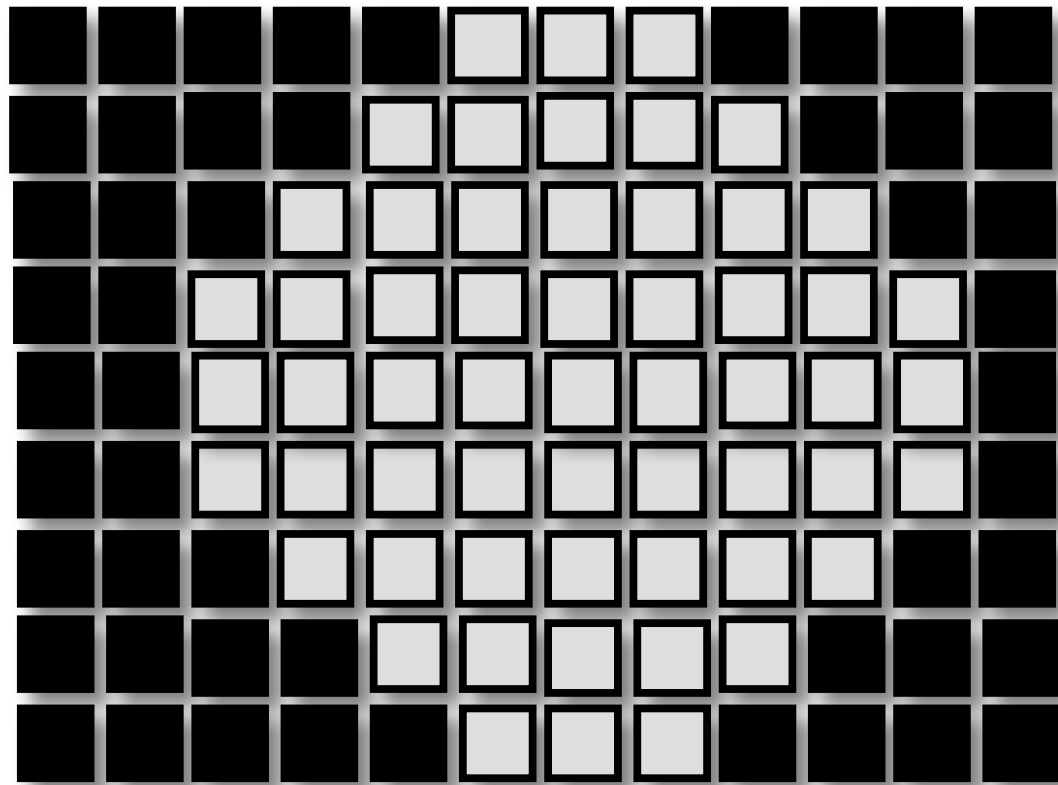# Homework-
CamCom Implementation

What you will learn

- Implement a simple CamCom system receiver

    - RX decode using software

- Basic modulation schemes
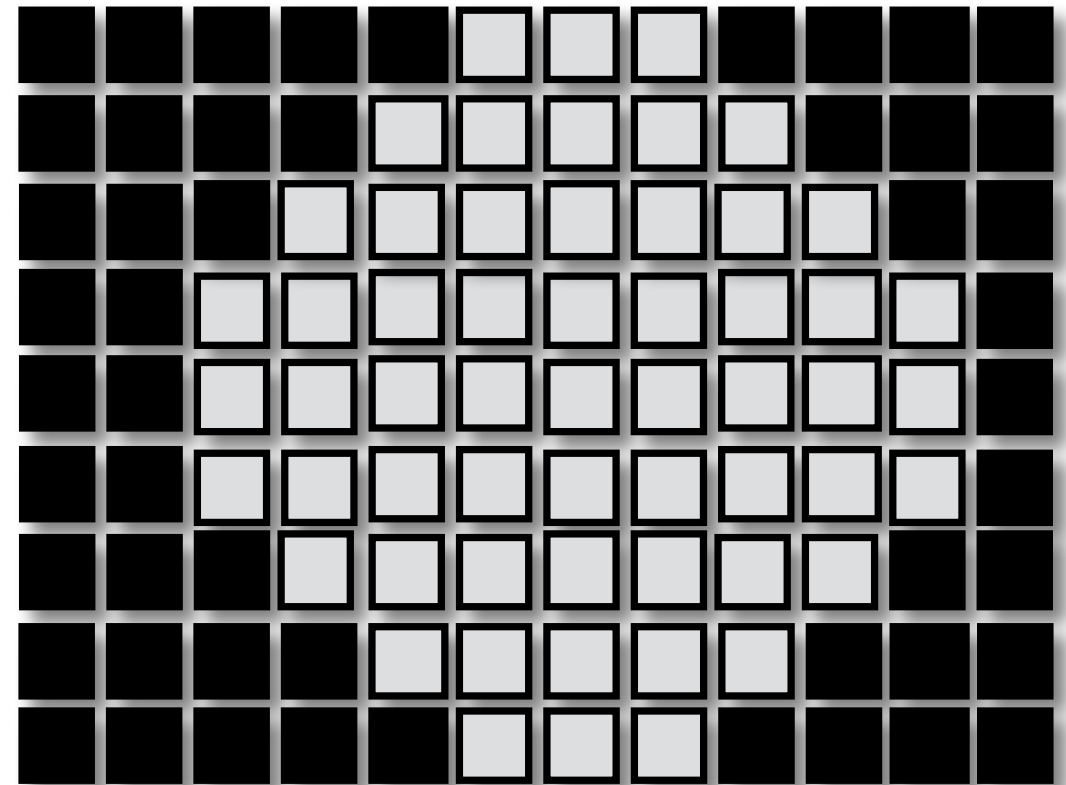
    - On-Off keying、Manchester coding

