Računarski fakultet Beograd

Diplomski rad

# Laserska komunikacija

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Mentor
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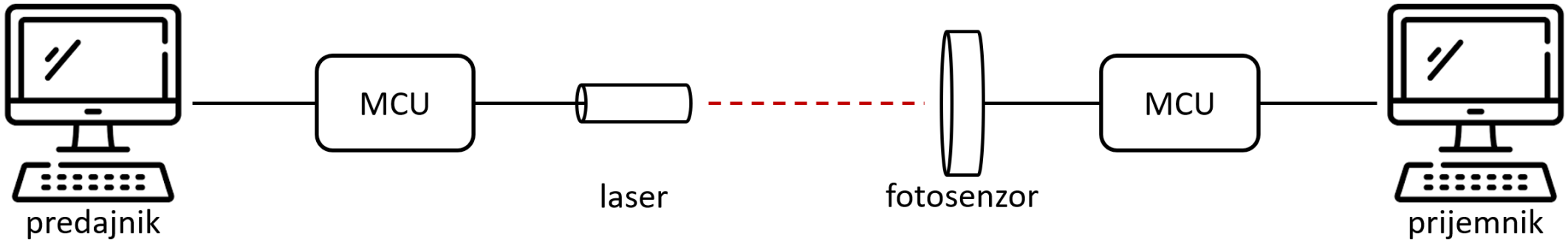
# Inspiracija i ideja

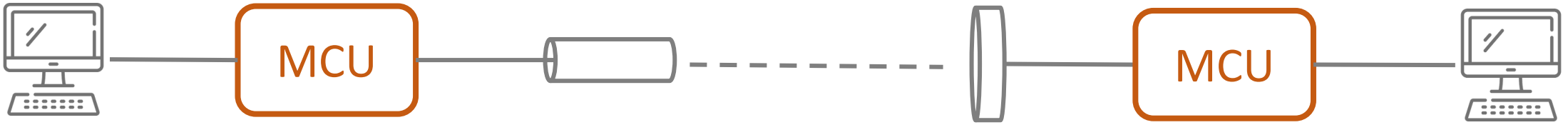
- Optička vlakna
- Preneti poruku sa jednog računara na drugi korišćenjem lasera

# Opis sistema



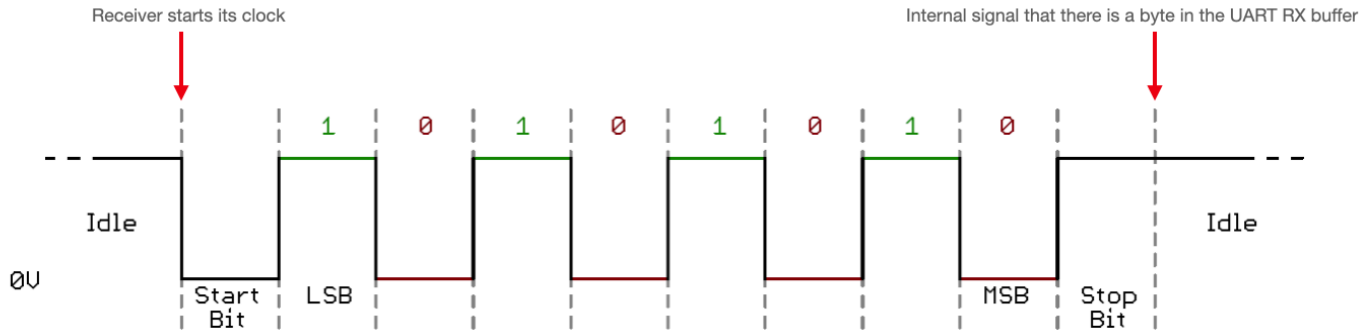
# Mikrokontroleri

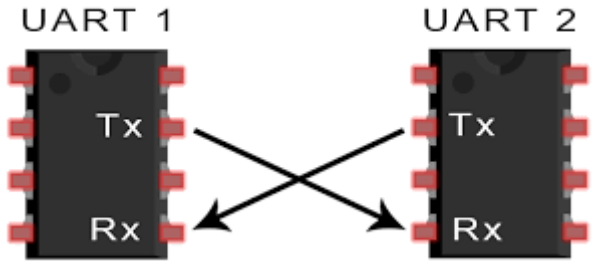
- Atmega238p
- Arduino razvojno okruženje

