CPSC 427
Video Game Programming

Human Computer Interaction and User Experience

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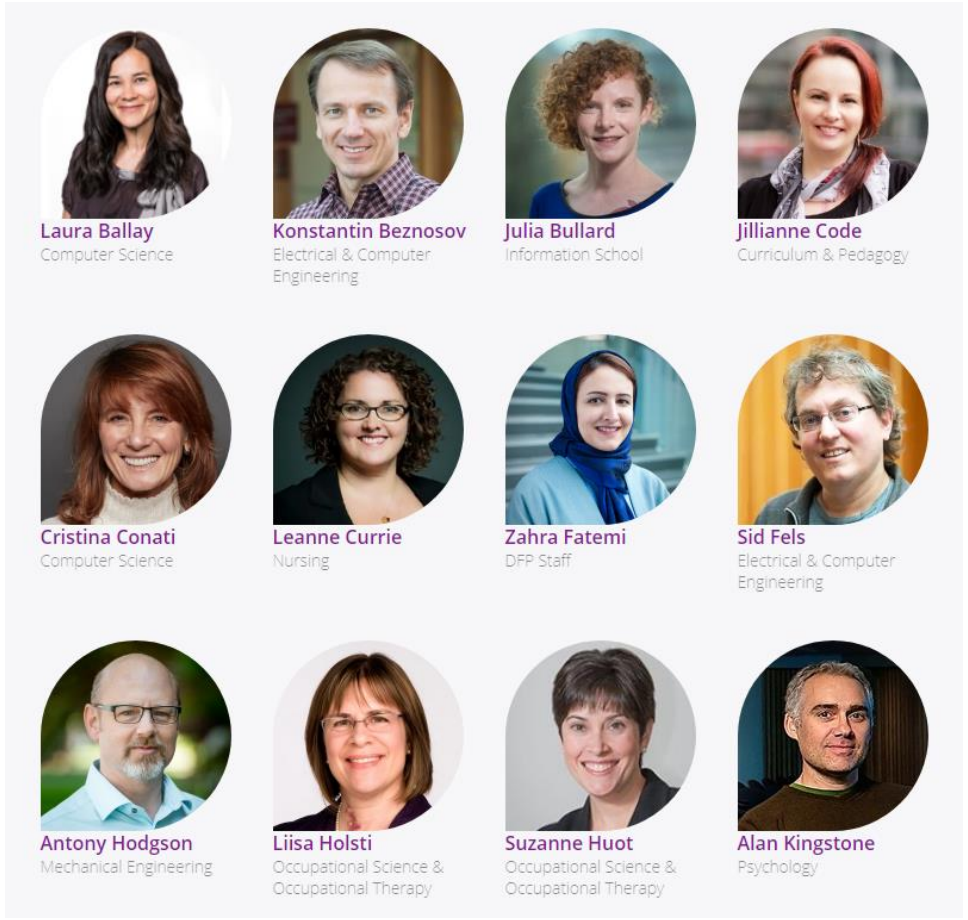
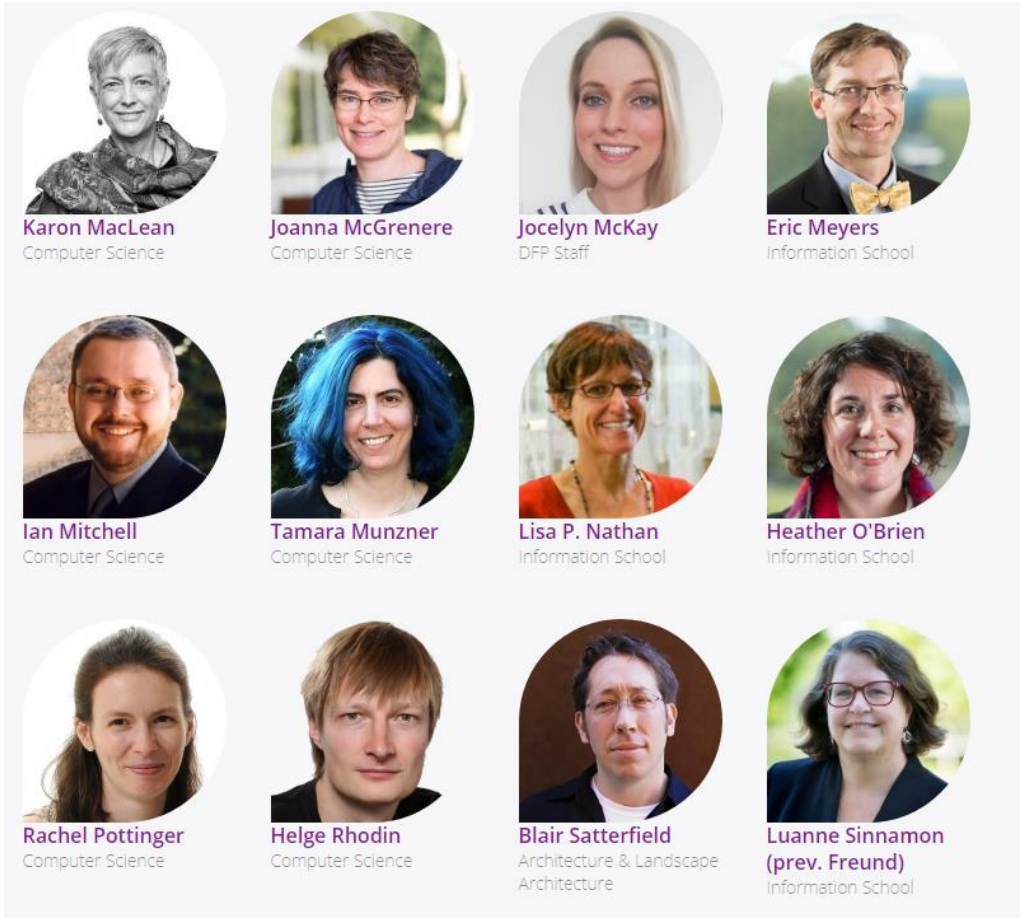
Designing for People (DFP)

- ***https://dfp.ubc.ca/***





What are HCI & UX?

- **Human Computer Interaction (HCI)**
  - ***Research in designing & understanding the way humans and technology interact***

- **User Experience (UX)**
  - ***Perception of a particular product, system or service***

- **Part of user-centered design**

Even Big Companies Get UX Wrong

- **Easy & expensive to get UX wrong**

Google Glass failed in the market because it wasn't clear why people should need it

and the privacy issue…

Connection to Game Design

- **Impact of design on ease of use & engagement**

In Wind Waker, the direction Link looked indicated to the player something of interest was there

- **Design applications & philosophies are interconnected**

How do HCI and UX Connect to Game Design?

- **Poor UX design can prevent players from experiencing games as intended**

For example, having to follow in-game characters with different walk speeds than your characters

Game Design Philosophy

- **User-centered game design = Put players needs first**
- **Make play easy (& fun)**
- **Good design is often invisible**
  - ***How to play is subtly implied***

Design Concepts

- **Design concepts: Basic ideas that help us understand & design what's happening in a user interface**

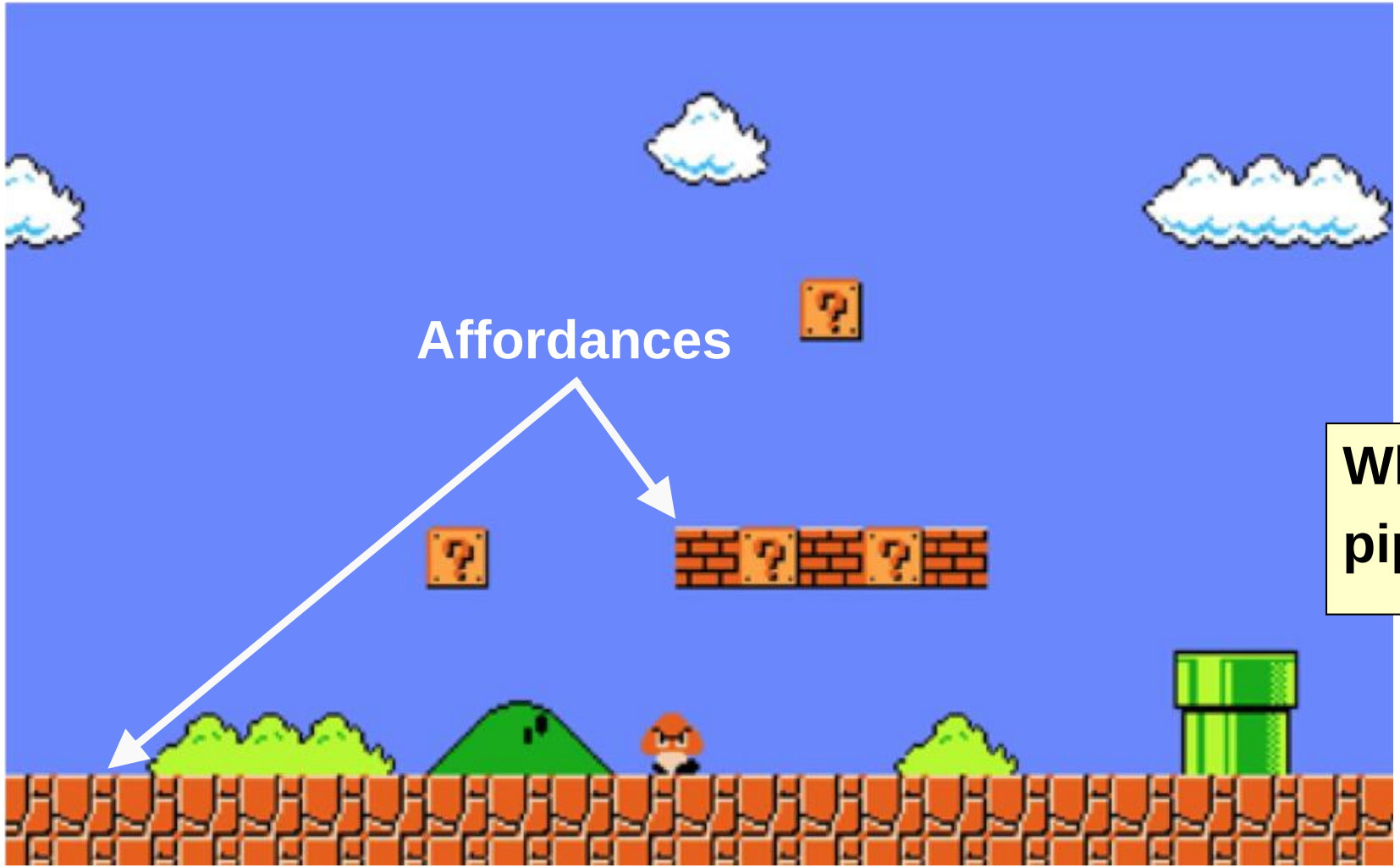
- **Norman's Design Concepts:**
  - **Affordances**
  - **Constraints**
  - **Mapping**
  - **Visibility**
  - **Feedback**
  - **Consistency**

