
CS 421 --- Regular Expression Activity

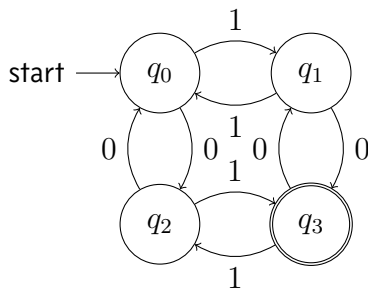
Manager	Keeps team on track	
Recorder	Records decisions	
Reporter	Reports to class	
Reflector	Assesses team performance	

Objectives

- Demonstrate the properties of regular languages.
- Demonstrate the correspondence between a Deterministic Finite Automata and a Right Linear Grammar.
- Identify languages that can be recognized by regular languages.
- Build an automata for a given regular language.

State Machines

Consider the following state machine:



Problem 1) Trace the following strings as inputs to the above state machine. Which strings are part of the language recognized by the state machine?

Input	Recognized?
0110	Y/N
00011	Y/N
0101	Y/N
11100010	Y/N

Problem 2) In English¹, describe the language this automata accepts.

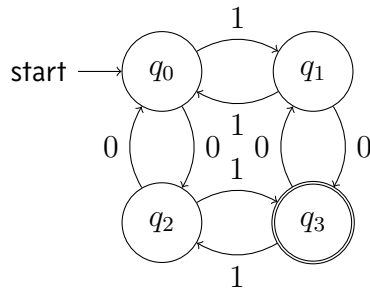
Problem 3) Is the language finite or infinite?

Problem 4) Is the amount of computation required to recognize or reject a string finite or infinite?

¹or what ever language you prefer

Correspondence to Right Linear Grammars

Here is that automata again, with an equivalent grammar.



$$\begin{aligned}
 S_0 &\rightarrow 1S_1|0S_2 \\
 S_1 &\rightarrow 1S_0|0S_3 \\
 S_2 &\rightarrow 1S_3|0S_0 \\
 S_3 &\rightarrow 1S_2|0S_1|\epsilon
 \end{aligned}$$

Problem 5) What do the S_n represent?

Problem 6) How is a transition modeled in the grammar?

Problem 7) The grammar is right linear, because there is at most one non-terminal symbol on the right hand side of any production. Suppose we added a rule like this one: $S_0 \rightarrow 1S_10S_2$. Could you still come up with a deterministic finite automata that matches the new grammar? Why or why not?

Categorization

Problem 8) Describe in English the following regular expressions

- `[a-zA-Z][a-zA-Z0-9]+`
- `[a-z]*(es|ed|ing)`
- `<[a-z0-9]+@[a-z0-9]+(\.[a-z0-9]+)+>`

Problem 9) Which of the following can be described by regular expressions?

- All the words in the English language
- All the Fibonacci numbers
- ``All Your Base Are Belong To Us'' video
- Numbers that are multiples of 4 (assume ≥ 2 digits)
- Words that have exactly as many as as they have bs
- Palindromes

Demo: Using grep and sed

Building an Automata

We can build an automata that recognizes integers that are multiples of 7!

Problem 10) To get started, fill out this table. The first two rows are done for you.

$n \bmod 7$	$10n \bmod 7$
0	0
1	3
2	
3	
4	
5	
6	

Problem 11) Now build your automata. If you are not sure how to get started, then ask yourself ``how many states will I need?" and ``what does a transition indicate?"

Regular Expression Activity --- Team's Assessment

Manager or Reflector: Consider the objectives of this activity and your team's experience with it, and then answer the following questions after consulting with your team.

1. What was a strength of this activity? List one aspect that helped it achieve its purpose.
2. What change could we make to this activity to make it more effective?
3. What insights did you have about the activity at the meta level? (I.e., we're not asking about the content, but maybe how the activity was organized)

Regular Expression Activity--- Reflector's Report

Manager	Keeps team on track	
Recorder	Records decisions	
Reporter	Reports to Class	
Reflector	Assesses team performance	

1. What was a strength of your team's performance for this activity?
2. What could you do next time to increase your team's performance?
3. What insights did you have about the activity or your team's interaction today?