Introduction to informatics

Piroska Biró

Labor 01

Contact & Office Hours

- Office Hours
  - Monday 9-10 am
  - Wednesday 4-5 pm
- Office: I-227

- E-mail:
  - biro.piroska@inf.unideb.hu
- Course material (Class Webpage):
  - https://w1.inf.unideb.hu/web/biropiroska/introduction-to-infromatics/

Syllabus

- **Types of course:** Theory/Labor
- **Course number/week:** 2+2
- **Subject code:** INGK201-K5
- **Credit:** 5

- **Theory**: Wednesday 8-10, F01
- **Labors:**
  - Wednesday 10-12, 108
  - Wednesday 12-14, 108

Requirements

- **Attendance and Participation:**
  - In every course and labor there will be an attendance sheet.
  - Maximum three absences are allowed in labor.
  - Maximum 15 minutes late arrival is accepted in labor.

- **Assessment and grading:**
  - Midterm 20%
  - End-term 20%
  - Final exam 60%

16th	**September**	Introduction, Test, Basic concepts, History of computing
24th	**September**	Computer number systems, Conversion rules, Arithmetic operations in different number systems
1st	**October**	Data storage
8th	**October**	Boole-algebra, Logical operations, Logical gates
15th	**October**	Operating Systems
22th	**October**	Professional Week – No class
29th	**October**	Networking and the Internet
5th	**November**	**Midterm 1**
12th	**November**	Algorithms
19th	**November**	C programming language Data types, Operators, Statements, Loops
26th	**November**	Basic algorithms, Functions
3rd	**December**	Arrays and strings, Pointers
10th	**December**	Iterative, Recursive, Induction
17th	**December**	**End-term 2**

Number systems

- Decimal number system
  - the concept of place value
- Generally the numbers can be described in the following form:

$$a_n a_{n-1} \ldots a_1 a_0 a_{-1} a_{-2} \ldots a_{-m}$$

$$\sum_{i=-m}^{n} a_i \cdot 10^i \text{ , when } 0 \leq a_i < 10.$$

- Optional in the p base ($p>1$) number system the used digits 0, 1, …, $p-1$, the place values are the powers of number p:

$$\sum_{i=-m}^{n} a_i \cdot p^i \text{ , when } 0 \leq a_i < p.$$

For example: 123,45

Number systems

- Binary (base two) number system
  - digits: 0, 1
- Ternary (base three) number system
  - digits: 0, 1, 2

  ...
- Octonary (base eight) number system
  - digits: 0, 1, 2,..., 7

  ...
- Decimal (base ten) number system/ten base
  - digits: 0, 1, 2,..., 9

  ...
- Hexadecimal (base sixteen) number system
  - digits: 0, 1, 2, ..., 9, A, B, C, D, E, F

Binary p = 2	Ternary p = 3	Quinary p = 5	Octonary p = 8	Decimal p = 10	Duodecimal p = 12	Hexadecimal p = 16
0	0	0	0	0	0	0
1	1	1	1	1	1	1
10	2	2	2	2	2	2
11	10	3	3	3	3	3
100	11	4	4	4	4	4
101	12	10	5	5	5	5
110	20	11	6	6	6	6
111	21	12	7	7	7	7
1000	22	13	10	8	8	8
1001	100	14	11	9	9	9
1010	101	20	12	10	a	A
1011	102	21	13	11	b	B
1100	110	22	14	12	10	C
1101	111	23	15	13	11	D
1110	112	24	16	14	12	E
1111	120	25	17	15	13	F
10000	121	26	20	16	14	10

Number systems base names

- 2 binary
- 3 ternary
- 4 quaternary
- 5 quinary
- 6 senary
- 7 septenary
- 8 octonary
- 9 nonary
- 10 decimal
- 11 undenary
- 12 duodecimal
- 13 tridecimal
- 14 quattuordecimal
- 15 quindecimal
- 16 sexadecimal

Exercise

- Convert each of the following different base representation to its equivalent base ten form:

1. $1011100.101_2 =$
2. $1221.12_3 =$
3. $152.43_6 =$
4. $173.104_8 =$
5. $841.47_9 =$
6. $13A.2F_{16} =$

Convert from base ten to different base number representations

$113.45_{(10}$

113	2
56	1
28	0
14	0
7	0
3	1
1	1
0	1

0	.45	2
0	.90	
1	.8	
1	.6	
1	.2	
0	.4	
0	.8	
1	.6	
1	.2	
0	.4	
0	.8	

$1100001.0111001100_{(2}$

Exercise

- Convert each of the following base ten representation to its equivalent binary form:
  1. $962_{10} =$
  2. $3241_{10} =$
  3. $871{,}64_{10} =$
  4. $1322{,}181_{10} =$
- Convert each of the following ten base representation to its equivalent octonary form:
  1. $51_{10} =$
  2. $718_{10} =$
  3. $417{,}18_{10} =$
  4. $791{,}27_{10} =$
- Convert each of the following ten base representation to its equivalent hexadecimal form:
  1. $334_{10} =$
  2. $8191_{10} =$
  3. $218{,}2_{10} =$
  4. $245{,}17_{10} =$

Connection between the octal and the binary system

Binary	Octal
000	0
001	1
010	2
011	3
100	4
101	5
110	6
111	7

Connection between the hexadecimal and the binary system

Binary	Hexadecimal	Binary	Hexadecimal
0000	0	1000	8
0001	1	1001	9
0010	2	1010	A
0011	3	1011	B
0100	4	1100	C
0101	5	1101	D
0110	6	1110	E
0111	7	1111	F

Exercise

- Convert each of the following binary representation to its equivalent octal and hexadecimal form, and each of the following hexadecimal representation to its equivalent binary and octal form:

1. $1110\ 1001\ 1100\ 0011_2 =$
2. $1011\ 0111\ 0101\ 0100_2 =$
3. $1000\ 1101\ 1111\ 0011\ 1101_2 =$
4. $1010\ 1011\ 0011\ 1110\ 0001\ 0101_2 =$
5. $3BCF_{16} =$
6. $BF29_{16} =$
7. $48C5_{16} =$
8. $63AE_{16} =$

Excercise

- Convert each of the following ten base representation to its equivalent binary form:
  1. $1862_{10} =$
  2. $93281_{10} =$
  3. $39871{,}64_{10} =$
  4. $49322{,}1813_{10} =$
- Convert each of the following ten base representation to its equivalent base seven (septenary) form:
  1. $1951_{10}=$
  2. $82718_{10}=$
  3. $417{,}18_{10}=$
  4. $13791{,}27_{10}=$
- Convert each of the following ten base representation to its equivalent base nine (nonary) form:
  1. $2334_{10}=$
  2. $83191_{10}=$
  3. $218{,}92_{10}=$
  4. $5245{,}67_{10}=$

Webpages – Practicing – Converters

- http://courses.cs.vt.edu/~cs1104/number_conversion/conv2.html
- http://www.easysurf.cc/cnver18.html
- http://planetcalc.com/862/