Affordances

- **Affordance is a physical characteristic that suggests function**
  - ***i.e. inviting interaction/use***

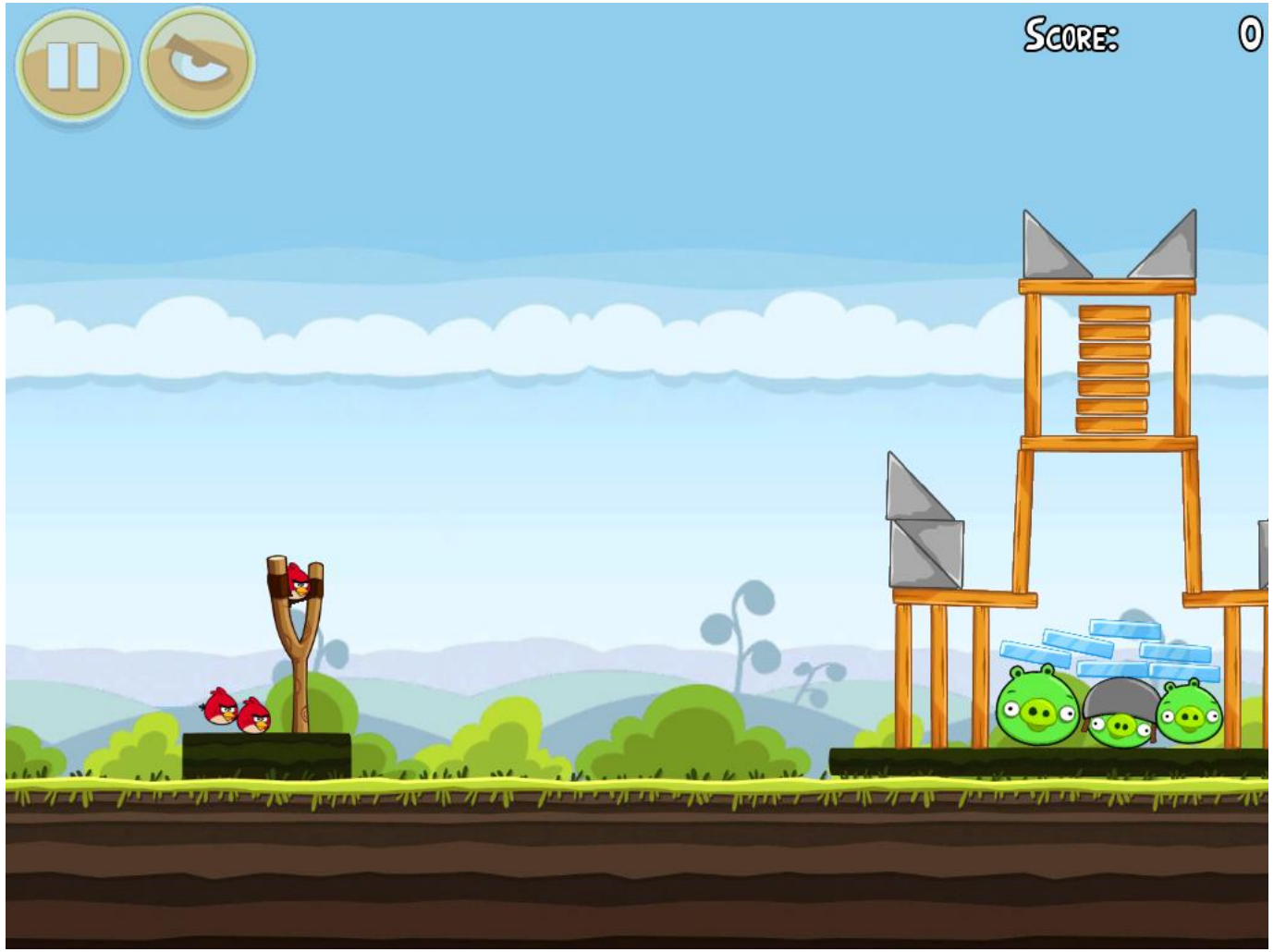
- **Chairs afford sitting, but so do tables, boxes, and floors**

Example of Affordances in Games



What does the pipe afford?

Example of Affordances in Games



- **What does the slingshot afford here?**
- **What do the blocks afford?**
- **What does the (pause) button afford?**

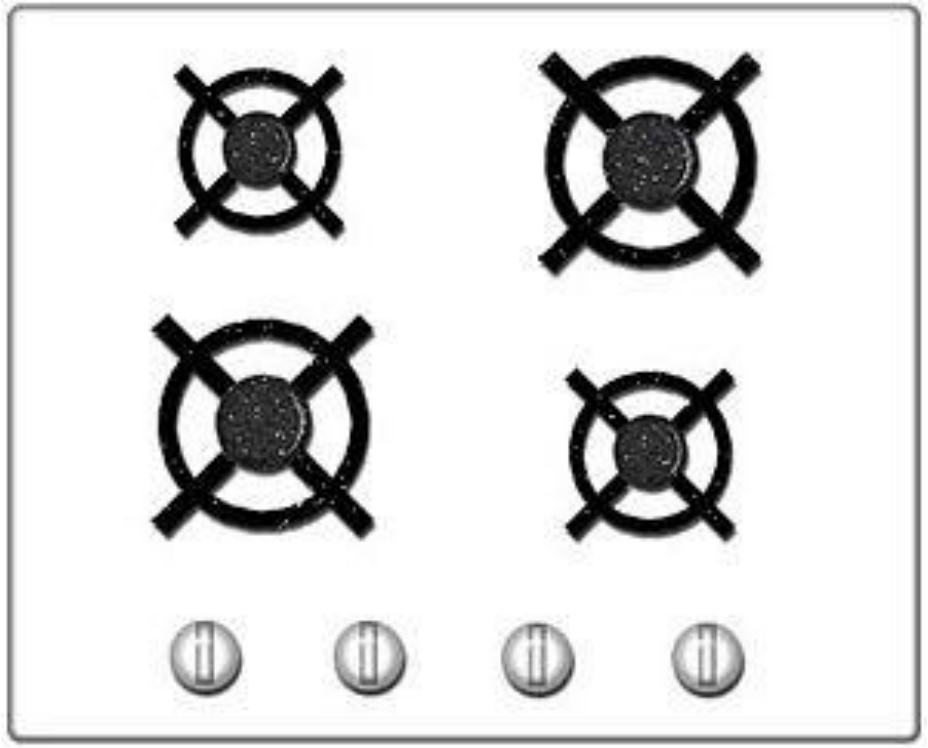
Mapping

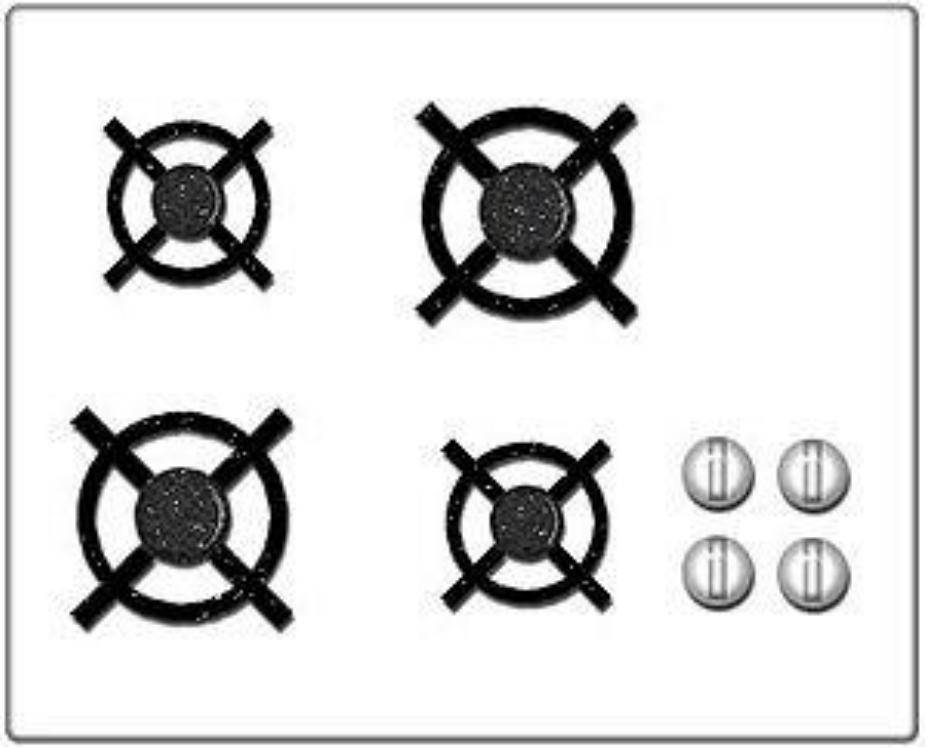
- Some controls are direct (slingshot), some indirect (button)
- Mapping is the relationship between look/feel of indirect controls & their implied actions

