Review Problem 24

Given the light display shown, build the FSM for a "move left" arrow traffic sign. It should animate an arrow moving left.

**Hint:** Can any of the bulbs be connected to the same signal?
FSM Design Process

1. Understand the problem
2. Draw the state diagram
3. Use state diagram to produce state table
4. Implement the combinational control logic
Vending Machine Example

- **Vending Machine:**
  - Deliver package of gum after $\geq 10$ cents deposited
  - Single coin slot for dimes, nickels
  - No change returned

- **State Diagram:**

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** FSM Rules:**

1. For each legal input pattern, there must be an edge that tells me what to do.
2. You cannot have two outgoing edges that both match a legal input pattern.
Vending Machine Example (cont.)

- **State Table:**

<table>
<thead>
<tr>
<th>PS</th>
<th>D</th>
<th>N</th>
<th>Open</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

\[ \text{Open} = D + \text{PS} \times N \]

\[ \text{NS} = \text{F} \times \text{PS} + \text{D} \times \text{PS} \]
\[ \text{Open} = D + \overline{PS} \times N \]
\[ \text{NS} = \overline{N} \overline{D} \overline{PS} + N \overline{PS} \]

Vending Machine Example (cont.)

- Implementation: