# SI100B TUTOURIAL-3

Misc.

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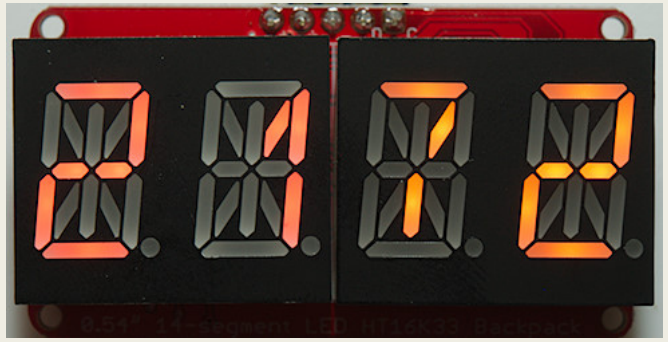
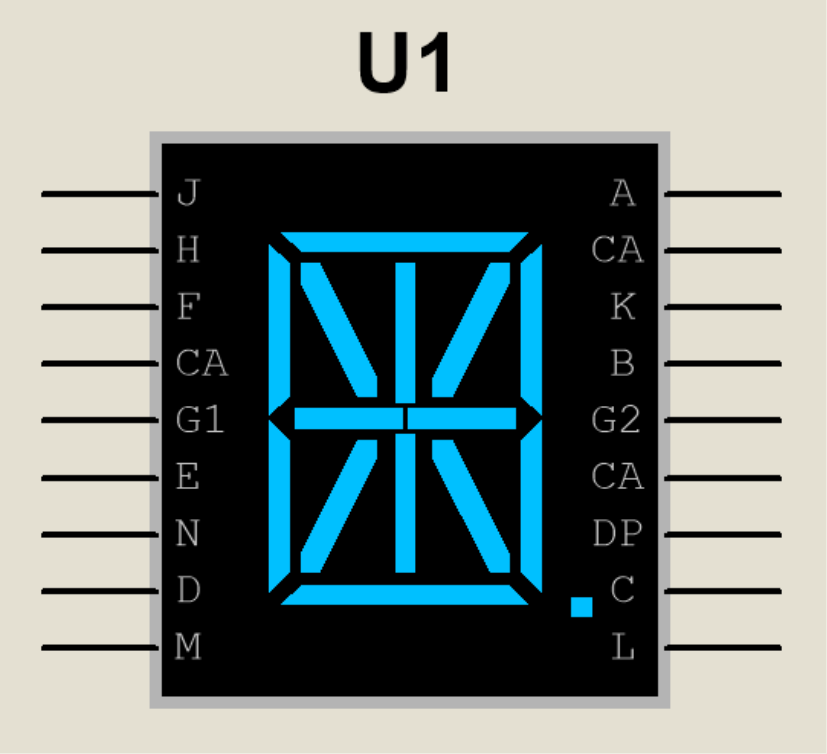
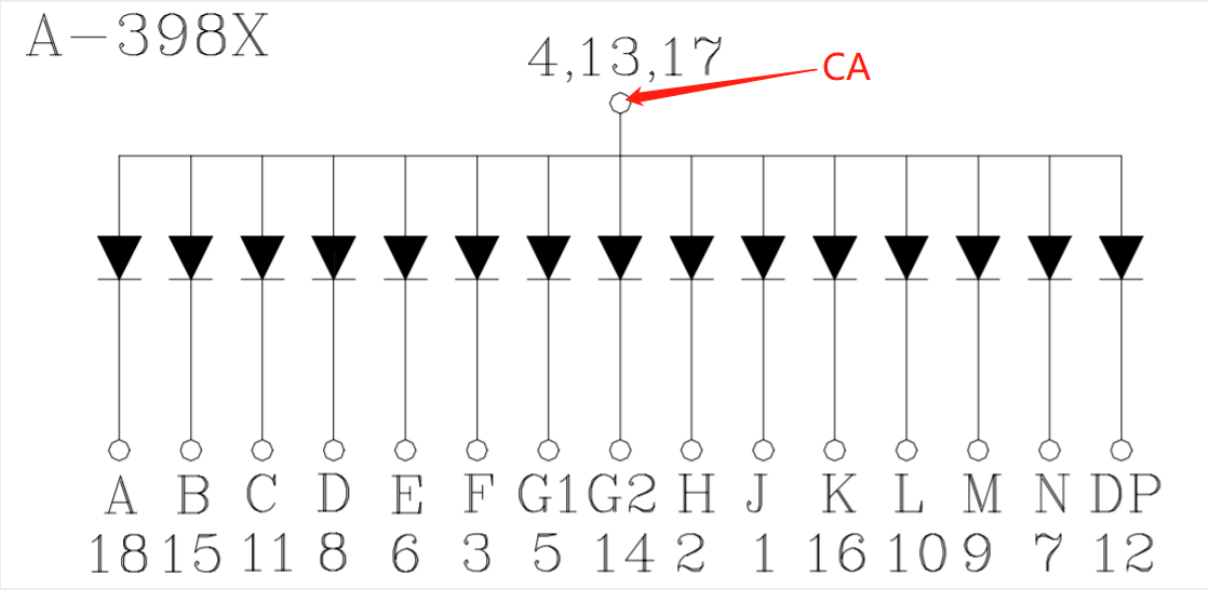
# Segment Display