Control		Implied action
push button	→	start/stop function
twist knob	→	increase/decrease value
turn wheel	→	rotate left/right

Mapping Example

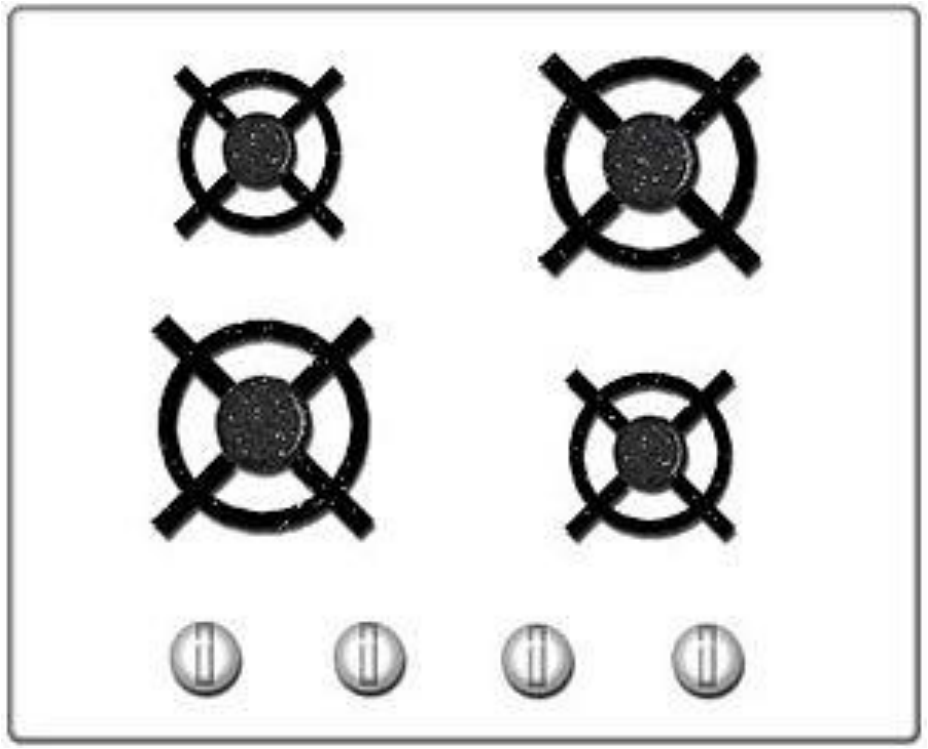
- **Which is better?**

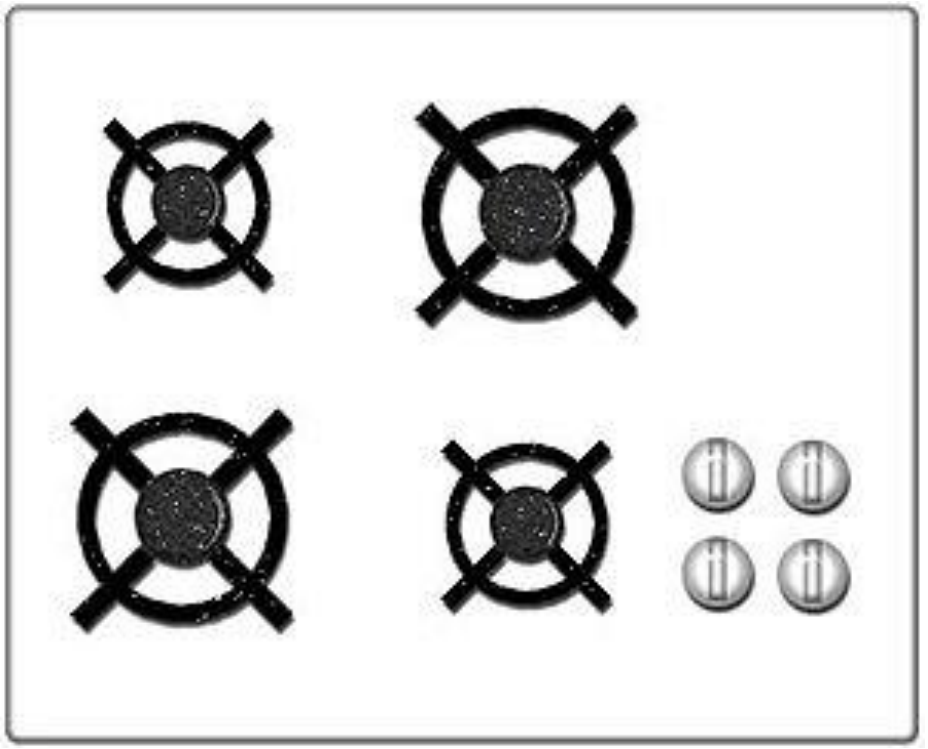




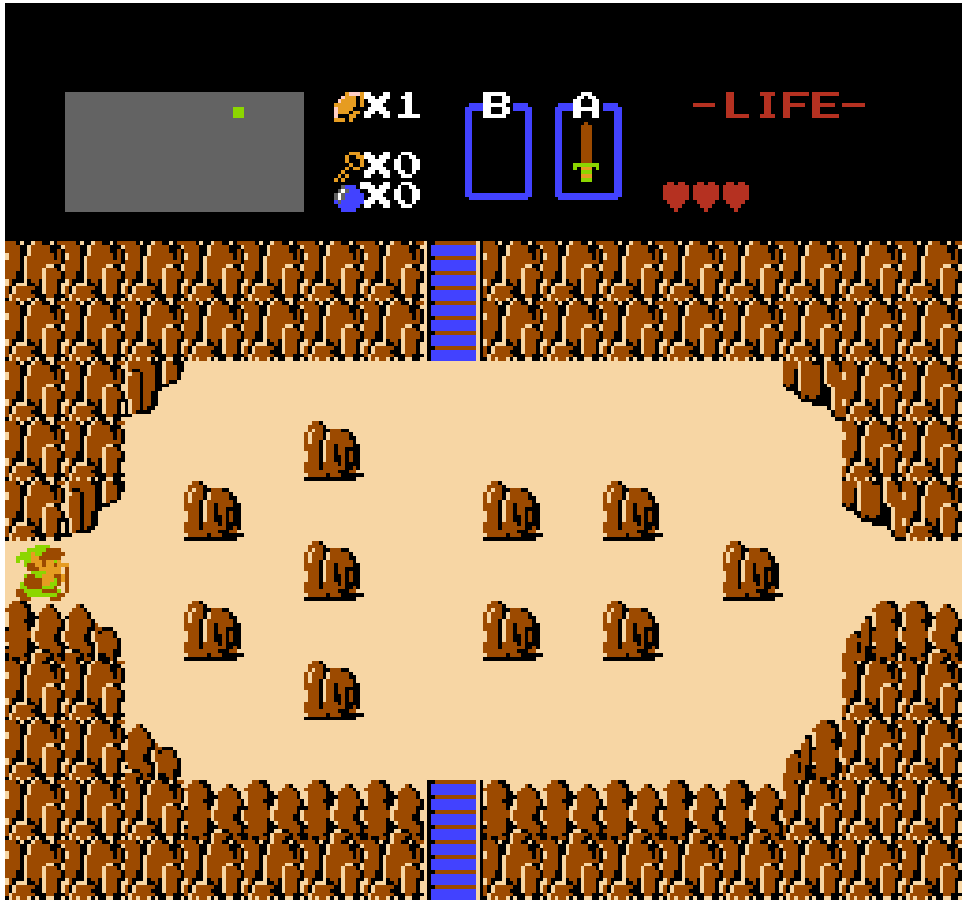
Mapping Example

- Natural mapping **minimizes** the need for labeling relationships





Mapping Example in Games



Clear mapping between up, down, right & left controls and game in Zelda.

Feedback

- **Feedback: response to action**

- **The color changes to inform us a connection has been made**
- **The sound of a ‘click’ tells us if it connected to the port**

Feedback in Games

- **Feedback in games is continuous**

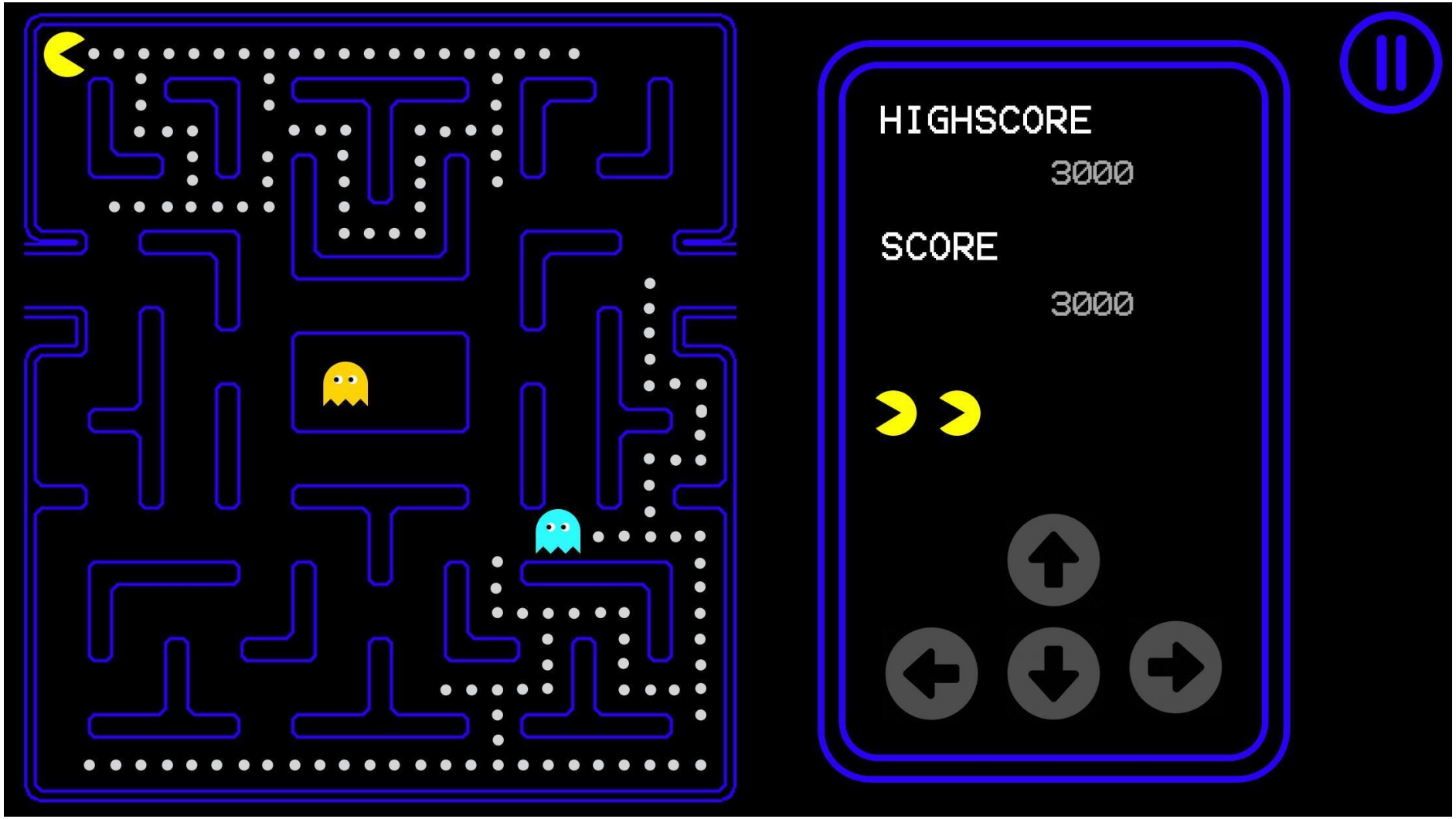
- **Visual**
  - ***interaction between sprites***
- **Sound**
  - ***music on defeat***
- **Touch**
  - ***controller vibrating***

