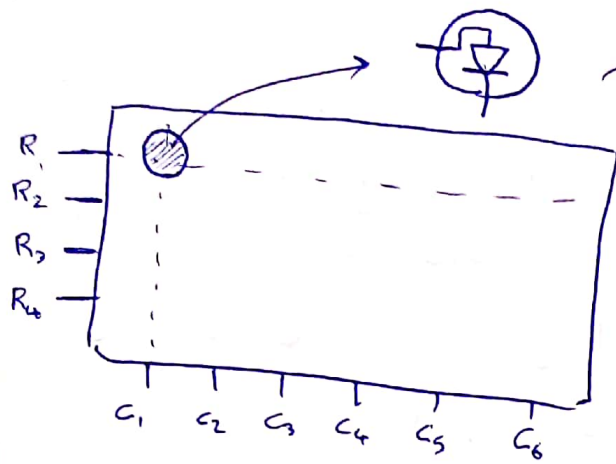


How to multiplex LED matrix:

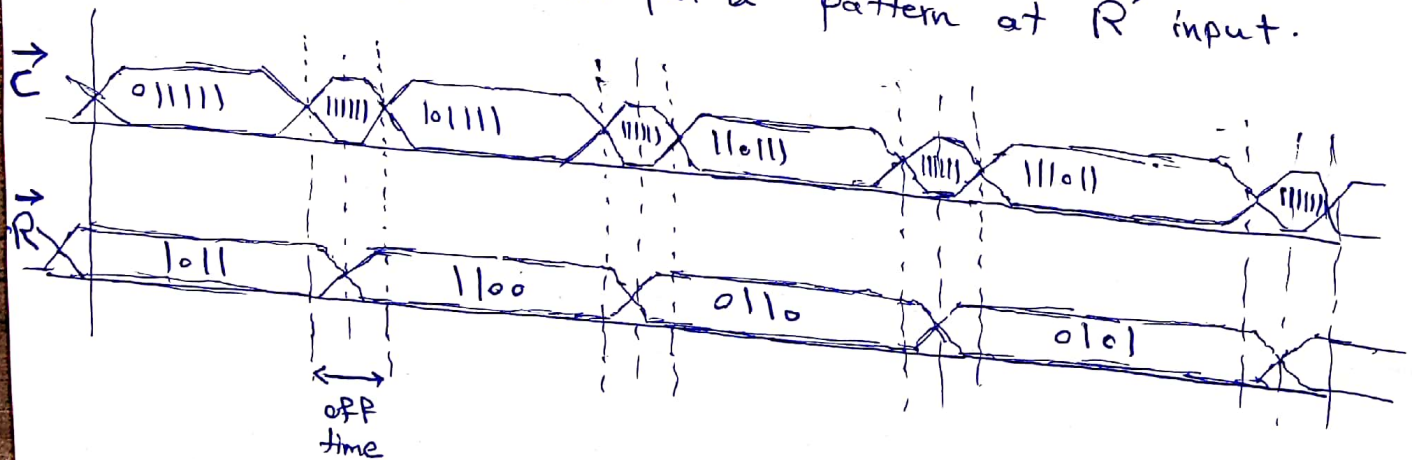


so we should connect C_1 to Ground and R_1 to VCC to light LED up

at each time, only one column is connected to Ground, and other pins are VCC (or can be floating). this can be done by a shift register that shifts 01111 in a circular pattern

01111 \rightarrow 10111 \rightarrow 11011 \rightarrow 11101 \rightarrow 11110 \rightarrow 01111 \rightarrow ...

at each time you should put a pattern at \vec{R} input.



in the off-time all of the \vec{C} 's are off, so you can change the \vec{R} data in this interval.

to put data at \vec{R} , you have two options.

1) parallel input: you can connect all of the pins of \vec{R} to your GPIO pin, and then put data in a parallel manner.

The delay needed in off-time interval needs to be the $\frac{1}{\text{GPIO speed}}$

2) using shift Registers :

we know that it is possible to use Shift Registers as Serial in to Parallel out device. so in using shift Registers you need to put your \vec{R} data in shift Register one by one in the off-time interval. if you have 16 Rows, then you can use two 8 bit shift Registers. one for the first 8 bit, and the other for second 8 bit.

Loading data at shift Registers can be done in parallel. in this case the bottleneck will be loading 8 bit serial data in shift register. if you put data at each rising edge then it will take 8 * GPIO speed to put your data at all of the \vec{R} elements.