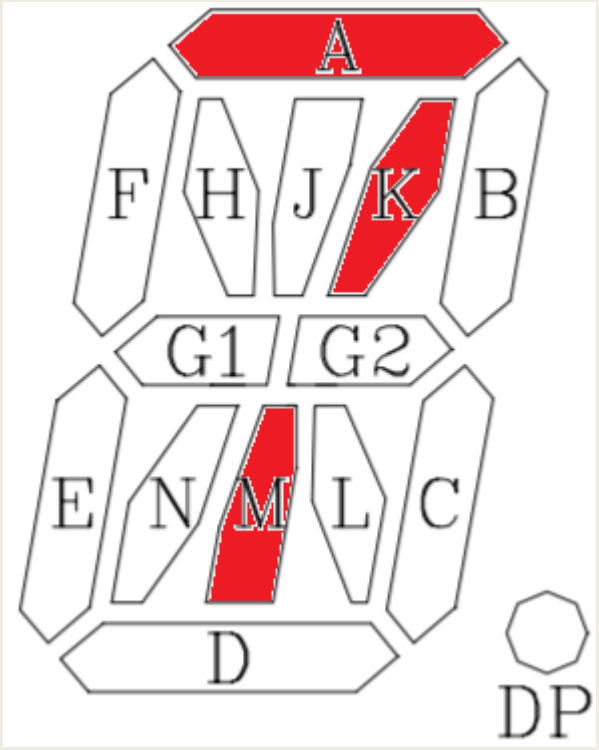


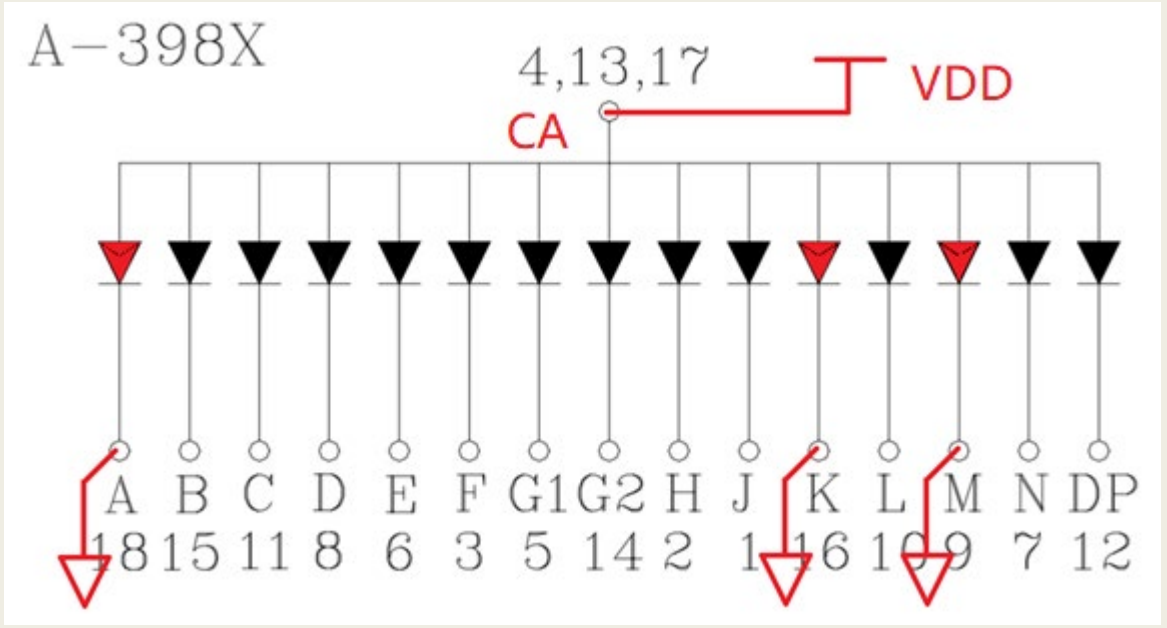


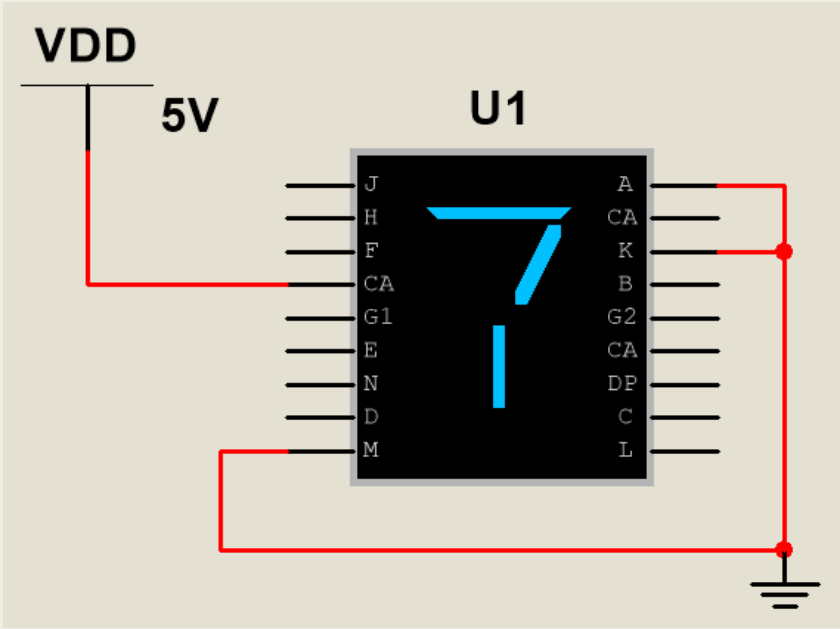

CA means “Common Anode”. Connect it to VDD

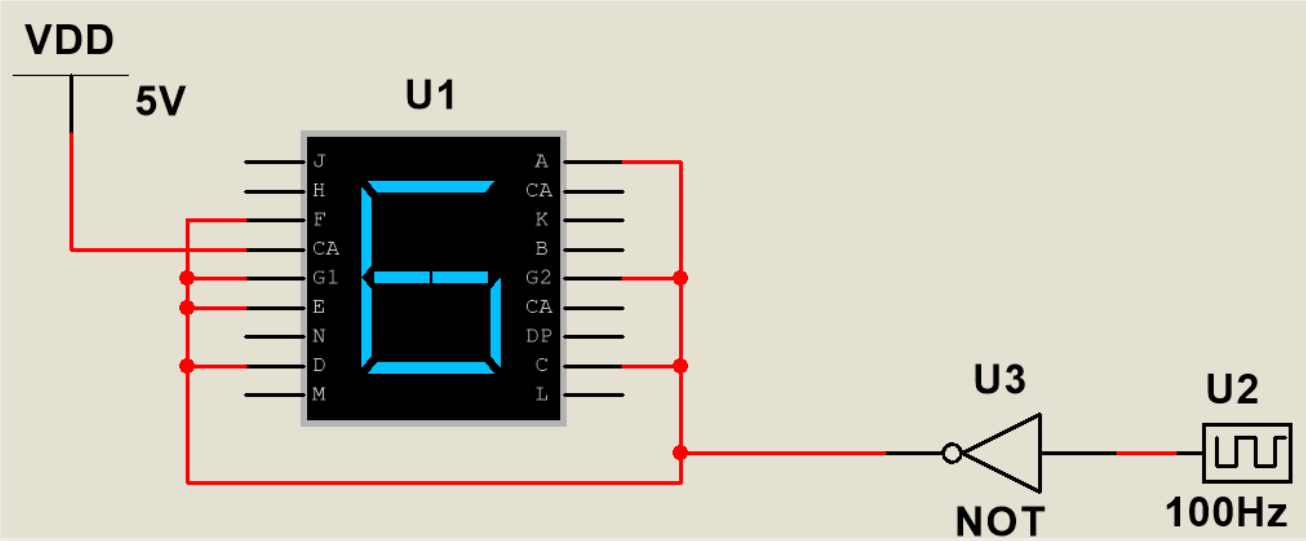
# Illumine “7”


