• HW questions?
• Shift-reduce parsing
• ASTs
• Visitor pattern
LR Conflicts

• A grammar with a shift/reduce conflict?

• A grammar with a reduce/reduce conflict?
Shift-Reduce Parsing

• Language: binary strings such that every 11 is followed by at least one 0, and ending in 0
• Regex?
Shift-Reduce Parsing

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• Regex? $$(110|1?0)^*$$
Shift-Reduce Parsing

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• Regex? \((110|1?0)\)*
• cfg?
Shift-Reduce Parsing

- **Language**: binary strings such that every 11 is followed by at least one 0, and ending in 0
- **Regex?**  
  \[(110|1\?0)^*\]
- **cfg?**  
  
  \[
  \begin{align*}
  &E' \rightarrow E \$ \\
  &E \rightarrow FE \mid \varepsilon \\
  &F \rightarrow 1 \ G \mid 0 \\
  &G \rightarrow 1 \ 0 \mid 0
  \end{align*}
  \]
Shift-Reduce Parsing

• Language: binary strings such that every 11 is followed by at least one 0, and ending in 0
• Regex? \((110|1?0)^*\)
• cfg?

\[
\begin{align*}
E' &\rightarrow E \$ \\
E &\rightarrow FE \mid \varepsilon \\
F &\rightarrow 1G \mid 0 \\
G &\rightarrow 10 \mid 0
\end{align*}
\]

• Is this grammar LR(0)?
Shift-Reduce Parsing

• Language: binary strings such that every 11 is followed by at least one 0, and ending in 0

• Suppose we edit the grammar a little...

• **cfg?**

  \[ \begin{align*}
  E' & \rightarrow E \, \$ \\
  E & \rightarrow FE \mid \varepsilon \\
  F & \rightarrow 1 \, G \mid 0 \\
  G & \rightarrow 10 \mid 0
  \end{align*} \]

  \[ \begin{align*}
  E' & \rightarrow E \, \$ \\
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  \end{align*} \]

• Is this grammar LR(0)?