

Exercise Week 06

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Time Schedule

- 10' Referenzen
- 15' Statische Arrays
- 15' Vektoren
- 5' Schriftzeichen

Learning Objectives

- Kenntnis des Nutzens von Referenzen
- Verständnis der Grenzen des Arrays und Kenntnis möglicher Alternativen

Referenzen II

```
1 void try_to_increment (int m) {  
2     m = m + 1;  
3 }  
4  
5 void increment (int& m) {  
6     m = m + 1;  
7 }
```

Referenzen II

```
1 //pre-increment
2 int& operator++(int& a){
3     a = a + 1;
4     return a;
5 }
6
7 //post-increment
8 int operator++(int& a){
9     int temp = a;
10    a = a + 1;
11    return temp;
12 }
```

Referenzen II

```
1 //pre-increment: return by reference
2 int& operator++(int& a){
3     a = a + 1;
4     return a;
5 }
6
7 //post-increment: return by value
8 int operator++(int& a){
9     int temp = a;
10    a = a + 1;
11    return temp;
12 }
```

Verkettung

- pre-increment erlaubt Verkettung:

```
1 ++(++i)
```

- post-increment erlaubt keine Verkettung:

```
1 ++(i++)  
2 (++i)++  
3 (i++)++
```

Verkettung

- pre-increment erlaubt Verkettung:

```
1 ++(++i) //funktioniert
```

- post-increment erlaubt keine Verkettung:

```
1 ++(i++) //funktioniert nicht  
2 (++i)++ //funktioniert  
3 (i++)++ //funktioniert nicht
```


Referenzen II

Vorteile

- Calling by reference verhindert unnötige Kopien.

```
1 void read_ij(Matrix& A, unsigned int i,  
   unsigned int j);
```

- Manchmal ist es unmöglich zu kopieren.

```
1 int a = 5;  
2 int b = a; //making a copy of an int  
3 std::ostream o = std::cout;  
4 //copying std::cout impossible!  
5 std::ostream& o = std::cout; //this works!
```

Statische Arrays

```
1  int b[8] = {1,2,3,4};  
2  int c[4];  
3  int a[] = {7,5,0,3,8};  
4  std::cout << a[0];  
5  std::cout << a[4];  
6  std::cout << a[5];  
7  std::cout << a[-10];
```

Statische Arrays

```
1  int b[8] = {1,2,3,4};    //[1 2 3 4 0 0 0 0]
2  int c[4];                //[w x y z]
3  int a[] = {7,5,0,3,8};   //[7 5 0 3 8]
4  std::cout << a[0];      // outputs 7
5  std::cout << a[4];      // outputs 8
6  std::cout << a[5];      // random garbage /
   segmentation fault
7  std::cout << a[-10];    // random garbage /
   segmentation fault
```

Statische Arrays

```
1 int array_length;  
2 cin>>array_length;  
3  
4 int array[array_length];
```

Statische Arrays

```
1  const int array_length = 10;  
2  
3  int array[array_length];
```

Exercise 06_1 ~ 5'

```
1  int numbers[10];  
2  
3  //read 10 numbers  
4  
5  //output all 10 numbers to cout  
6  
7  //make a copy of "numbers"
```

Solution 06_1 ~ 5'

```
1  int numbers[10];
2
3  //read 10 numbers
4  for (int i = 0; i < 10; i++)
5  std::cin >> numbers[i];
6
7  //output all 10 numbers to cout
8  for (int i = 0; i < 10; i++)
9  std::cout << numbers[i] << " ";
10
11 //make a copy of "numbers"
12 int copy[10];
13 for (int i=0; i<10; i++)
14     copy[i] = numbers[i];
```

Vectors

```
1  #include <vector>
2
3  int main(){
4      int n;
5      cin>>n;
6      std::vector<int> numbers(n,0);
7
8      for (int i = 0; i<n; i++)
9          std::cin>>numbers[i];
10
11     for (int i = 0; i<n; i++)
12         std::cout<<numbers[i]<<" ";
13
14     std::vector<int> copy = numbers;
15
16 }
```


Vectors

```
1 cout<<numbers.size(); //Laenge des Vektors
2
3 numbers.push_back(7); //Verlaengerung des
  Vektors
4
5 cout<<numbers[11]; //garbage /
  segmentation fault
6
7 cout<<numbers.at(11); //Prueft Index auf
  Validitaet
```

vector

Schriftzeichen

char

- 1 byte - 7 bits verfügbar ([Spezialrolle 1. bit](#))
- Speichert Symbole

*	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	TAB	LF	VT	FF	CR	SO	SI
1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
2		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	

[ASCII code](#)

Schriftzeichen

```
1 char letter 'a';
2 int number = letter; // conversion
3 //number = 97
4
5 int number = 66;
6 char letter = number; //implicite
7     conversion
8 //letter = 'B'
```

Schriftzeichen

Das Alphabet

(65)–	10 00001 =	'A'
(66)–	10 00010 =	'B'
	⋮	
(97)–	11 00001 =	'a'
(98)–	11 00010 =	'b'