# GARAGE DOOR STATE MACHINE

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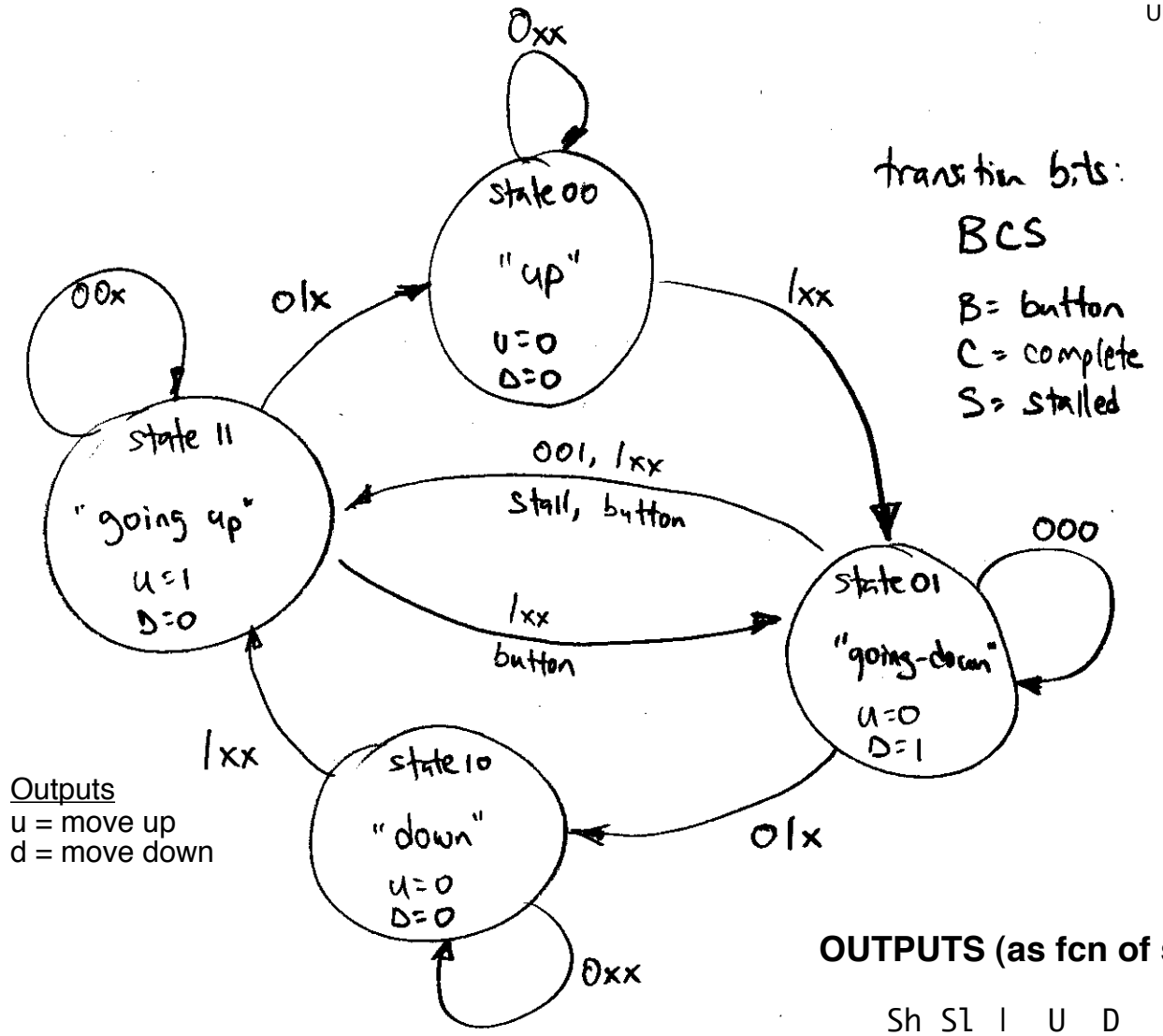


## OUTPUTS (as fcn of state)

| Sh | Sl | U | D |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 |

## STATE TRANSITION TABLE

| Sh | Sl | B | C | S | Sh+ | Sl+ | comment |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | x | x | 0 | 0 | no button |
| 0 | 0 | 1 | x | x | 0 | 1 | button |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | no change |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | stalled, no button |
| 0 | 1 | 0 | 1 | x | 1 | 0 | no button, complete, maybe stalled too |
| 0 | 1 | 1 | x | x | 1 | 1 | button, maybe stalled or complete |
| 1 | 0 | 0 | x | x | 1 | 0 | no button |
| 1 | 0 | 1 | x | x | 1 | 1 | button |
| 1 | 1 | 0 | 0 | x | 1 | 1 | no button, not complete, ignore stall |
| 1 | 1 | 0 | 1 | x | 0 | 0 | complete |
| 1 | 1 | 1 | x | x | 0 | 1 | button override (stall, complete OK) |

**STATE EQUATIONS & MINIMIZATION**

$$S_H^+ = \overline{S_H}\, S_L \overline{B}\,\overline{C}\, S + \overline{S_H}\, S_L \overline{B} C + \overline{S_H}\, S_L B + S_H \overline{S_L}\,\overline{B} + S_H \overline{S_L} B + S_H S_L \overline{B}\,\overline{C}$$

$$= \overline{S_H}\, S_L \left(\overline{B}\,\overline{C} S + \overline{B} C + B\right) + S_H \overline{S_L} + S_H S_L \overline{B}\,\overline{C}$$

$$= \overline{S_H}\, S_L \left(\overline{B}\left(\overline{C} S + C\right) + B\right) + S_H \left(\overline{S_L} + S_L \overline{B}\,\overline{C}\right)$$

$$S_L^+ = \overline{S_H}\,\overline{S_L} B + \overline{S_H}\, S_L \overline{B}\,\overline{C}\,\overline{S} + \overline{S_H} S_L \overline{B}\,\overline{C} S + \overline{S_H} S_L B + S_H \overline{S_L} B + S_H S_L \overline{B}\,\overline{C} + S_H S_L B$$

$$= \overline{S_H}\,\overline{S_L} B + \overline{S_H}\, S_L \left(\overline{B}\,\overline{C} + B\right) + S_H \overline{S_L} B + S_H S_L \left(\overline{B}\,\overline{C} + B\right)$$