Design Principles Example in Games

- **Affordances?**
- **Mappings?**
- **Feedback?**

Design Principles

- **Affordances**
- **Mapping**
- **Feedback**



Users

- **Who are the players?**
  - ***Age: Children, adults, university students***
  - ***Culture***

- **Where will they be playing?**
  - ***Commuting, at home, remotely***

- **What do they need or want?**
  - ***Fulfilling plot, relaxing play***

Examples

- **Who is this game designed for?**

(A) children

(B) adults

(C) elderly

(D) all ages

Why does it matter?

…. Design choices…

Examples

- **Who is this game designed for?**

Examples

- **Who is this game designed for?**

(A) children

(B) adults

(C) elderly

(D) all ages

Why does it matter?

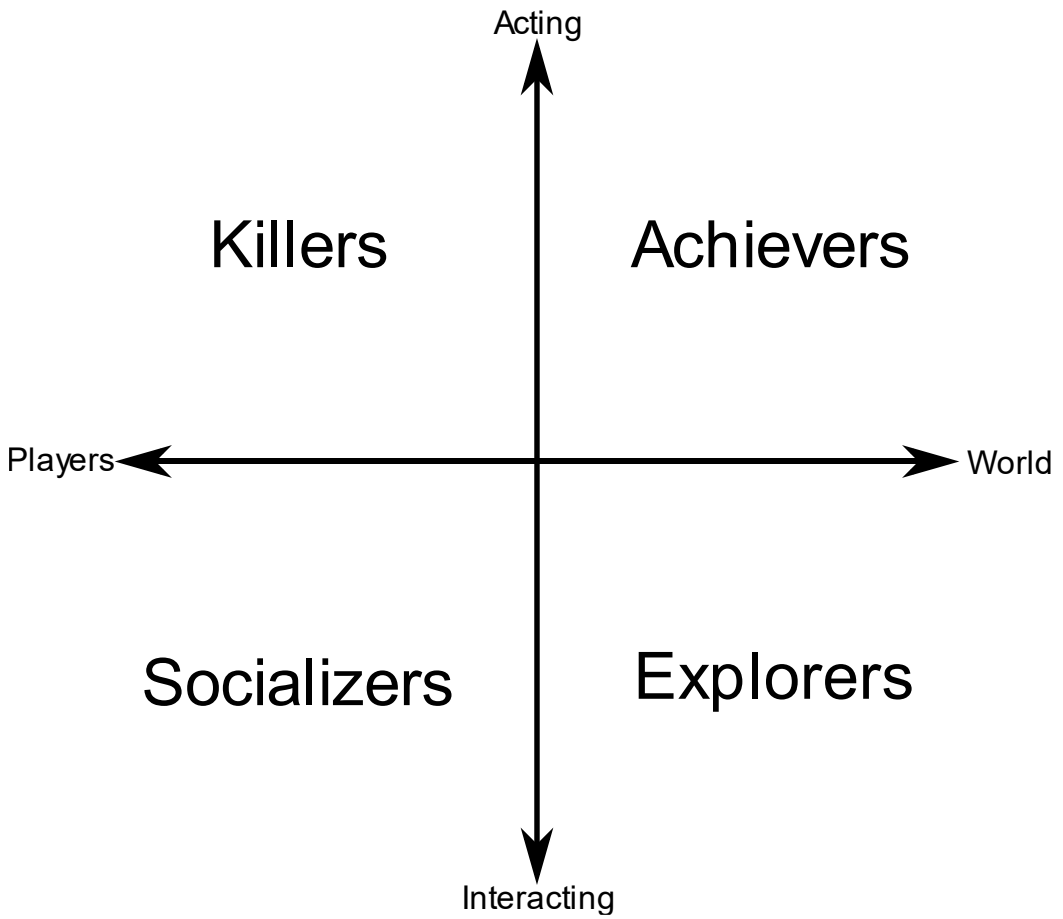
Examples

- **What do the players of this game want?**

(A) fast-paced action
(B) relaxing play
(C) rich environments
(D) other

What Motivates Users?

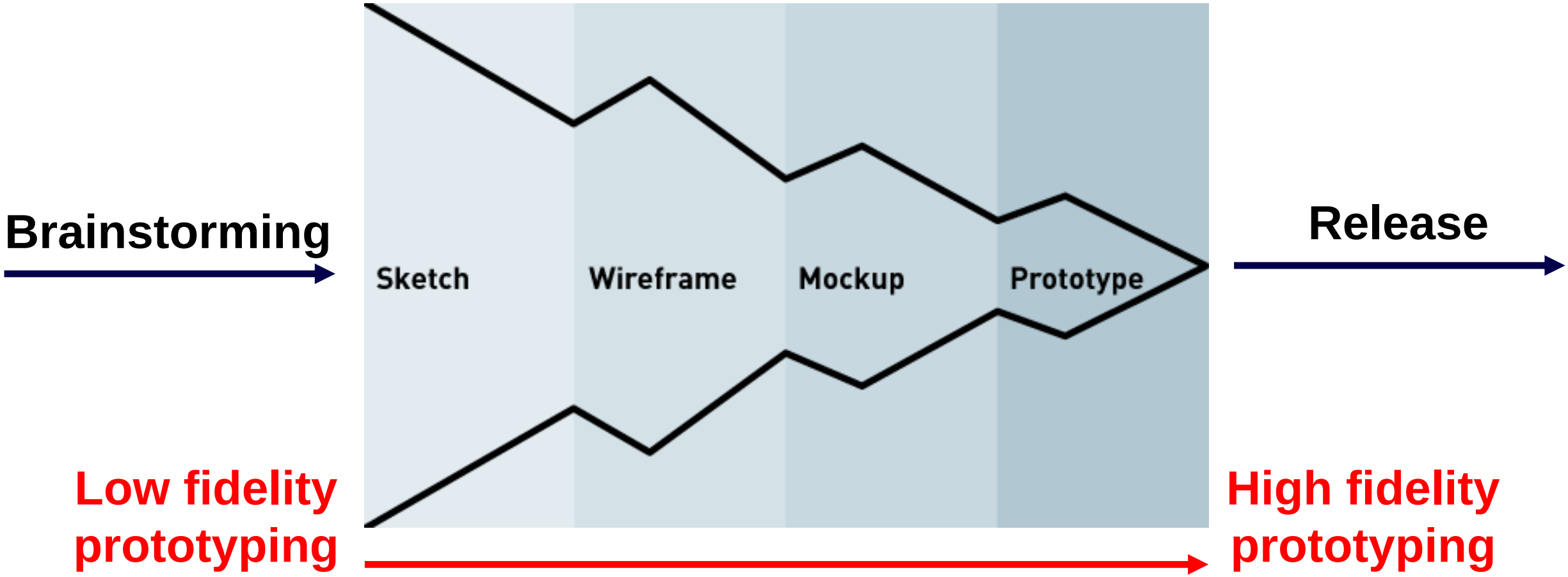
- **Work has been done to identify player types**
- **Users can be classified by preference for interacting/acting with/on others/the world**
- **The four classifications tell us what motivates each player type**



Think:

