CSE2005 - Operating Systems

LAB ASSIGNMENT-5

Slot: L35 + L36

Faculty: GERALDINE BESSIE AMALI D MAM

Date: 26-10-2020

19BCE0829 KSHEERAJ KANDRA

1. Page replacement algorithms
   a) FIFO -First In First Out

```
#include<bits/stdc++.h>
using namespace std;
int main(){
    int n,m,i,j,k,hit=0;
    cout<<"Enter number of frames\n";
    cin>>n;
    cout<<"Enter number of processes\n";
    cin>>m;
    vector<int> p(m);
    vector<int> hi(m);
    cout<<"Enter processes\n";
    for(i=0;i<m;i++){
        cin>>p[i];
    }
    vector<vector<int>> a(n);
    for(i=0;i<n;i++){
        a[i]=vector<int>(m,-1);
    }
    map <int, int> mp;
    for(i=0;i<m;i++){
        vector<pair<int,int>> c;
        for(auto q: mp){
            c.push_back({q.second,q.first});
        }
        sort(c.begin(),c.end());
        bool hasrun=false;
        for(j=0;j<n;j++){
            if(a[j][i]==p[i]){
```

```
                hit++;
                hi[i]=1;
                mp[p[i]]++;
                hasrun=true;
                break;
            }
            if(a[j][i]==-1){
                for(k=i;k<m;k++)
                    a[j][k]=p[i];
                mp[p[i]]++;
                hasrun=true;
                break;
            }
        }
        if(j==n||hasrun==false){
            for(j=0;j<n;j++){
                if(a[j][i]==c[c.size()-1].second){
                    mp.erase(a[j][i]);
                    for(k=i;k<m;k++)
                        a[j][k]=p[i];
                    mp[p[i]]++;
                    break;
                }
            }
        }
        for(auto q:mp){
            if(q.first!=p[i]){
                mp[q.first]++;
            }
        }
    }
    cout<<"Process ";
    for(i=0;i<m;i++){
        cout<<p[i]<<" ";
    }
    cout<<'\n';
    for(i=0;i<n;i++){
        cout<<"Frame "<<i<<" ";
        for(j=0;j<m;j++){
            if(a[i][j]==-1)
```

```
                cout<<"E ";
                else
            cout<<a[i][j]<<" ";
        }
        cout<<'\n';
    }
    for(i=0;i<m;i++){
        if(hi[i]==0)
        cout<<"  ";
        else
        cout<<hi[i]<<" ";
    }
    cout<<"\n";
    cout<<"Hit "<<hit<<'\n'<<"Page Fault "<<m-hit<<'\n';
    return 0;
}
```

```
ksheeraj@ksheeraj-VirtualBox:~$ gedit pagefifo.cpp
ksheeraj@ksheeraj-VirtualBox:~$ g++ pagefifo.cpp
ksheeraj@ksheeraj-VirtualBox:~$ ./a.out
Enter number of frames
3
Enter number of processes
12
Enter processes
1 2 3 4 1 2 5 1 2 3 4 5
Process 1 2 3 4 1 2 5 1 2 3 4 5
Frame 0 1 1 1 4 4 4 5 5 5 5 5 5
Frame 1 E 2 2 2 1 1 1 1 1 3 3 3
Frame 2 E E 3 3 3 2 2 2 2 2 4 4
              1 1     1
Hit 3
Page Fault 9
ksheeraj@ksheeraj-VirtualBox:~$
```

b) LRU- Least Recently Used

```
#include<bits/stdc++.h>
using namespace std;
int main(){
    int n,m,i,j,k,hit=0;
    cout<<"Enter number of frames\n";
    cin>>n;
    cout<<"Enter number of processes\n";
```

```
cin>>m;
vector<int> p(m);
vector<int> hi(m);
cout<<"Enter processes\n";
for(i=0;i<m;i++){
    cin>>p[i];
}
vector<vector<int>> a(n);
for(i=0;i<n;i++){
    a[i]=vector<int>(m,-1);
}
map <int, int> mp;
for(i=0;i<m;i++){
    vector<pair<int,int>> c;
    for(auto q: mp){
        c.push_back({q.second,q.first});
    }
    sort(c.begin(),c.end());
    bool hasrun=false;
    for(j=0;j<n;j++){
        if(a[j][i]==p[i]){
            hit++;
            hi[i]=1;
            mp[p[i]]=1;
            hasrun=true;
            break;
        }
        if(a[j][i]==-1){
            for(k=i;k<m;k++)
                a[j][k]=p[i];
            mp[p[i]]++;
            hasrun=true;
            break;
        }
    }
    if(j==n||hasrun==false){
        for(j=0;j<n;j++){
            if(a[j][i]==c[c.size()-1].second){
                mp.erase(a[j][i]);
                for(k=i;k<m;k++)
```

```
                        a[j][k]=p[i];
                    mp[p[i]]++;
                    break;
                }
            }
        }
        for(auto q:mp){
            if(q.first!=p[i]){
                mp[q.first]++;
            }
        }
    }
    cout<<"Process ";
    for(i=0;i<m;i++){
        cout<<p[i]<<" ";
    }
    cout<<'\n';
    for(i=0;i<n;i++){
        cout<<"Frame "<<i<<" ";
        for(j=0;j<m;j++){
            if(a[i][j]==-1)
                cout<<"E ";
                else
            cout<<a[i][j]<<" ";
        }
        cout<<'\n';
    }
    for(i=0;i<m;i++){
        if(hi[i]==0)
        cout<<"  ";
        else
        cout<<hi[i]<<" ";
    }
    cout<<"\n";
    cout<<"Hit "<<hit<<'\n'<<"Page Fault "<<m-hit<<'\n';
    return 0;
}
```

```
ksheeraj@ksheeraj-VirtualBox:~$ gedit pagelru.cpp
ksheeraj@ksheeraj-VirtualBox:~$ g++ pagelru.cpp
ksheeraj@ksheeraj-VirtualBox:~$ ./a.out
Enter number of frames
3
Enter number of processes
12
Enter processes
1 2 3 4 1 2 5 1 2 3 4 5
Process 1 2 3 4 1 2 5 1 2 3 4 5
Frame 0 1 1 1 4 4 4 5 5 5 3 3 3
Frame 1 E 2 2 2 1 1 1 1 1 1 4 4
Frame 2 E E 3 3 3 2 2 2 2 2 2 5
              1 1
Hit 2
Page Fault 10
ksheeraj@ksheeraj-VirtualBox:~$
```