# UART protokol

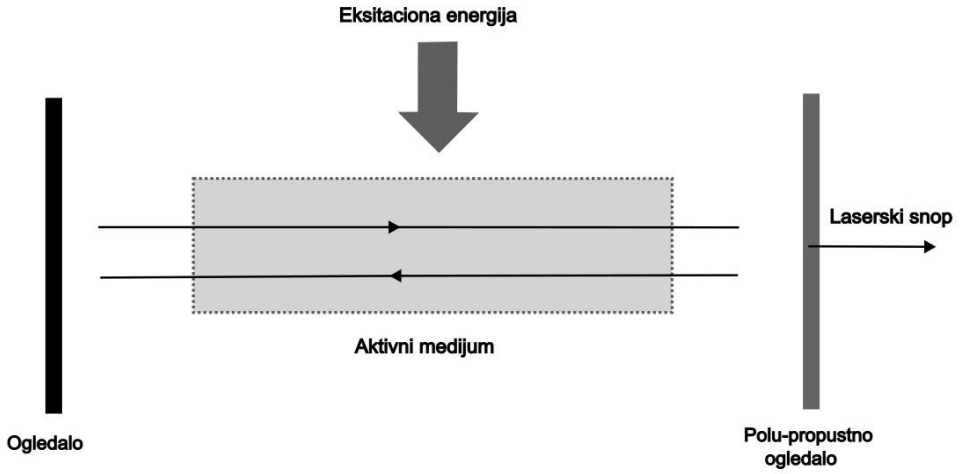
- Universal asynchronous receiver – transmitter
- Jedan kanal po smeru
- Full duplex
- Frekvencija odabiranja (baud rate)

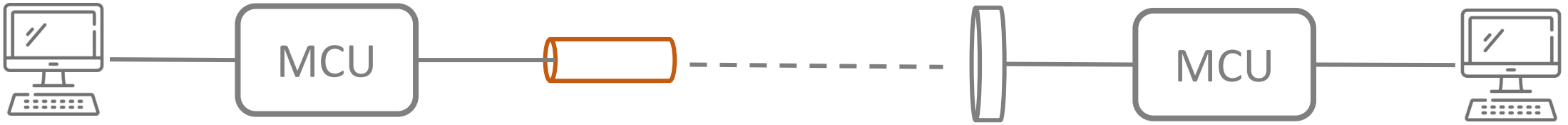



# Laser

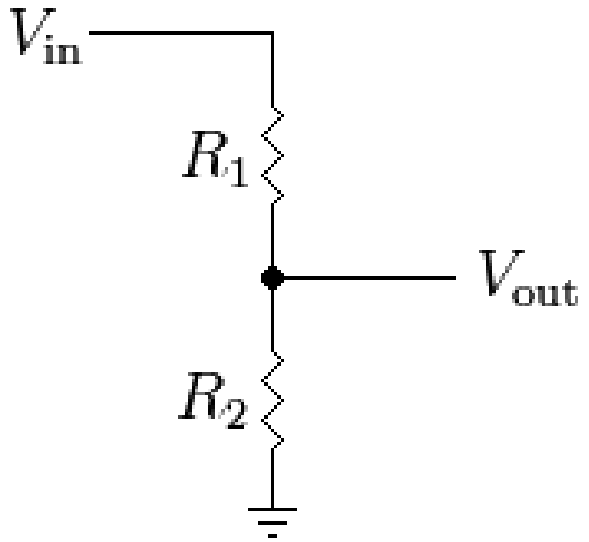
- Light Amplification by Stimulated Emission of Radiation
- Poluprovodnički crveni laser (640nm)



