Discrete Maths

set of symbols → Alphabet (A)

Word: an ordered set

phrase / sentence / para:

sequence of symbols

Language ⊆ A^* (Regular expression

* means 0 or more occurrences)

Can you perform set operations?

YES

Here, a person speaking mixed languages can be understood by a person who knows them all

→ While DB query can't, problem might be easily solved by set operations.

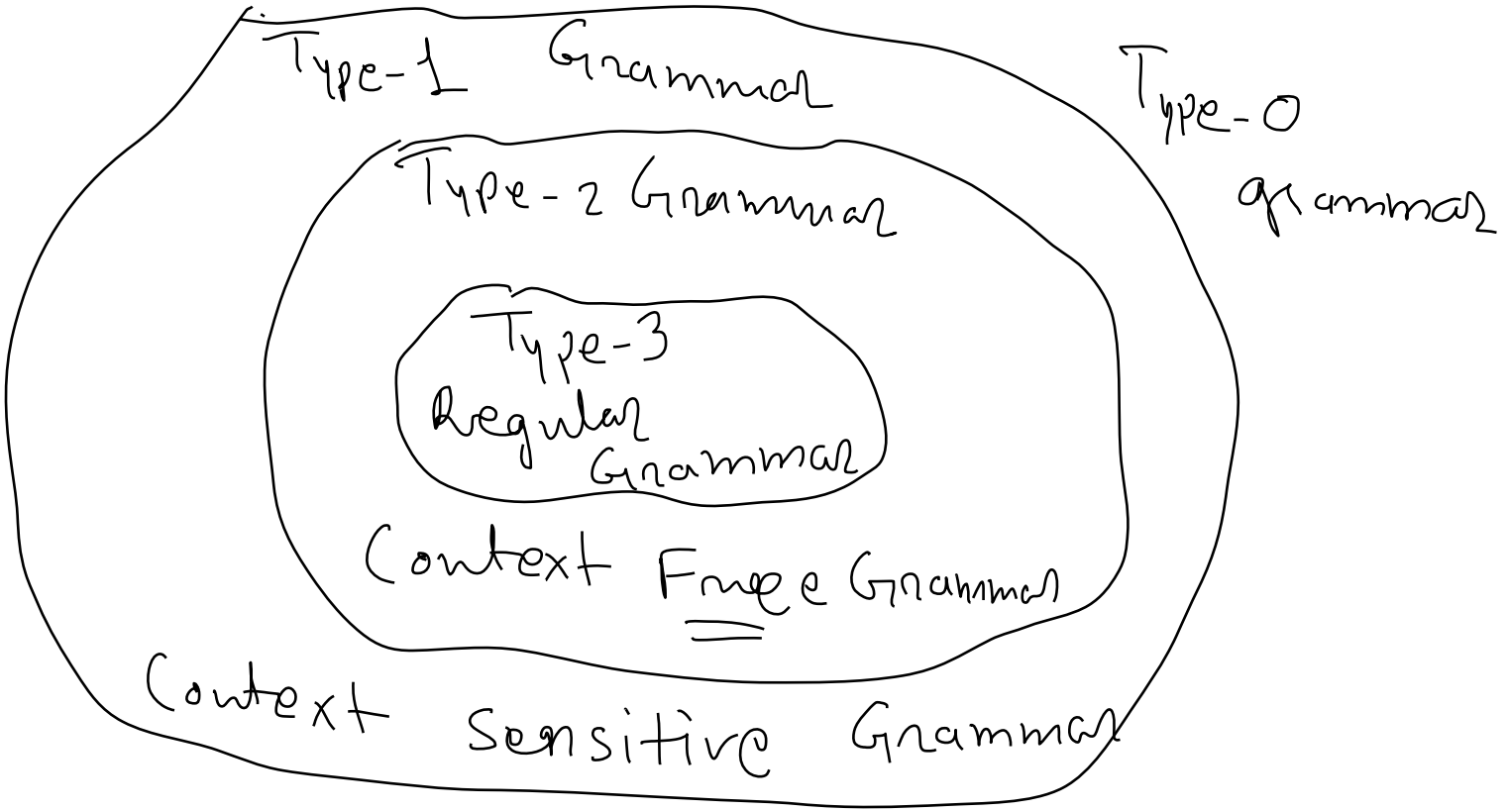
Phrase Structure Grammar

1. A set of terminals T (alphabet)
2. A set of non-terminal N
3. A set of productions P
4. Among all the non-terminal in N, there is a special NT that is referred as the starting Symbol $S \in N$ (S for starting)

