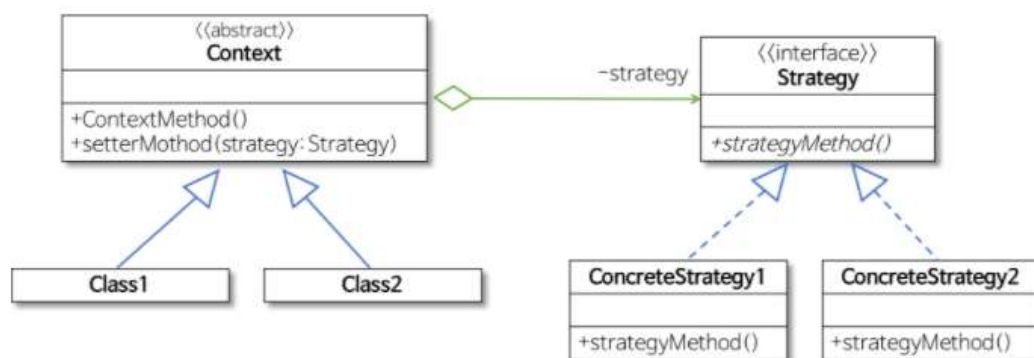


사용된 디자인 패턴: Strategy Pattern

전쟁에서 이기려면 전략이 필요합니다. 전략은 수십 수백가지가 존재하며 이 전략들의 목표는 승리입니다. 전략 패턴도 마찬가지로 어떠한 문제를 해결하기 위해서 전략이 여러 가지 쓰일 수 있습니다. 전략 패턴은 정책(policy)패턴 이라고도 부르는데, 객체 내부에서 해결해야 하는 목적을 알고리즘객체로 분리해서 적용하는 기법입니다. 실제 내부의 동작을 외부 알고리즘 객체로 분리해서 유연하게 동작을 변경 시킬 수 있습니다. 외부 알고리즘 객체로 처리 로직을 분리하면 향후에 코드 확장이 용이해지고, 동작객체와 알고리즘 객체간의 관계를 구성하며, 분리된 알고리즘 코드를 언제든지 수정할 수 있습니다. 일반적인 코드에서 알고리즘을 수정하는 것은 어렵는데 전략패턴에서는 독립된 객체로 관리하기 때문에 관리가 쉽고, 변화하는 부분을 관리하려면 구조를 유지해야하는데 이 구조는 인터페이스를 이용해서 설계합니다. 이 인터페이스에서 추상 메서드를 활용하는 이유는 상위구조에 맞춰서 개발하고 변화하는 부분만 분리 결합하기 위해서입니다. 패턴화로 분리된 알고리즘 객체는 전략 객체의 외부로부터 전달받아 관계를 설정하는데 이를 의존성 주입이라고합니다. 전략객체는 외부의 의존성을 매개변수 인자로 받고, 전략패턴은 위임을 통해서 느슨한 결합을 처리합니다. 매개변수를 통해서 의존성 주입하면 전략객체를 생성하는 단계에서 관계를 설정하거나 재설정할 수 있습니다. 또한 프로그램이 실행되는 도중에도 알고리즘을 쉽게 교체할 수 있습니다. 이를 위해서는 setter메서드를 구현해야합니다.

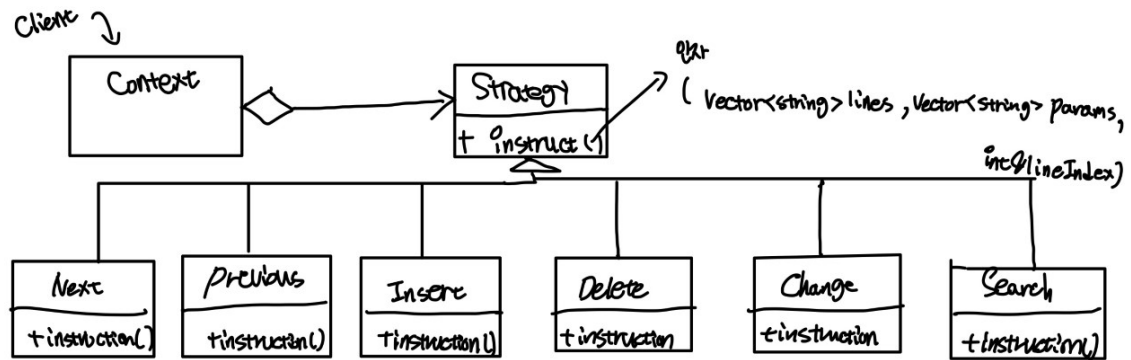
정리하자면, 객체는 상태와 행동을 갖고있는데, 전략 패턴에서는 행동을 여러 알고리즘으로 객체를 분리하고, 선택한 알고리즘 객체만 실행해서 전술을 실행합니다. 전략 패턴은 동적으로 알고리즘을 변경할 수 있고, 행동변경시에 조건문을 사용하지않고, 알고리즘 캡슐화를 통해 조건문 없이 원하는 행동으로 교체합니다. 하지만 알고리즘 객체가 교체된다는 점에서 실행시 많은 수의 객체를 갖는다는 단점도 있습니다.



