

1) You have been asked to design a VERY simple circuit to determine the direction of motion for the quadrature output of a mouse 20pts

Design Requirements:

Forward or Backward. (don't over complicate it – direction only)

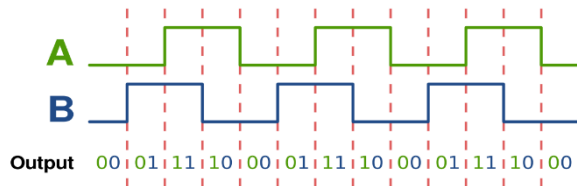
Available signals:

A, B

Explore several design spaces – there is a truly simple solution

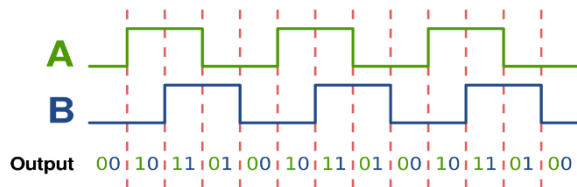
Forward rotation

B "leads" A



Backwards rotation

A "leads" B



ELE 4142

HW8

Name _____

2) You have been tasked with calculating the required frame rate for a new optical mouse design

30pts

Design Requirements:

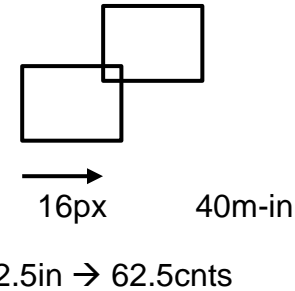
Motion up to 25ips must be supported

System Specs:

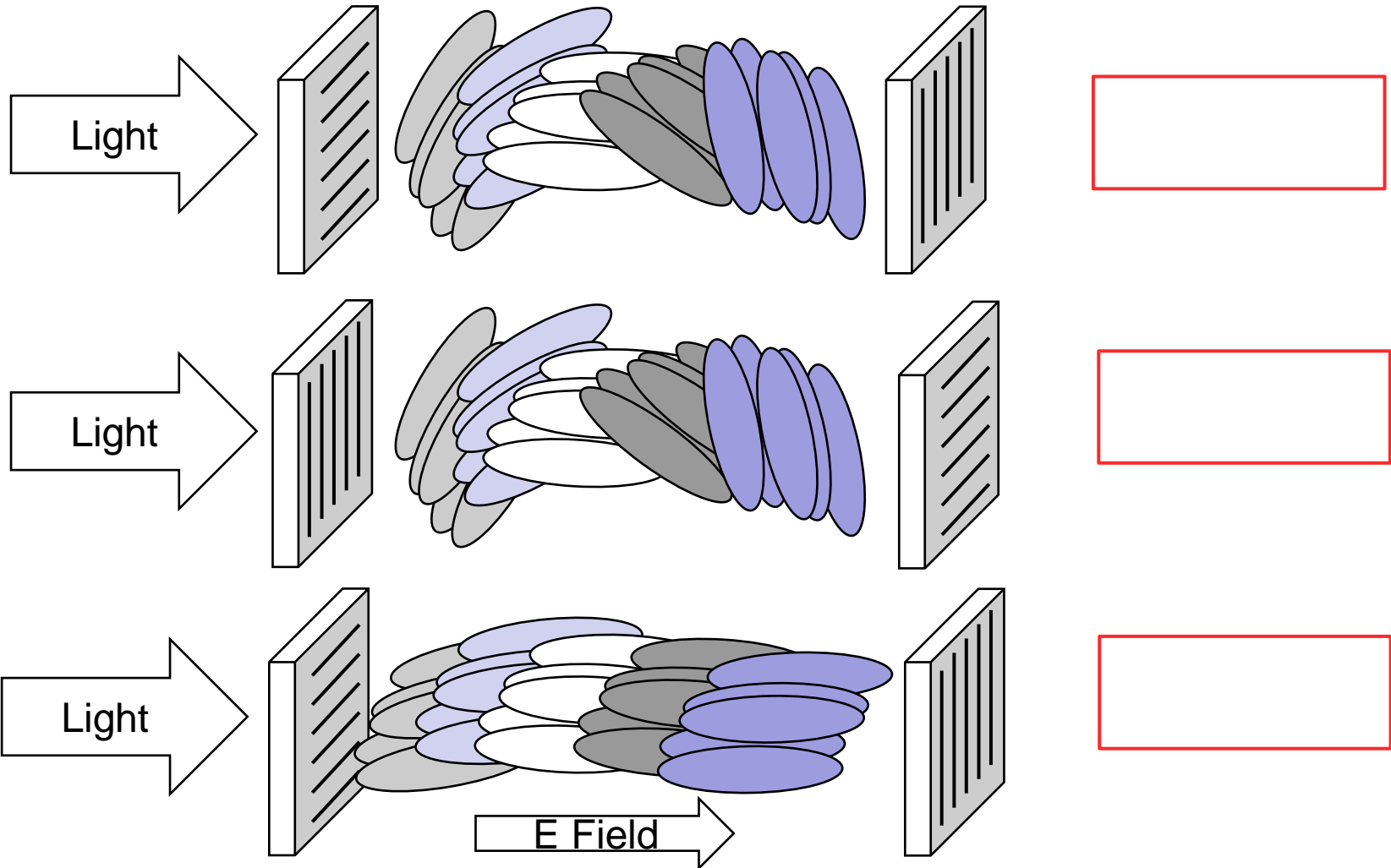
20 x 20 sensor

Sensor resolution = 400 cpi

4x4 pixel minimum required to attain correlation



3) Assuming a Twisted Nematic Liquid Crystal – indicate the polarity of light exiting the structure: Horizontal, Vertical, None
10pts



4) You have been assigned the job of sizing the Cell capacitance of a new OLED pixel cell. This cell will be used in a 1080p display operating at a 60Hz refresh rate.

30pts

Design Requirements:

Maintain 95% programmed brightness between refresh cycles at 75% of peak brightness

Known Parameters:

Peak programming voltage = 8V

Parasitic capacitance on the source follower gate node = 5fF

Parasitic leakage on the source follower gate node is 0.5pA

Design Understanding:

Brightness is proportional to diode current

Diode current is proportional to the gate voltage of the source follower

5a) Determine the difference in time for a specific individual pixel to update comparing a 1080p display operating at 120Hz and a 1080i display operating at 120Hz

5 pts

5b) What is the fundamental physical principle behind E Ink operation

5 pts