615 points, and TolerantPlayer scored 4.5137615 points.
```

```
RandomPlayer scored 1.1752577 points, TolerantPlayer scored 3.2886598 points, and FreakyPlayer scored 3.3917525 points.
RandomPlayer scored 6.19 points, TolerantPlayer scored 3.69 points, and T4TPlayer scored 5.04 points.
RandomPlayer scored 1.5555556 points, TolerantPlayer scored 3.5 points, and GrimPlayer scored 3.8333333 points.
RandomPlayer scored 6.9333334 points, FreakyPlayer scored 4.6 points, and FreakyPlayer scored 4.6 points.
RandomPlayer scored 1.8736842 points, FreakyPlayer scored 4.0842104 points, and T4TPlayer scored 2.8210526 points.
RandomPlayer scored 4.082474 points, FreakyPlayer scored 1.4536083 points, and GrimPlayer scored 6.402062 points.
RandomPlayer scored 3.754902 points, T4TPlayer scored 4.245098 points, and T4TPlayer scored 4.0 points.
RandomPlayer scored 1.6633663 points, T4TPlayer scored 3.049505 points, and GrimPlayer scored 3.940594 points.
RandomPlayer scored 0.9574468 points, GrimPlayer scored 3.6702127 points, and GrimPlayer scored 3.6702127 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
TolerantPlayer scored 3.0 points, TolerantPlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
TolerantPlayer scored 1.9795918 points, FreakyPlayer scored 2.0306122 points, and FreakyPlayer scored 2.0306122 points.
TolerantPlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 1.9907408 points, FreakyPlayer scored 2.0833333 points, and GrimPlayer scored 2.0370371 points.
TolerantPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, GrimPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
FreakyPlayer scored 8.0 points, FreakyPlayer scored 3.0 points, and FreakyPlayer scored 3.0 points.
FreakyPlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
FreakyPlayer scored 0.03 points, FreakyPlayer scored 5.03 points, and GrimPlayer scored 4.98 points.
FreakyPlayer scored 2.0550458 points, T4TPlayer scored 2.0091743 points, and T4TPlayer scored 2.0091743 points.
FreakyPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
FreakyPlayer scored 6.0 points, GrimPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, GrimPlayer scored 6.0 points, and GrimPlayer scored 6.0 points.
```

```
Tournament Results
GrimPlayer: 174.83466 points.
T4TPlayer: 164.72073 points.
TolerantPlayer: 157.54297 points.
FreakyPlayer: 152.73088 points.
NicePlayer: 150.41681 points.
NastyPlayer: 141.11183 points.
RandomPlayer: 133.92407 points.
```

3. Contrite Tit-for-Tat Strategy

The defect Boolean variable keeps track of whether the player should defect or cooperate in the current round. If the current round is the first round, the player starts with cooperation and defect is set to false. If either opponent defected in the previous round, the player remembers that and defects in the current round and in all subsequent rounds until one of the opponents cooperates again.

This method aims to quickly recover from any misunderstandings or mistakes made during the game. The motivation behinds is to maintain a cooperative relationship with the opponent even after a mutual defection or a series of defections have occurred.

```
class ContriteT4TPlayer extends Player {
    boolean defect = false;

    int selectAction(int n, int[] myHistory, int[] oppHistory1, int[] oppHistory2) {
        if (n == 0) {
            defect = false; // start with cooperation
            return 0;
        }
        if (oppHistory1[n-1] == 1 || oppHistory2[n-1] == 1) {
            defect = true; // opponent defected, so remember and defect next round
        }
        if (defect) {
            return 1; // defect
        }
        return 0; // cooperate
    }
}
```