Cameras have two kinds of shutter

Global shutter
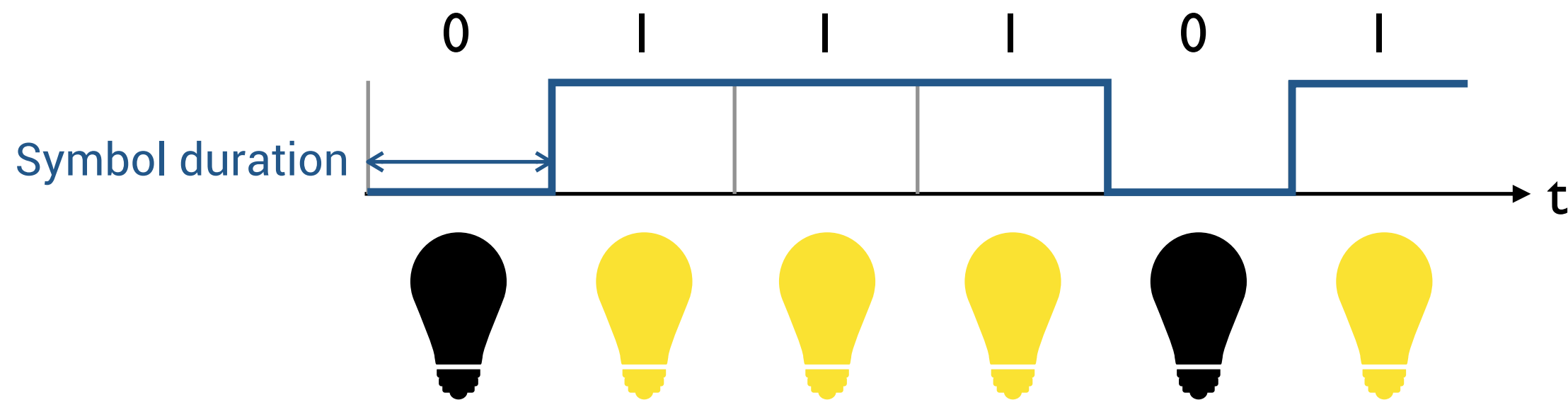
Rolling shutter

