Col 352

Introduction to Automata Theory of Computation

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Course Page: www.cse.iitd.ac.in/jssen

→ Col 352

H., W., Thu. Time: 12-1
11-12 11-12 12-1

→ Hopcroft and Ullman + Motwani (new ed.)

2 Hours: ~ 20%, Each
Major: ~ 40%
Take home assignment + 3 quizzes: ~ 20%

Prerequisites: → Data Str & Alg

→ Discrete Structure
Computation / Algorithms

Input \[\text{set of rules/transformations, program/computation/algorithm}\]
Output

(i) All operands are integers
(ii) First set of rules program is of finite length
(iii) Computation should terminate
(iv) Output should correct according to some specification

Efficiency is important but not central to the notion of computation

Algorithm / Computation

Computation \[\rightarrow\text{hand computation}\]
\[\leftrightarrow\text{Computer}\]
1. What kind of rules/instructions?
2. What kind of computing machinery?

Minimum set of instructions that can be considered "universal"

(i) Increment, (ii) Conditional decrement

```
if zero
  go to Inst A
else
  go to B
```

For any problem, we can write a program?

Diagram:

```
Input: I -> Program -> Algorithm -> YES/NO
  If Program terminates on input I
```
Question: Is there a sequence of integers $i_1, i_2, i_3, i_4, \ldots, i_m$ such that $i_j \in \{1, 2, 3\}$?

Given: $w_{i_1} \cdot w_{i_2} \cdot w_{i_3} \cdots w_{i_m}$

Then: $x_{i_1} \cdot x_{i_2} \cdot x_{i_3} \cdots x_{i_m}$

If yes, then $w_2 \cdot w_1 \cdot w_1 \cdot w_3 = 10.111.1.1.10$

If no, then $x_2 \cdot x_1 \cdot x_1 \cdot x_3 = 10.111.111.0$

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<th>A</th>
<th>B</th>
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<td>10</td>
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