UNIVERSITAS INDONESIA

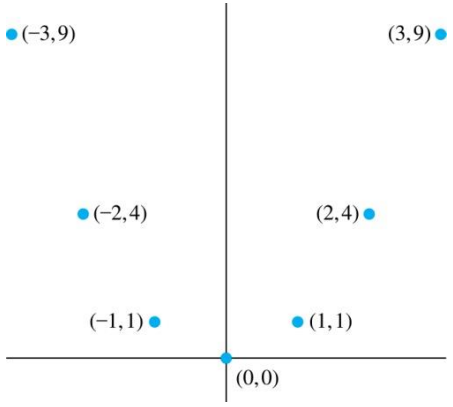
FAKULTAS ILMU KOMPUTER

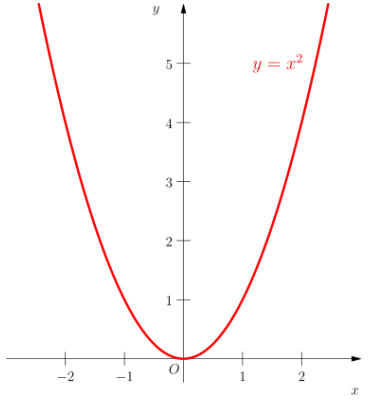
Pengenalan Matematika Diskret

Ari Saptawijaya, Ph.D.

Diskret vs. Kontinu

Diskret	Kontinu
Musim di Indonesia (hujan, kemarau)	Suhu rata-rata harian di Indonesia (26.8^o, 27.1^o, …)
Ukuran baju (S, M, L, XL)	Tinggi badan (155.7 cm, 183.4 cm, …)





Matematika Diskret & Ilmu Komputer

- Matematika Diskret vs. Kalkulus
- Landasan matematis untuk banyak mata kuliah bidang ilmu komputer

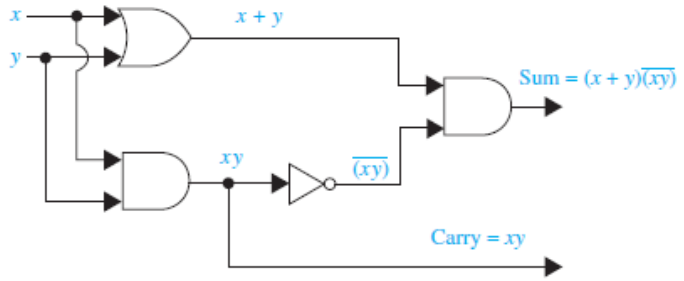


FIGURE 8 The Half Adder.

	2	9				4		
			5			1		
	4							
				4	2			
6							7	
5								
7			3					5
	1			9				
							6	

FIGURE 1 A 9 x 9 Sudoku puzzle.

TABLE 5 Teaching_assignments.

Professor	*Department*	*Course_ number*
Cruz	Zoology	335
Cruz	Zoology	412
Farber	Psychology	501
Farber	Psychology	617
Grammer	Physics	544
Grammer	Physics	551
Rosen	Computer Science	518
Rosen	Mathematics	575

TABLE 6 Class_schedule.

Department	*Course_ number*	*Room*	*Time*
Computer Science	518	N521	2:00 P.M.
Mathematics	575	N502	3:00 P.M.
Mathematics	611	N521	4:00 P.M.
Physics	544	B505	4:00 P.M.
Psychology	501	A100	3:00 P.M.
Psychology	617	A110	11:00 A.M.
Zoology	335	A100	9:00 A.M.
Zoology	412	A100	8:00 A.M.

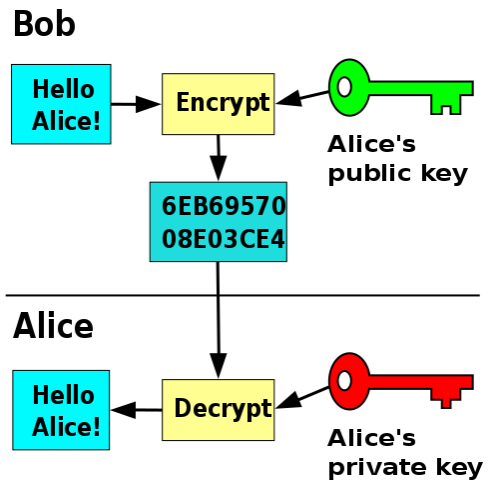
Applications of Satisfiability

Many problems, in diverse areas such as robotics, software testing, computer-aided design, machine vision, integrated circuit design, computer networking, and genetics, can be modeled in terms of propositional satisfiability. Although most of these applications are beyond the scope of this book, we will study one application here. In particular, we will show how to use propositional satisfiability to model Sudoku puzzles.

Sumber gambar:
Discrete Mathematics and Its Applications (K. H. Rossen)

FAKULTAS ILMU KOMPUTER

Matematika Diskret & Ilmu Komputer



ALGORITHM 4 The Bubble Sort.