A
F
H
J
K
B
G1
G2
E
N
M
L
C
D
DP

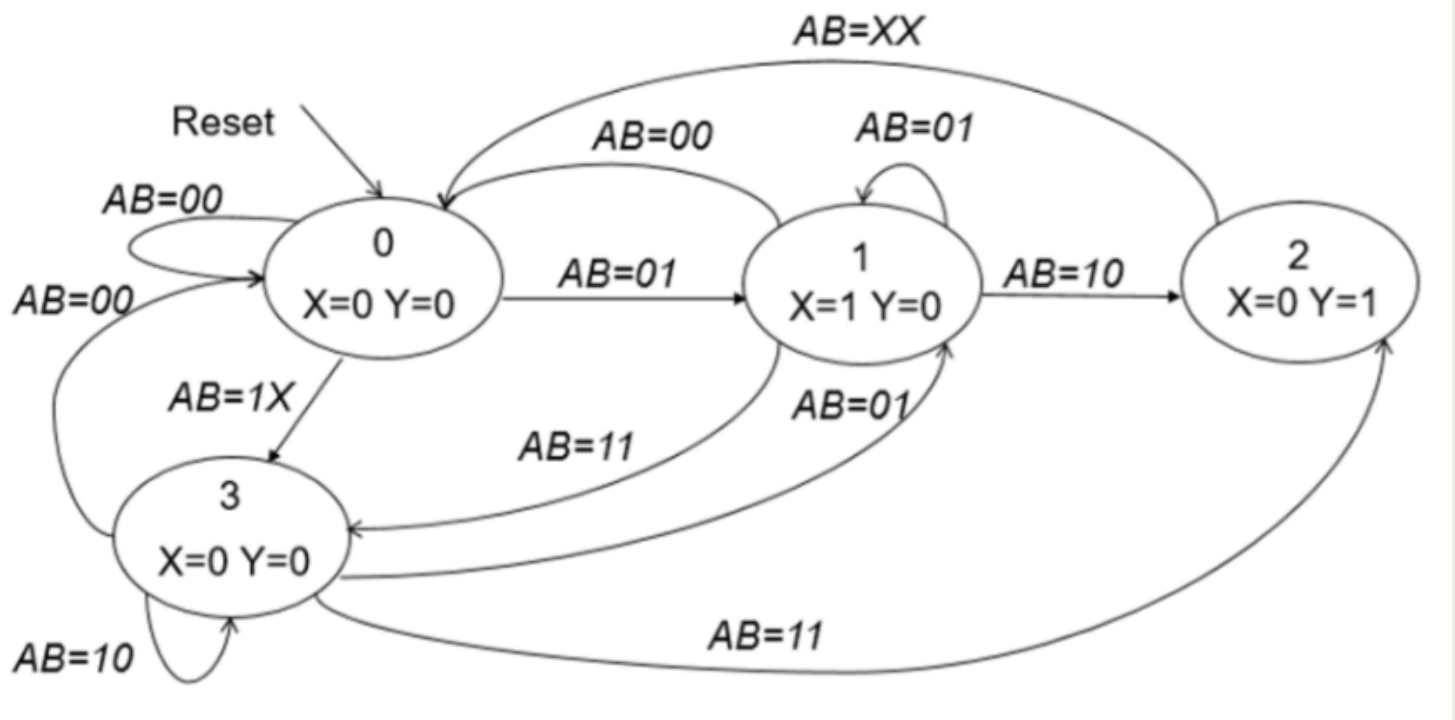

A−398X
4,13,17
VDD
CA
A B C D E F G1 G2 H J K L M N DP
18 15 11 8 6 3 5 14 2 1 16 10 9 7 12

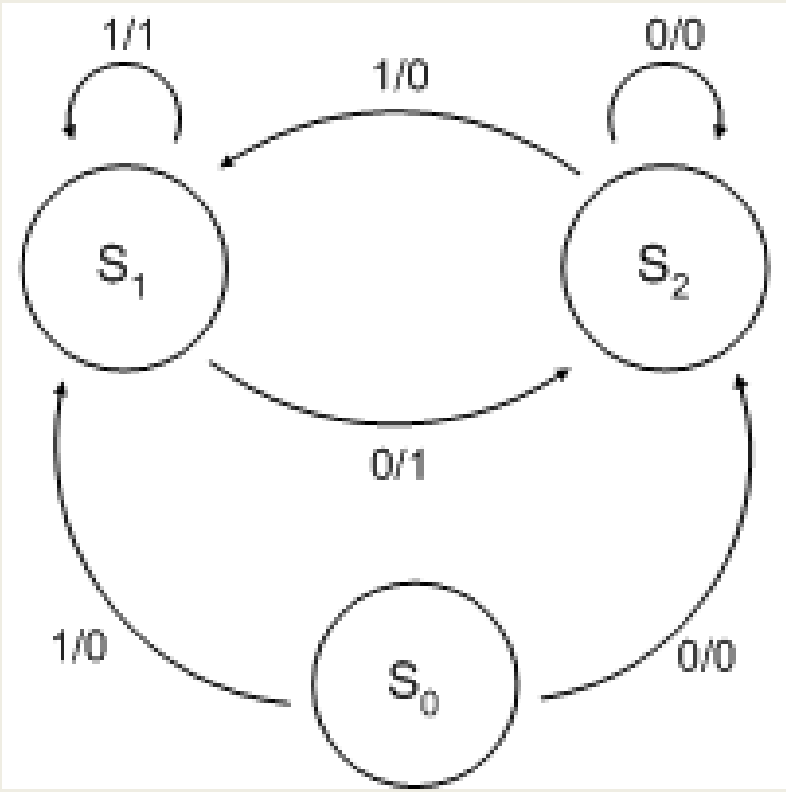
# Illumine with Logic Gates



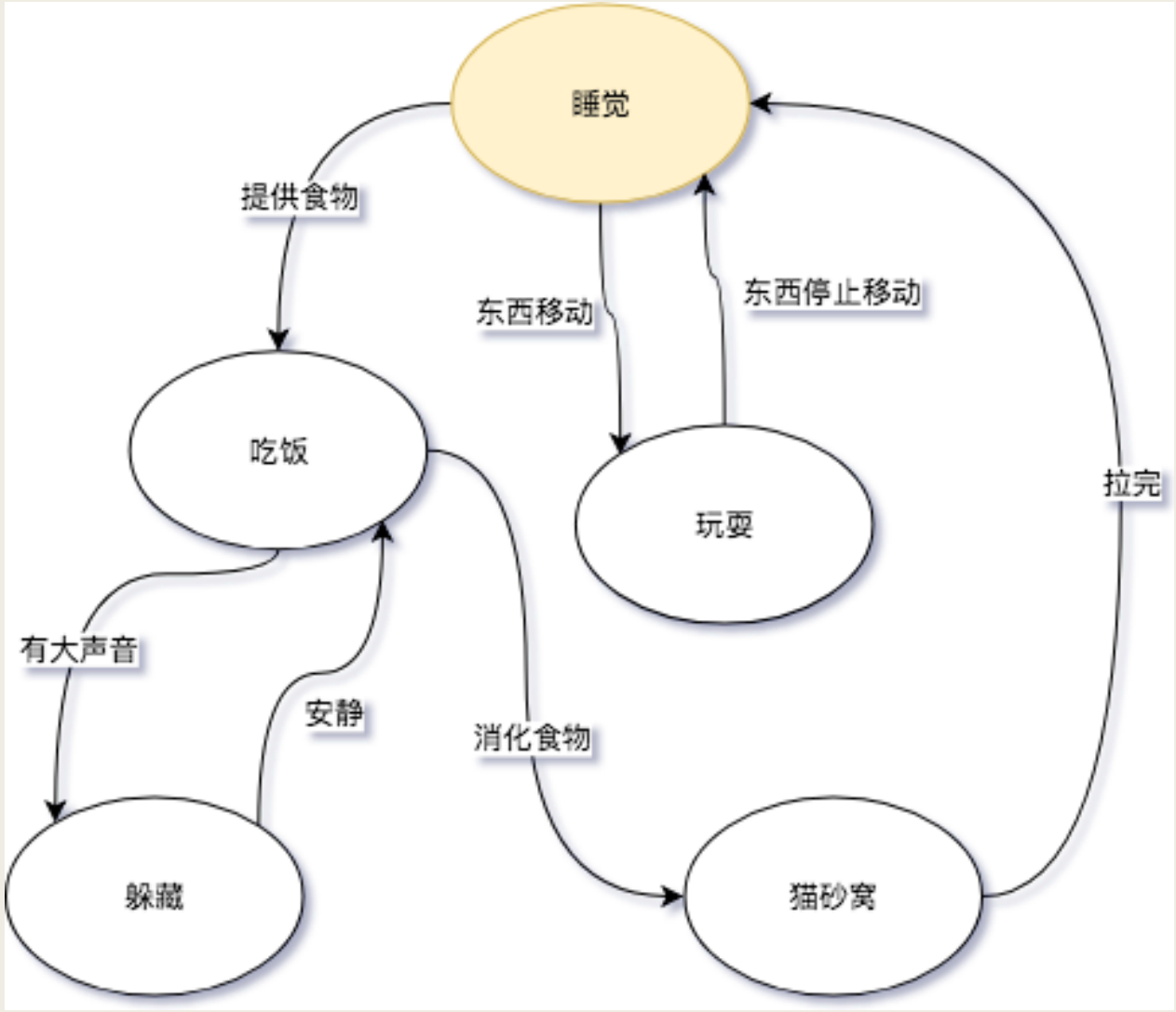