c) Optimal

```
#include<bits/stdc++.h>
using namespace std;
int main(){
    int n,m,i,j,k;
    cout<<"Enter number of frames\n";
    cin>>n;
    cout<<"Enter number of processes\n";
    cin>>m;
    vector<int> p(m);
    cout<<"Enter processes\n";
    for(i=0;i<m;i++){
        cin>>p[i];
    }
    vector<vector<int>> a(n,vector<int>(m,-1));
    map <int, int> mp;
    for(i=0;i<m;i++){
        vector<int> op;
        vector<pair<int,int>> c;
        for(auto q: mp){
            c.push_back({q.second,q.first});
        }
        for(int q=i+1;q<m;q++){
            for(j=0;j<n;j++){
                if(a[j][i]==p[q]){
```

```
                op.push_back(p[q]);
            }
        }
    }
    sort(op.begin(),op.end());
    op.erase(unique(op.begin(),op.end()),op.end());
    bool dontCall=true;
    if(op.size()==n){
        dontCall=false;
    }
    sort(c.begin(),c.end());
    bool hasrun=false;
    for(j=0;j<n;j++){
        if(a[j][i]==p[i]){
            mp[p[i]]++;
            hasrun=true;
            break;
        }
        if(a[j][i]==-1){
            for(k=i;k<m;k++)
                a[j][k]=p[i];
            mp[p[i]]++;
            hasrun=true;
            break;
        }
    }
    if(j==n||hasrun==false){
        for(j=0;j<n;j++){
            if(dontCall==true){
                if(a[j][i]==c[c.size()-1].second){
                    mp.erase(a[j][i]);
                    for(k=i;k<m;k++)
                        a[j][k]=p[i];
                    mp[p[i]]++;
                    break;
                }
            }
            else if(dontCall==false){
                if(a[j][i]==op[op.size()-1]){
                    mp.erase(a[j][i]);
```

```
                    for(k=i;k<m;k++)
                        a[j][k]=p[i];
                    mp[p[i]]++;
                    break;
                }
            }
        }
    }
    for(auto q:mp){
        if(q.first!=p[i]){
            mp[q.first]++;
        }
    }
}
int hit=0;
vector<int> hitv(m);

for(i=1;i<m;i++){
    for(j=0;j<n;j++){
        if(p[i]==a[j][i-1]){
            hit++;
            hitv[i]=1;
            break;
        }
    }
}

cout<<"Process ";
for(i=0;i<m;i++){
    cout<<p[i]<<" ";
}
cout<<'\n';
for(i=0;i<n;i++){
    cout<<"Frame "<<i<<" ";
    for(j=0;j<m;j++){
        if(a[i][j]==-1)
            cout<<"E ";
            else
        cout<<a[i][j]<<" ";
    }
```

```
            cout<<'\n';
        }
        cout<<"HIT     ";
        for(i=0;i<hitv.size();i++){
            if(hitv[i]==0)
                cout<<"  ";
            else
            cout<<hitv[i]<<" ";
        }
        cout<<"\n";
        cout<<"Hit "<<hit<<'\n'<<"Page Fault "<<m-hit<<'\n';
        return 0;
}
```

```
ksheeraj@ksheeraj-VirtualBox:~$ gedit pageoptimal.cpp
ksheeraj@ksheeraj-VirtualBox:~$ g++ pageoptimal.cpp
ksheeraj@ksheeraj-VirtualBox:~$ ./a.out
Enter number of frames
3
Enter number of processes
12
Enter processes
1 2 3 4 1 2 5 1 2 3 4 5
Process 1 2 3 4 1 2 5 1 2 3 4 5
Frame 0 1 1 1 1 1 1 1 1 3 3 3
Frame 1 E 2 2 2 2 2 2 2 2 4 4
Frame 2 E E 3 4 4 4 5 5 5 5 5 5
HIT             1 1   1 1     1
Hit 5
Page Fault 7
ksheeraj@ksheeraj-VirtualBox:~$
```