

# **OPTICAL COMMUNICATION**

# Optical Communication: An Introduction

## From Historical Perspective



add photo for:  
1. 烽火  
2. old train signal  
3. optical fiber  
4. bulb communication

# **LIFI: Light Fidelity**

## **A VISIBLE LIGHT COMMUNICATION SYSTEM**

### **LiFi: Transforming Fibre into Wireless**

Professor Harald Haas

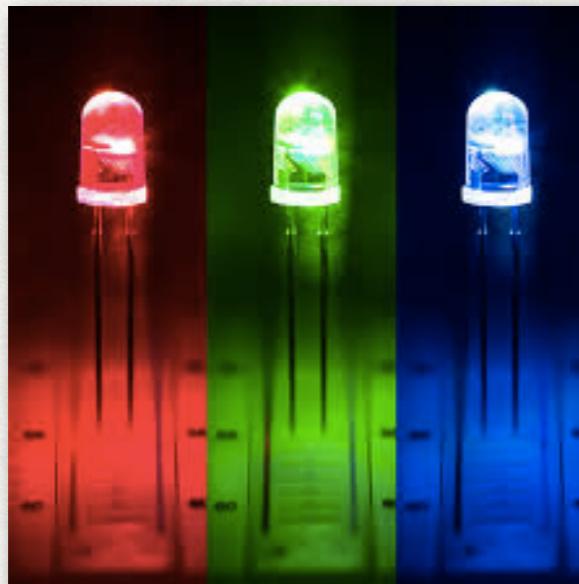
<http://www.lifi.eng.ed.ac.uk/>

Twitter: @dlarah15



# What We Have?

## Hardware, Software and Basic Ideas



Add graph:  
1. Ardinuo UNO  
2. LED and Optical-Elec Diode  
3. PC  
And some specifccation