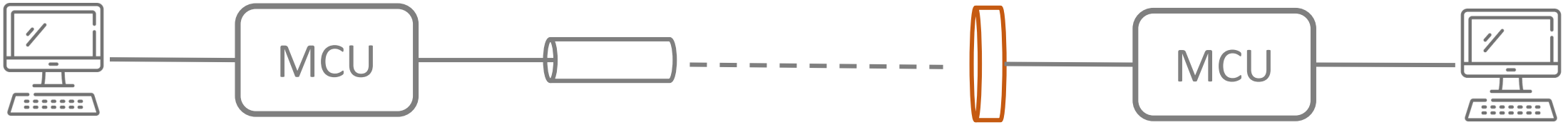



# Fotosenzori

- Fotootpornik
- Fotodioda
- Naponski razdelnik

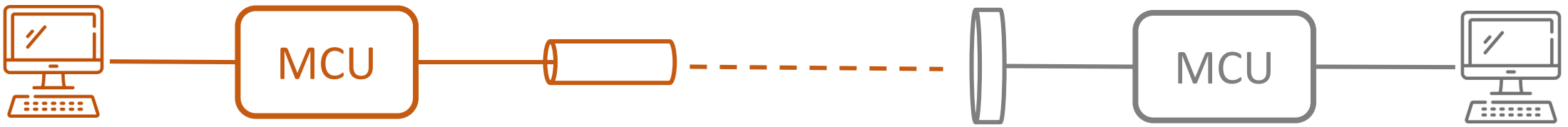



$$V_{out} = \frac{R2}{R1 + R2} * V_{in}$$

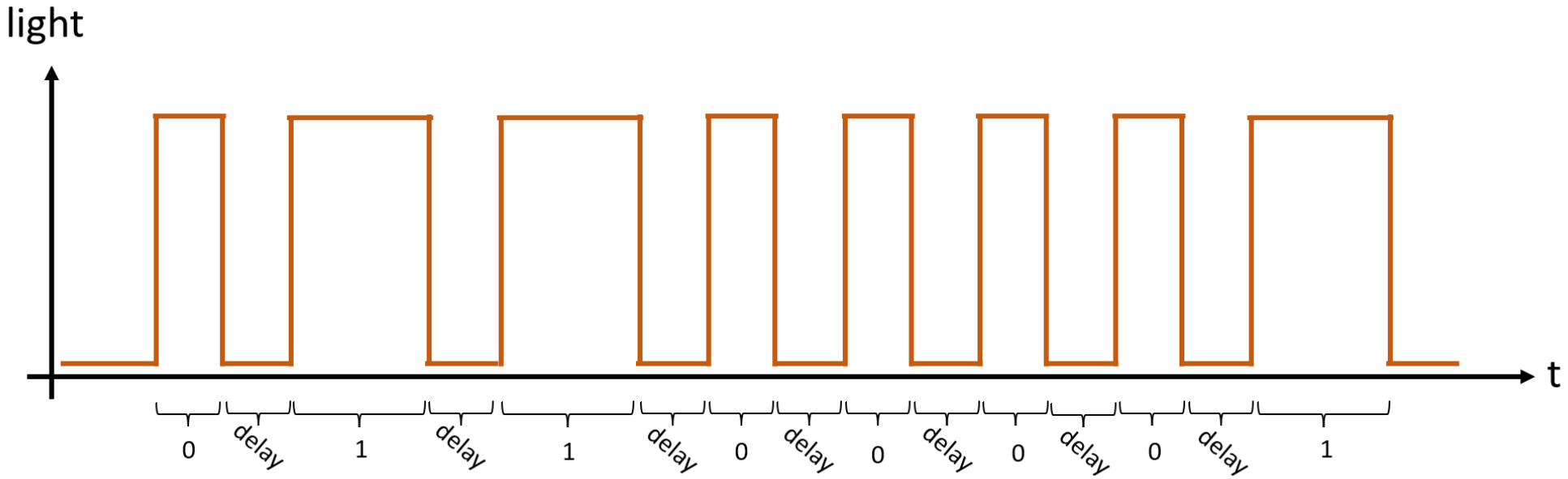


