Industrial Automation

(Automação de Processos Industriais)

GRAFCET

(Sequential Function Chart) 3/3

http://users.isr.ist.utl.pt/~jag/courses/api1617/api1617.html

Prof. José Gaspar, rev. 2016/2017

GRAFCET vs Ladder

GRAFCET/SFC can be converted directly to ladder logic

Memory variables:

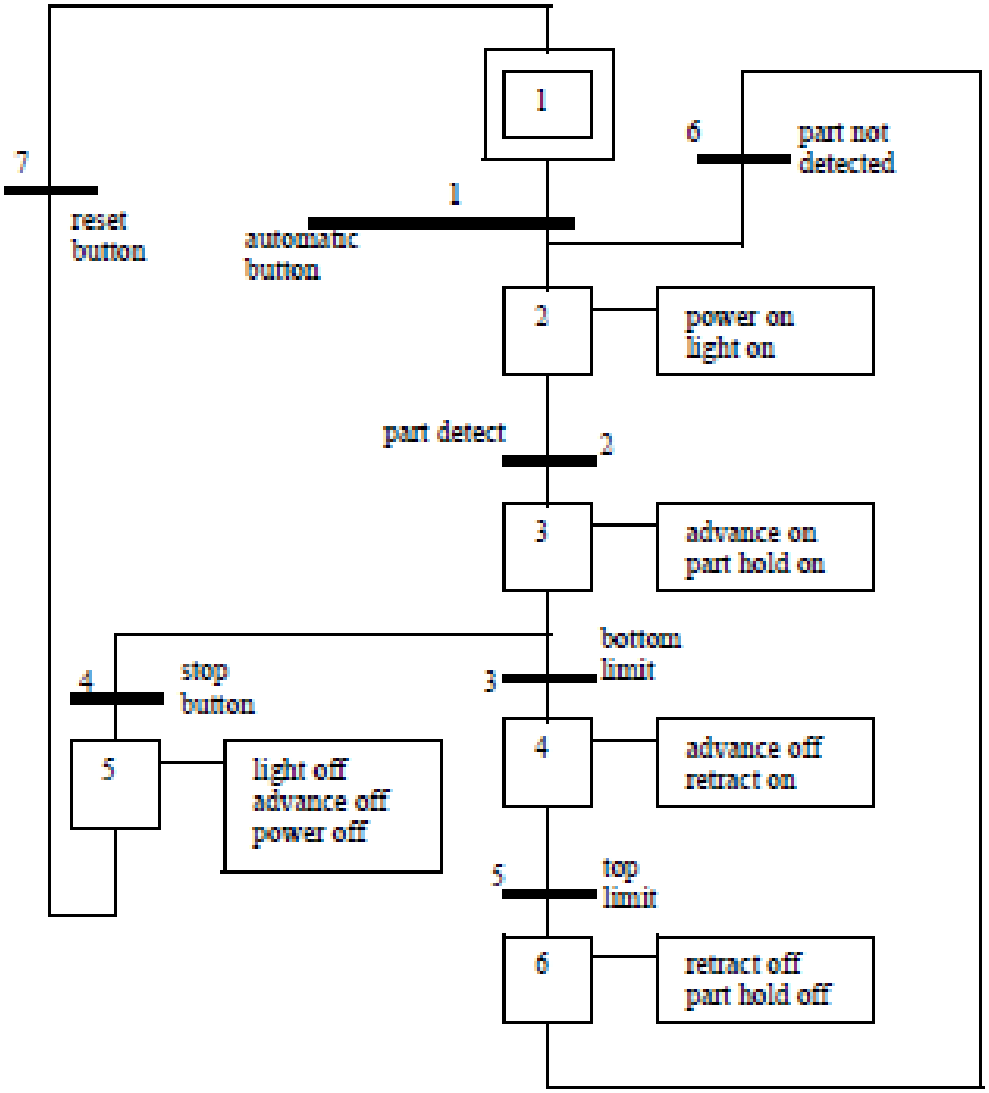
Assign one Boolean variable to each step (si) and transition (tj)