# What We Have?

## Hardware, Software and Basic Ideas



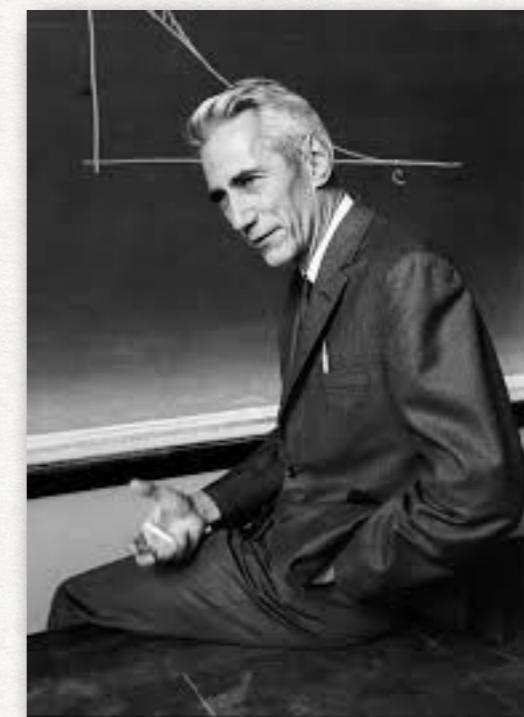
A screenshot of the Arduino IDE interface. The title bar says "sketch\_deepti | Arduino 1.8.3". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". Below the menu is a toolbar with icons for file operations. The main area shows the code for the sketch:

```
void setup() {
  // put your setup code here, to run once}

void loop() {
  // put your main code here, to run repeatedly}

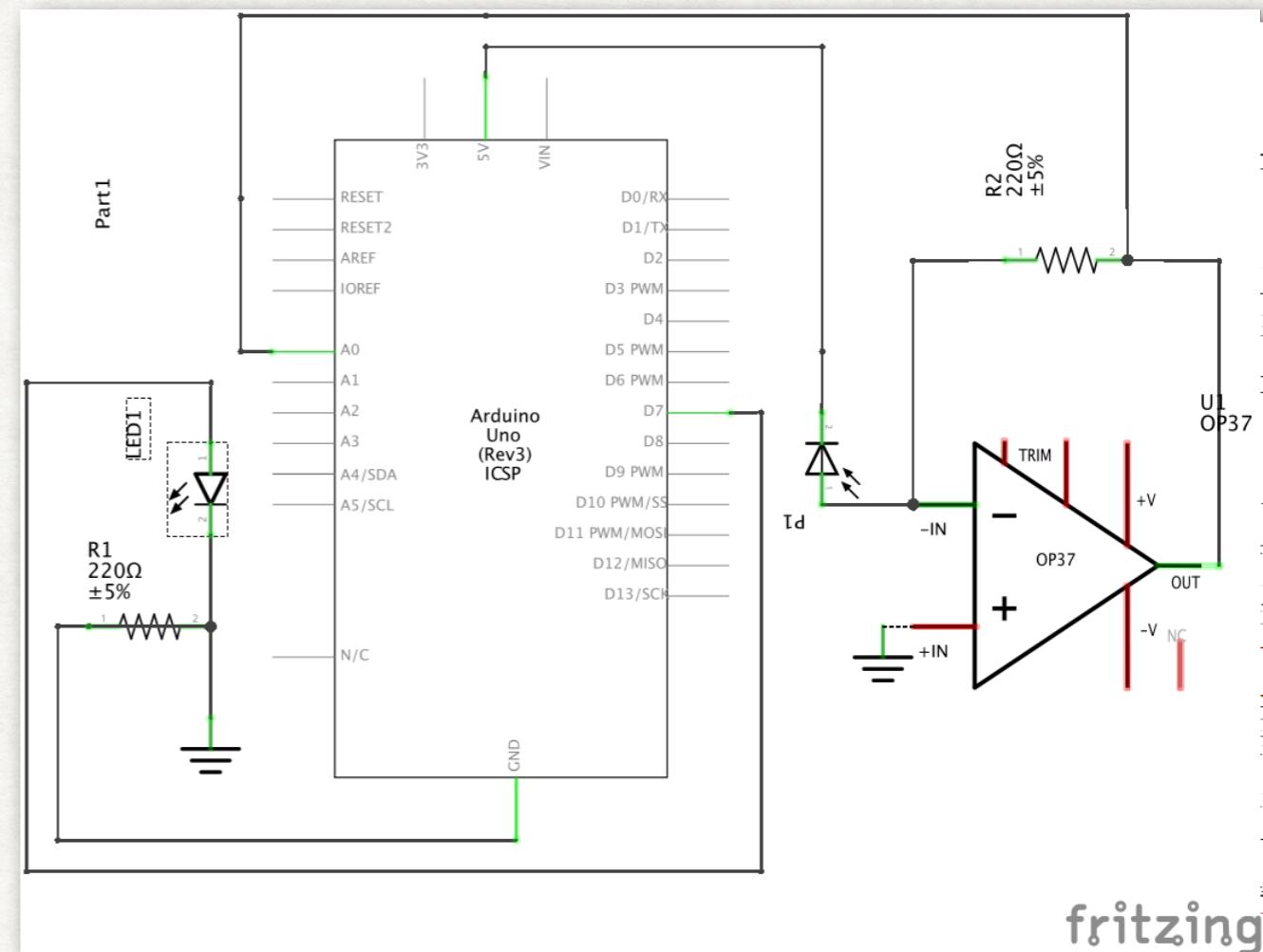
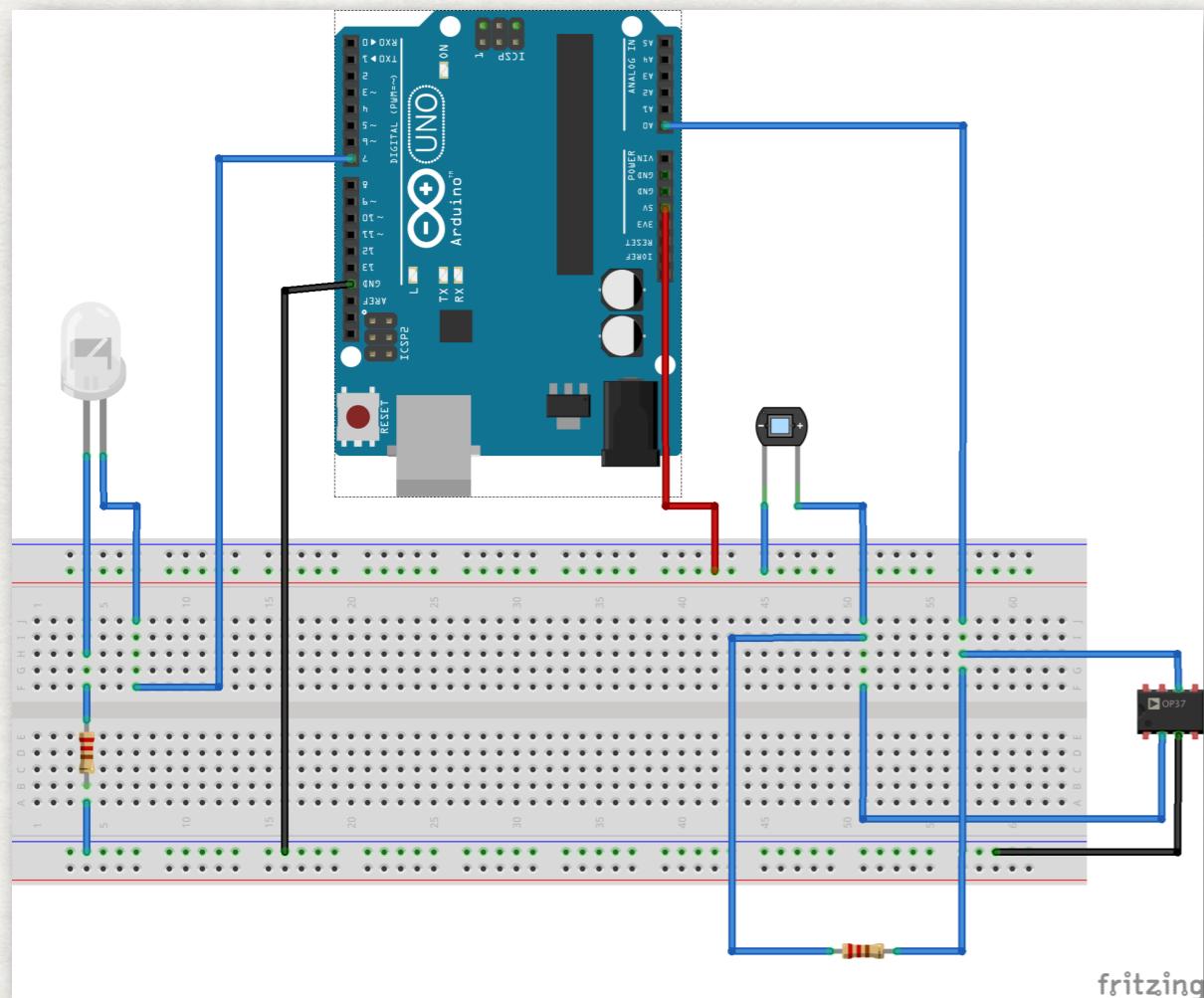