**Pixels exposed
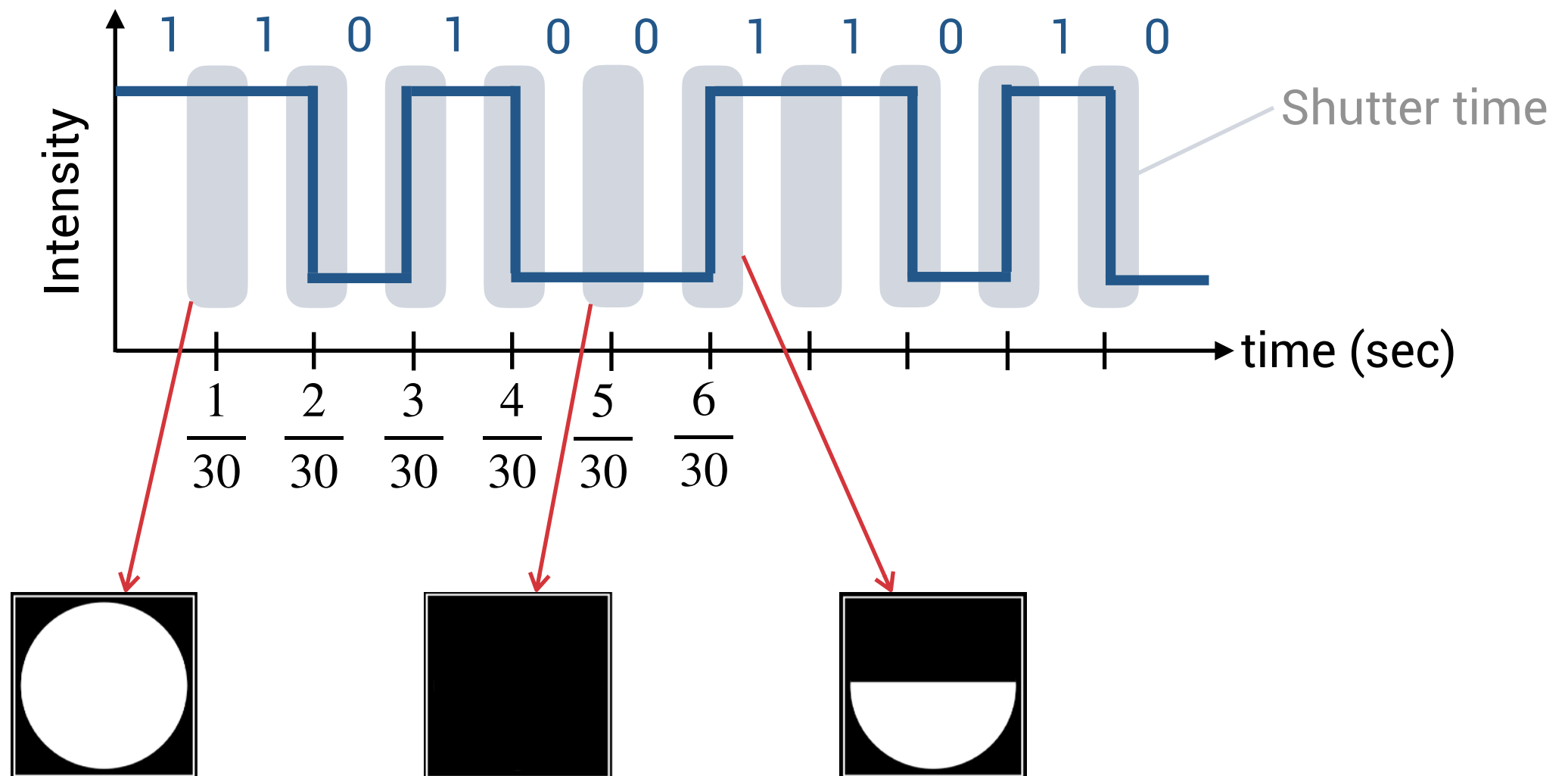SIMULTANEOUSLY**

**Pixels exposed
Row by Row**

On-Off keying (OOK)