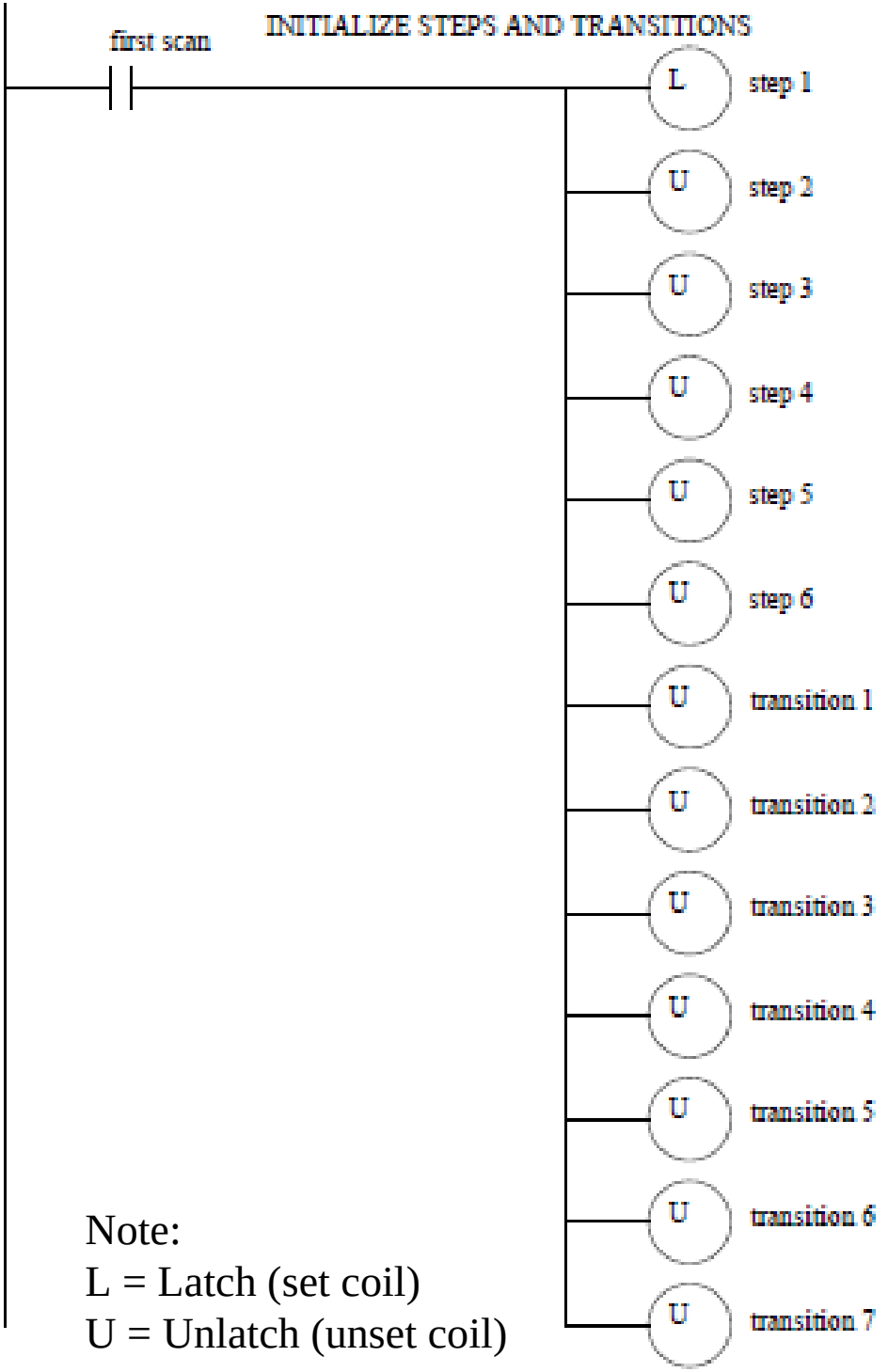
Code:

1. Initialize steps and transitions
2. Check transitions and activate steps
3. Perform activities for steps
4. Enable transitions (jump to 2.)

Ref: [Hugh Jack 2008]