# Finite-state Machine of Digital System

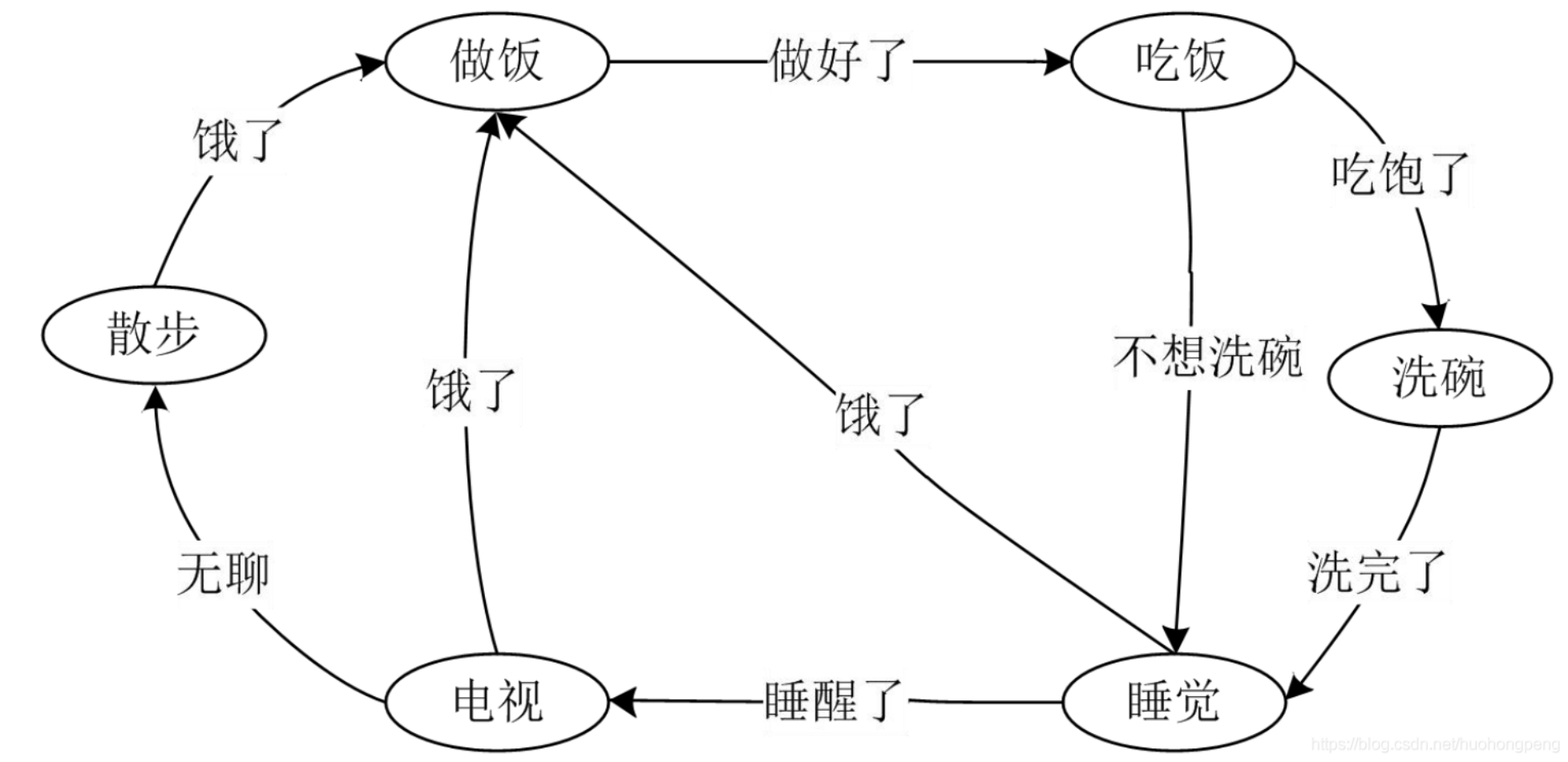


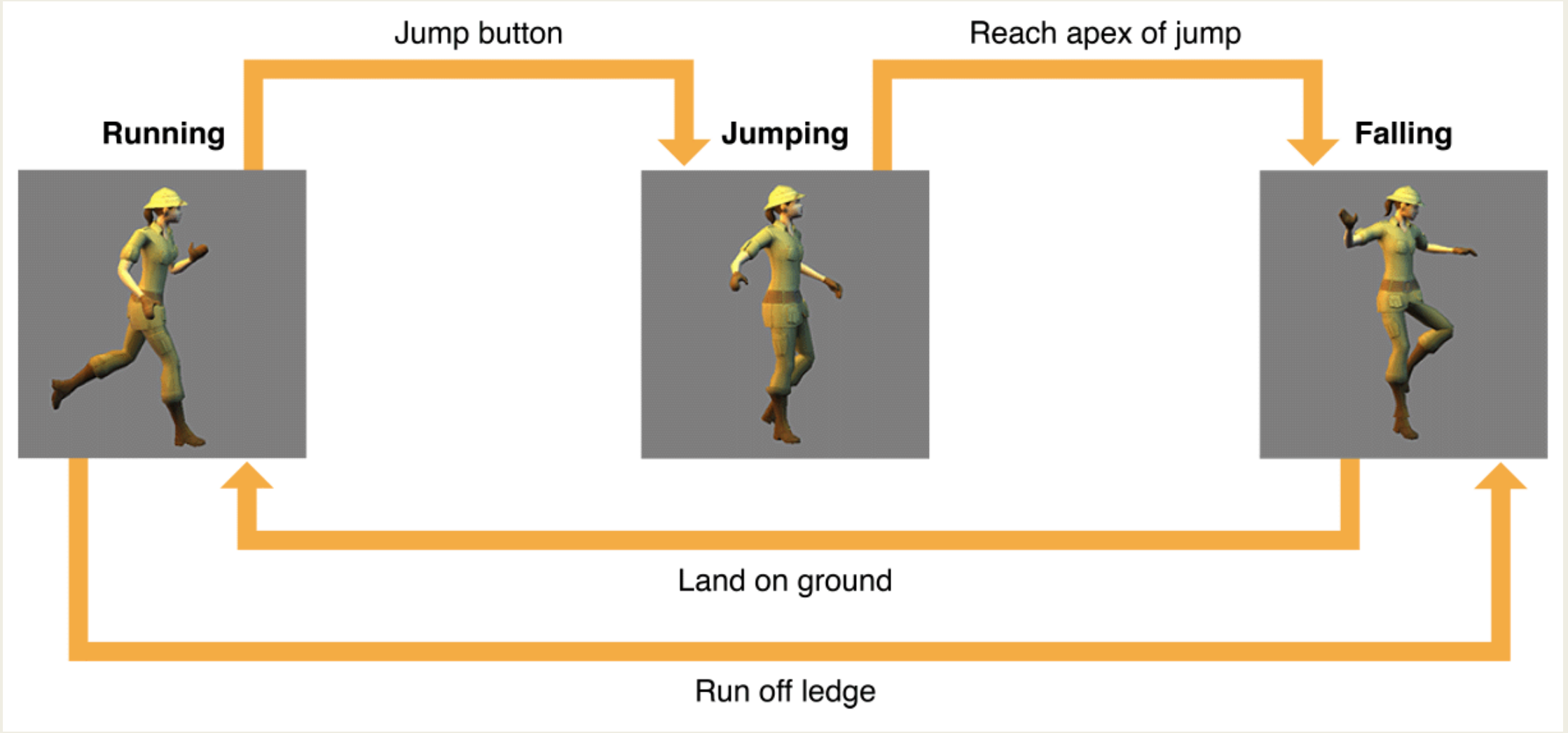
# FSM of 🐱



# FSM of 👩 or 👦


做饭
做好了
吃饭
饿了
吃饱了
散步
不想洗碗
洗碗
饿了
饿了
无聊
洗完了
电视
睡醒了
睡觉
https://blog.csdn.net/huohongpeng