Bright: bit 1, dark: bit 0

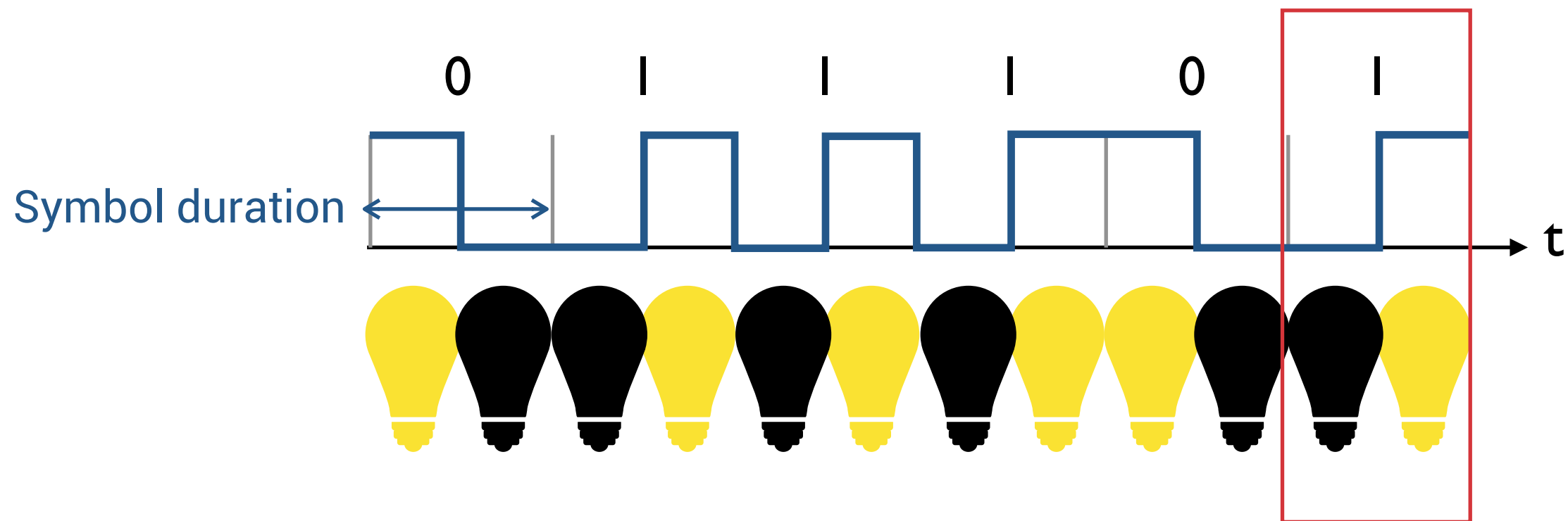# When recoded by a camera...

TX: $\dfrac{1}{30}$ sec symbol duration, RX: 30 frames per seconds (fps)

A symbol might be captured in adjacent two frames!