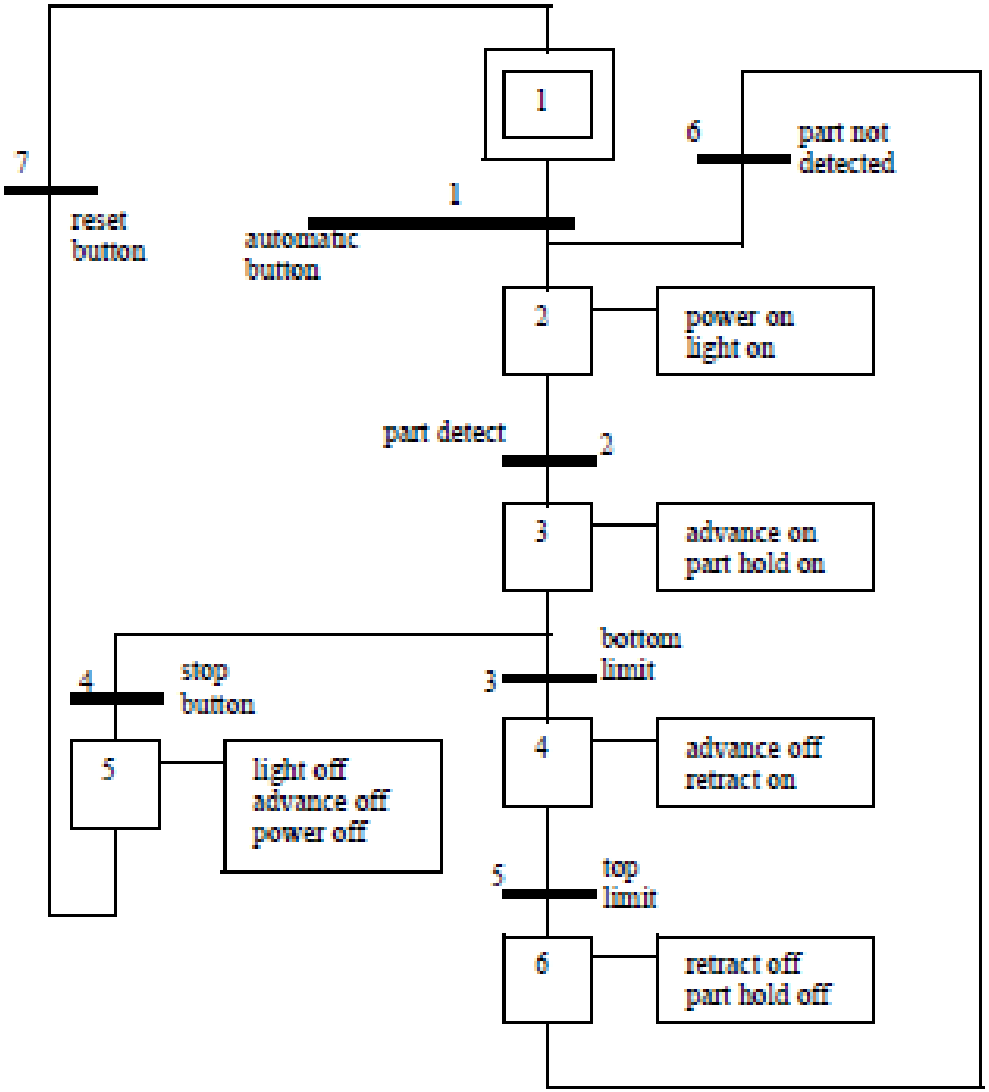
1. Initialize steps and transitions

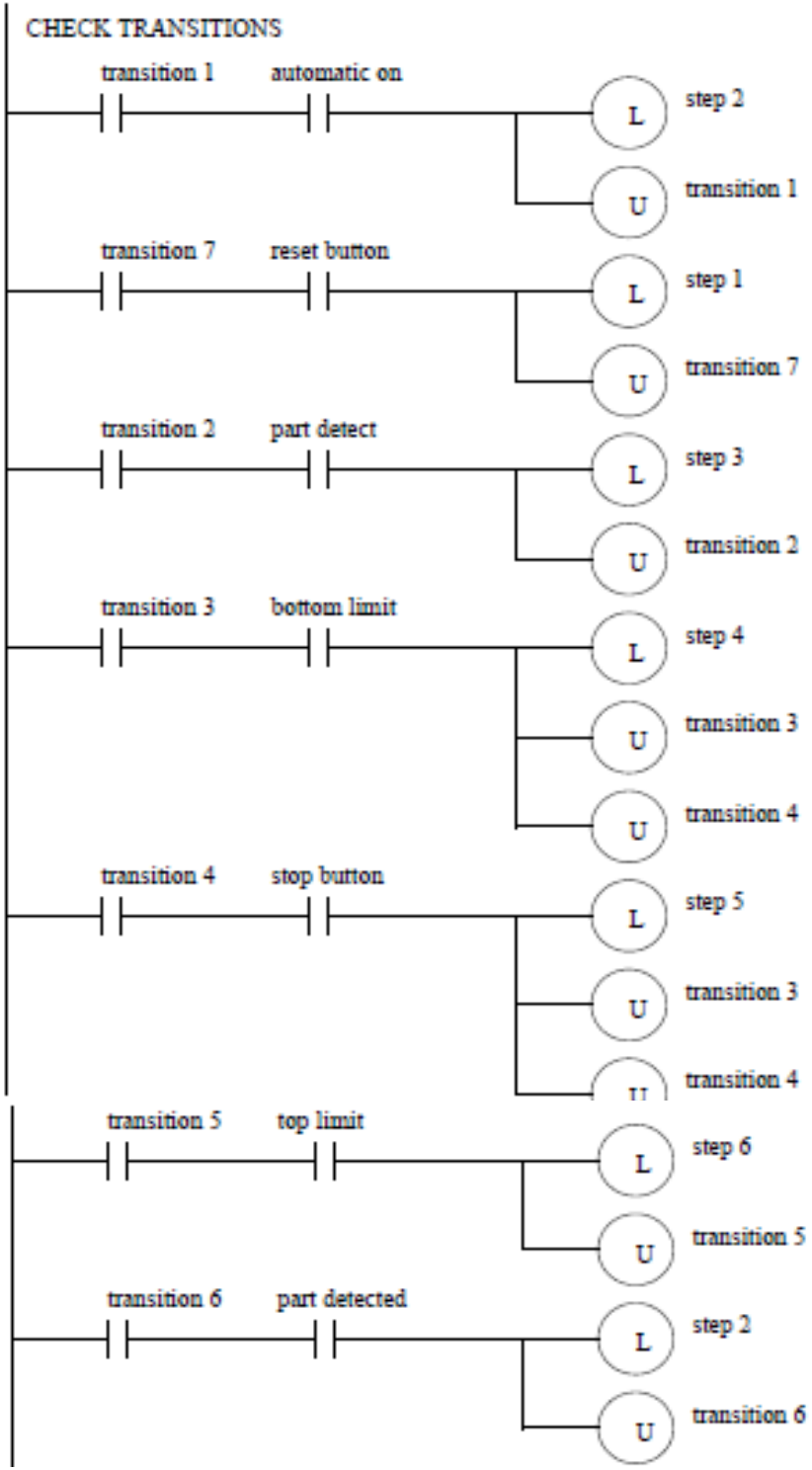