위의 그림처럼 term project의 문제도 콘솔기반 텍스트 편집기를 구현하기 위해서 여러 가지 전략을 활용했습니다.(delete,insert,nextpage,previouspage,change,search 등) 이 전략들을 하나의 strategy 라는 인터페이스를 이용해서 규격화했고, 실제 동작 객체인 Context객체에서 전략을 의존성 주입했습니다. context에 의존성을 주입하려면 setStrategy라는 setter메서드를 활용해야합니다. context객체는이제 전략객체를 가지고있으므로 이를 활용해서 어떤 전략을 수행 할 수 있게됩니다. 본 프로그램에서는 사용자입력이 어떤 것이냐에 따라서 전

락을 수정하면서 객체를 생성하고 사용자 입력과 다른 전략객체는 생성하지 않음으로써 전략 패턴의 단점인 객체를 많이 생성한다는 단점을 극복하려고 했습니다.

콘솔기반 텍스트 편집기를 클래스 다이어그램으로 표현하면 아래와 같습니다.



주요 코드에 대한 설명

```

int main() {
    vector<string> lines;
    string filestring;
    string word;
    ifstream in("test.txt");
    if (!in.is_open()) {
        cout << "파일을 여는 데 실패했습니다." << endl;
    }
    else {
        getline(in, filestring);
        istringstream ss(filestring);
        string temp;
        int byteSize = 0;
        while (getline(ss, word, ' ')) {
            byteSize = byteSize + word.size() + 1;
            if (byteSize < 75) temp = temp + word + ' ';
            else {
                byteSize = word.size();
                lines.push_back(temp);
                temp.clear();
            }
        }
    }
}

```

Main 함수에서 파일을 읽고, 코드를 line 단위로 쪼개는 코드입니다. 처음에 파일을 word별로 쪼개서 byteSize가 75바이트 이상이면 line으로 만들어서 `vector<string> lines`에 push해줍니다. 하지만 75바이트 보다 작으면 단어를 더해줍니다.

```

string instruct(vector<string>& lines, vector<string>& params, int& lineIndex) {
    curPage++;
    if (curPage * 20 >= lines.size()) {
        curPage--;
        message = "마지막 페이지 입니다.";
        return message;
    }
    else {
        message = "다음 페이지 입니다.";
        return message;
    }
}

```

Next class의 instruct 함수에서는 전역변수인 curPage를 증가시키고 한 페이지당 20줄이니까  $curpage * 20 \geq lines$  줄개수 이면 마지막페이지로 간주하고 아니면 다음페이지를 출력하게 curpage를 증가시킵니다.Previous class 도 같은 방법입니다.

```

void parseparams(vector<string> &params, string command) {
    string param;
    params.clear();
    command = command.substr(2, command.length()-3);
    istringstream ss(command);
    while (getline(ss, param, ','))
    {
        params.push_back(param);
    }
}

```

Parseparams 메서드는 i(1,1,hello)와같이 입력된 값을 substr메서드를 활용해서 자르고 vector<string> params 에 ,를 기준으로 나눠서 하나씩 넣어주는 메서드입니다.

```

lineIndex= stoi(params[0]) - 1;
wheretoinserIndex = stoi(params[1]) - 1;
word = params[2];
string line = lines[lineIndex];
istringstream ss(line);
string stringBuffer;
while (getline(ss, stringBuffer, ' ')) {
    words.push_back(stringBuffer);
}
words.insert(words.begin() + wheretoinserIndex + 1, word);

string makeline = "";
for (int i = 0; i < words.size(); i++) {
    makeline += words[i] + " ";
}

lines[lineIndex] = makeline;

return "insert 성공";

