DOKUZ EYLUL UNIVERSITY

ENGINEERING FACULTY

DEPARTMENT OF ENGINEERING

COMPUTER

CME 2204 Assignment-2

Dynamic Programming Approach, Greedy Approach

Oğuzhan YARDIMCI

2015510066

oguzhan.yardimci@ceng.deu.edu.tr

Lecturers

Asst. Prof. Zerrin Işık

Res.Asst. Ali Cüvitoğlu

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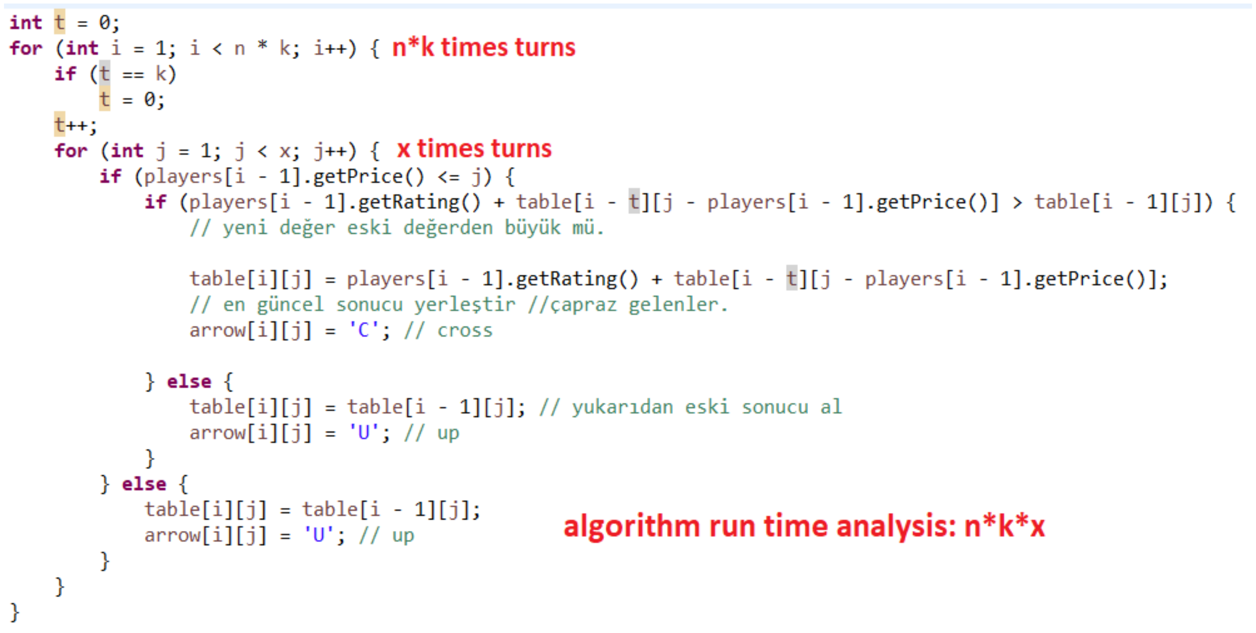
DYNAMIC PROGRAMMING APPROACH

Dynamic programming is both a mathematical optimization method and a computer programming method. We formulate the solution to a problem recursively as in terms of its sub-problems, we can try reformulating the problem in a bottom-up fashion: try solving the sub-problems first and use their solutions to build-on and arrive at solutions to bigger sub-problems. This is also usually done in a tabular form by iteratively generating solutions to bigger and bigger sub-problems by using the solutions to small sub-problems.

Analysis of Run Time Dynamic Programing Approach:

Dynamic Programming approach is achieved by using a matrix. In our problem, the columns of the Matrix show the number of players (n*k (n: first n position, k: first k players)), the rows of the Matrix show the budget (max budget).

As a result of, run time is n*k*x .



```
int t = 0;
for (int i = 1; i < n * k; i++) {
    if (t == k)
        t = 0;
    t++;
    for (int j = 1; j < x; j++) {
        if (players[i - 1].getPrice() <= j) {
            if (players[i - 1].getRating() + table[i - t][j - players[i - 1].getPrice()] > table[i - 1][j]) {
                // yeni değer eski değerden büyük mü.

                table[i][j] = players[i - 1].getRating() + table[i - t][j - players[i - 1].getPrice()];
                // en güncel sonucu yerleştir //çapraz gelenler.
                arrow[i][j] = 'C'; // cross

            } else {
                table[i][j] = table[i - 1][j]; // yukarıdan eski sonucu al
                arrow[i][j] = 'U'; // up
            }
        } else {
            table[i][j] = table[i - 1][j];
            arrow[i][j] = 'U'; // up
        }
    }
}
```