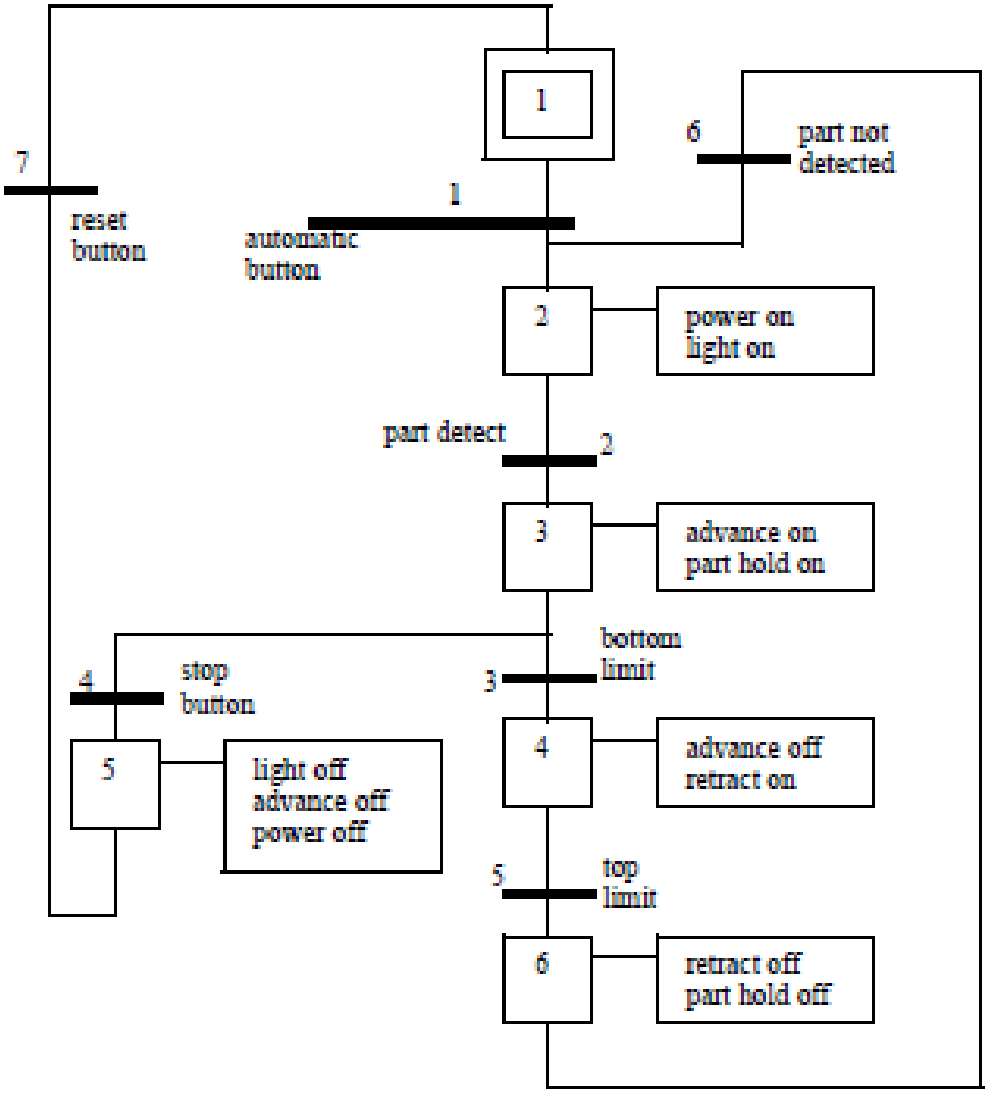
Note:
L = Latch (set coil)
U = Unlatch (unset coil)

