CPSC 427
Video Game Programming

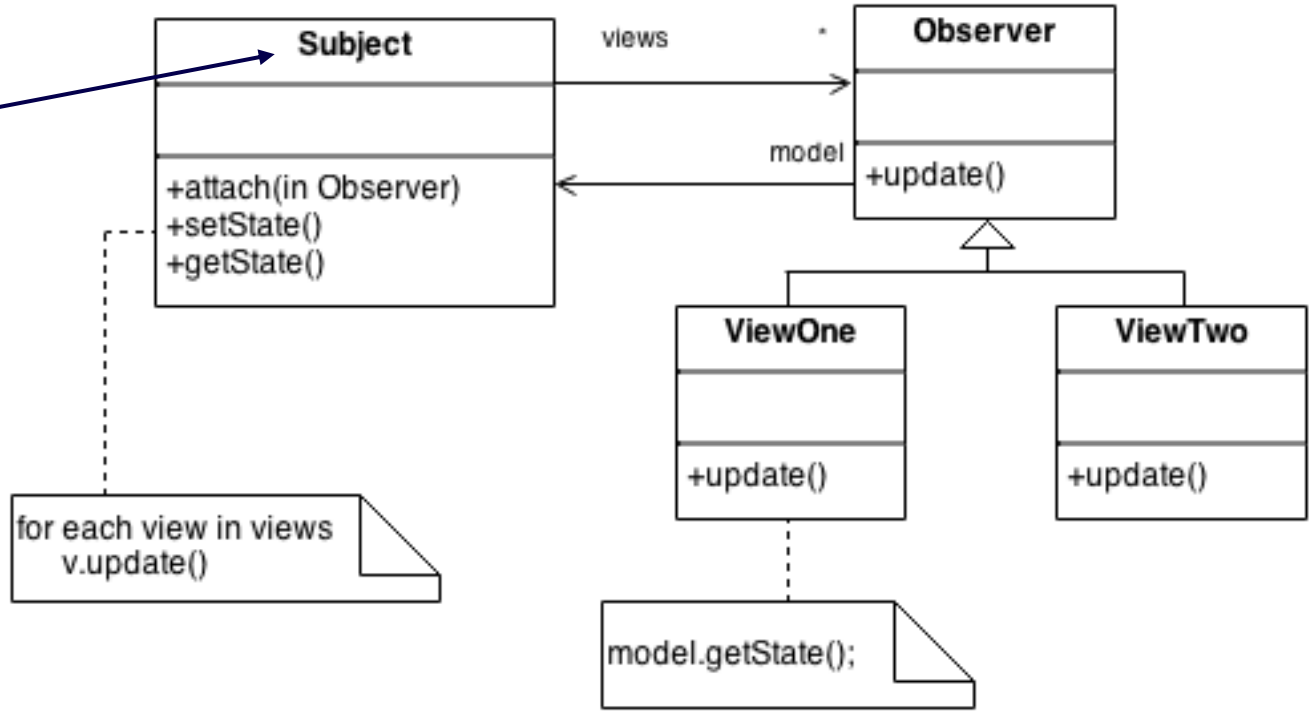
Human Computer Interaction and User Experience

Helge Rhodin

Observer Pattern – OOP

- *Define a common interface*
- *All observers inherit from that interface*

Called Subject by GoF



Lambda Functions

Definition:

- auto y = [] (int first, int second) { return first + second; };

Call: int z = y(1+3);

- Infers return type for simple functions (single return statement)
  - otherwise

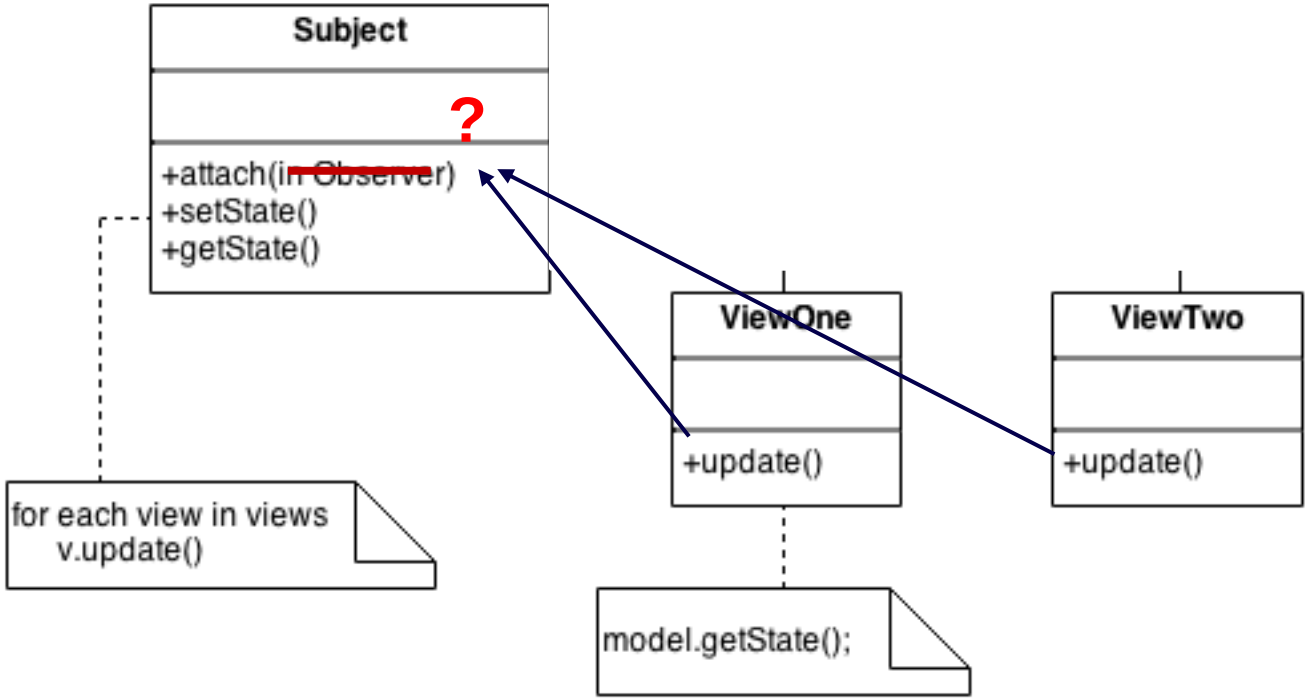
    auto y = [] (int first, int second) -> int { return first + second; };
- Can capture variables from the surrounding scope.

```
int scale;
auto y = [] (int first, int second) -> int { return scale*first + second; };

auto y = [&] (int first, int second) -> int { return scale*first + second; };
```