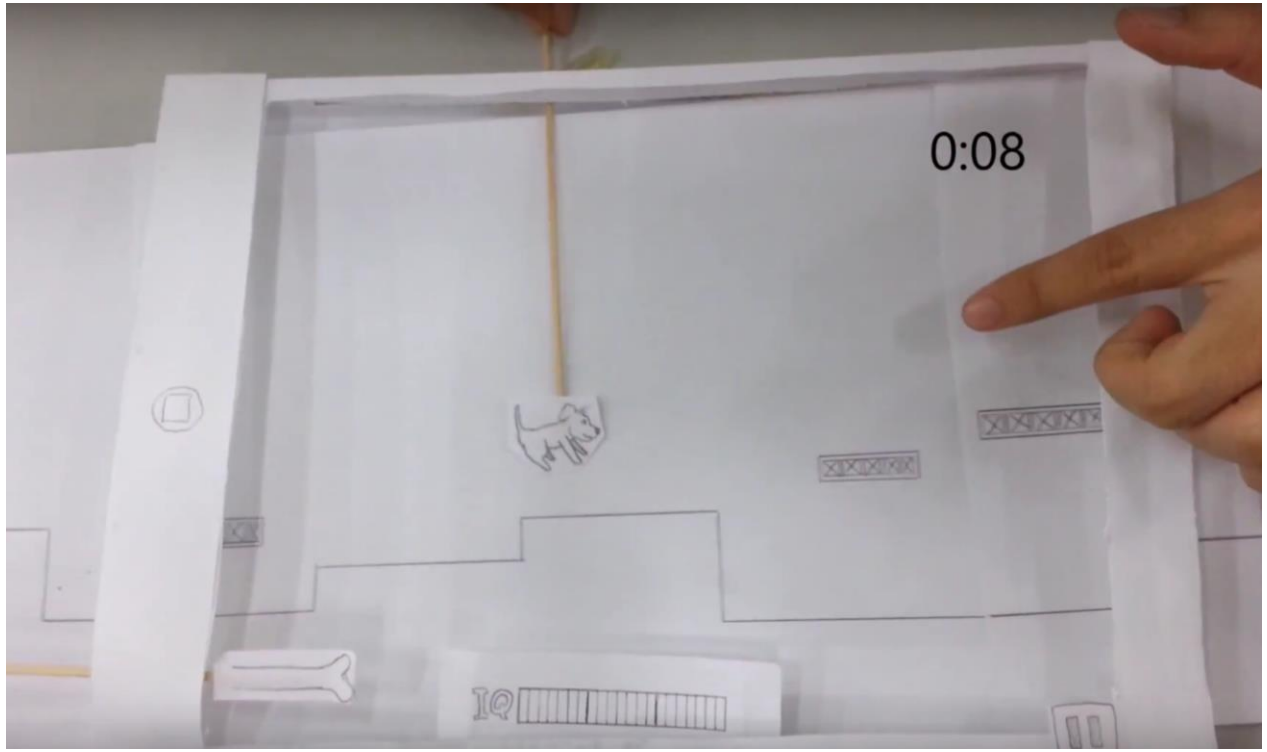
- Who is your game designed for (demographics/type)?
- What do the players of your game want?
- (How is your game going to stand out?)

The Design Process



Low Fidelity Prototyping

- **Used for early stages of design**
  - ***Quick & cheap to deploy***
  - ***Easy to test***
- **Iterate on story and core gameplay mechanics**
- **Sketches are a great way to start designing**



Testing Low Fidelity Prototypes

- **Don't commit to one approach, design a few prototypes & compare**
- **Invite someone to try them out**
- **Try to drill down on feedback**
  - ***If they just say it's "fun", ask why?***

Fail Early, Fail Often, and Iterate on Feedback

- **Designing something that people will use is both an art & a science**
  - ***Iteration** is how you make it better*
- **Early feedback ensures design meets users' needs**
- **Throwing around ideas is quick**
  - ***Fixing a bad design is expensive***
- **No idea is perfect the first time around**

Medium Fidelity Prototyping

- **Use medium fidelity prototyping for the early to middle stages of design**
  - ***Identify questions before coding***
  - ***Be selective with what gets built***
  - ***Get it right in black and white first***

- **Iterate on tone & feel of game**
  - ***Supplementary game mechanics***
  - ***Rough visuals & audio***
  - ***Feedback***

Greyboxing

- **Greyboxing blocks out all elements as shapes to test gameplay**

High Fidelity Prototyping

- **High fidelity prototyping happens during the late stages of design**
  - ***Alpha & beta releases***
  - ***Polish artwork***
  - ***Perform playtesting***
  - ***Fix bugs***
  - ***Release***

- **Fine tuning before release**

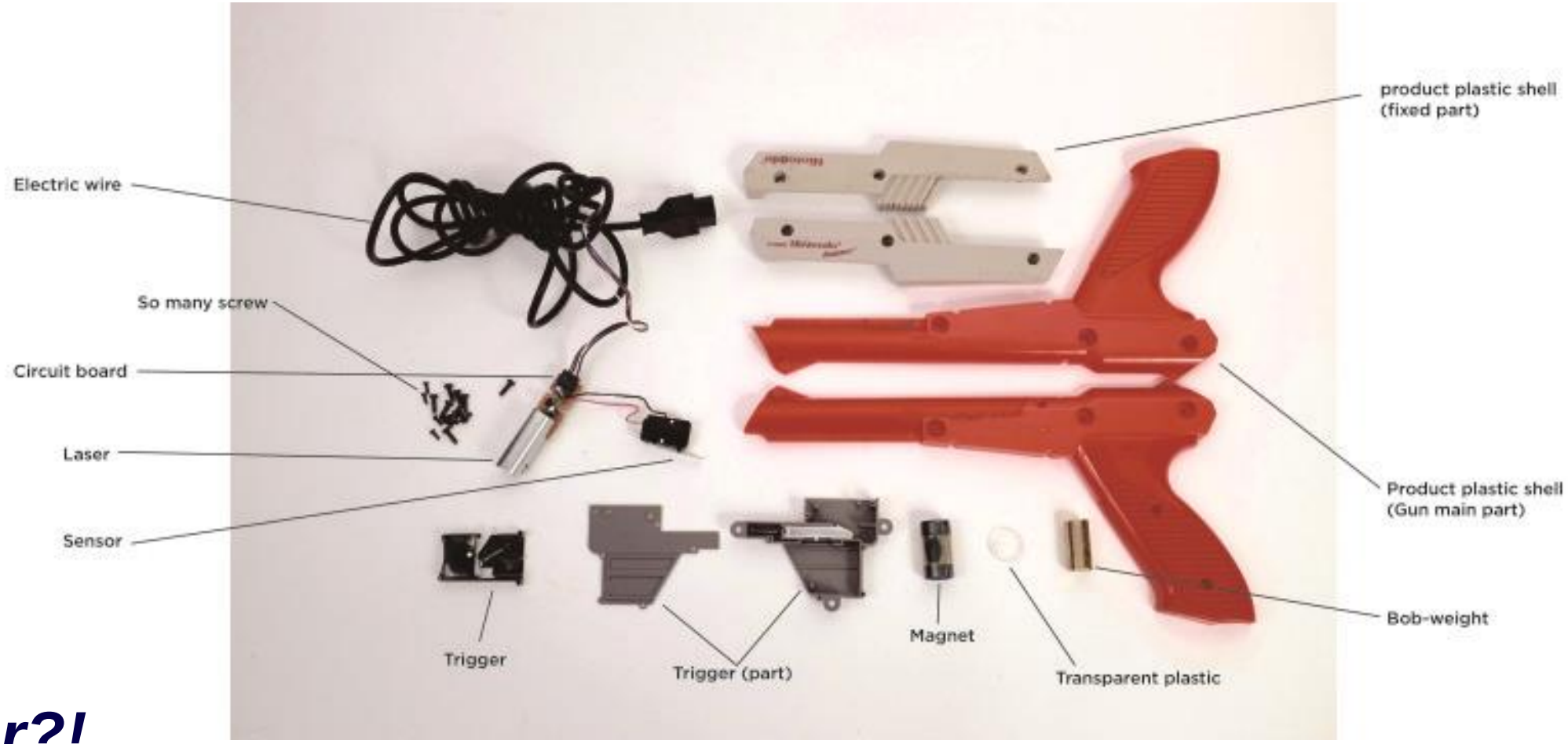
Technical Designs

The Light Gun

http://www.arcadecab.com/News.htm

Classic: NES Zapper

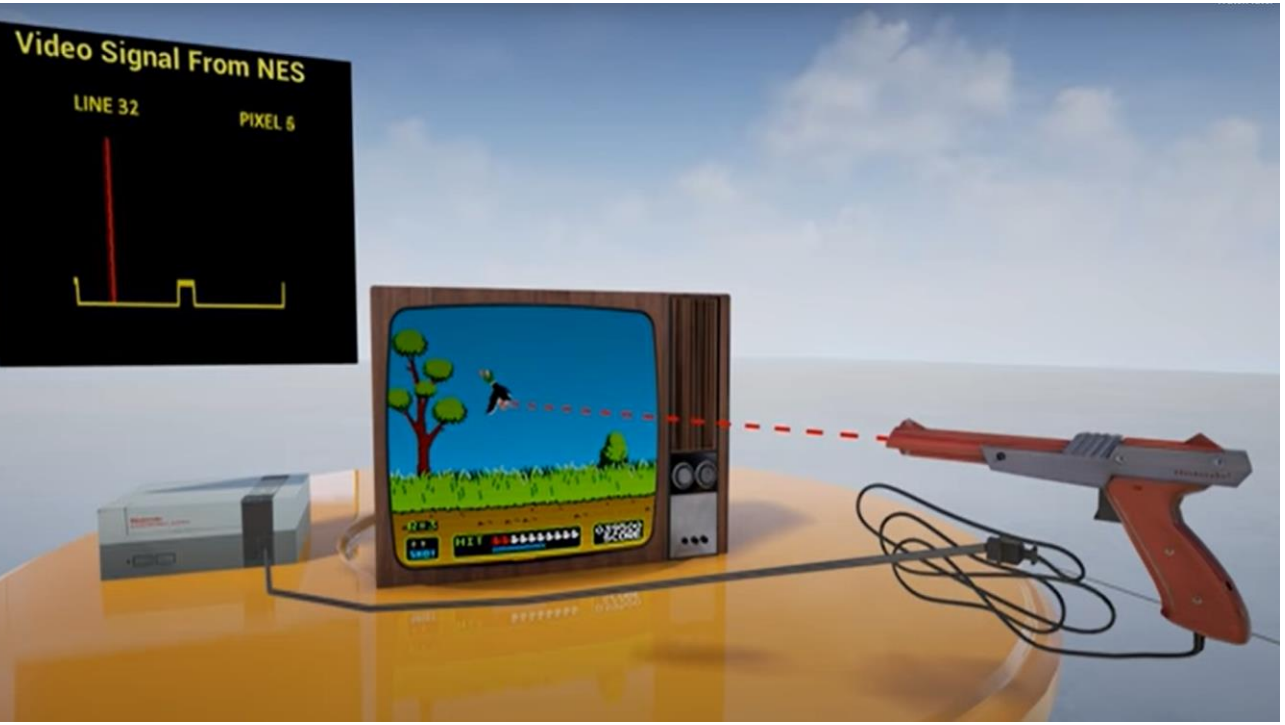
The Light Gun (first glance)