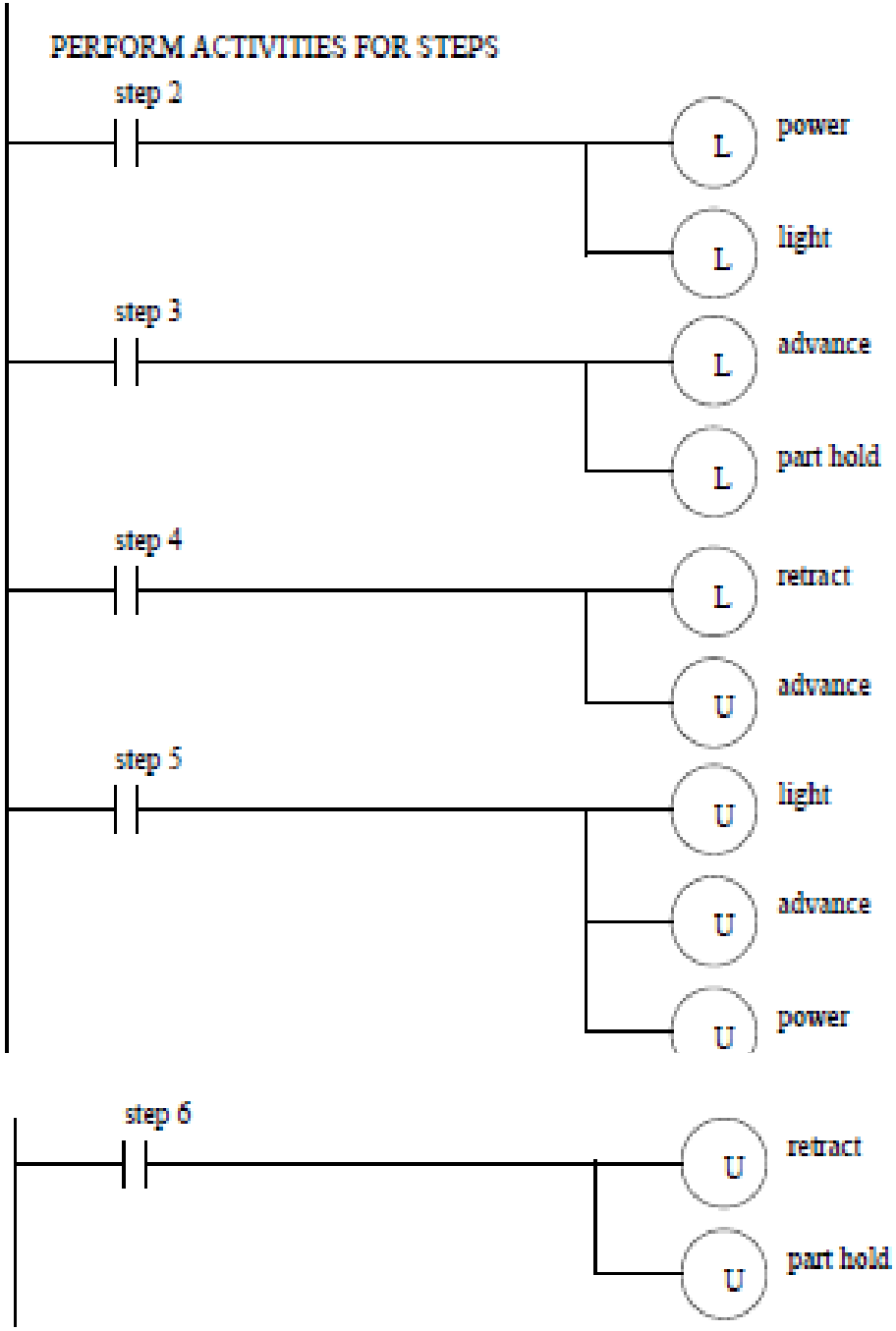
2. Check transitions & activate steps



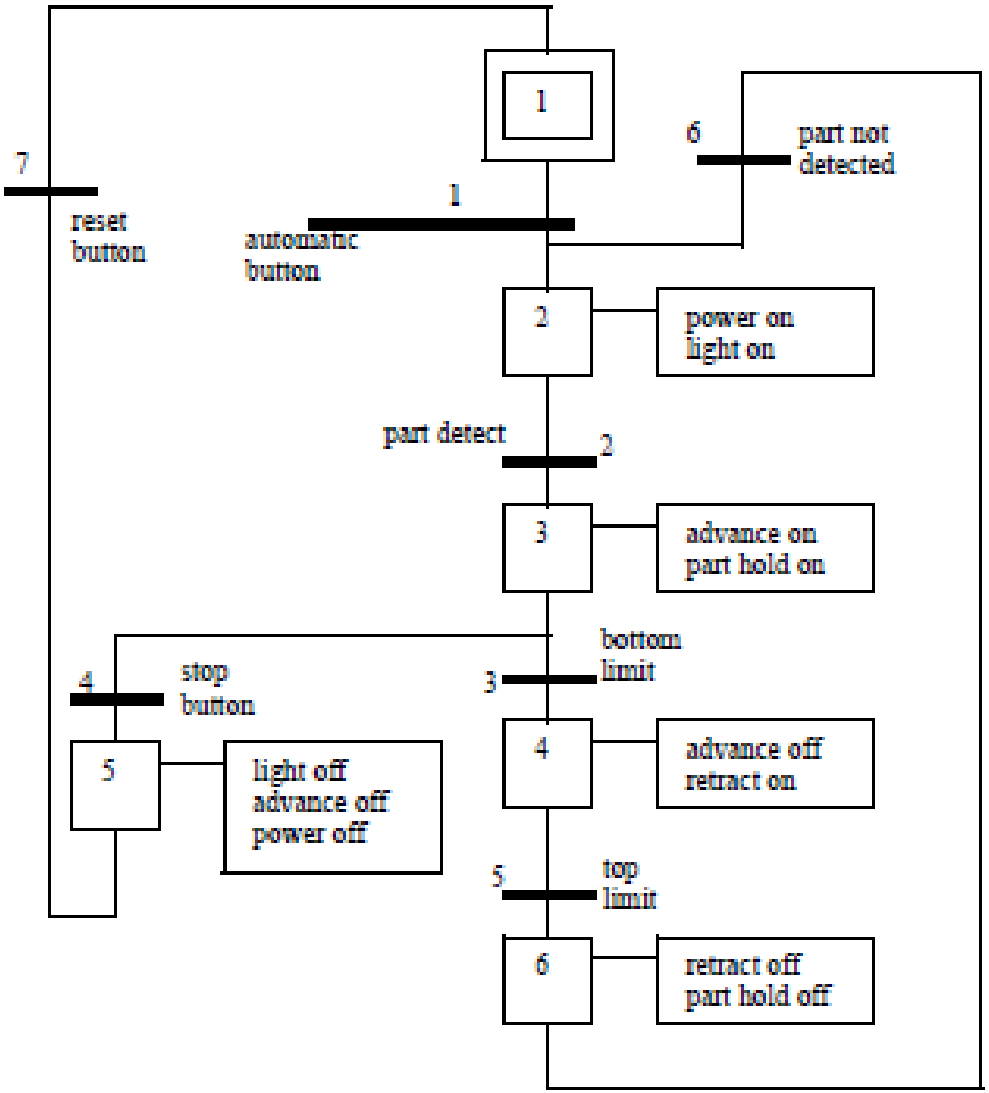


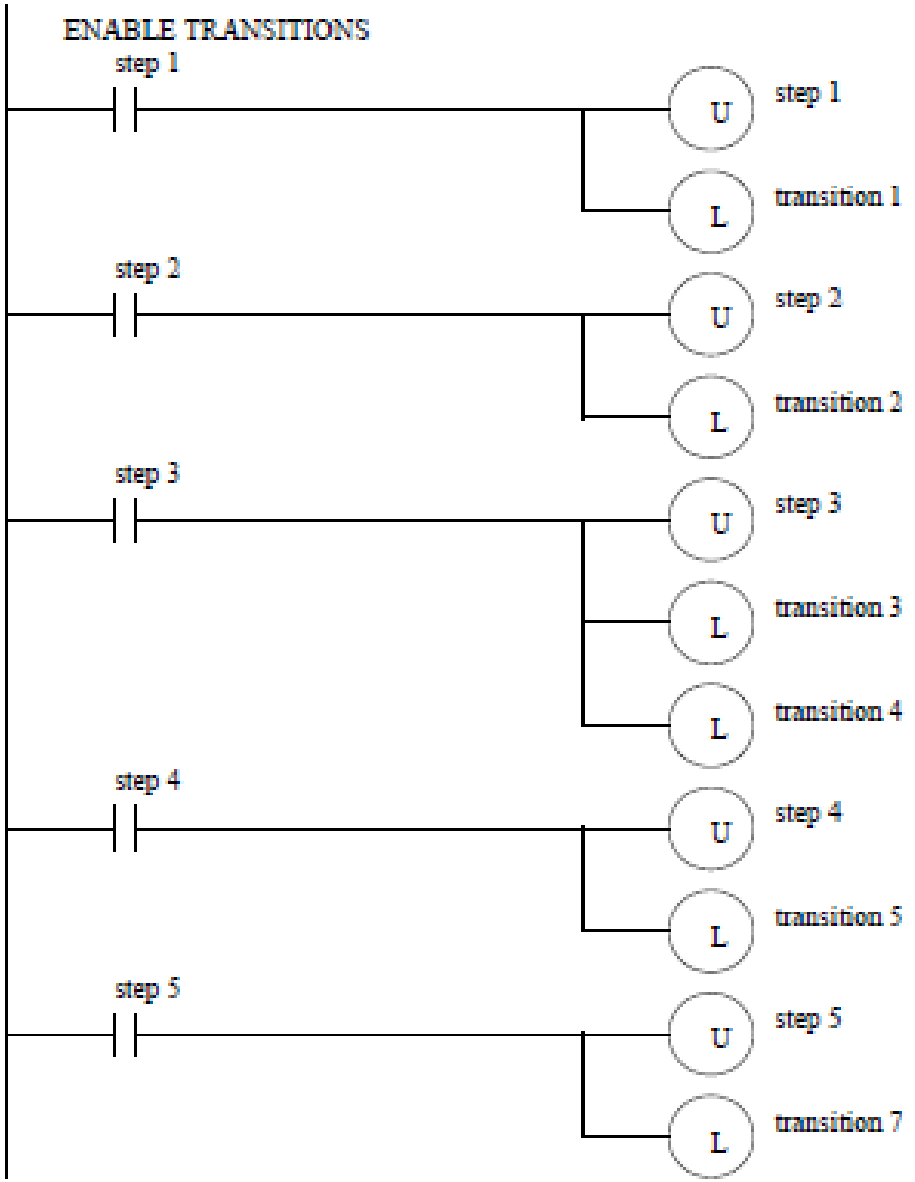
3. Perform activities for steps



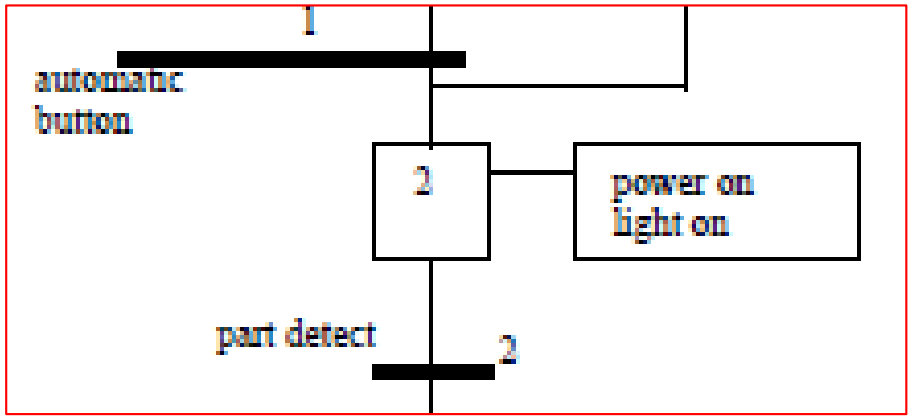