```

The status bar at the bottom right says "Serial Monitor Open on C:M0".



Add graph:  
1. Ardinuro IDE  
2. Python TTY communication tool  
3. basic channel coding theme.

# A Basic Setup



# Challenges: Go from Basic Idea

## From Basic Setup

- Can we use the redundancy in the input?
  - Source coding/data compression!
- Can we use the hardware more efficiently?
  - Channel coding!
- Can we use more hardware resources?
- Can we modify the current hardware?
- Can we build a reliable system given interference?

# Answer Challenge with Competition

## Competition with 4 Tracks

There are 4 tracks in this competition:

1. Go as Fast as You Can
2. Fight against the Random Noise (Poisson noise) (TBA)
3. Jamming or Not (Attacker or Defender) (TBA)
4. Communication and Jamming (Attacker and Defender) (TBA)
5. How Long Can You Reach? (Optional )
6. Can you guess? (Optional)

3 Students form a Team

- \* Participate in each track.
- \* Winner in each track will be awarded highest final score.
- \* If there are winner in multiple tracks, the highest final score will be awarded to others.

Final Presentation & Report in English is Required!

# Track 1: Go Fast as You Can

## with Single Diode or Multiple Diode

- A single or multiple diodes can be used both for sending the signal or receiving the the signal.
- Multiple port on UNO can be used. However only ONE UNO board can be used.
- Evaluation should be run with in 1 minute.
- Correctly transmitted BYTES will be counted.
- Evaluation text will be *Alice's Adventures in Wonderland*.
- The team with highest correctly transmitted Bytes will be the winner.
- **Only one run for each team!**
- The final evaluation is planned to held on Nov 20, 2018

ALICE'S ADVENTURES IN WONDERLAND

Lewis Carroll

THE MILLENNIUM FULCRUM EDITION 3.0

### CHAPTER I. Down the Rabbit-Hole

Alice was beginning to get very tired of sitting by her sister on the bank, and of having nothing to do: once or twice she had peeped into the book her sister was reading, but it had no pictures or conversations in it, 'and what is the use of a book,' thought Alice 'without pictures or conversations?'

So she was considering in her own mind (as well as she could, for the hot day made her feel very sleepy and stupid), whether the pleasure of making a daisy-chain would be worth the trouble of getting up and picking the daisies, when suddenly a White Rabbit with pink eyes ran close by her.

There was nothing so VERY remarkable in that; nor did Alice think it so VERY much out of the way to hear the Rabbit say to itself, 'Oh dear! Oh dear! I shall be late!' (when she thought it over afterwards, it occurred to her that she ought to have wondered at this, but at the time it all seemed quite natural); but when the Rabbit actually TOOK A WATCH

# Track 2: Fight against the Random Noise

Channel is Always Noisy.

- A single or multiple diodes can be used both for sending the signal or receiving the the signal.
- Multiple port on UNO can be used. However only ONE UNO board can be used.
- Evaluation should be run with in 1 minute.
- Correctly transmitted BYTES will be counted.
- Evaluation text will be *Alice's Adventures in Wonderland*.
- The noise is a Poisson process with constant unknown rate parameter.
- The implementation is on [https://github.com/pipethappy1/  
sse\\_project\\_practise/tree/master/poisson\\_blink](https://github.com/pipethappy1/sse_project_practise/tree/master/poisson_blink)
- Only 3 runs for each team!
- The team with highest correctly transmitted Bytes will be the winner.
- The final evaluation is planned to held on Dec 4, 2018

GitHub



# TRACK 3: JAMMING OR NOT

- Teams will be divided into two categories: Communication & Jamming.
- A single or multiple diodes can be used both for sending the signal or receiving the the signal.
- Multiple port on UNO can be used. However only ONE UNO board can be used.
- Evaluation should be run with in 1 minute.
- Correctly transmitted BYTES will be counted.
- Evaluation text will be *Alice's Adventures in Wonderland*.
- **Each pair of team will be evaluated for one run.**
- The team with highest correctly transmitted Bytes will be the winner.
- The final evaluation is planned to held on Dec 11, 2018

**QUESTION TIME!**