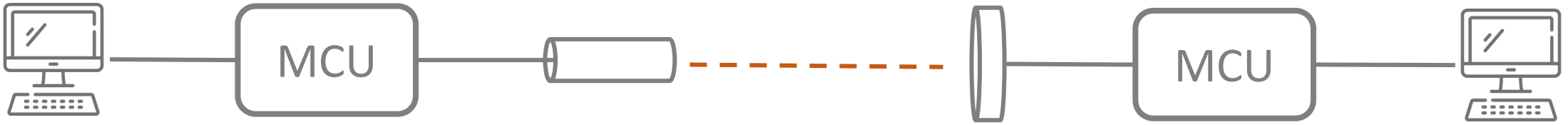
# Predajnik

- ASCI binarni kod
- Modulacije:
  - Vremenska
  - Direktna

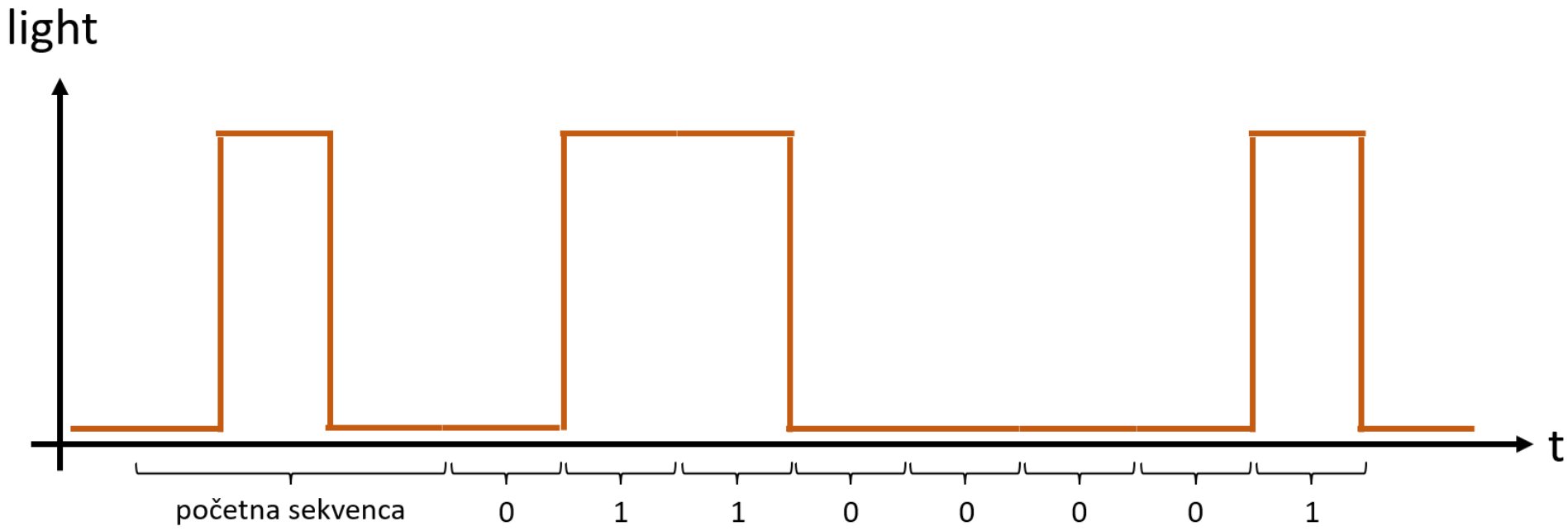


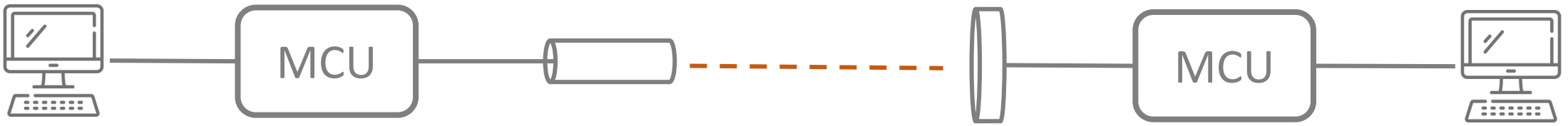