4. Enable transitions

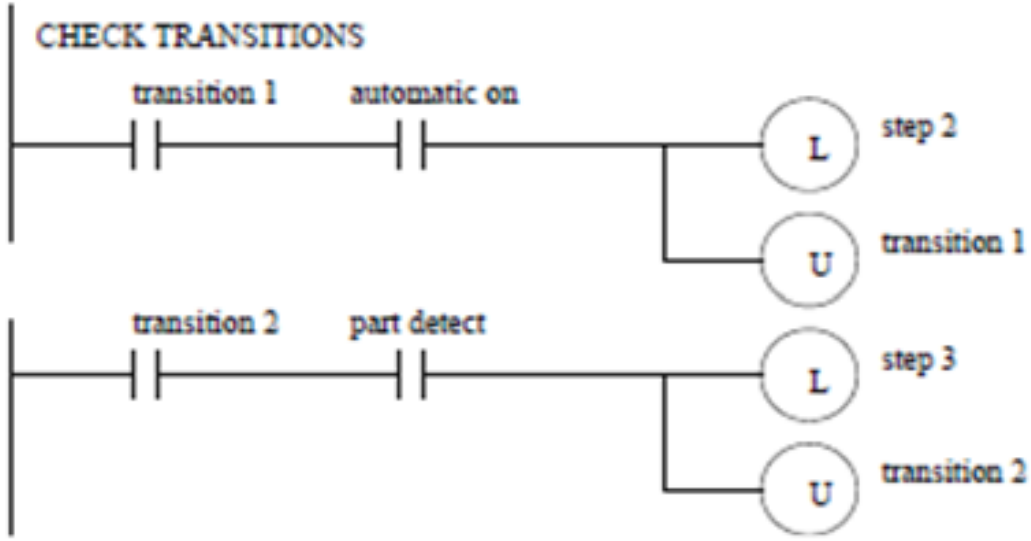




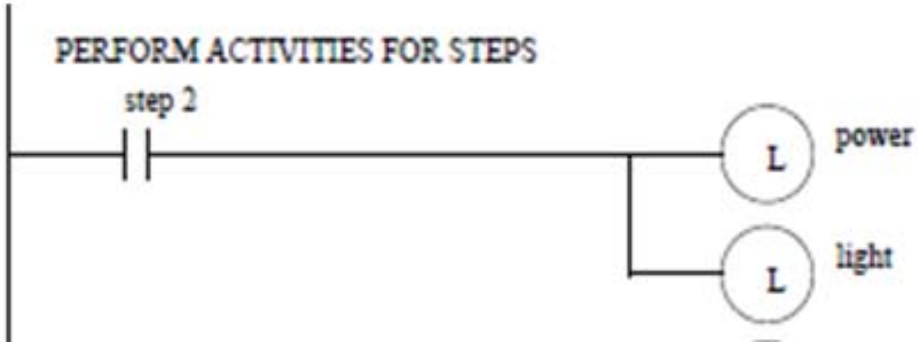
Discussion: not-keeping vs keeping steps active



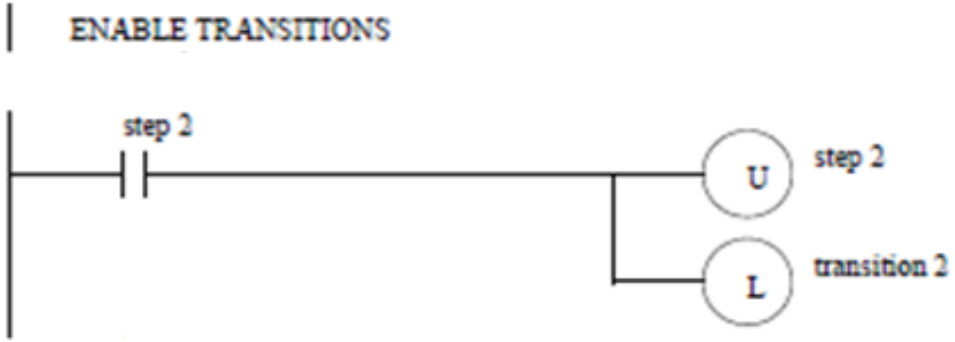
1)