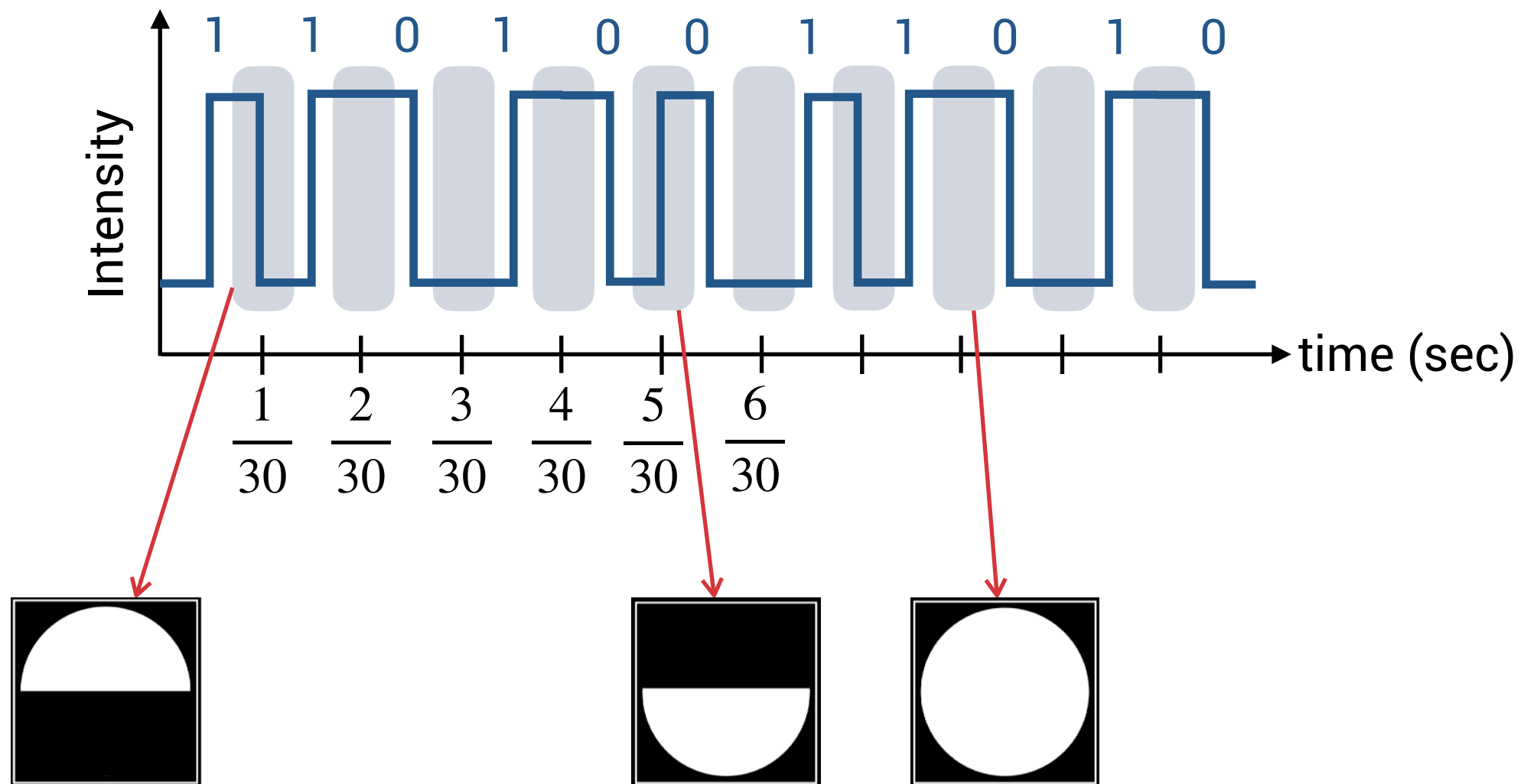# OOK with Manchester coding

Dark to bright: bit 1, bright to dark: bit 0

Symbol duration

0   I   I   I   0   I

t

Intensity changes in EVERY symbol

OOK with Manchester coding + Camera

TX: sec symbol duration, RX: 30 frames per seconds (fps)

Homework - Goal

- Decode the pre-recorded video of LED modulated with OOK with Manchester coding

  - 1080p (1920 x 1080), 30 fps

  - **Only need to decode 1 second, 24 bit in total**
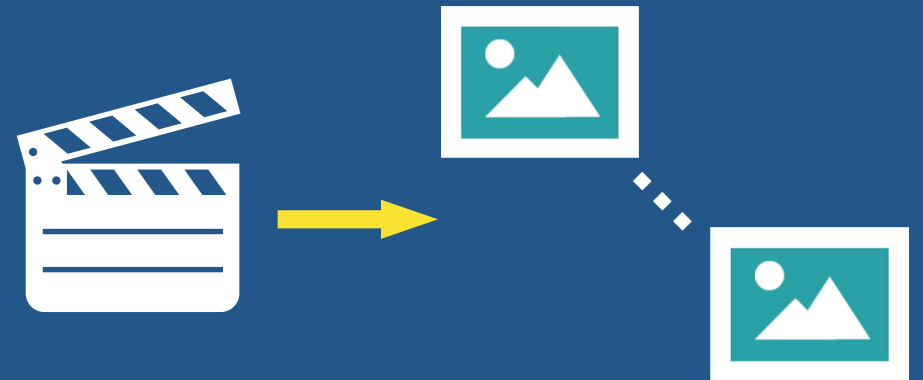

Time

Homework - Tx parameters

- Data: 24 bit (What you need to report)