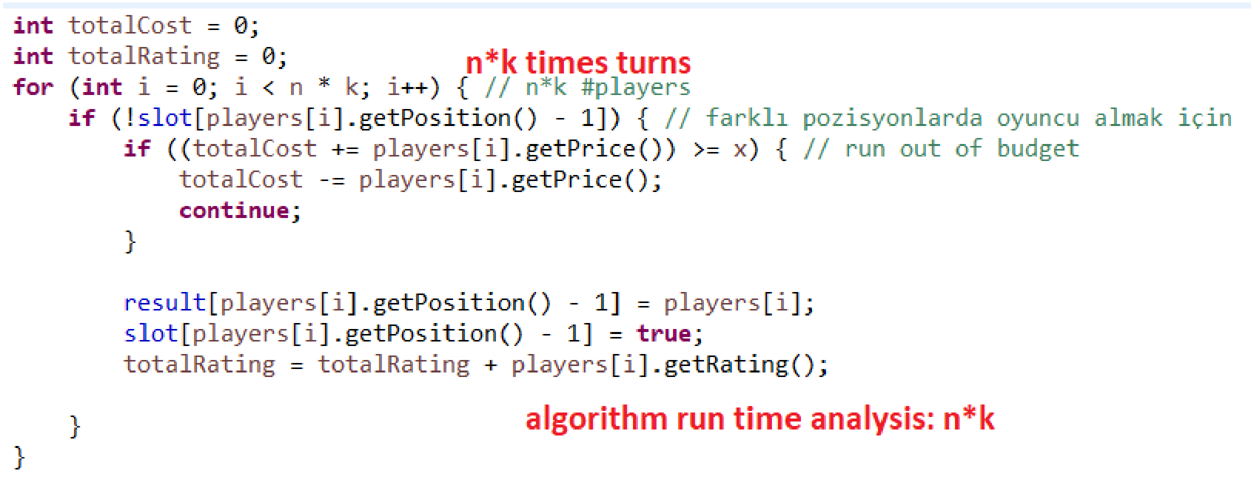
GREEDY APPROACH

Greedy is an algorithmic paradigm that builds up a solution piece by piece, always choosing the next piece that offers the most obvious and immediate benefit. So the problems where choosing locally optimal also leads to global solution are best fit for Greedy.

Analysis of Run Time Greedy Approach:

The greedy approach controls each player individually while working, so the runtime equals the number of players.

Result: n*k (n: first n position, k: first k players).



```
int totalCost = 0;
int totalRating = 0;
for (int i = 0; i < n * k; i++) { // n*k #players
    if (!slot[players[i].getPosition() - 1]) { // farklı pozisyonlarda oyuncu almak için
        if ((totalCost += players[i].getPrice()) >= x) { // run out of budget
            totalCost -= players[i].getPrice();
            continue;
        }

        result[players[i].getPosition() - 1] = players[i];
        slot[players[i].getPosition() - 1] = true;
        totalRating = totalRating + players[i].getRating();

    }
}
```

COMPARISON

x: max budget n: first n position k: first k player	Greedy Approach	DP Approach
x: 150000, n: 10, k: 10	10.3	69228.8
x: 140000, n: 10, k: 10	9.9	79986.1
x: 20000, n: 2, k: 10	5.2	14781
x: 20000, n: 10, k: 10	12.5	16686.6
x: 30000, n: 3, k: 3	4.9	6661.6
x: 50000, n: 5, k: 5	5.7	12501
x: 9000, n: 10, k: 10	10.1	8853.9
x: 18000, n: 10, k: 1	4.6	5051.4

In the data we have obtained, it is observed that the greedy approach works much faster than the dynamic approach. However, the greedy approach can not guarantee the exact result. The dynamic approach gives us the exact result while causing us to waste time.

References

https://www.youtube.com/watch?v=iGij-YCBxxY&t=80s

https://www.geeksforgeeks.org/greedy-algorithms/#standardGreedyAlgorithms

http://www.wikizero.biz/index.php?q=aHR0cHM6Ly9lbi53aWtpcGVkaWEub3JnL3dpa2kvRHluYW1pY19wcm9ncmFtbWluZw

https://classroom.google.com/u/1/c/MzA1MDkxMjcwNzha