2)



3)

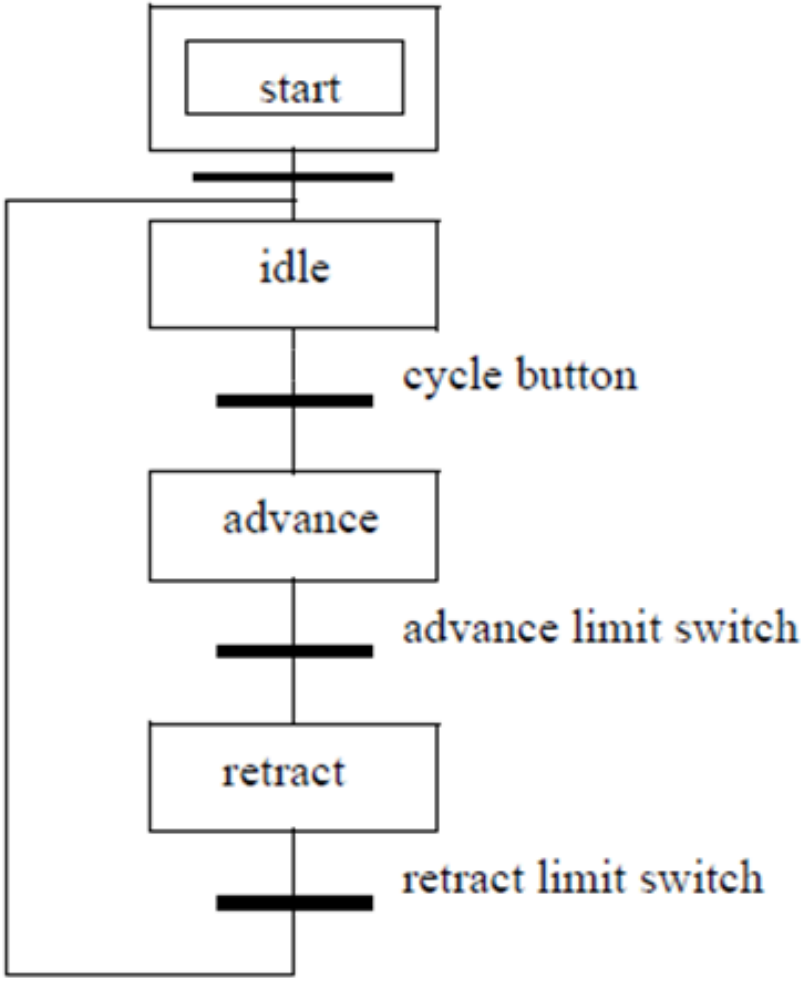


If step2 is active then it is going to be made inactive (unlatched). In Unity-Pro step2 gets inactive only after transposing transition2.

GRAFCET **Practice Problem 1**

Draw **one SFC** for one stamping press that can **advance and retract** when a **cycle button** is pushed, and then stop until the button is pushed again. The press has **limit switches** indicating stop advancing and stop retracting.

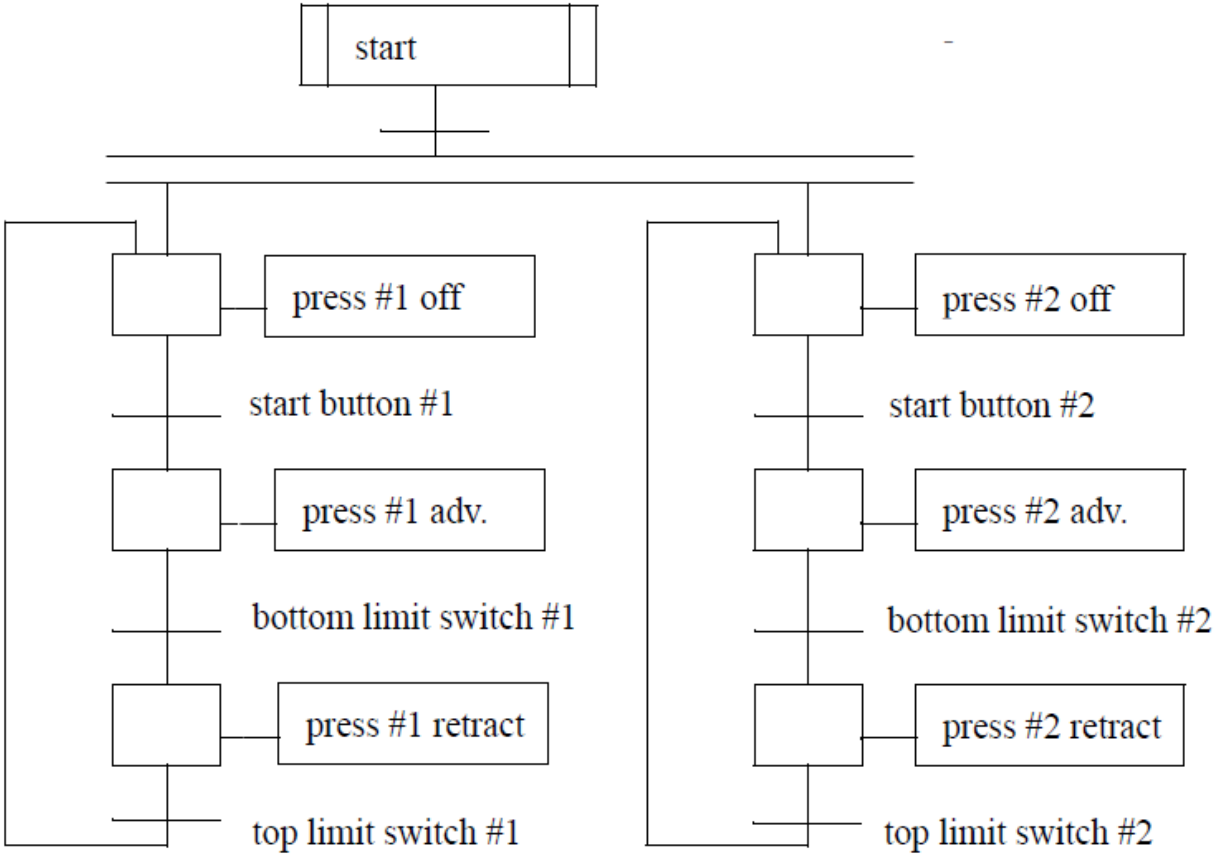
Further study: discuss the advantages of using SFC as compared with using Ladder in this problem.