  – OOK with Manchester coding, symbol duration: 1/30 s

- Preamble for determining when the transmission begins

  – 6 symbols [1 1 1 0 0 0], symbol duration: 1/30 s

- Preamble + data sequence are sent repetitively
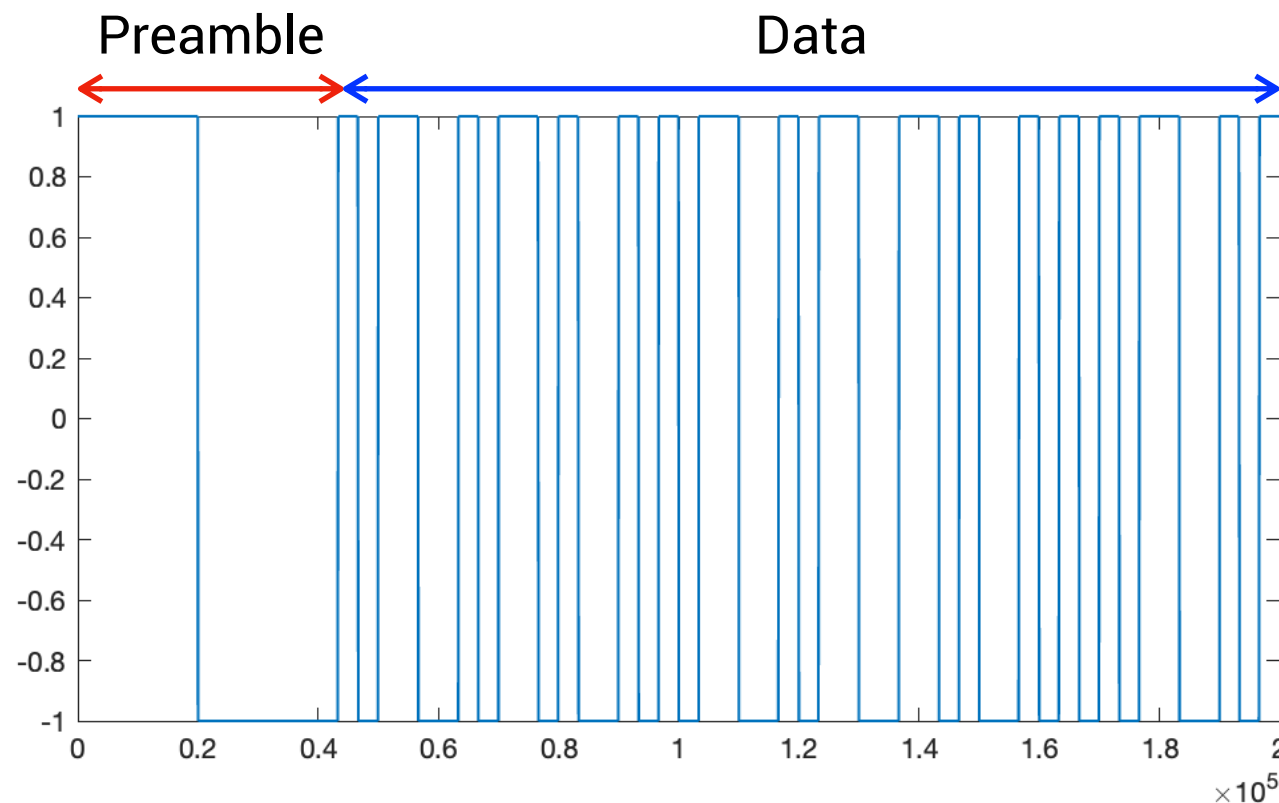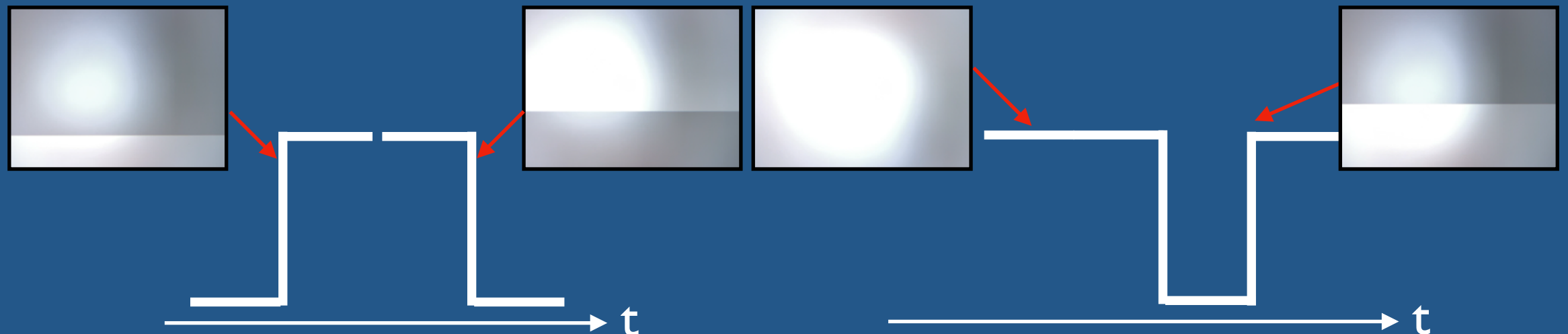
Recommended decoding procedure