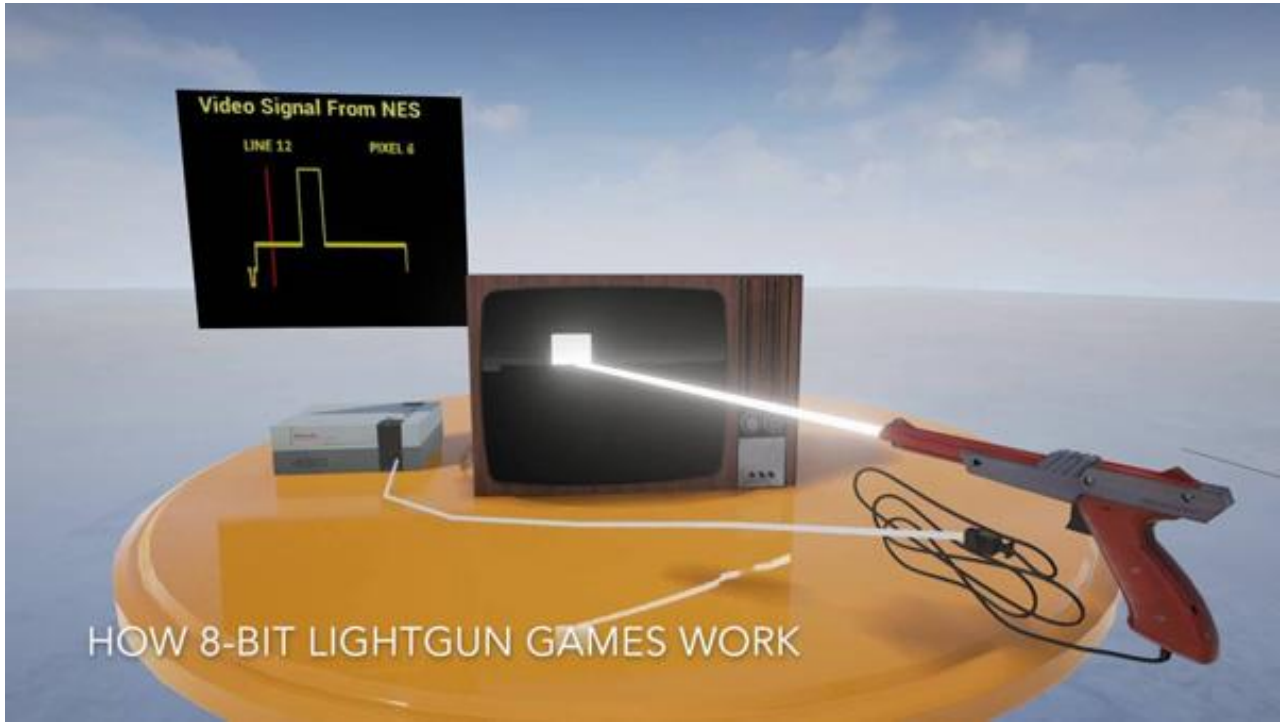
- ***a laser?!***

https://makingstudio.blog/2017/09/20/teardown-nintendo-zapper/

Principle I: Black&white target



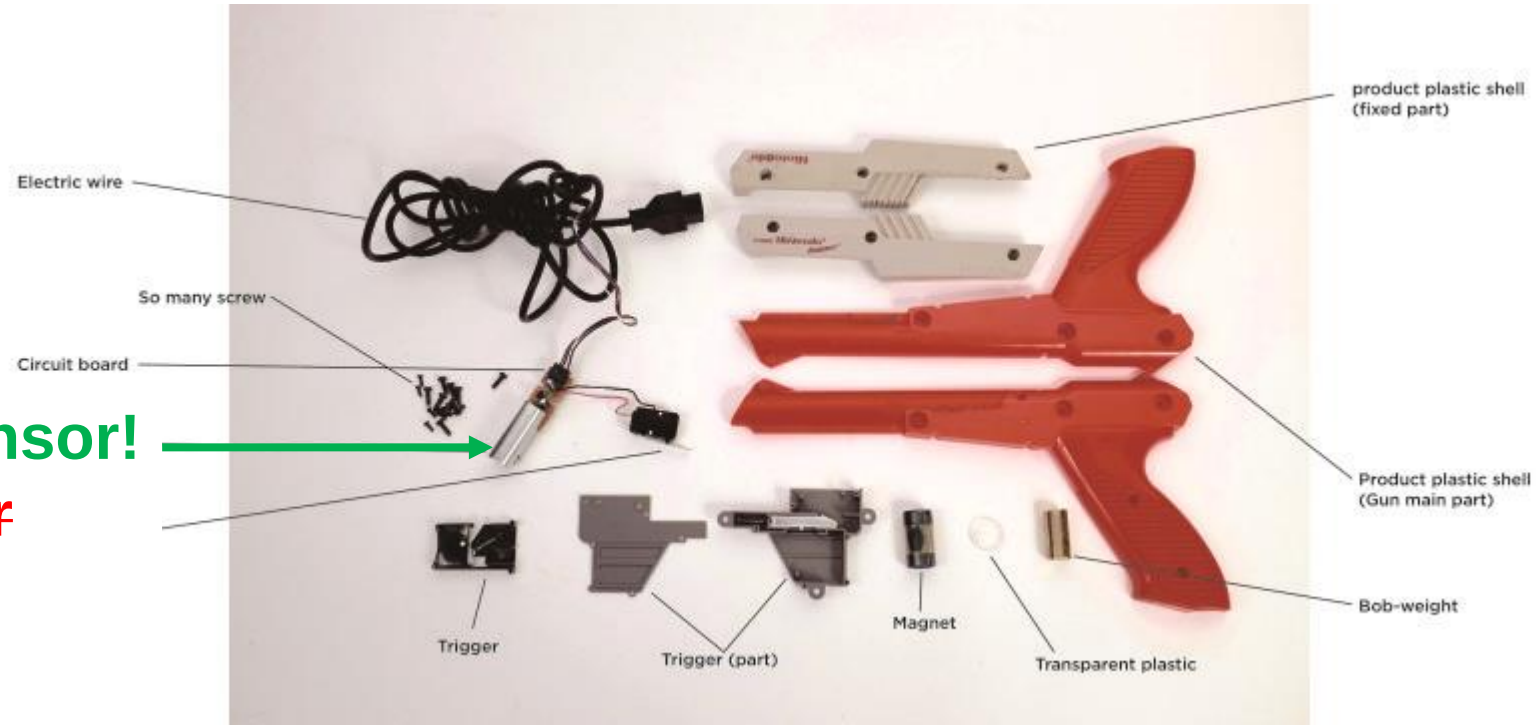
Normal frame



Flash

https://mag.mo5.com/actu/101495/une-solution-pour-utiliser-les-light-guns-sur-les-tv-modernes/

