More Finite Automata
In Class Exercise #5

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for loop language:

Due: Today, Feb 15 posted to Moodle by 11:55 pm

Specifications

1. Work on your own first on this exercise. During class or later, when you are satisfied with your results, you may compare and discuss with a classmate.
2. Post individually on Moodle sometime before midnight tonight. The diagrams in your post can be a scan / picture of the worksheet, since diagrams are involved. Everything else should be in this worksheet. Nothing to hand in in class.
3. No late exercises for credit.
4. Remember to put your name on everything submitted!

Finite automata (FA)

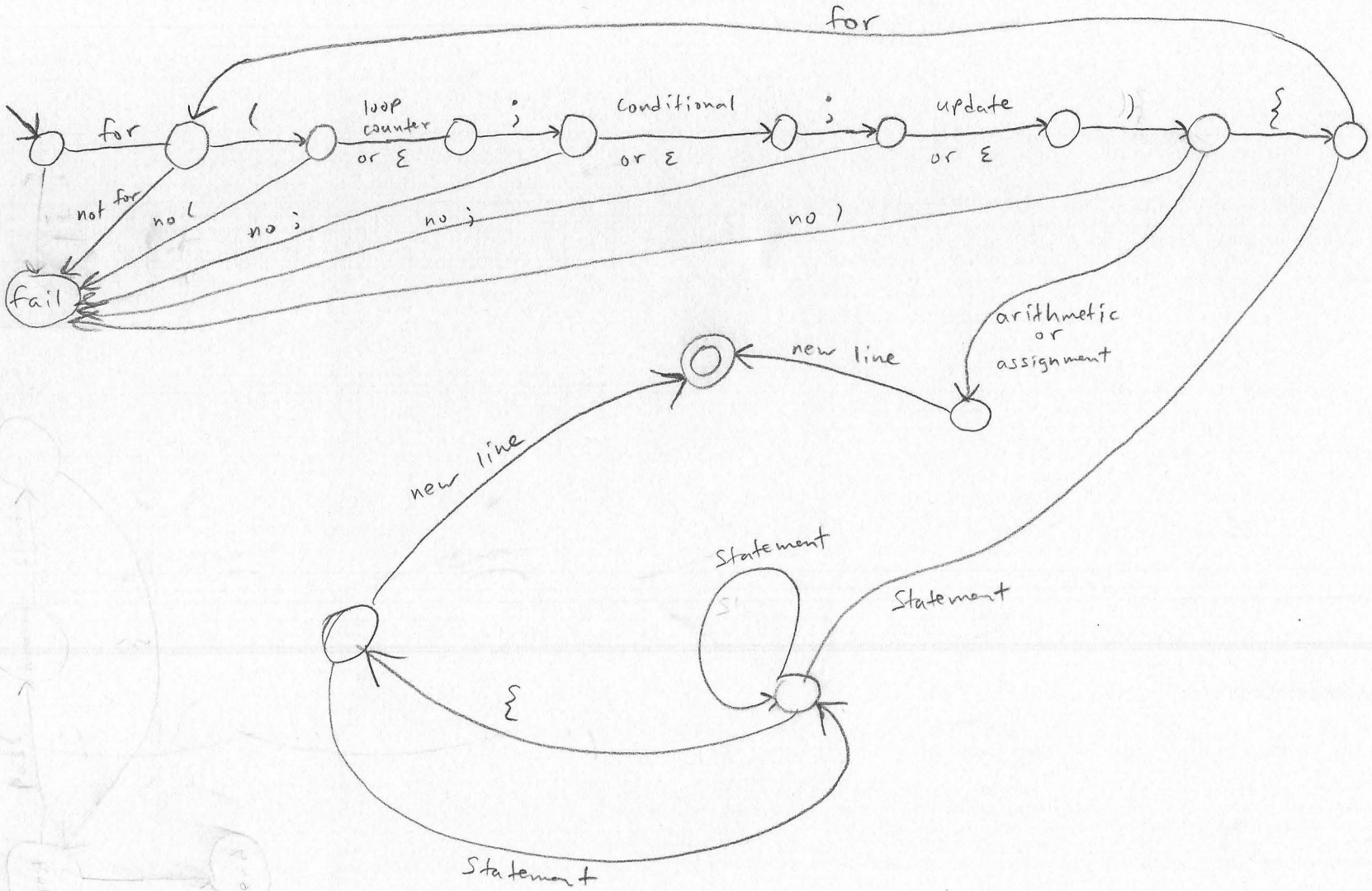
Who (if anyone) you discussed your FA with:

Draw a finite automata for a for loop by the rules of Java or C. Begin with a test plan containing at least 10 cases (add rows to the table); the test plan should include various good cases and bad (i.e., not a valid for loop). Try to think of unusual special cases (good and bad); bad cases that are "close" to good case make strong tests.

Test plan structure:

| case # | description of test case | for loop | OK? |
|---|---|---|---|
| 1 | nested for loop | `for(i=0;i<1;i++){`<br>`for(j=0;j<1;j++){`<br>`}}` | no |
| 2 | no brackets, only one statement | `for(i=0,i<1;i++)`<br>`sum+=i;` | yes |
| 3 | no loop counter | `for(;i<1;i++){`<br>`}` | yes |
| 4 | missing bracket | `for(i=0;i<1;i++){` | no |
| 5 | missing parenthesis | `for(i=0;i<1;i++{`<br>`}` | no |
| 6 | no increment | `for(i=0;i<1;){`<br>`}` | yes |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

FA (draw this on separate paper to allow enough space)


for
for
(
loop counter
or ε
;
Conditional
or ε
;
update
or ε
)
{
not for
no (
no ;
no ;
no )
fail
arithmetic or assignment
new line
new line
Statement
Statement
{
Statement

Label edges with either a complete reserved word, a single character (punctuation mark), or an additional Java / C construct to be shown later (surrounded by angle brackets; examples: <integer>, <declaration>). Don't put all detail in the initial diagram.

Draw additional FA for any additional constructs used in the main diagram.

Grammar

Create a grammar for a for loop, starting at the level of <statement>. Then give a parse tree for three of your valid for loops from the first part of the exercise.

<statement> → for ( <set up> ) <body>

<body> → { <statements> } | <statement>

<statements> → <statement>*

<set up> → <assignment> | ε ; <boolean> | ε ; <expression>

<assignment> → <id> = <num>

<id> → [a-zA-Z]+

<num> → <digit><digit>*

<digit> → 0|1|2|3|4|5|6|7|8|9

<boolean> → <id>|<num> <relational op> <id>|<num>

<relational op> → == | > | < | >= | <= | !=