

# 11/23(木) M2276 Chay of Turing Machine - Part IV

Part I - Chap 1 - Int. to Mathematic

Part II - Chap 2 - F.A

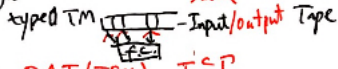
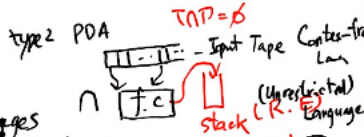
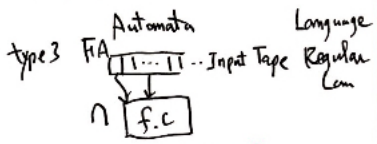
- 3 - Reg. Exp & Reg. Lang's
- 4 - Prop. of Regular languages

Part III - Chap 5 - Context-free Grammars

- 6 - Pushdown Automata
- 7 - Prop. of Context-free Languages

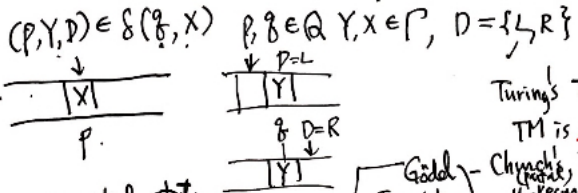
Part IV - Chap 8 - Turing Machine

- 9 - Undecidability
- 10 - Int. to problem = NP complete - SAT (TSM)  $T \leq P$
- X 11 - Adv. class. of problems - NP, coNP, PS, ...



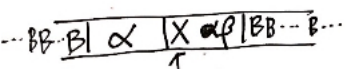
Def. Turing Machine  $M = (Q, T, \Gamma, \delta, q_0, B, F)$

- 1)  $Q$  ... a finite set of state (= state vocabulary)
- 2)  $T$  ... " " input symbol (= input symbol voc.)
- 3)  $\Gamma$  ... " " tape " (= tape voc.)  $T \subseteq \Gamma$
- 4)  $\delta: Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R\}$  or  $\delta \subseteq (Q \times \Gamma) \times (Q \times \Gamma \times \{L, R\})$



- 5)  $q_0 \in Q$  ... an initial state
- 6)  $B \in \Gamma$  ... Blank symbol  $B \notin T$ .
- 7)  $F \subseteq Q$  ... a set of finite state

Instantaneous Description (Configuration) of TM



$\alpha \in \Gamma^*$ ,  $X \in \Gamma$ ,  $\beta \in \Gamma^*$   $(\alpha, q, X\beta) \dots ID$  (Conf.) of TM

Left context Right context

Gödel Incompleteness Theorem (ICT)

Church's Thesis  $\mu$ -recursive function is computable

Turing & Church's Thesis.  $TM = \mu$ -rec. fn (practical)

P30 of Chap 9's TP

완벽한 이론은 완결적이다 (Complete)

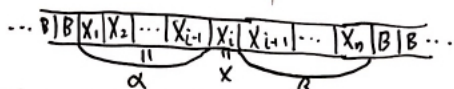
일관성 이론 (Consistent)

완전하다

Turing's Thesis

TM is computable

$\rightarrow$  If  $(p, Y, L) \in \delta(q, X_i)$ , then  $(X_1, X_2, \dots, X_{i-1}, q, X_i, X_{i+1}, \dots, X_n) \Rightarrow (X_1, X_2, \dots, X_{i-2}, p, X_{i-1}, Y, X_{i+1}, \dots, X_n)$   
 $(q, p) \in \delta$  " " ( " " )  $\xrightarrow{M}$   $\Rightarrow (X_1, X_2, \dots, X_{i-2}, X_{i-1}, Y, X_{i+1}, \dots, X_n)$   
 $X_{i-1}, X_{i+2}, \dots, X_n$



Three cases for TM

- 1) TM halts and accept  $w$   $w \in L(M)$
- 2) TM halts and does not accept  $w$   $w \notin L(M)$
- 3) TM runs forever for  $w$   $w \notin L(M)$