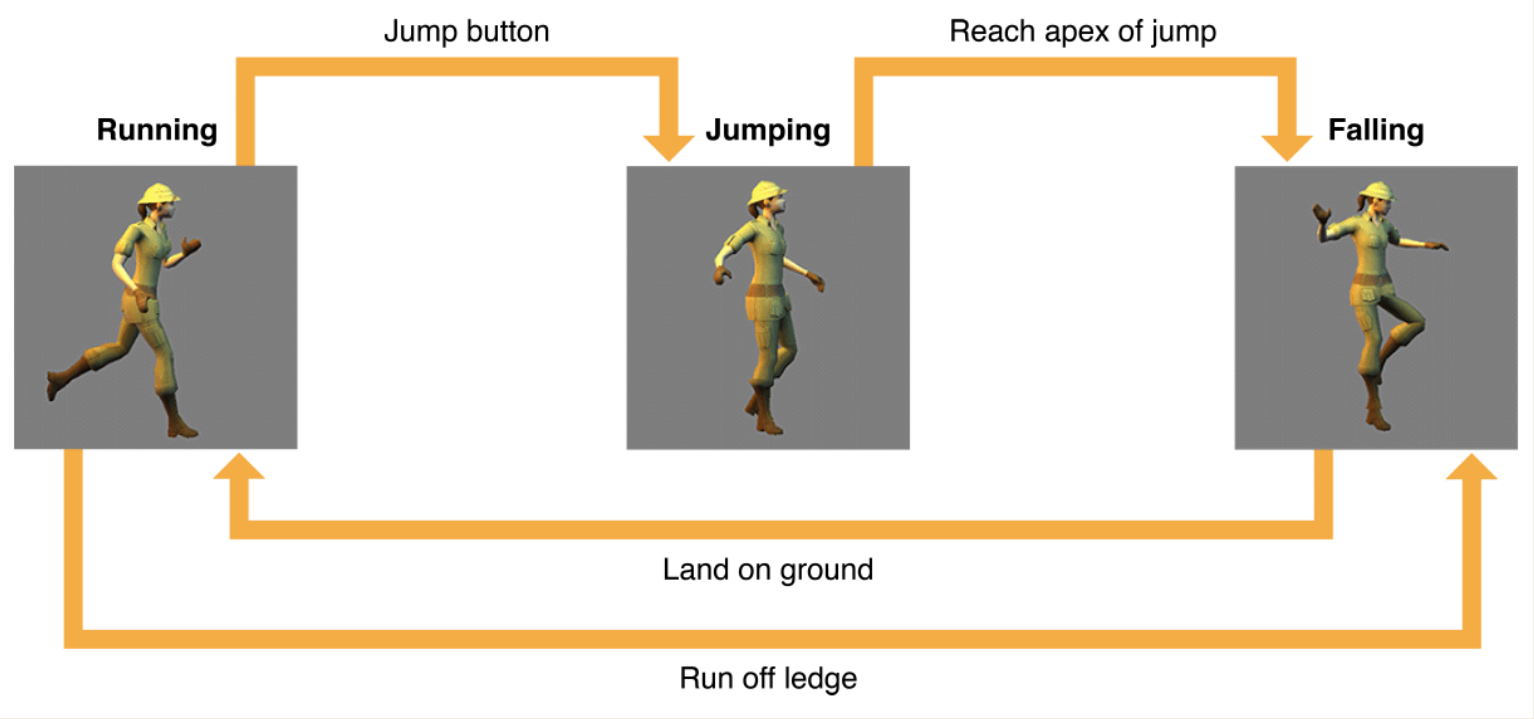
# FSM in Action Games

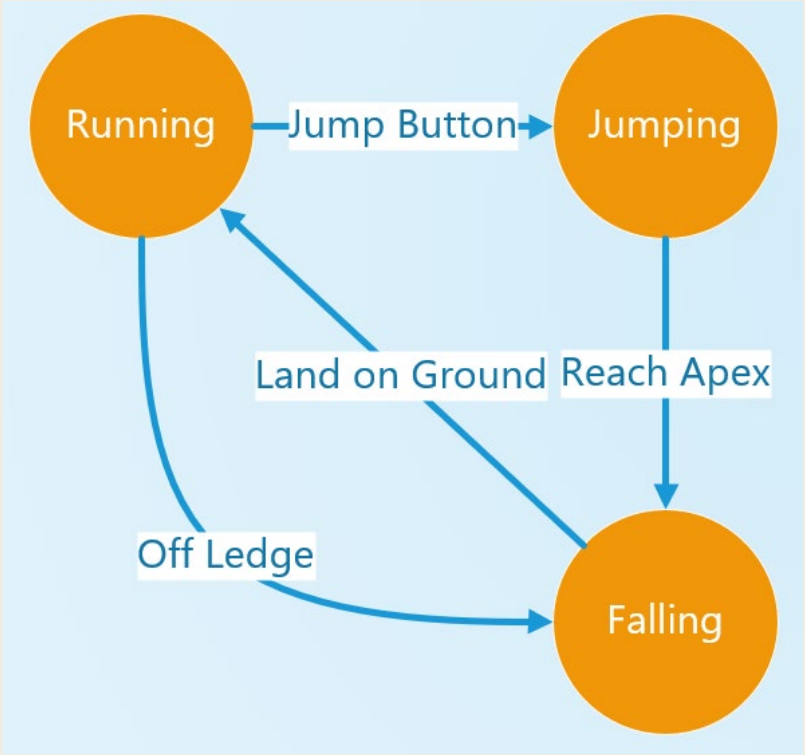


# Motions in Video Games

危险动作，请勿模仿

# FSM Design
# 0. 转换实际问题为状态机

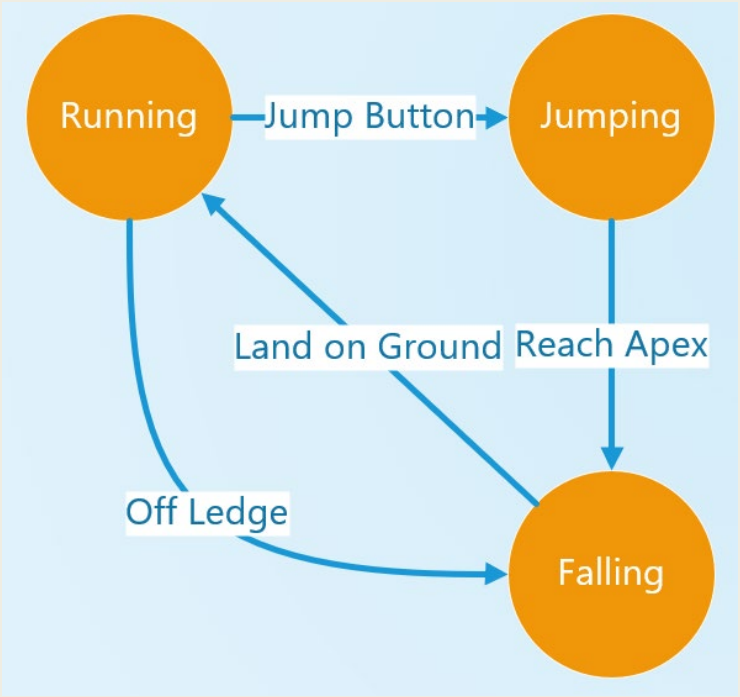


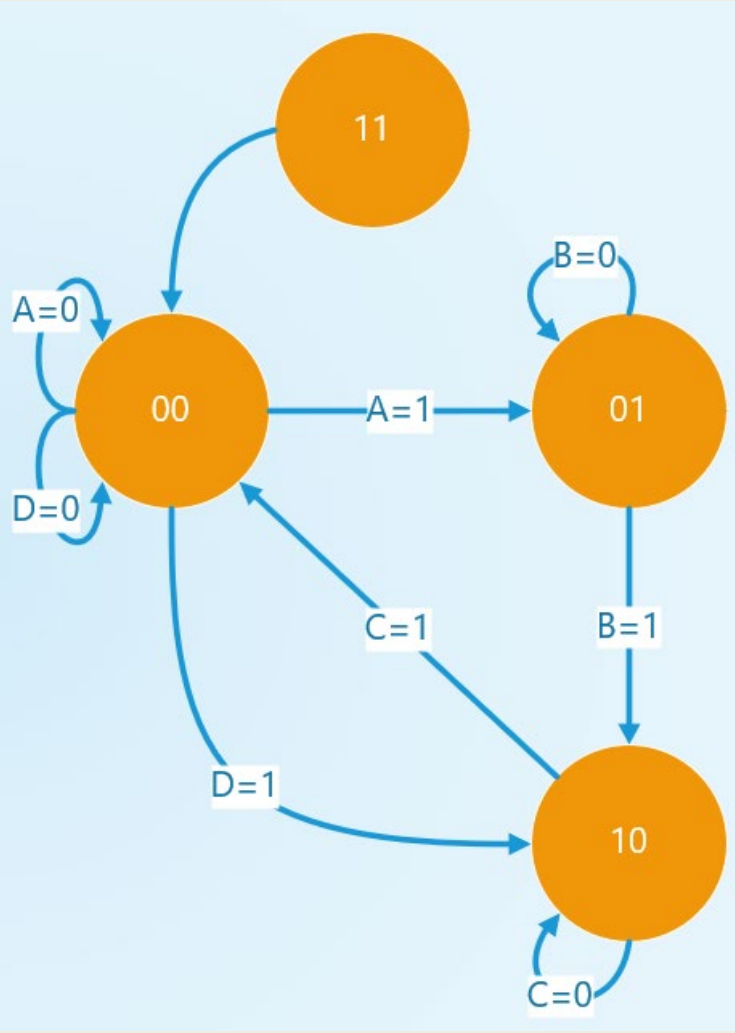



