

Wrap-up

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June 2

Announcements

- Pick up graded H/W #7
- Pick up (partial) solutions to sample final
- Final exam
 - Monday, June 5, 2:30-4:20pm, here
- Review session
 - Sunday, June 4, 3:00-4:00pm, EE1 045
- No puzzle today
 - I think you've had enough of them!

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Q4 in H/W #8

- This question will not be graded
 - Is a solved problem in Sipser
 - I apologize for the blunder
 - H/W #8 will out of a total of 48 (earlier was 60)
- Solutions to H/W #8
 - Will be online by today evening

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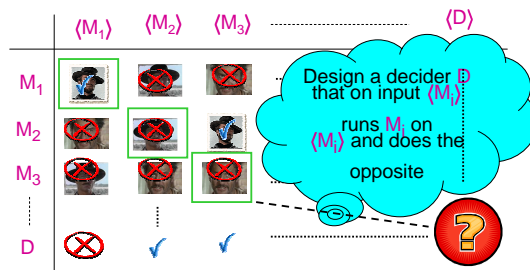
Last lecture

- $A_{TM} = \{ \langle M, w \rangle \mid M \text{ accepts } w \}$
- A_{TM} is undecidable
- Proof by contradiction (diagonalization)
- Assume there is a decider H for A_{TM}

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As H is a decider...



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Questions ?

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Up next...

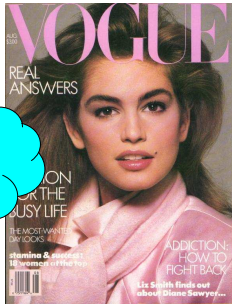
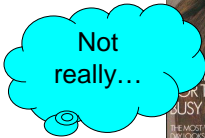
- $A_{CFG} = \{ \langle G, w \rangle \mid G \text{ is a CFG that generates } w \}$
- All context-free languages are also decidable
- If we have time
 - Some more undecidable languages
 - One language that is not Turing-recognizable

End of quarter report...



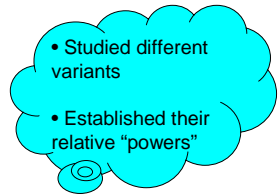
What we studied in this course...

- Models!



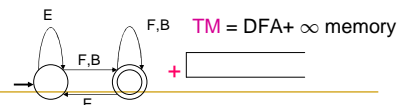
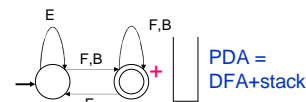
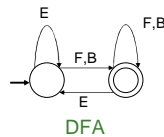
Models of Computation

- The machine series
- The grammar series
- The language series



The machine series

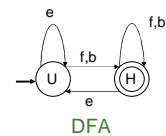
Deciders vs "normal" TMs



The grammar series (Chomsky hierarchy)

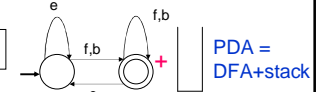
Regular grammars

$$\begin{aligned} U &\rightarrow eU \mid fH \mid bH \\ H &\rightarrow eU \mid fH \mid bH \mid \epsilon \end{aligned}$$

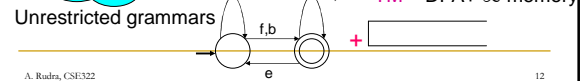


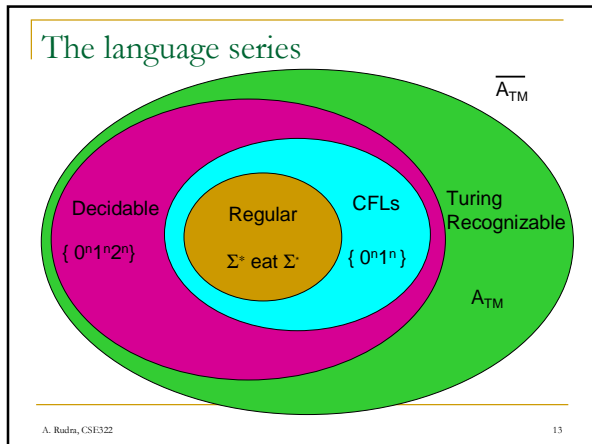
CFGs

$$S \rightarrow OS1 \mid \epsilon$$

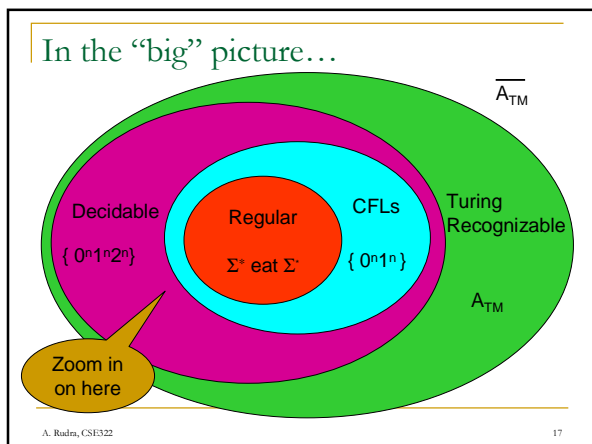


Context Sensitive Grammars





- ### What next ?
- Computational Complexity
 - This course builds the platform
 - CSE 431, offered every spring
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- ### What the heck do I mean ?
-
- Computability vs Complexity
 - TM can decide if $w \in L$ in $2^{2^{|w|}}$ time for any w
 - L is computable
 - Sure it is a decider but is it any "good" ?
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Computational Complexity

- Worry about resource consumption
 - How much time does an algorithm take
 - Exp. time vs. poly time vs. linear time
 - How much space does an algorithm take ?
 - How much randomness does an algorithm use ?
- The P vs NP question
 - In a nutshell: if it is easy to verify a proof is it also easy to come up with a short proof ?
 - Solve it and earn a million \$

Categorize languages according to resource consumption



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So now the game is...

- Given a problem
 - Is there an efficient algorithm ?
 - Or is there "no" efficient algorithm ?
- Questions ?

Algorithms
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Thanks!



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