# Vremenska modulacija



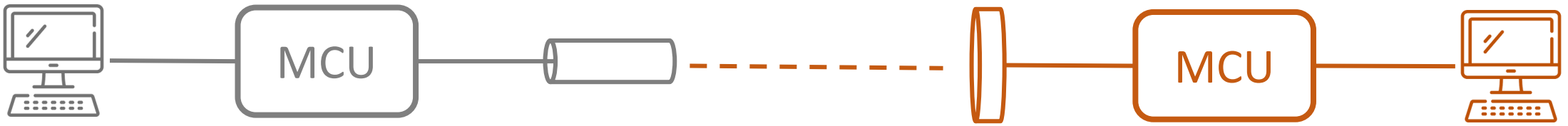
# Direktna modulacija



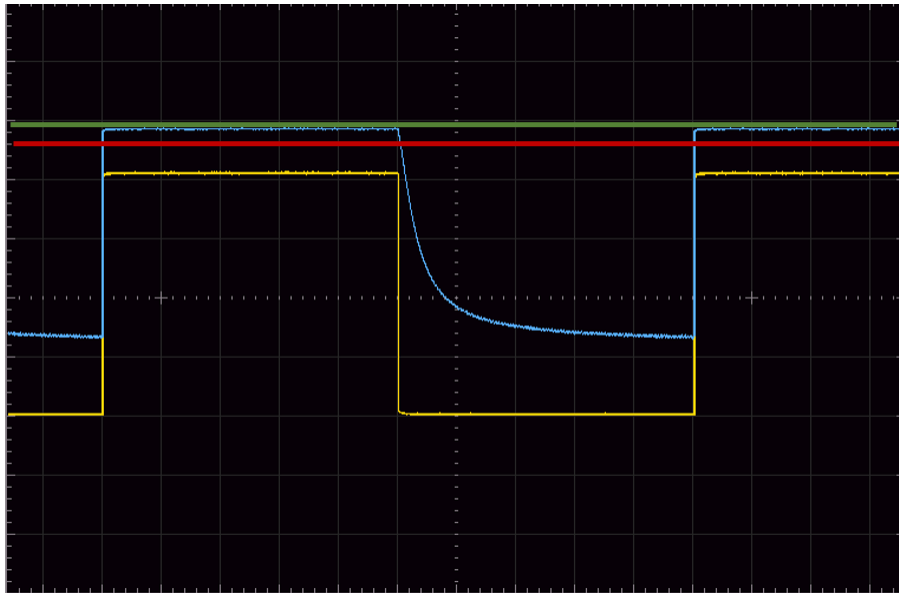



# Prijemnik

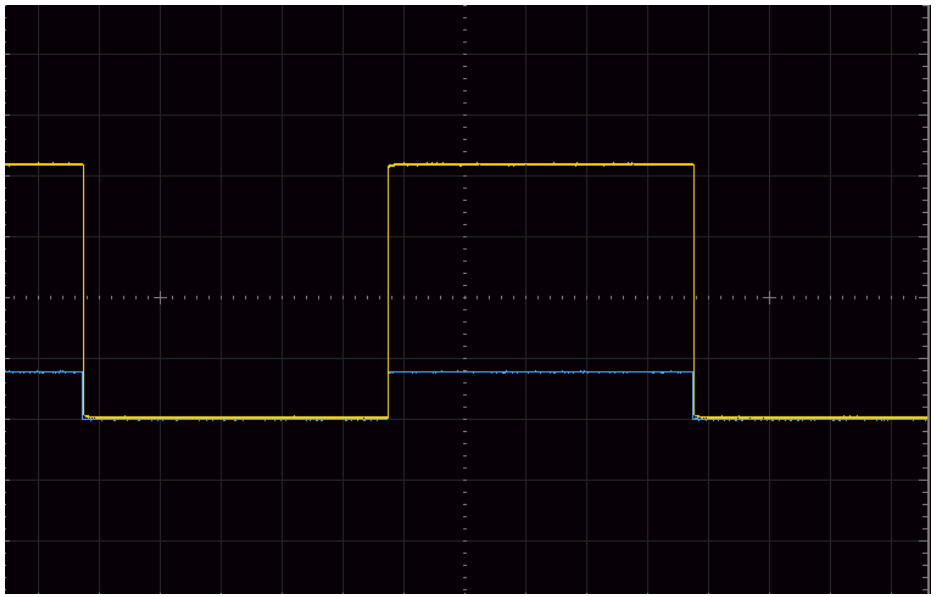
- ADC
- Binarizacija
- Ograničenje odziva fotosenzora