The Light Gun

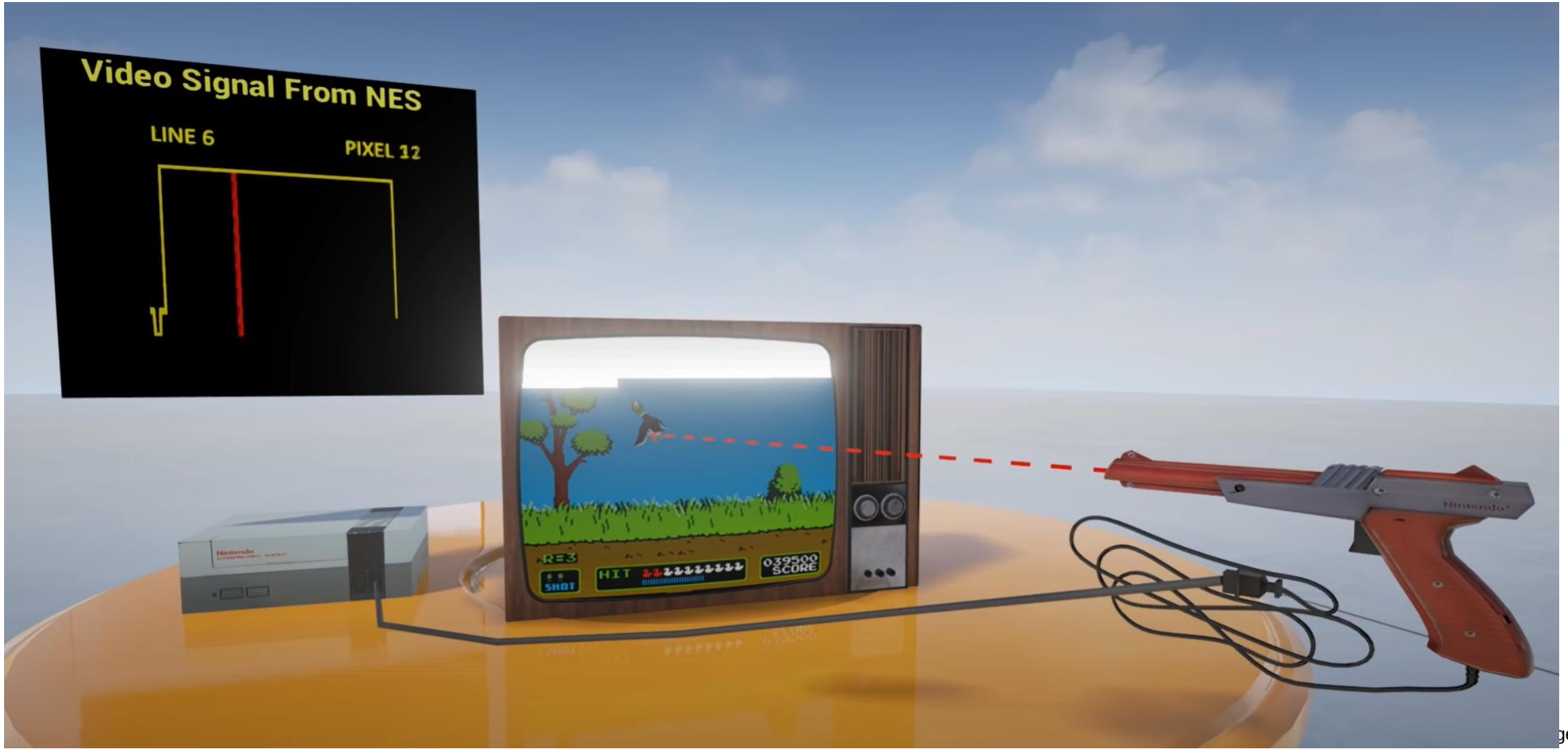


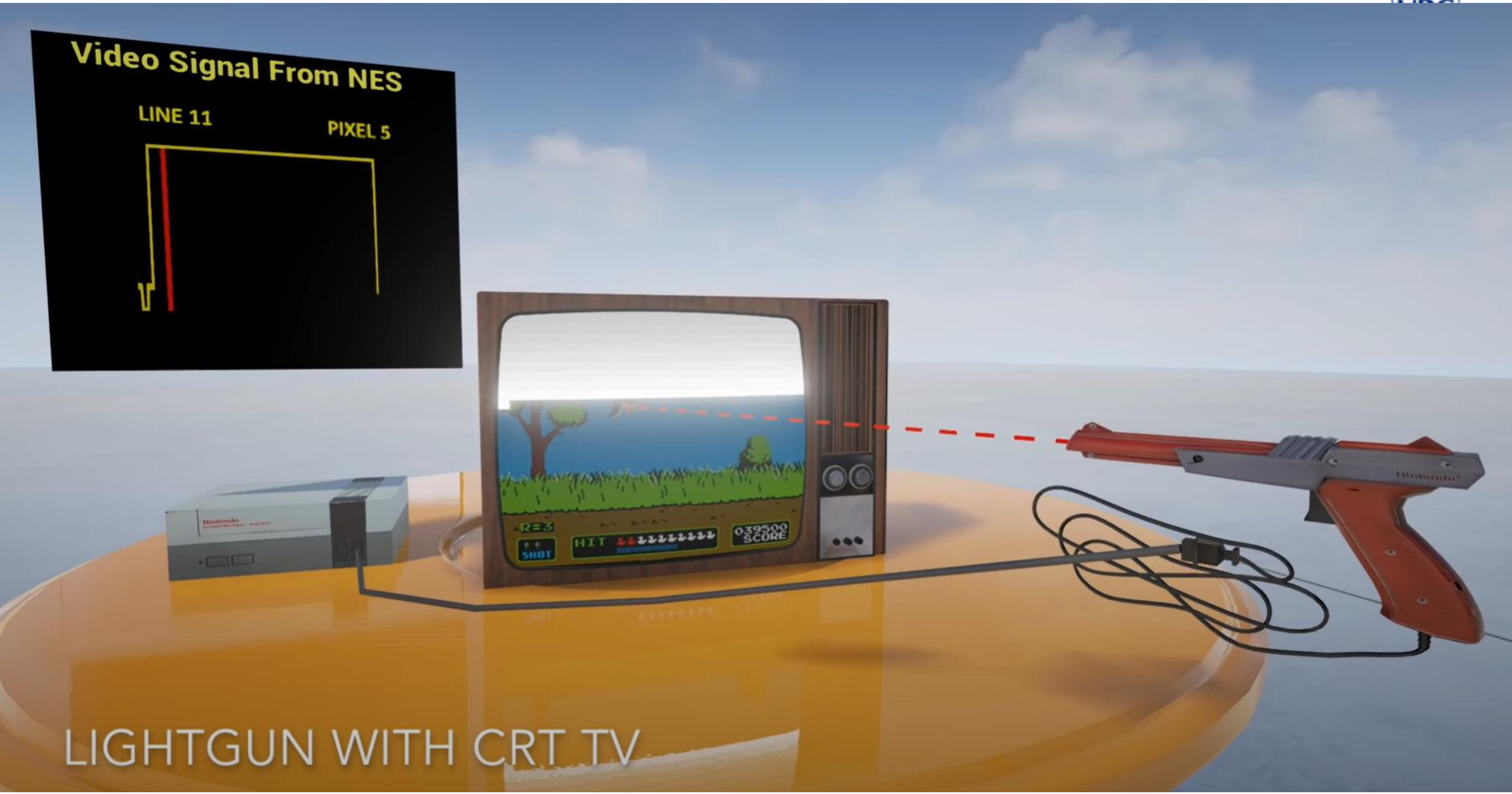
Light sensor!

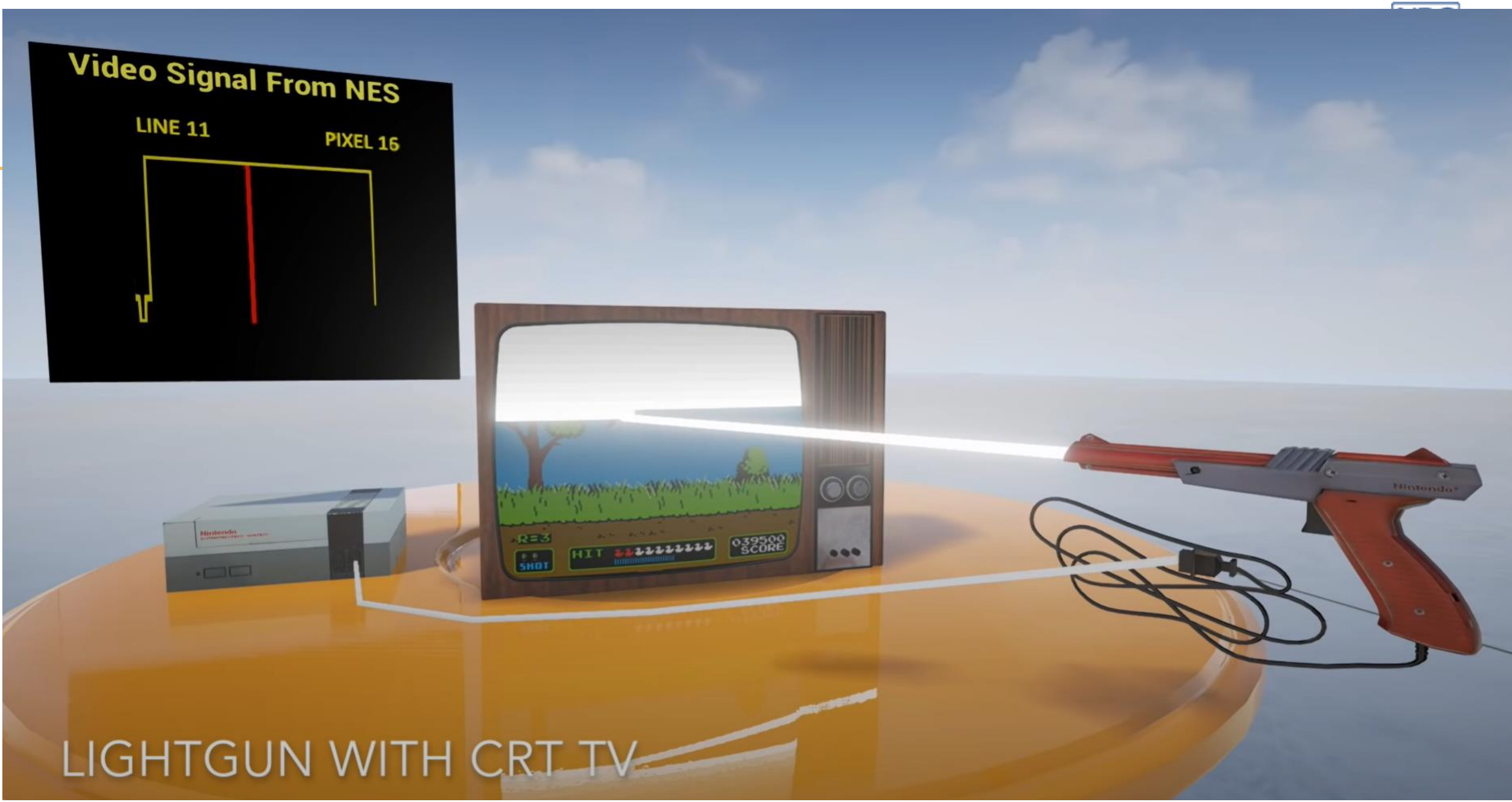
~~laser~~

- *the sensor (single-pixel-camera) is in the gun,*
- *receive light from the on-screen targets,*
- *flash the screen, and ???*

Principle II: Timing on Cathode Ray Tube (CRT) displays







Read the zoom chat?

https://github.com/tesseract-ocr/tesseract

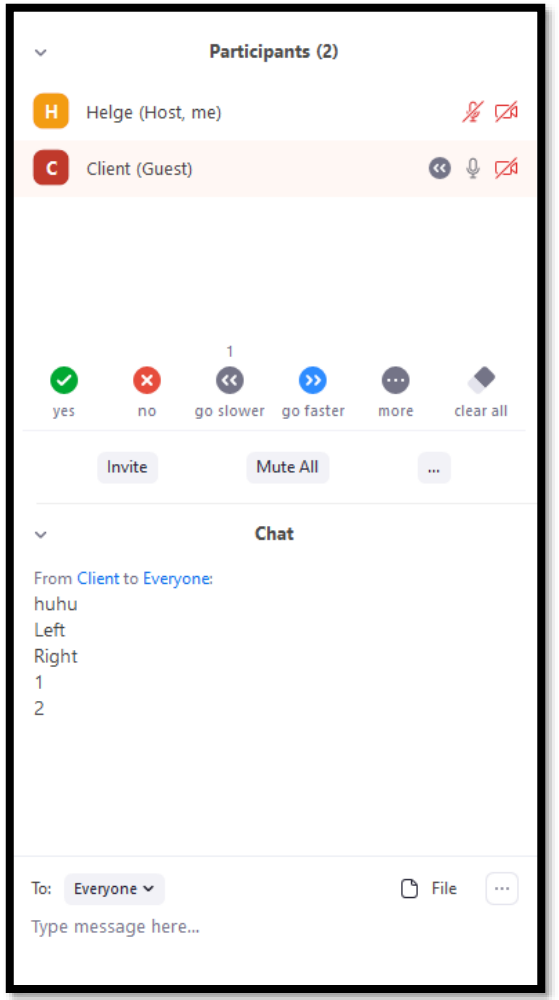
- *does optical character recognition*
- *works with c++*
- *works on windows and linux (not sure about mac)*
- *might be too slow?!*

How to apply tesseract on a screen capture (zoom)?