From [Hugh Jack 2008]

GRAFCET **Practice Problem 2**

Develop **one SFC** for a two person assembly station. The station has **two presses** that may be used at the same time, **independently**. Each press has a cycle button that will start the advance of the press. A bottom limit switch will stop the advance, and the cylinder must then be retracted until a top limit switch is hit. The two presses are enabled only after a common starting procedure.



From [Hugh Jack 2008]

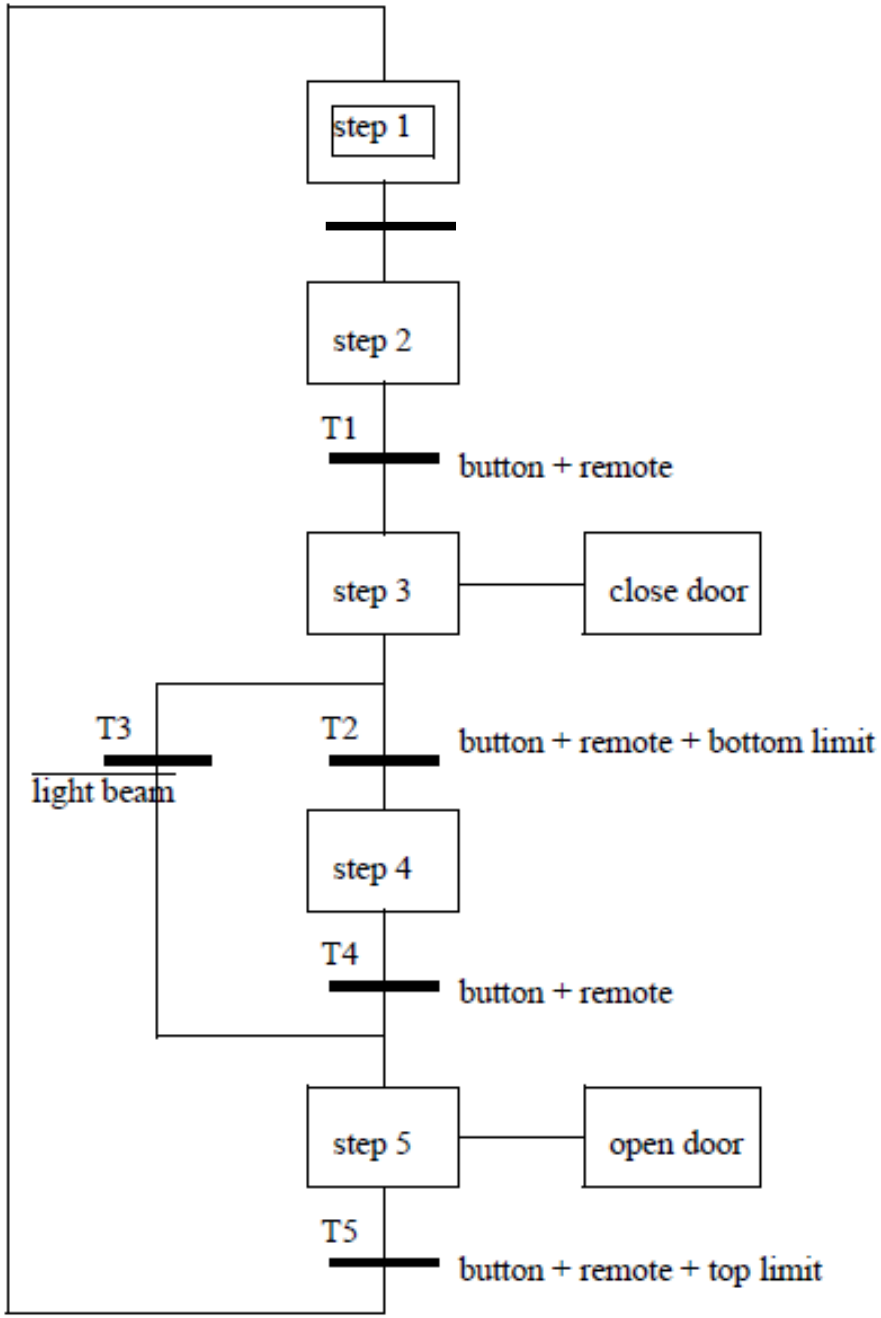
GRAFCET **Practice Problem 3**

Design a garage door controller using an SFC. The behavior of the garage door controller is as follows:

- There is a single button in the garage and a single button remote control. When the button is pushed the door will move up or down.
- There are top/bottom limit switches to stop the motion of the door.

- If the button is pushed once while moving, the door will stop. A second push will start motion again in the opposite direction.
- There is a light beam across the bottom of the door. If the beam is cut while the door is closing the door will stop and reverse.

- There is a garage light that will be on for 5 minutes after the door opens or closes.



From [Hugh Jack 2008]