```

Insert 클래스의 instruct 메서드의 한부분인데, params에 들어있는 값을 stoi(stirng to int)를 활용해서 index값으로 전환하고, 그 라인인덱스의 라인을 찾아서 words라는 벡터에 넣고, 그 벡터에 wheretoinserIndex를 활용해서 주입한후에 다시 라인을 만들고 그라인을 해당 lineIndex에 다시 넣어줍니다.

```

void initVector(vector<string>& lines) {
    vector<string> temp;
    string word = "";
    string line = "";
    string full = "";
    for (int i = 0; i < lines.size(); i++) {
        full += lines[i];
    }

    istringstream ss(full);

    while (getline(ss, word, ' ')) {
        if (line.length() + word.length() > 74) {
            temp.push_back(line);
            line = "";
        }
        line += word + " ";
    }
    if (line != "") { temp.push_back(line); }

    lines.clear();
    lines.assign(temp.begin(), temp.end());
}

```

insert와 delete와같이 line 자체가 바뀌어버린 경우에는 lines vector를 꼭 초기화 해주어야 하는데 main 함수의 while문 가장밑에서 이루어집니다. 라인들을 다더해서 full을 만들고 여기서 word를 기준으로 75바이트 부터는 새로운 라인으로 인정하고 라인으로 만듭니다. 마지막에 남는 word는 line으로 처리해줍니다. vector<string> temp에 담겨져있으니 실제 lines 벡터에 옮겨줍니다. delete도 비슷한 방법으로 처리했습니다.

```

for (int i = 0; i < lines.size(); i++) {
    line = lines[i];
    istringstream ss(line);
    string stringBuffer;
    while (getline(ss, stringBuffer, ' ')) {
        words.push_back(stringBuffer);
    }
}

for (int i = 0; i < words.size(); i++) {
    if (prevStr == words[i]) words[i] = curStr;
}

string makeline = "";
vector<string> temp;
for (int i = 0; i < words.size(); i++) {
    if (words[i].length() + makeline.length() > 74) {
        temp.push_back(makeline);
        makeline = "";
    }
    makeline = makeline + words[i] + " ";
}
if (makeline != "") temp.push_back(makeline);
lines.clear();
lines.assign(temp.begin(), temp.end());
return "모두 바뀌었습니다.";

```

Change class의 한 부분인데, 여기서는 단어들로 가져와서 이전단어와 일치하는 모든단어들



을 찾아서 바꿔주는 부분입니다. for문을 활용했습니다.

## 실행결과 스크린샷

초기실행:

```
C:\Users\hyunjin\source\repos\testpj\Debug\testpj.exe
1 | 聯邦最高法院上周一裁定，允许宾夕法尼亚州?의
2 | 法院允许选举官员清点一些邮寄选票
3 | 直到选举日后的三天。该州是关键的
4 | 在总统选举中。最高法院?의 行动
5 | 是死锁的结果。它需要五票来授予暂停，而
6 | 谁曾要求法院干预只能凑齐四位：
7 | 克拉伦斯·托马斯、塞缪尔·A·阿利托 Jr.、尼尔·M·戈萨奇和布雷特
8 | 卡瓦诺。在另一边的是首席大法官约翰·G·
9 | 罗伯茨和法院?의 三名自由派成员：大法官斯蒂芬
10 | 布雷耶、索尼娅·索托马约尔和埃琳娜·加根。双方都没有给出理由。大法官
11 | 布雷耶建议法官艾米·科尼·巴雷特，谁总统特朗普
12 | 在取代鲁斯·巴德·金斯伯格法官去年
13 | 可能扮演选举争议中的决定性角色。法官巴雷特
14 | 下周将被确认。宾夕法尼亚最高法院裁定
15 | 三天延期是由冠状病毒大流行和
16 | 在邮寄服务中，并命令选票清楚地
17 | 在选举日前或那些有缺失或无法辨认
18 | 的选票。除非证据表明它
19 | 在选举日后邮寄的。??该裁决是重大胜利，
20 | 对于在州内推动扩大投票权的人

(콘솔메세지)
n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료
입력:
```

nextpage

```
C:\Users\hyunjin\source\repos\testpj\Debug\testpj.exe
n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료
입력: n
1 | 1,755,940 ballots, and Republicans had 672,381, according to the
2 | Pennsylvania secretary of state?의 Of course, it could result in further
3 | delays in reporting results, is already expected to be one of the last
4 | states to report, a statewide law preventing election officials from
5 | beginning to count ballots until Election Day and Republicans in the state
6 | indicating that they will not give them more time. The also removes one
7 | more legal hurdle facing elections in where numerous voting-related
8 | lawsuits are undecided, whether election officials will have to perform
9 | signature on absentee ballots. Two Republican state lawmakers and the
10 | Party of Pennsylvania asked the U.S. Supreme Court to block the court?의
11 | treatment of ballots without legible postmarks. The wrote that the state
12 | court?의 ruling was ?한 open invitation voters to cast their ballots
13 | after Election Day, thereby injecting and the potential for gamesmanship
14 | into what was an orderly and schedule of clear, bright-line deadlines.??
15 | ?한 a year where is a very real possibility that the final presidential
16 | election hinges on Pennsylvania, the new rules imposed by the decision of
17 | Supreme Court of Pennsylvania (a body elected in partisan elections)
18 | destroy the American public?의 confidence in the electoral system a
19 | whole.??the brief said. The U.S. Supreme Court has not hesitated to
20 | orders from federal judges that sought to alter state rules for elections.

(콘솔메세지) 다음 페이지 입니다.
n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료
입력:
```

