Lexical Analysis
Part 2
Example Regular Expressions over the alphabet \{0, 1\}

<table>
<thead>
<tr>
<th>Regular Expression</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>{ 0 }</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0 (0</td>
<td>1)</td>
</tr>
<tr>
<td>1*</td>
<td>{ x</td>
</tr>
<tr>
<td>(0</td>
<td>1) *</td>
</tr>
</tbody>
</table>
RE -> NFA

Regular Expression

\[ \epsilon \]

0

NFA

[Diagram of NFA with states S0 and S1 and transitions labeled 0 and \( \epsilon \)].
RE -> NFA

Regular Expression (Assume R and S are regular expressions)

\[ R \ast S \]

The start state of the NFA for R is the start state of the new machine. The final state in the NFA for R connects via an epsilon transition to the start state of the NFA for S. The final state in the NFA for S is the final state for the new machine.
Regular Expression (Assume $R$ and $S$ are regular expressions)

$R \mid S$

S0 connects to the start states of the NFA for $R$ and the NFA for $S$ by epsilon transitions and the final states of the NFA for $R$ and NFA for $S$ connect to S1 by epsilon transitions
Regular Expression (Assume \( R \) is a regular expressions)

\[ R^* \]

S0 connects to S1 and the start state of the NFA for \( R \) by epsilon transitions. The final state of the NFA for \( R \) connects to S1 and to the start state of the NFA for \( R \) by epsilon transitions.
Example Problems

• Construct NFAs for the following regular expressions.
  – 0
  – 00
  – 0 | 1
  – (0 | 1) *
  – 0*(10*10*)*