TOC

Condensed Notes

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Chapter 1

Turing Machine

1.1 Intro

A turing machine consist of a finite control and an infinite tape which can move in both direction,

TM can read as well as write in tape

TM can accept ϵ

TM is (Q,Σ,τ,δ,q_0,B,F)

τ is tape alphabet

$\Sigma \subseteq \tau$

B (blank) $\subset \tau$

$\delta = Qx\tau XL, R$

1.2 Trancducers

A TM thats checks whether a strting belongs to a language is called acceptor

A TM that produces output is called transducer

a TM can do addition multiplication and comparision so it can do any mathe matical computation

a TM that does not halt is called non-halting TM

$FA + queue = FA + 2(ormore)Stacks = FA + tape = TM$

we can reduce any TM to 3 state TM or to a multi tape TM with stay option having 2 states

we can encode any TM in 0 and 1

1.3 Universal TM

It is multi tape TM in which 3 tapes are there first one contains an encoding of another Tm second containd input and third contains internal states, it simulates the TM on tape to input on tape using internal state

1.4 Modification of TM

TM with the tape ristricted as queue = PDA

TM with finite tape with uni directional movement = FA

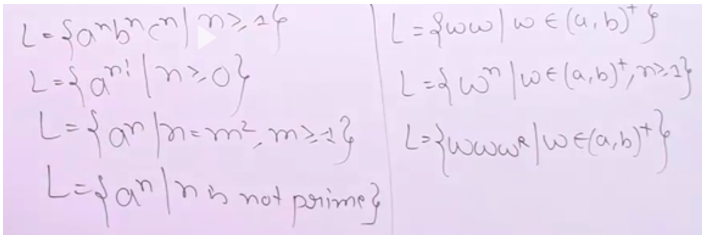
TM with tape with usable space as input only = LBA

1.5 LBA

porev powerfull then PDA and less powerfull than TM

we dont know a language that is accepted by TM and not by LBA the power hirarchy is mathematically proven

- the equivalence of deterministic LBA and ND-LBA is un decidable



if a string is not present in the language the TM may not halt

for a language if it always halts for string not belonging to language is RL and TM is halting TM.

Chapter 2

Computational Complexity

2.1 Countability

- an infinite set is of two types countably infinite an uncountably infinite
- if we are able to make a one to one correspondance is made between the set of natural no. and a set s then s is countabily infinte otherwise uncountably infinite
- if Σ is finite set then Σ^* is countabily finite
- set of all languages are uncountable
- set of TM or set of any machine lower than TM are countable
- set of REL and set of any language below that is countable
- a power set of a countabily infinite set is uncountable

2.2 Computability and decidability

Computability: given a function and domain if there exist a TM which will produce an o/p on the tape given an i/p on tape & it should definately halt for evero i/p in domain then such a function is computable. **Problem**: a statement whose output will be either true or false **Decidability**: if for a problem there exist a halting turing machine