PROGRAM STUDI
TEKNIK INFORMATIKA
FAKULTAS ILMU KOMPUTER
UNIVERSITAS DIAN NUSWANTORO

Mata Kuliah
Dasar Pemrograman

Array Multidimensi

TIM DASAR PEMROGRAMAN
TEKNIK INFORMATIKA S1
UNIVERSITAS DIAN NUSWANTORO

Capaian Pembelajaran

1. Menjelaskan skema pemrosesan sekuensial array 2 dimensi
2. Mempraktekkan skema pemrosesan sekuensial pada array 1 dimensi dan 2 dimensi

Array 2D Skema Pemrosesan Sekuensial

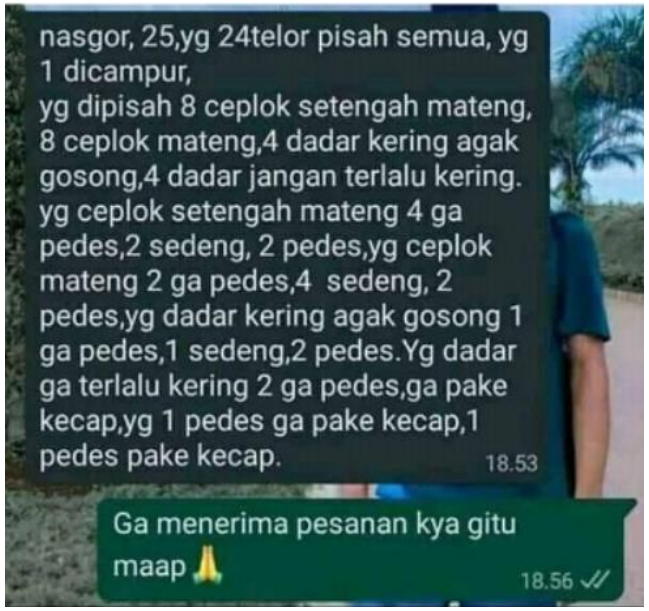
```
#include <iostream>

using namespace std;

int main()
{
//kamus
    int arrNilai[2][3];
//algoritma
    //input
    for(int i=0;i<2;i++)
    {
        for(int j=0;j<3;j++)
        {
            cin>>arrNilai[i][j];
        }
    }
    //output
    for(int i=0;i<2;i++)
    {
        for(int j=0;j<3;j++)
        {
            cout<<"i:"<<i<<"j:"<<j<<"nilai:"<<arrNilai[i][j]<<endl;
        }
    }
    return 0;
}
```

Studi Kasus

- https://www.ruangguru.com/blog/mengenal-matriks-dalam-matematika-pengertian-jenis-dan-transpose



Telor	Tingkat Kepedasan				
	Tidak pedas	Sedang	Pedas	Tidak pedas + tidak pakai kecap	Pedas + tidak pakai kecap
Telor campur	0	1	0	0	0
Ceplok ½ mateng	4	2	2	0	0
Ceplok mateng	2	4	2	0	0
Dadar kering agak gosong	1	1	2	0	0
Dadar jangan terlalu kering	0	0	1	2	1

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 4 & 2 & 2 & 0 & 0 \\ 2 & 4 & 2 & 0 & 0 \\ 1 & 1 & 2 & 0 & 0 \\ 0 & 0 & 1 & 2 & 1 \end{bmatrix}$$

Kamus dan Matriks Input Output

```
int matriksA[10][10], matriksB[10][10];
int matriksAtranspose[10][10], matriksABtambah[10][10], matriksABkurang[10][10], matriksABkali[10][10];
int baris, kolom;

cout << "Masukkan baris untuk matriks A dan B = ";
cin >> baris;
cout << "Masukkan kolom untuk matriks A dan B = ";
cin >> kolom;

//input
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        cout << "matriksA["<<i<<"]["<<j<<"] = ";
        cin >> matriksA[i][j];
    }
}
//output matriksA
cout << "matriksA" << endl;
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        cout << matriksA[i][j] << "\t";
    }
    cout << endl;
}
```

```
"D:\111Pengajarann\1111Daspro\MATERI DASPRO 2021\Koding\Larihan 12 - Array 2D\bin\Debug\
Masukkan baris untuk matriks A dan B = 2
Masukkan kolom untuk matriks A dan B = 2
matriksA[0][0] = 0
matriksA[0][1] = 1
matriksA[1][0] = 4
matriksA[1][1] = 2
matriksA
0       1
4       2
```