```
(base) KudoXinyueMBP:Assignment huxinyue$ javac HU.Xinyue.Player.java
(base) KudoXinyueMBP:Assignment huxinyue$ java HU.Xinyue.Player.java
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and NicePlayer scored 6.0 points.
NicePlayer scored 3.0 points, NicePlayer scored 3.0 points, and NastyPlayer scored 8.0 points.
NicePlayer scored 4.3608246 points, NicePlayer scored 4.3608246 points, and RandomPlayer scored 7.0927835 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and FreakyPlayer scored 6.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, NicePlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
NicePlayer scored 0.0 points, NastyPlayer scored 5.0 points, and NastyPlayer scored 5.0 points.
NicePlayer scored 1.4727273 points, NastyPlayer scored 6.4727273 points, and RandomPlayer scored 4.018182 points.
NicePlayer scored 3.0 points, NastyPlayer scored 8.0 points, and TolerantPlayer scored 3.0 points.
NicePlayer scored 3.0 points, NastyPlayer scored 8.0 points, and FreakyPlayer scored 3.0 points.
NicePlayer scored 1.7472527 points, NastyPlayer scored 6.747253 points, and T4TPlayer scored 3.8351648 points.
NicePlayer scored 0.032967035 points, NastyPlayer scored 5.032967 points, and ContributeT4TPlayer scored 4.978022 points.
NicePlayer scored 3.0947368 points, RandomPlayer scored 5.726316 points, and RandomPlayer scored 5.305263 points.
NicePlayer scored 4.355769 points, RandomPlayer scored 7.0961537 points, and TolerantPlayer scored 4.355769 points.
NicePlayer scored 1.6111112 points, RandomPlayer scored 3.925926 points, and FreakyPlayer scored 6.611111 points.
NicePlayer scored 4.163265 points, RandomPlayer scored 6.357143 points, and T4TPlayer scored 5.0306125 points.
NicePlayer scored 1.375 points, RandomPlayer scored 4.1875 points, and ContributeT4TPlayer scored 6.2708335 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
NicePlayer scored 3.0 points, TolerantPlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
NicePlayer scored 0.0 points, FreakyPlayer scored 5.0 points, and FreakyPlayer scored 5.0 points.
NicePlayer scored 1.4587156 points, FreakyPlayer scored 6.4587154 points, and T4TPlayer scored 4.027523 points.
NicePlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, T4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
NicePlayer scored 6.0 points, ContributeT4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
NastyPlayer scored 2.0 points, NastyPlayer scored 2.0 points, and NastyPlayer scored 2.0 points.
NastyPlayer scored 3.6542056 points, NastyPlayer scored 3.6542056 points, and RandomPlayer scored 0.89719623 points.
NastyPlayer scored 2.0294118 points, NastyPlayer scored 2.0294118 points, and TolerantPlayer scored 1.9803921 points.
NastyPlayer scored 2.0 points, NastyPlayer scored 2.0 points, and FreakyPlayer scored 2.0 points.
NastyPlayer scored 2.0294118 points, NastyPlayer scored 2.0294118 points, and T4TPlayer scored 1.9803921 points.
NastyPlayer scored 2.027523 points, NastyPlayer scored 2.027523 points, and ContributeT4TPlayer scored 1.9816514 points.
NastyPlayer scored 4.809091 points, RandomPlayer scored 2.4 points, and RandomPlayer scored 2.5363636 points.
NastyPlayer scored 3.441764 points, RandomPlayer scored 1.137255 points, and TolerantPlayer scored 3.3431373 points.
NastyPlayer scored 6.4859815 points, RandomPlayer scored 4.009346 points, and FreakyPlayer scored 1.4859813 points.
NastyPlayer scored 4.3465347 points, RandomPlayer scored 1.8217822 points, and T4TPlayer scored 2.960396 points.
NastyPlayer scored 3.5142858 points, RandomPlayer scored 1.0380952 points, and ContributeT4TPlayer scored 3.4666667 points.
NastyPlayer scored 8.0 points, TolerantPlayer scored 3.0 points, and TolerantPlayer scored 3.0 points.
NastyPlayer scored 2.0277777 points, TolerantPlayer scored 1.9814814 points, and FreakyPlayer scored 2.0277777 points.
NastyPlayer scored 2.2307692 points, TolerantPlayer scored 2.010989 points, and T4TPlayer scored 2.0659342 points.
NastyPlayer scored 2.0033333 points, TolerantPlayer scored 1.9907408 points, and ContributeT4TPlayer scored 2.0370371 points.
NastyPlayer scored 2.0 points, FreakyPlayer scored 2.0 points, and FreakyPlayer scored 2.0 points.
NastyPlayer scored 2.03 points, FreakyPlayer scored 2.03 points, and T4TPlayer scored 1.98 points.
NastyPlayer scored 5.0326085 points, FreakyPlayer scored 0.032608695 points, and ContributeT4TPlayer scored 4.978261 points.