# Karakteristike fotosenzora



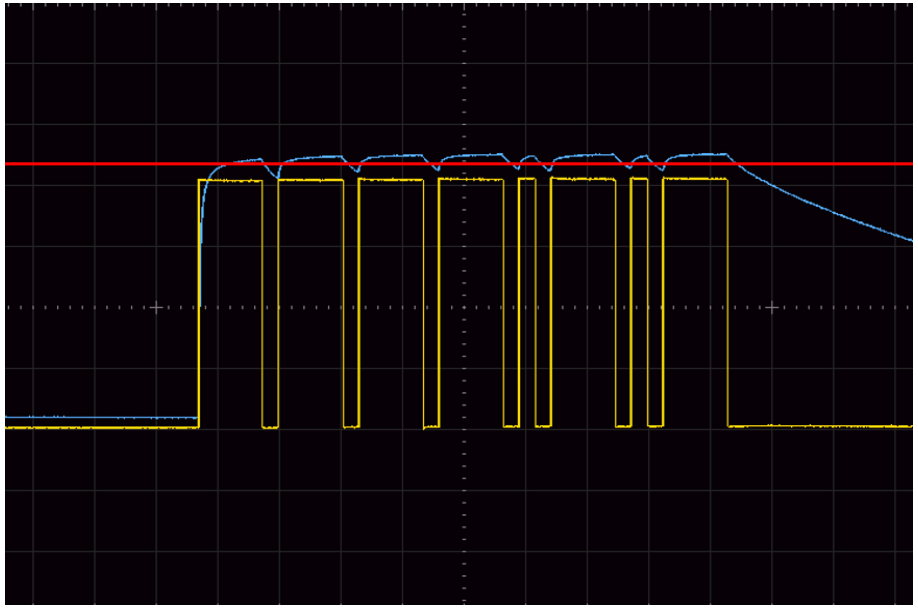
fotootpornik



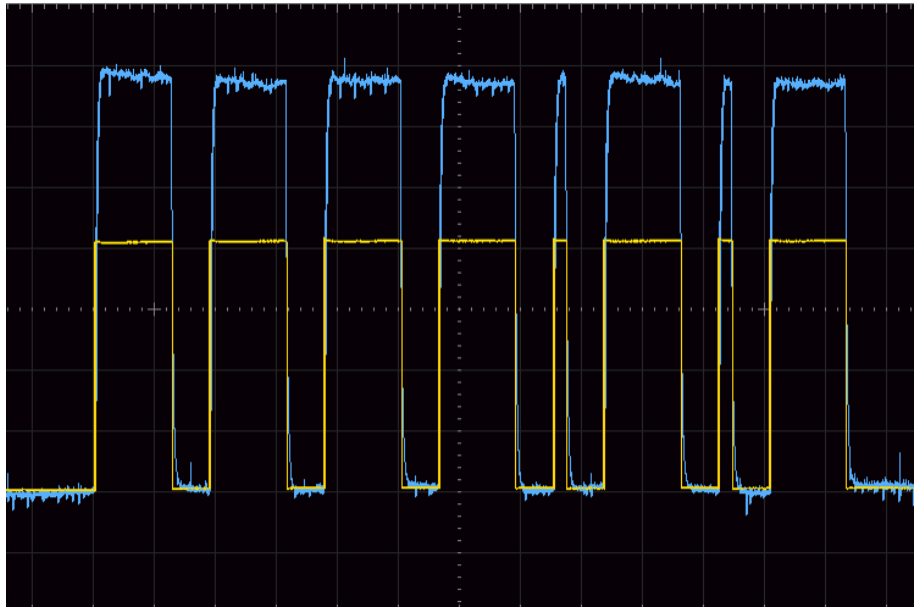
fotodioda

# Rezultati

- Vremenska modulacija



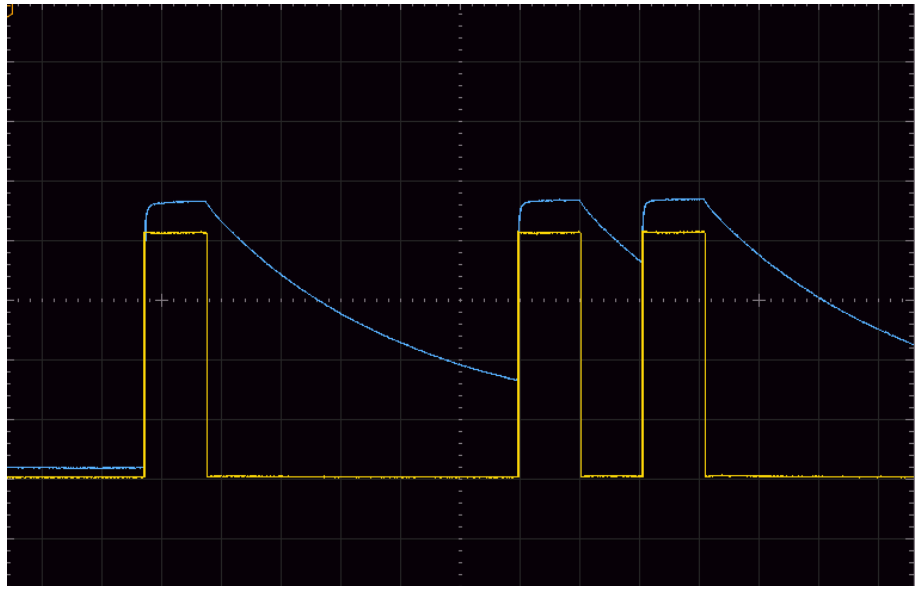
fotootpornik



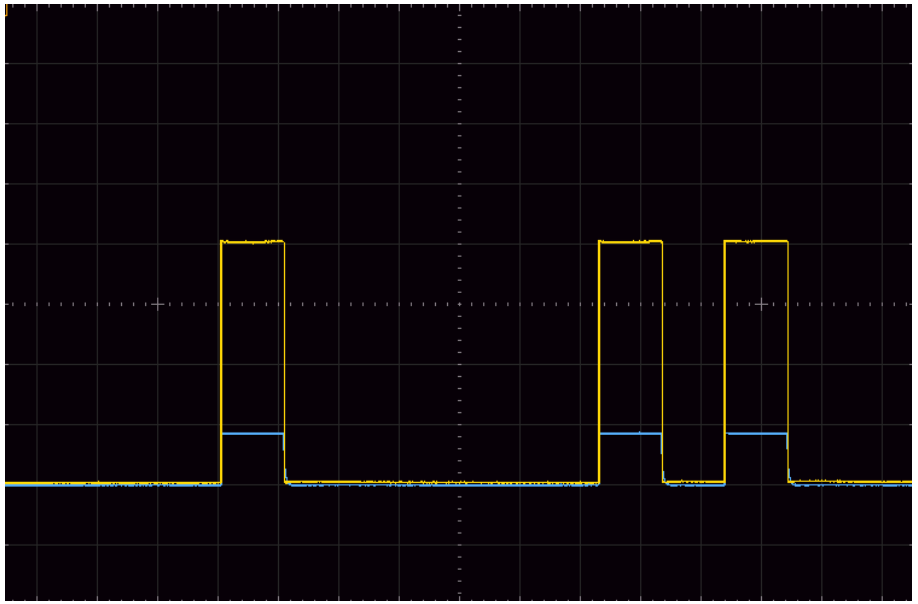
fotodioda

# Rezultati

- Direktnaa modulacija



fotootpornik



fotodioda