Matriks Transpose

```
//transpose
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        matriksAtranspose[j][i] = matriksA[i][j];
    }
}
//output matriksAtranspose
cout << "matriksAtranspose" << endl;
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        cout << matriksAtranspose[i][j] << "\t";
    }
    cout << endl;
}
```

```
"D:\111Pengajarann\
matriksAtranspose
0       4
1       2
```

Diketahui:

- Baris = 2
- Kolom = 2

matriksA → matriksAtranspose

0	1
4	2

0	4
1	2

i	j	matriksAtranspose				

0
i<baris?
0<2? v
	0
	j<kolom
	0<2? v
		matriksAtranspose[j][i] = matriksA[i][j];
		matriksAtranspose[0][0] = matriksA[0][0];
		matriksAtranspose[0][0] = 0;
			0		**0**	1

					4	2

	1
	j<kolom
	1<2? v
		matriksAtranspose[j][i] = matriksA[i][j];
		matriksAtranspose[1][0] = matriksA[0][1];
		matriksAtranspose[1][0] = 1;
			0		0	**1**

			1		4	2
	2 j<kolom 2<2? x					

1
i<baris?
1<2? v
	0
	j<kolom
	0<2? v
		matriksAtranspose[j][i] = matriksA[i][j];
		matriksAtranspose[0][1] = matriksA[1][0];
		matriksAtranspose[0][1] = 4;
			0	4	0	1

			1		**4**	2

	1
	j<kolom
	1<2? v
		matriksAtranspose[j][i] = matriksA[i][j];
		matriksAtranspose[1][1] = matriksA[1][1];
		matriksAtranspose[1][1] = 2;
			0	4	0	1

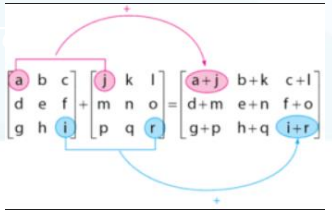
			1	2	4	**2**
	2 j<kolom 2<2? x					
2 i<baris? 2<2? x						

matriksA + matriksB = matriksABtambah

0	1
4	2

2	4
1	1

2	5
5	3



Penjumlahan Matriks

```
//input
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        cout << "matriksB["<<i<<"]["<<j<<"] = ";
        cin >> matriksB[i][j];
    }
}
//output matriksB
cout << "matriksB" << endl;
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        cout << matriksB[i][j] << "\t";
    }
    cout << endl;
}
//penjumlahan matrik AB
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        matriksABtambah[i][j] = matriksA[i][j] + matriksB[i][j];
    }
}
//output matriksABtambah
cout << "matriksABtambah" << endl;
for(int i=0; i<baris; i++){
    for(int j=0; j<kolom; j++){
        cout << matriksABtambah[i][j] << "\t";
    }
    cout << endl;
}
```

```
"D:\111Pengajarann\1111Daspro\MATE
matriksB[0][0] = 2
matriksB[0][1] = 4
matriksB[1][0] = 1
matriksB[1][1] = 1
matriksB
2       4
1       1
matriksABtambah
2       5
5       3
```

i	j	matriksABtambah

0
i<baris?
0<2? v
	0
	j<kolom
	0<2? v
		matriksABtambah[i][j] = matriksA[i][j] + matriksB[i][j];
		matriksABtambah[0][0] = matriksA[0][0] + matriksB[0][0];
		matriksABtambah[0][0] = 0 + 2;

	1
	j<kolom
	1<2? v
		matriksABtambah[i][j] = matriksA[i][j] + matriksB[i][j];
		matriksABtambah[0][1] = matriksA[0][1] + matriksB[0][1];
		matriksABtambah[0][1] = 1 + 4;

	2 j<kolom 2<2? x	

1
i<baris?
1<2? v
	0
	j<kolom
	0<2? v
		matriksABtambah[i][j] = matriksA[i][j] + matriksB[i][j];
		matriksABtambah[1][0] = matriksA[1][0] + matriksB[1][0];
		matriksABtambah[1][0] = 4 + 1;