Step 1
- Read out each frame in the video
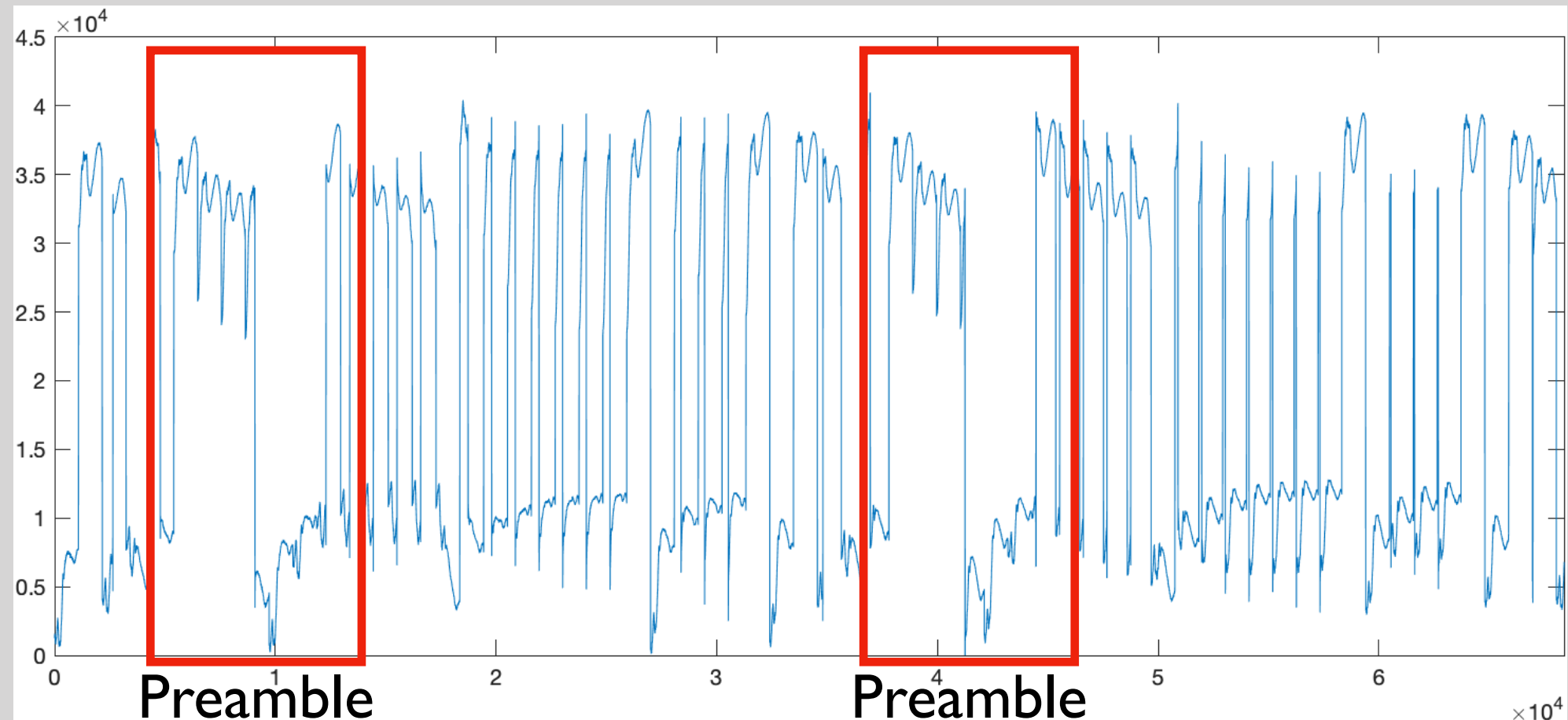 - FFmpeg, OpenCV,...

Step 2
- Turn 2D images into 1D signals
  - Maybe with some preprocessing, e.g., image crop...

Step 3

- Find the start of transmission
    - Design preamble: [1 1 1 0 0 0], 1/30 s for each symbol

Step 4

- Start to decode

- Turn the 24-bit binary number to decimal number

Submission

- Deadline: 2022. 4. 8 (Fri) 23:59:59

- .zip file, containing

  - Your code (C/C++, Python, Matlab)

  - One page report (**pdf** file) about

    ‣ Decode result (in decimal number)

    ‣ How do you decode the signal

    ‣ How to execute your code

Notice

- One test data is given for your reference

  - Filename: **camcom_testdata.mp4**

  - Answer: **15466070**

- Different videos are randomly given to every student

- Discussions are welcome, however

  - **DO NOT SHOW YOUR CODE TO OTHERS**

- Late submission is not allowed

Questions?

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