# Rezultati

- Maksimalna brzina protoka

Vremenska modulacija

$$V = \frac{1000ms}{\frac{t_1 + t_0}{2} + t_p}$$

Direktna modulacija

$$V = \frac{1000ms}{T_b + \frac{3 * t_b}{8}}$$

# Rezultati Diskusija

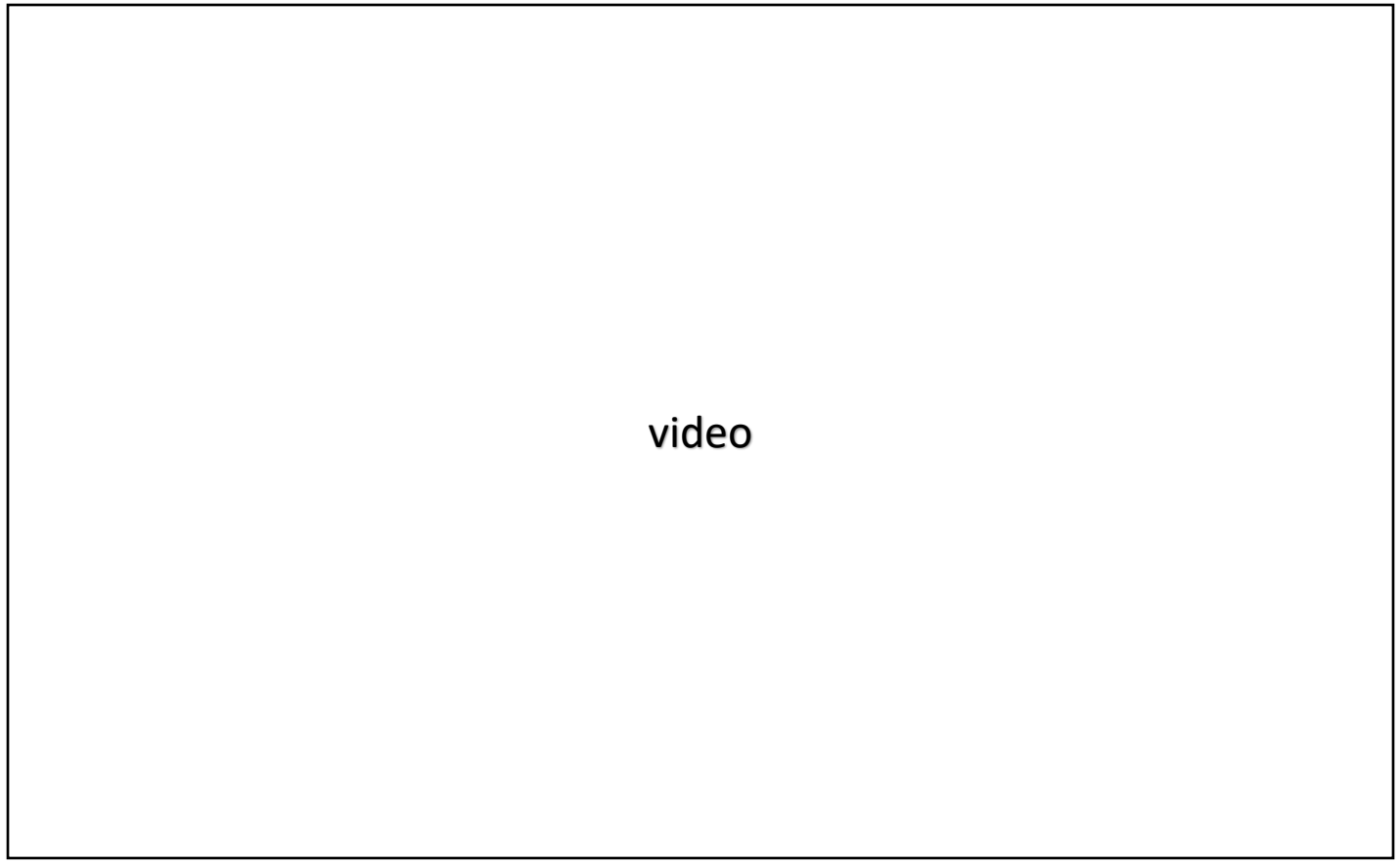
- Maksimalna postignute brzina protoka

| maksimalne postignute brzine protoka | fotootpornik kao prijemnik | fotodioda kao prijemnik |
|---|---|---|
| vremenska modulacija | 570bit/s | 1528bit/s |
| direktna modulacija | 73bit/s | 91bit/s |

# Moguća unapređenja

- Korišćenje dodatnih linija za sinhronizaciju
- Korišćenje bržih mikrokontrolera
- Korišćenje algoritama za kompresiju podataka
- Korišćenje algoritama za detekciju i ispravljanje greške

# Demonstracija



# Hvala na pažnji!

# Pitanja?