# FSM Design
# 1. 状态编码&定义输入

| | Binary Code(S1,S0) |
|---|---|
| Running | 00 |
| Jumping | 01 |
| Falling | 10 |
| Not Used | 11 |

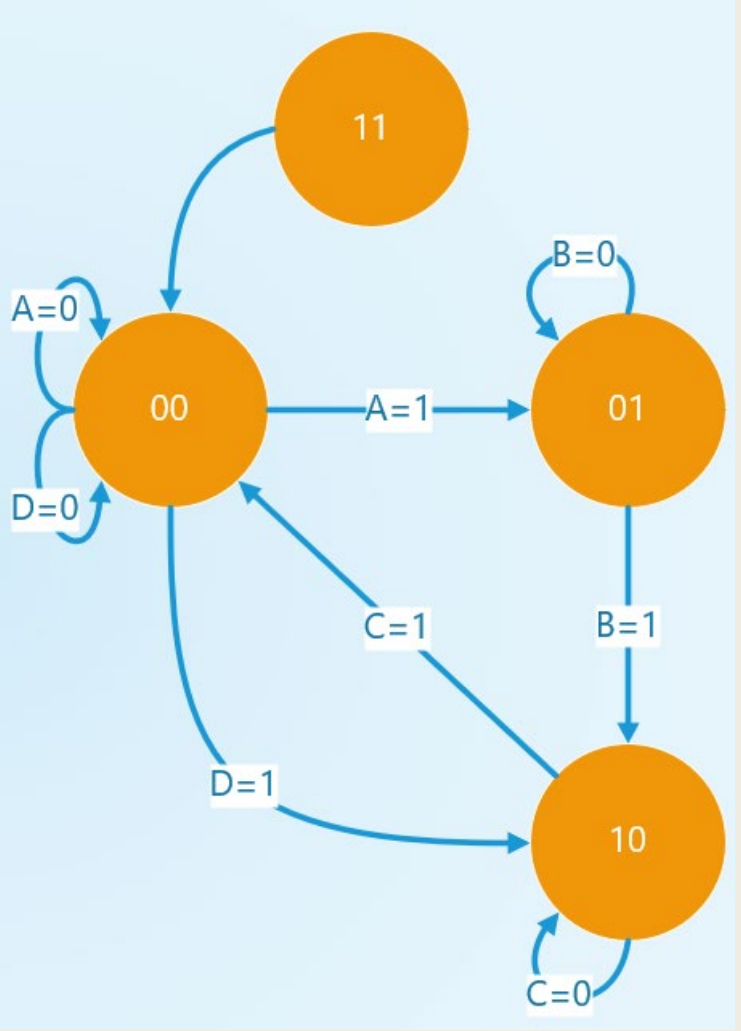
| Input information | Definition |
|---|---|
| Jump button | A |
| Reach apex | B |
| Land on ground | C |
| Run off ledge | D |