	1
	j<kolom
	1<2? v
		matriksABtambah[i][j] = matriksA[i][j] + matriksB[i][j];
		matriksABtambah[1][1] = matriksA[1][1] + matriksB[1][1];
		matriksABtambah[1][1] = 2 + 1;

	2 j<kolom 2<2? x	
2 i<baris? 2<2? x		

Perkalian Matriks, buat kodingnya

- Contoh-contoh perkalian matriks

Kalikan sesuai urutannya

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \times \begin{pmatrix} p & q \\ r & s \end{pmatrix} = \begin{pmatrix} ap+br & aq+bs \\ cp+dr & cq+ds \end{pmatrix}$$

$$A \times B = \begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix} \times \begin{bmatrix} 2 & 1 \\ 1 & -1 \end{bmatrix}$$

$$A \times B = \begin{bmatrix} (3 \times 2) + (1 \times 1) & (3 \times 1) + (1 \times -1) \\ (2 \times 2) + (0 \times 1) & (2 \times 1) + (0 \times -1) \end{bmatrix}$$

$$A \times B = \begin{bmatrix} 6+1 & 3-1 \\ 4+0 & 2+0 \end{bmatrix}$$

$$A \times B = \begin{bmatrix} 7 & 2 \\ 4 & 2 \end{bmatrix}$$

$$\begin{pmatrix} 2 & -3 \\ 0 & 5 \\ -1 & 3 \end{pmatrix} \begin{pmatrix} 0 & 3 \\ -4 & 1 \end{pmatrix}$$

$3 \times \cancel{2}$ $\quad \cancel{2} \times 2$

jika dikali maka menjadi 3×2

$$= \begin{pmatrix} 2 \cdot 0 + (-3) \cdot (-4) & 2 \cdot 3 + (-3) \cdot 1 \\ 0 \cdot 0 + 5 \cdot (-4) & 0 \cdot 3 + 5 \cdot 1 \\ -1 \cdot 0 + 3 \cdot (-4) & -1 \cdot 3 + 3 \cdot 1 \end{pmatrix}$$

$$= \begin{pmatrix} 0 + 12 & 6 - 3 \\ 0 - 20 & 0 + 5 \\ 0 - 12 & -3 + 3 \end{pmatrix}$$

$$= \begin{pmatrix} 12 & 3 \\ -20 & 5 \\ -12 & 0 \end{pmatrix}$$

cara mengalikan matriks

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} e & f \\ g & h \end{pmatrix}$$

$$= \begin{pmatrix} a \cdot e + b \cdot g & a \cdot f + b \cdot h \\ c \cdot e + d \cdot g & c \cdot f + d \cdot h \end{pmatrix}$$

horizontal kali vertikal

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 3 & 1 \\ -1 & 2 \end{bmatrix} =$$

$$\begin{bmatrix} 1.1 + 2.3 + 3.-1 & 1.2 + 2.1 + 3.2 \\ 4.1 + 0.3 + 1.-1 & 4.2 + 0.1 + 1.2 \end{bmatrix} =$$

$$\begin{bmatrix} 4 & 10 \\ 3 & 10 \end{bmatrix}$$

Array 3D Skema Pemrosesan Sekuensial

```
#include <iostream>

using namespace std;

int main()
{
//kamus
    int arrNilai[2][3][4];
//algoritma
    //input
    for(int i=0;i<2;i++)
    {
        for(int j=0;j<3;j++)
        {
            for(int k=0;k<3;k++)
            {
                cin>>arrNilai[i][j][k];
            }
        }
    }
    //output
    for(int i=0;i<2;i++)
    {
        for(int j=0;j<3;j++)
        {
            for(int k=0;k<3;k++)
            {
                cout<<"i:"<<i<<"j:"<<j<<"k:"<<k<<" nilai:"<<arrNilai[i][j][k]<<endl;
            }
        }
    }
    return 0;
}
```

Referensi

Utama:

1. Bjarne Stroustrup, 2014, Programming: Principles and Practice Using C++ (Second Edition), Addison-Wesley Professional

Pendukung:

1. Introduction to Computer Science and Programming in Python, MIT https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016

2. Introduction to Computer Science and Programming, MIT https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-00sc-introduction-to-computer-science-and-programming-spring-2011/index.htm

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ANY QUESTIONS?