- *https://stackoverflow.com/questions/22924209/how-to-make-tesseract-ocr-read-from-coordinates-on-a-screen*

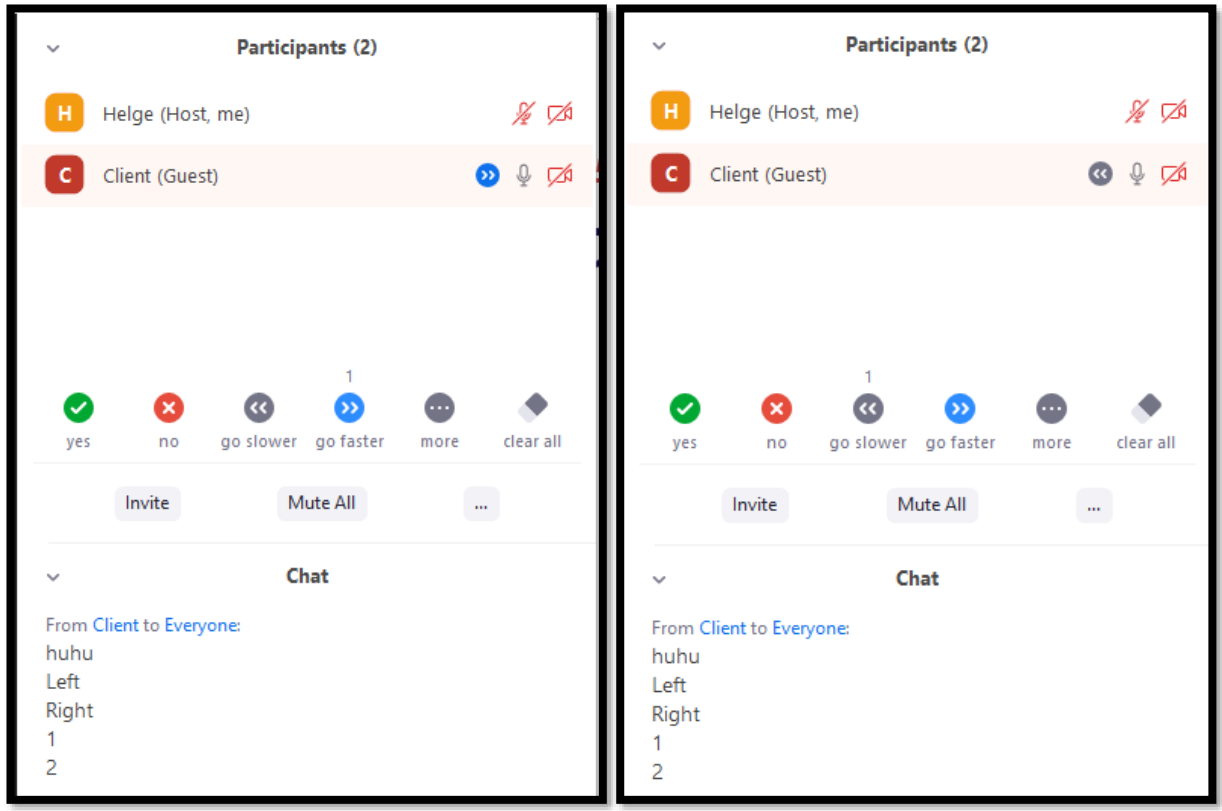
Can we exploit the Zoom window?

- ***Multi player?***



Read the zoom chat (hacks)

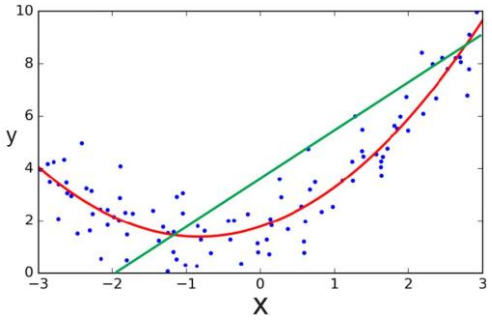
- ***Capture the screen***
  - *https://github.com/smasherprog/screen_capture_lite*
- ***Search for the zoom window***
- ***Check for colored symbol***
  - red, green, gray, blue?
    - *only need to read a few pixels*
      - its fast!
- ***Recognize numbers?***
  - only 10 different ones, brute force?

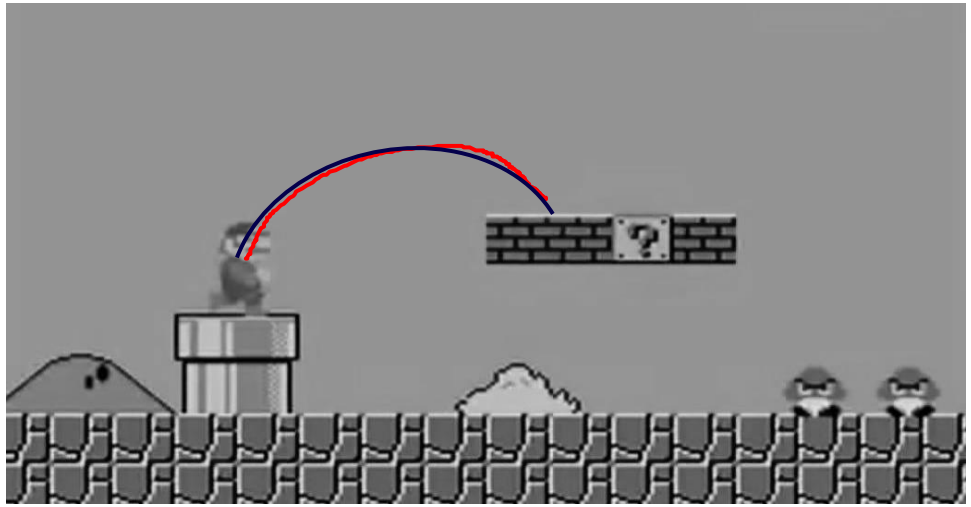


Mouse gestures

Regression

- ***least squares fit***
  - linear, polynomial, and other parametric functions



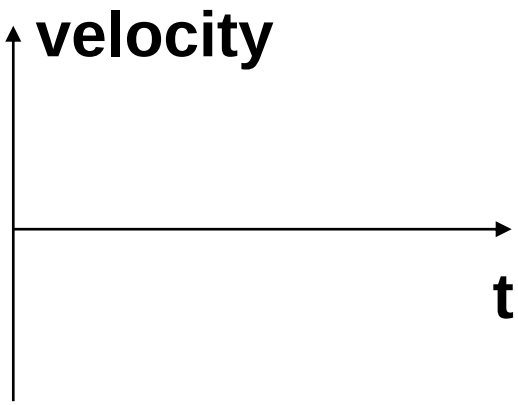


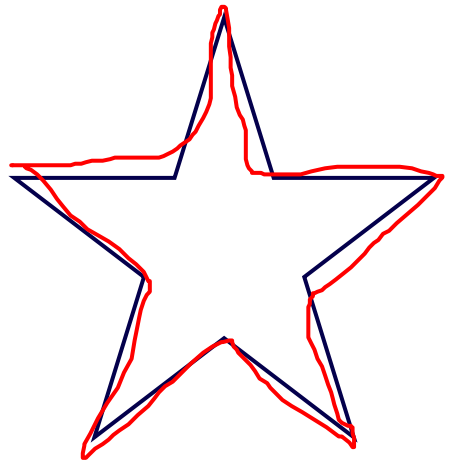
Search

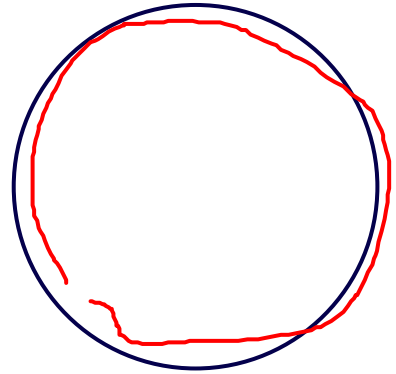
- brute force?
- binary search?

Detection

- key events
- pattern matching







Mouse gesture detection

1. Determine start and end time, i.e. store all mouse curser positions in a vector.
2. Resample your vector to have a fixed number of elements (e.g., N=20). This is done to gain invariance to different drawing/sampling speeds.
3. Subtract the start point (or the mean of the curve) as reference point. Yields translation invariance, it should not matter where on the screen you draw.
4. If you want scale invariance (detect small and big circles), divide all points by the maximum or mean position of all points (you need to try what is better)
5. Compare this normalized curve to a reference curve (you drawing the pattern once for reference and saving the points) that was processed with 1-4. The comparison metric could simply be the distance between the N points in the reference and new curve (after all the normalizations).

   Debugging: Plot the curve after every processing step, e.g., save as .csv and plot in excel (to save you from coding a graph plotter)

http://depts.washington.edu/acelab/proj/dollar/index.html