NastyPlayer scored 2.1914895 points, T4TPlayer scored 2.031915 points, and T4TPlayer scored 2.031915 points.
NastyPlayer scored 2.0631578 points, T4TPlayer scored 2.0105264 points, and ContributeT4TPlayer scored 2.0105264 points.
NastyPlayer scored 2.0618556 points, ContributeT4TPlayer scored 2.0103092 points, and ContributeT4TPlayer scored 2.0103092 points.
RandomPlayer scored 3.3087379 points, RandomPlayer scored 4.0970874 points, and RandomPlayer scored 4.291262 points.
RandomPlayer scored 5.2788463 points, RandomPlayer scored 5.423077 points, and TolerantPlayer scored 3.2596154 points.
RandomPlayer scored 5.3913845 points, RandomPlayer scored 5.554348 points, and FreakyPlayer scored 2.8369565 points.
RandomPlayer scored 4.185185 points, RandomPlayer scored 3.9537036 points, and T4TPlayer scored 4.046296 points.
RandomPlayer scored 2.5555556 points, RandomPlayer scored 2.6111112 points, and ContributeT4TPlayer scored 5.2777777 points.
RandomPlayer scored 6.857143 points, TolerantPlayer scored 4.714286 points, and TolerantPlayer scored 4.714286 points.
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RandomPlayer scored 7.8612245 points, TolerantPlayer scored 4.408163 points, and FreakyPlayer scored 4.408163 points.
RandomPlayer scored 1.8224299 points, TolerantPlayer scored 4.0654206 points, and T4TPlayer scored 2.9906542 points.
RandomPlayer scored 1.2424242 points, TolerantPlayer scored 3.2626262 points, and ContributeT4TPlayer scored 3.3131313 points.
RandomPlayer scored 3.7428572 points, FreakyPlayer scored 6.885714 points, and FreakyPlayer scored 1.8857143 points.
RandomPlayer scored 6.1238093 points, FreakyPlayer scored 3.6 points, and T4TPlayer scored 5.0761905 points.
RandomPlayer scored 4.027523 points, FreakyPlayer scored 1.5963303 points, and ContributeT4TPlayer scored 6.504587 points.
RandomPlayer scored 4.587629 points, T4TPlayer scored 4.4329896 points, and T4TPlayer scored 4.484536 points.
RandomPlayer scored 1.75 points, T4TPlayer scored 3.1630435 points, and ContributeT4TPlayer scored 3.8695652 points.
RandomPlayer scored 1.089109 points, ContributeT4TPlayer scored 3.6633663 points, and ContributeT4TPlayer scored 3.6633663 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and TolerantPlayer scored 6.0 points.
TolerantPlayer scored 3.0 points, TolerantPlayer scored 3.0 points, and FreakyPlayer scored 8.0 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, TolerantPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and FreakyPlayer scored 6.0 points.
TolerantPlayer scored 2.0194175 points, FreakyPlayer scored 2.116505 points, and T4TPlayer scored 2.0194175 points.
TolerantPlayer scored 1.9901961 points, FreakyPlayer scored 2.0882354 points, and ContributeT4TPlayer scored 2.0392158 points.
TolerantPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
TolerantPlayer scored 6.0 points, ContributeT4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
FreakyPlayer scored 6.0 points, FreakyPlayer scored 6.0 points, and FreakyPlayer scored 6.0 points.
FreakyPlayer scored 2.031915 points, FreakyPlayer scored 2.031915 points, and T4TPlayer scored 1.9787234 points.
FreakyPlayer scored 5.030303 points, FreakyPlayer scored 0.030303031 points, and ContributeT4TPlayer scored 4.979798 points.
FreakyPlayer scored 2.064516 points, T4TPlayer scored 2.0107527 points, and T4TPlayer scored 2.0107527 points.
FreakyPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
FreakyPlayer scored 2.0560749 points, ContributeT4TPlayer scored 2.0093458 points, and ContributeT4TPlayer scored 2.0093458 points.
T4TPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and T4TPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, T4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
T4TPlayer scored 6.0 points, ContributeT4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
ContributeT4TPlayer scored 6.0 points, ContributeT4TPlayer scored 6.0 points, and ContributeT4TPlayer scored 6.0 points.
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Tournament Results
ContributeT4TPlayer: 169.0731 points.
TolerantPlayer: 158.09653 points.
T4TPlayer: 156.16772 points.
NicePlayer: 151.0332 points.
RandomPlayer: 142.9037 points.
FreakyPlayer: 140.30882 points.
NastyPlayer: 134.05211 points.
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