## Nestpage to lastpage

C:\Users\hyunjin\source\repos\testpj\Debug\testpj.exe

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력: n

```
1 | empowers legislatures to set the times, places and manner of congressional
2 | In a second brief, the Republican Party of Pennsylvania argued that the
3 | Constitution reserves a special role for state legislatures in
4 | elections, one that cannot be overridden by state courts. The brief
5 | heavily on the Supreme Court's decision in the cases in Bush v. Gore,
6 | the 2000 ruling that handed the presidency to W. Bush. By extending the
7 | deadline by judicial fiat and a presumption of timeliness that will allow
8 | voters to cast or ballots after Election Day, the brief said, the
9 | Pennsylvania Court has impermissibly altered both the time and
10 | established by the General Assembly for conducting In response, Josh
11 | Shapiro, Pennsylvania's attorney general, said a provision of the
12 | State Constitution protecting free equal elections allowed the
13 | Pennsylvania Supreme Court to extend deadline. He added that the state
14 | court's decision was inconsistent how Pennsylvania law handles military
15 | and overseas ballots timely but not received until after Election Day.
16 | Later Monday, in a federal appeals court exempted first-time voters from
17 | having appear in person at the polls on Nov. 3 if they registered online
18 | or by as required by a state law, which critics said would endanger
19 |
20 |
```

(콘솔메세지) 마지막 페이지 입니다.

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력:

## Previouspage

C:\Users\hyunjin\source\repos\testpj\Debug\testpj.exe

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력: p

```
1 | The Supreme Court on Monday let stand a ruling by Pennsylvania's
2 | court that allowed election officials to count some mailed ballots up to
3 | three days after Election Day. The state is a key in the presidential
4 | election. The Supreme Court's action the result of a deadlock. It takes
5 | five votes to grant a stay, and the who had asked the court to intervene
6 | could muster only four: Clarence Thomas, Samuel A. Alito Jr., Neil M.
7 | Gorsuch and Brett Kavanaugh. On the other side of the divide were Chief
8 | Justice John G. Jr. and the court's three-member liberal wing: Justices
9 | Stephen Breyer, Sonia Sotomayor and Elena Kagan. Neither side gave
10 | reasons. The suggested that Judge Amy Coney Barrett, whom President Trump
11 | to replace Justice Ruth Bader Ginsburg after her death last could play a
12 | decisive role in election disputes. Judge Barrett is to be confirmed next
13 | week. The Pennsylvania Supreme Court ruled the three-day extension was
14 | required by the coronavirus pandemic and in mail service, and it ordered
15 | the counting of ballots clearly on or before Election Day and of those
16 | with missing or illegible unless a preponderance of the evidence
17 | demonstrates that it mailed after Election Day. The ruling is a major
18 | victory for in the state who have been pushing to expand access to voting
19 | in pandemic, and for a party that has been requesting absentee ballots in
20 | greater numbers than Republicans. As of Friday, Democrats in had requested
```

(콘솔메세지) 첫 번째 페이지 입니다.

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력:

i(1,10,hello)

C:\Users\hyunjin\source\repos\testpj\Debug\testpj.exe

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력: i(1,10,hello)

```
1 | 憲法院the Supreme Court on Monday let stand a ruling by hello
2 | Pennsylvania?씩 court that allowed election officials to count some
3 | mailed ballots up to three days after Election Day. The state is a key in
4 | the presidential election. The Supreme Court?씩 action the result of a
5 | deadlock. It takes five votes to grant a stay, and the who had asked the
6 | court to intervene could muster only four: Clarence Thomas, Samuel A.
7 | Alito Jr., Neil M. Gorsuch and Brett Kavanaugh. On the other side of the
8 | divide were Chief Justice John G. Jr. and the court?씩 three-member
9 | liberal wing: Justices Stephen Breyer, Sonia Sotomayor and Elena Kagan.
10 | Neither side gave reasons. The suggested that Judge Amy Coney Barrett,
11 | whom President Trump to replace Justice Ruth Bader Ginsburg after her
12 | death last could play a decisive role in election disputes. Judge Barrett
13 | is to be confirmed next week. The Pennsylvania Supreme Court ruled the
14 | three-day extension was required by the coronavirus pandemic and in mail
15 | service, and it ordered the counting of ballots clearly on or before
16 | Election Day and of those with missing or illegible ?했 unless a
17 | preponderance of the evidence demonstrates that it mailed after Election
18 | Day.??The ruling is a major victory for in the state who have been
19 | pushing to expand access to voting in pandemic, and for a party that has
20 | been requesting absentee ballots in greater numbers than Republicans. As
```