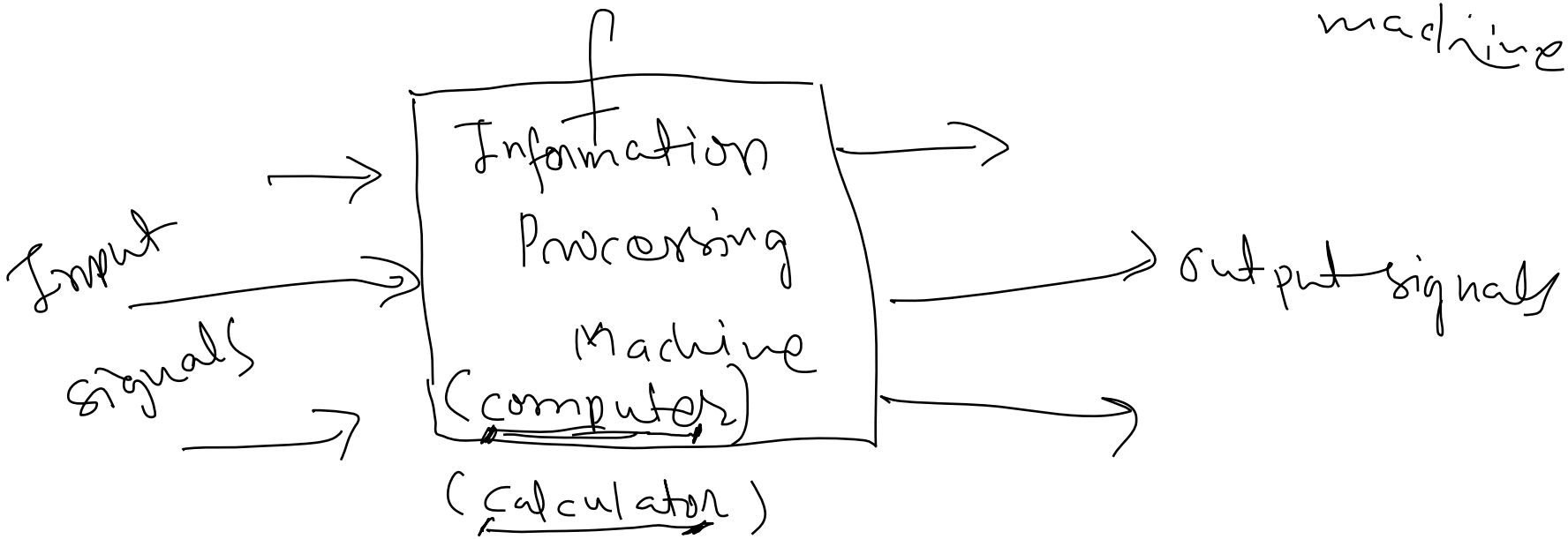
It is NOT a set.

General: mostly its gonna be single.

Relationship among different types of Grammar



Basic concepts of information proces



i.e. convert input
from upper case to lower
case

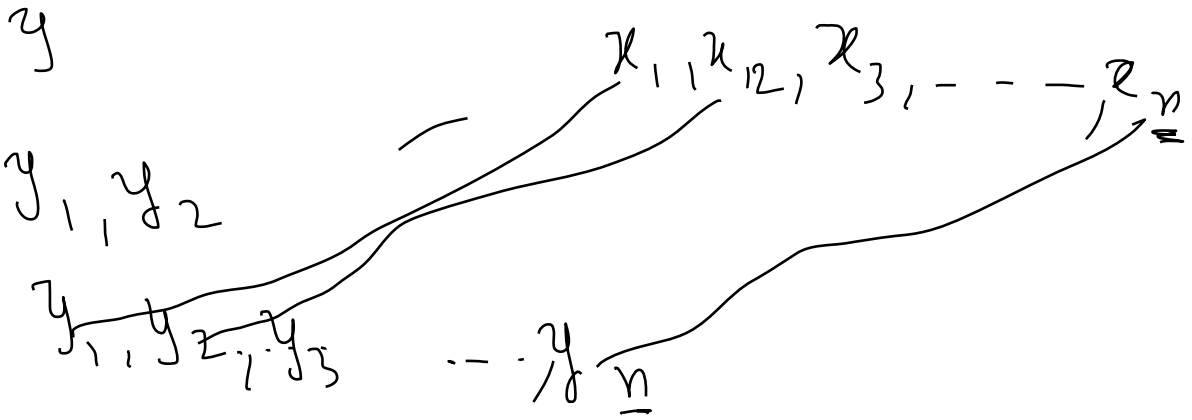
Box diagram before programming.

Observe relation of input to output

f

$y = f(x)$

Think of one to one / many to many.



Application

Vending Machine

Currency coin
- Penny 1
- Nickle 5
- Dime 10
- Quarter 25
- Dollar 100 (1 bill)

? will it revert the extra change

? will it carry forward / credit extra change for next transaction ?

.... V1 or V2 or V3 ...

Finite state machine

Abstract model

1. A finite set of states
$$S = \{S_0, S_1, S_2, \ldots, S_n\}$$
↑ finite

2. A special element of set S, "S_0" referred to as the initial state.

3. A finite set of input letters
$$\Sigma = \{i_1, i_2, i_3, \ldots\}$$

4. A finite set of output letters

$$O = \{o_1, o_2, \ldots\}$$

5. A function f from $S \times I$ to S || same as P_q in grammar

referred to as transition function.

6. A function g from S to O,

referred to as the output function.

Equivalent machines

How do you tell
two or more machines
exactly same?

i.e.
There might be solutions to
2 or more same single problem.

- If there are extra states?
  Removing them will make it
  efficient.