# FSM Design
# 2. 列出状态转移表

| S1 | S0 | A | B | C | D | S1* | S0* |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | x | x | x | 0 | 1 |
| 0 | 0 | 0 | x | x | x | 0 | 0 |
| 0 | 0 | x | x | x | 1 | 1 | 0 |
| 0 | 0 | x | x | x | 0 | 0 | 0 |
| 0 | 1 | x | 1 | x | x | 1 | 0 |
| 0 | 1 | x | 0 | x | x | 0 | 1 |
| 1 | 0 | x | x | 1 | x | 0 | 0 |
| 1 | 0 | x | x | 0 | x | 1 | 0 |
| 1 | 1 | x | x | x | x | 0 | 0 |



# FSM Design
# 3. 列出转移方程

| S1 | S0 | A | B | C | D | S1* | S0* |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | x | x | x | 0 | 1 |
| 0 | 0 | 0 | x | x | x | 0 | 0 |
| 0 | 0 | x | x | x | 1 | 1 | 0 |
| 0 | 0 | x | x | x | 0 | 0 | 0 |
| 0 | 1 | x | 1 | x | x | 1 | 0 |
| 0 | 1 | x | 0 | x | x | 0 | 1 |
| 1 | 0 | x | x | 1 | x | 0 | 0 |
| 1 | 0 | x | x | 0 | x | 1 | 0 |
| 1 | 1 | x | x | x | x | 0 | 0 |

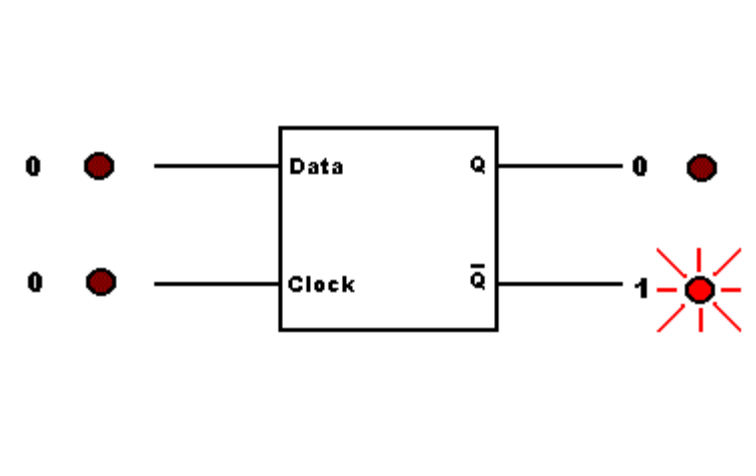
$$S_1{}^* = S_1'S_0'D + S_1'S_0B + S_1S_0'C'$$

$$S_0{}^* = S_1'S_0'A + S_1'S_0B'$$

# FSM Design
# 4. 根据转移方程绘制时序电路

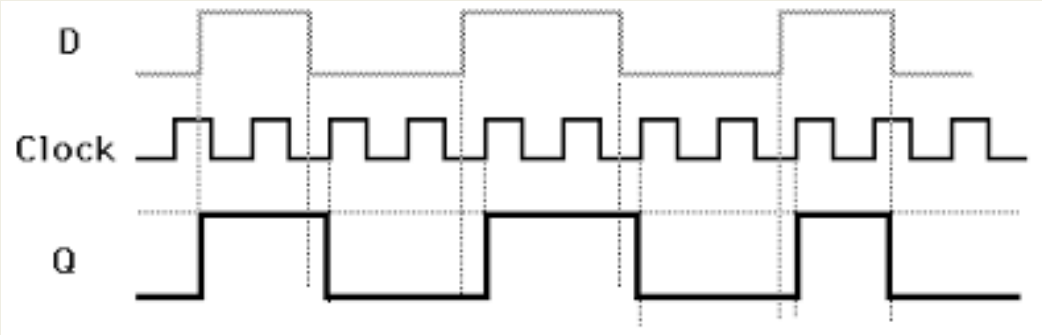
$$S_1{}^* = S_1'S_0'D + S_1'S_0B + S_1S_0'C'$$

$$S_0{}^* = S_1'S_0'A + S_1'S_0B'$$



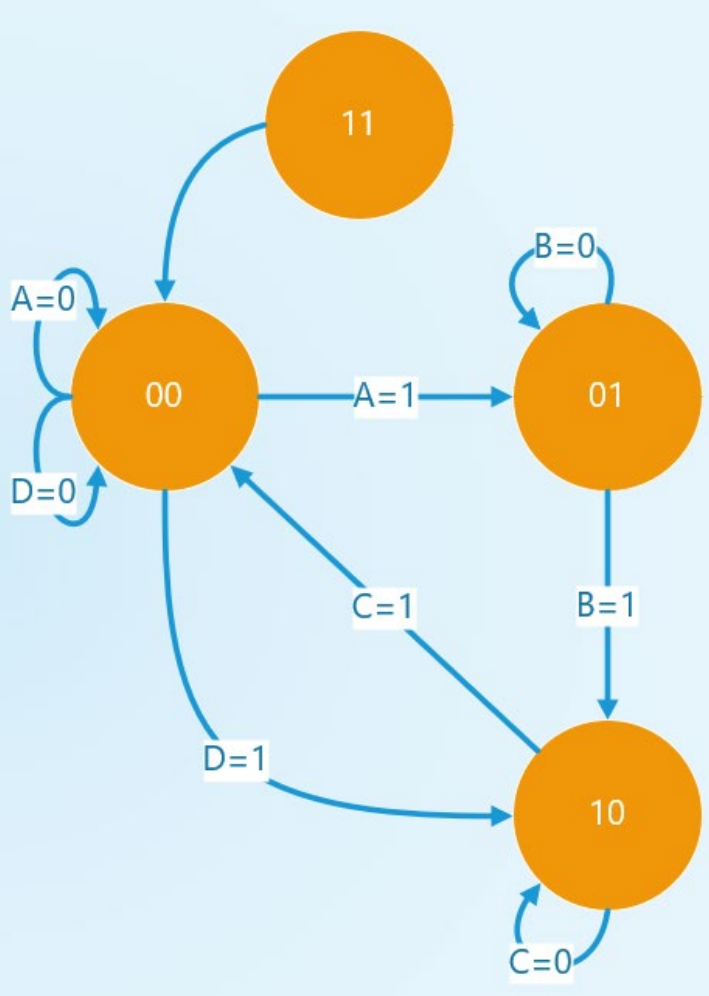

D Flip Flop (DFF)