(콘솔메세지) insert 성공

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력:

i(1,10,hello)직후 d(1,1)

C:\Users\hyunjin\source\repos\testpj\Debug\testpj.exe

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력: d(1,1)

```
1 | Supreme Court on Monday let stand a ruling by hello Pennsylvania?씩 court
2 | that allowed election officials to count some mailed ballots up to three
3 | days after Election Day. The state is a key in the presidential election.
4 | The Supreme Court?씩 action the result of a deadlock. It takes five votes
5 | to grant a stay, and the who had asked the court to intervene could muster
6 | only four: Clarence Thomas, Samuel A. Alito Jr., Neil M. Gorsuch and Brett
7 | Kavanaugh. On the other side of the divide were Chief Justice John G. Jr.
8 | and the court?씩 three-member liberal wing: Justices Stephen Breyer,
9 | Sonia Sotomayor and Elena Kagan. Neither side gave reasons. The suggested
10 | that Judge Amy Coney Barrett, whom President Trump to replace Justice Ruth
11 | Bader Ginsburg after her death last could play a decisive role in election
12 | disputes. Judge Barrett is to be confirmed next week. The Pennsylvania
13 | Supreme Court ruled the three-day extension was required by the
14 | coronavirus pandemic and in mail service, and it ordered the counting of
15 | ballots clearly on or before Election Day and of those with missing or
16 | illegible ?했 unless a preponderance of the evidence demonstrates that it
17 | mailed after Election Day.??The ruling is a major victory for in the
18 | state who have been pushing to expand access to voting in pandemic, and
19 | for a party that has been requesting absentee ballots in greater numbers
20 | than Republicans. As of Friday, Democrats in had requested 1,755,940
```

(콘솔메세지) delete 성공

n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료

입력:

s(hello)



```

1 | Supreme Court on Monday let stand a ruling by hello Pennsylvania?썩 court
2 | that allowed election officials to count some mailed ballots up to three
3 | days after Election Day. The state is a key in the presidential election.
4 | The Supreme Court?썩 action the result of a deadlock. It takes five votes
5 | to grant a stay, and the who had asked the court to intervene could muster
6 | only four: Clarence Thomas, Samuel A. Alito Jr., Neil M. Gorsuch and Brett
7 | Kavanaugh. On the other side of the divide were Chief Justice John G. Jr.
8 | and the court?썩 three-member liberal wing: Justices Stephen Breyer,
9 | Sonia Sotomayor and Elena Kagan. Neither side gave reasons. The suggested
10 | that Judge Amy Coney Barrett, whom President Trump to replace Justice Ruth
11 | Bader Ginsburg after her death last could play a decisive role in election
12 | disputes. Judge Barrett is to be confirmed next week. The Pennsylvania
13 | Supreme Court ruled the three-day extension was required by the
14 | coronavirus pandemic and in mail service, and it ordered the counting of
15 | ballots clearly on or before Election Day and of those with missing or
16 | illegible ?썩 unless a preponderance of the evidence demonstrates that it
17 | mailed after Election Day.??The ruling is a major victory for in the
18 | state who have been pushing to expand access to voting in pandemic, and
19 | for a party that has been requesting absentee ballots in greater numbers
20 | than Republicans. As of Friday, Democrats in had requested 1,755,940

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(콘솔메세지) 찾음!

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n: 다음페이지, p: 이전페이지, i : 삽입, d : 삭제, c: 변경, s: 찾기, t: 저장후 종료
입력:

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C(hello,bye)

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입력:

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참고문헌

책: 쉽게 배워 바로 써먹는 디자인패턴(저자 이호진)

블로그:

<https://blockdmask.tistory.com/333>

<http://www.cplusplus.com/reference/cctype/isdigit/>

<https://sabarada.tistory.com/72>

<https://m.blog.naver.com/PostView.nhn?blogId=jodi999&logNo=221051811891&proxyRefere>



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