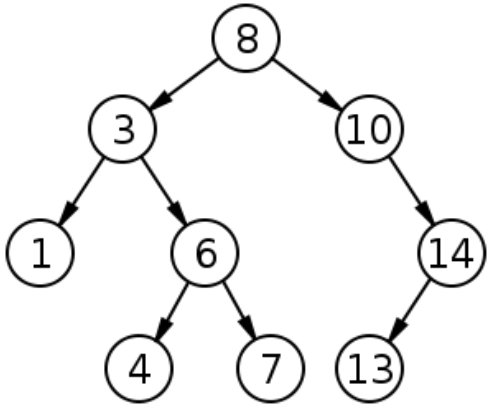
procedure *bubblesort*($a_1, \ldots, a_n$: real numbers with $n \geq 2$)
for $i := 1$ **to** $n - 1$
  for $j := 1$ **to** $n - i$
    if $a_j > a_{j+1}$ **then** interchange a_j and a_{j+1}
{$a_1, \ldots, a_n$ is in increasing order}

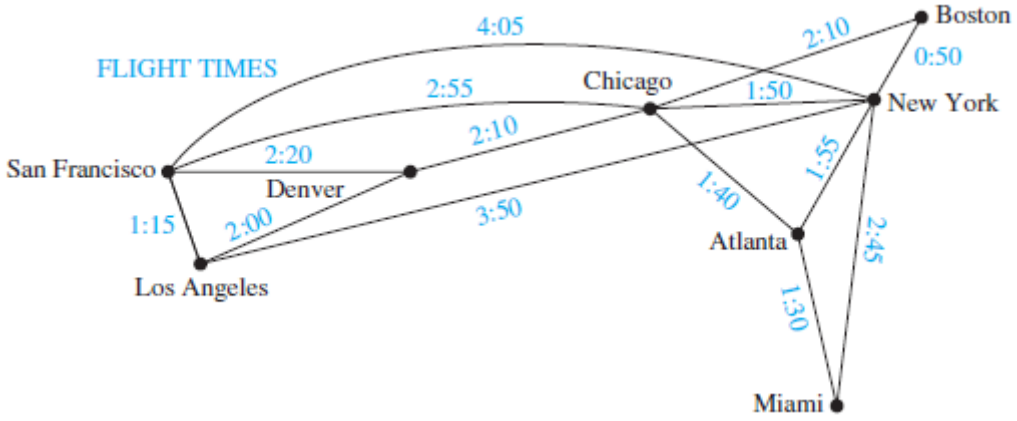
TABLE 2 The Computer Time Used by Algorithms.

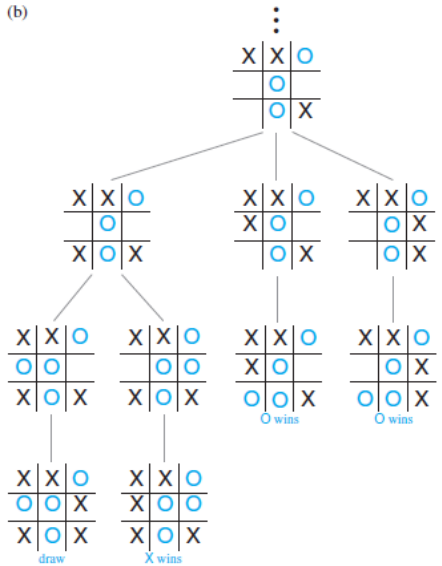
Problem Size	*Bit Operations Used*					
n	$\log n$	n	$n \log n$	n^2	2^n	$n!$
10	3×10^{-11} s	10^{-10} s	3×10^{-10} s	10^{-9} s	10^{-8} s	3×10^{-7} s
10^2	7×10^{-11} s	10^{-9} s	7×10^{-9} s	10^{-7} s	4×10^{11} yr	*
10^3	1.0×10^{-10} s	10^{-8} s	1×10^{-7} s	10^{-5} s	*	*
10^4	1.3×10^{-10} s	10^{-7} s	1×10^{-6} s	10^{-3} s	*	*
10^5	1.7×10^{-10} s	10^{-6} s	2×10^{-5} s	0.1 s	*	*
10^6	2×10^{-10} s	10^{-5} s	2×10^{-4} s	0.17 min	*	*

ALGORITHM 3 A Recursive Algorithm for Computing gcd(a, b).

procedure *gcd*(a, b: nonnegative integers with $a < b$)
if $a = 0$ **then return** b
else return *gcd*(b **mod** a, a)
{output is gcd(a, b)}







Sumber gambar:

- Discrete Mathematics and Its Applications (K. H. Rossen)
- Wikipedia

Tujuan Pembelajaran Matematika Diskret

- Penalaran Matematis

  Membangun argumentasi matematis dan pembuktian secara logis

- Analisis Kombinatoris

  Menggunakan teknik yang tepat untuk menghitung objek diskret

- Struktur Diskret

  Menggunakan struktur matematis (himpunan, relasi, graph, tree, bilangan bulat, …) untuk merepresentasikan objek diskret, hubungan antar objek, sifat, dan operasinya

Menggunakan struktur dan teknik dalam matematika diskret untuk mengformulasikan masalah dan memecahkannya

Membangun dasar-dasar yang kuat untuk mata kuliah lanjutan di bidang ilmu komputer

UNIVERSITAS INDONESIA

FAKULTAS ILMU KOMPUTER

Apa yang sudah kita pelajari …

- Diskret vs. Kontinu
- Matematika Diskret
- Pentingnya Matematika Diskret untuk Ilmu Komputer
- Tujuan Pembelajaran Matematika Diskret

Topik selanjutnya: Logika Proposisi