| Q | d | CK | Q* |
|---|---|---|---|
| x | 0 | ↑ | 0 |
| x | 1 | ↑ | 1 |
| 0 | X | else | 0 |
| 1 | X | else | 1 |




$$Q^* = d$$

# FSM Design
# 5.设计输出电路(状态码转输出)



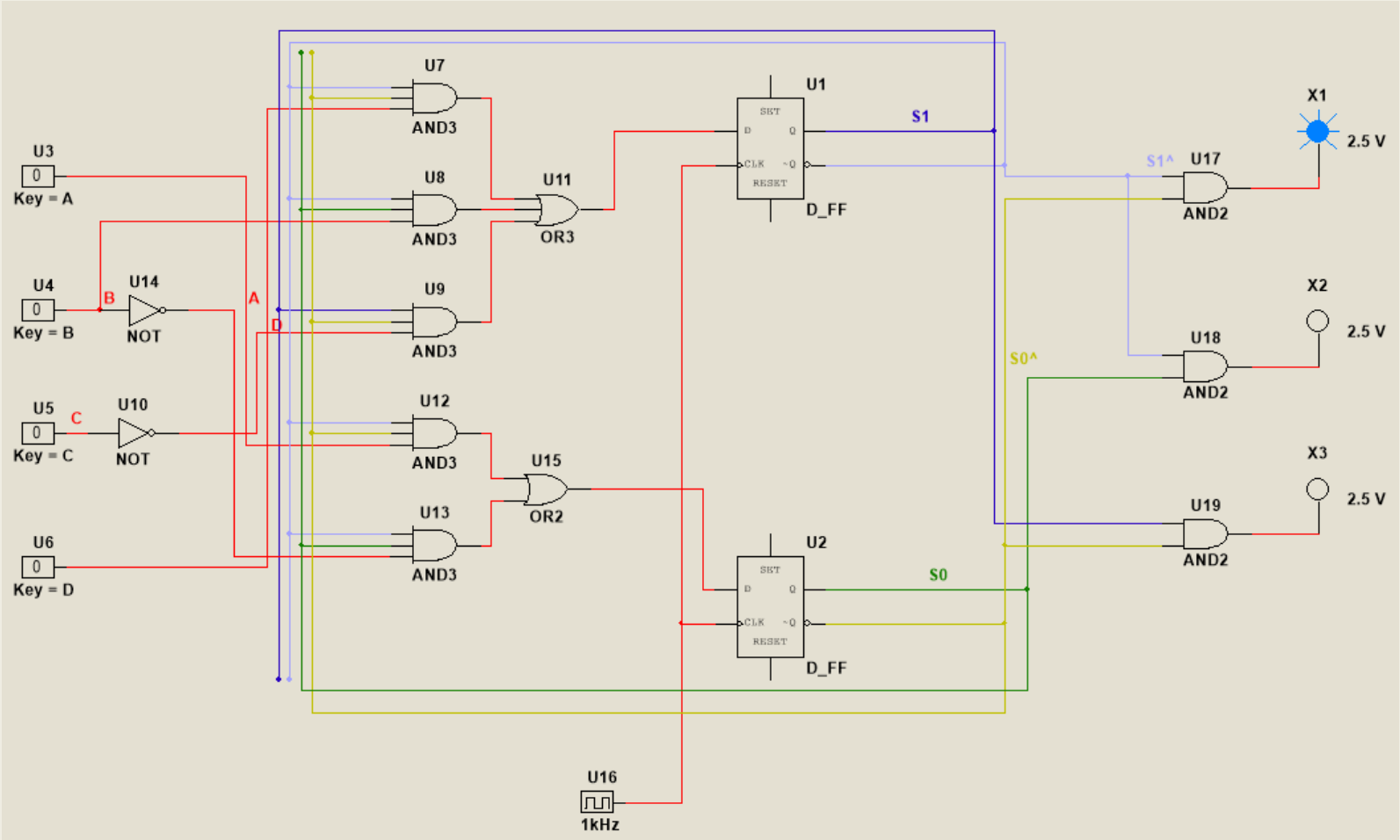

| | Binary Code(S1,S0) |
|---|---|
| Running | 00 |
| Jumping | 01 |
| Falling | 10 |
| Not Used | 11 |

$$\text{Running} = S_1'S_0'$$

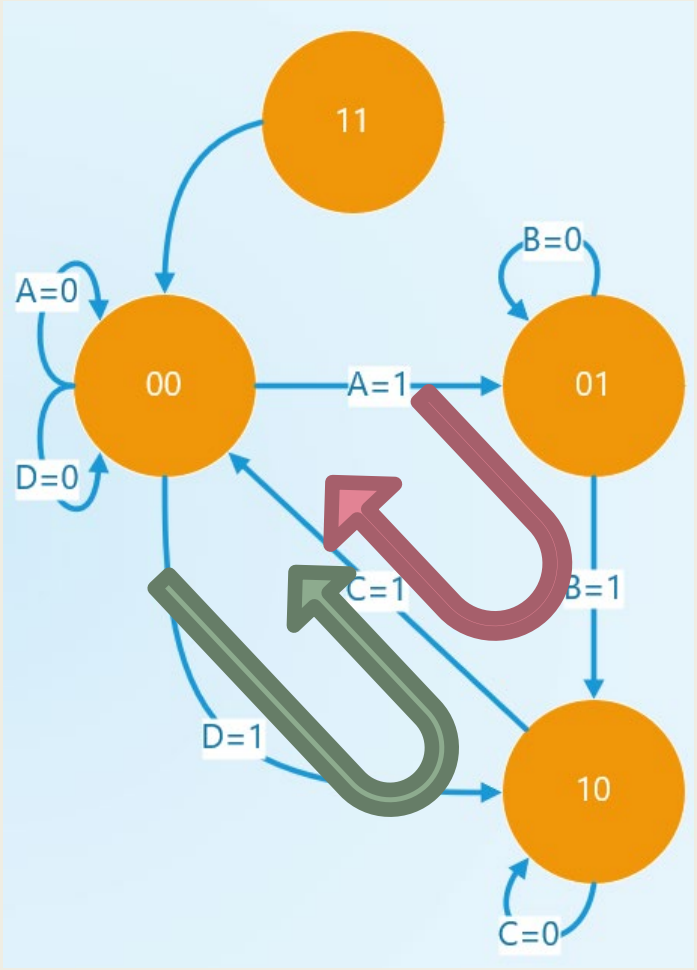
$$\text{Jumping} = S_1'S_0$$

$$\text{Falling} = S_1S_0'$$

# FSM Design
# Final Circuit



# Potential Problem: Loops




Thanks!