Observer Pattern – With Functions

- ***function with matching signature instead of class***



A function that accepts a function

- ***Using std::function***

```
#include<functional>

void LambdaTest (const std::function <void (int)>& f)
{
    ...
}
```

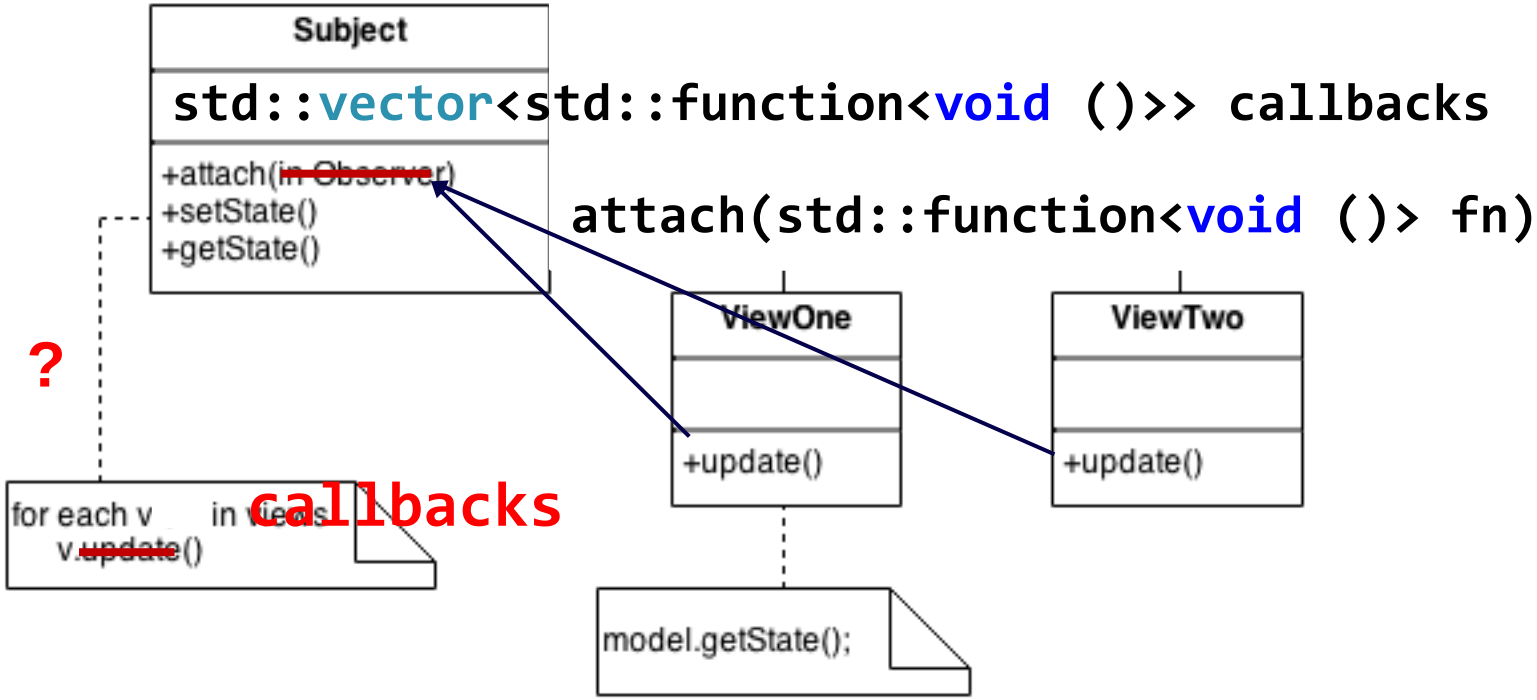
- ***Using templates***

```
template<typename Func>
void LambdaTest(Func f) {
    f(10);
}
```

  - *use templates to accept any argument with an operator()*

Observer Pattern – With Functions

- ***function with matching signature instead of class***



A0 Important!!! Make use of &

```
Animal animal = ECS::registry<Animal>.get(fish);
animal.name = "Big " + animal.name;
```

- *a copy*

```
Animal& animal = ECS::registry<Animal>.get(fish);
animal.name = "Big " + animal.name;
```

- *a reference*

```
Animal animal = ECS::registry<Animal>.get(fish);
ECS::registry<Animal>.get(fish) = "Big " + animal.name;
```

- *a map lookup, too complicated & slow!!*

A1 Released

- ***Collision***

- ***Visual Debugging***
  - Very important for your team project too

- ***AI***
  - The AI task is simple, no need to wait for the Thursday lecture

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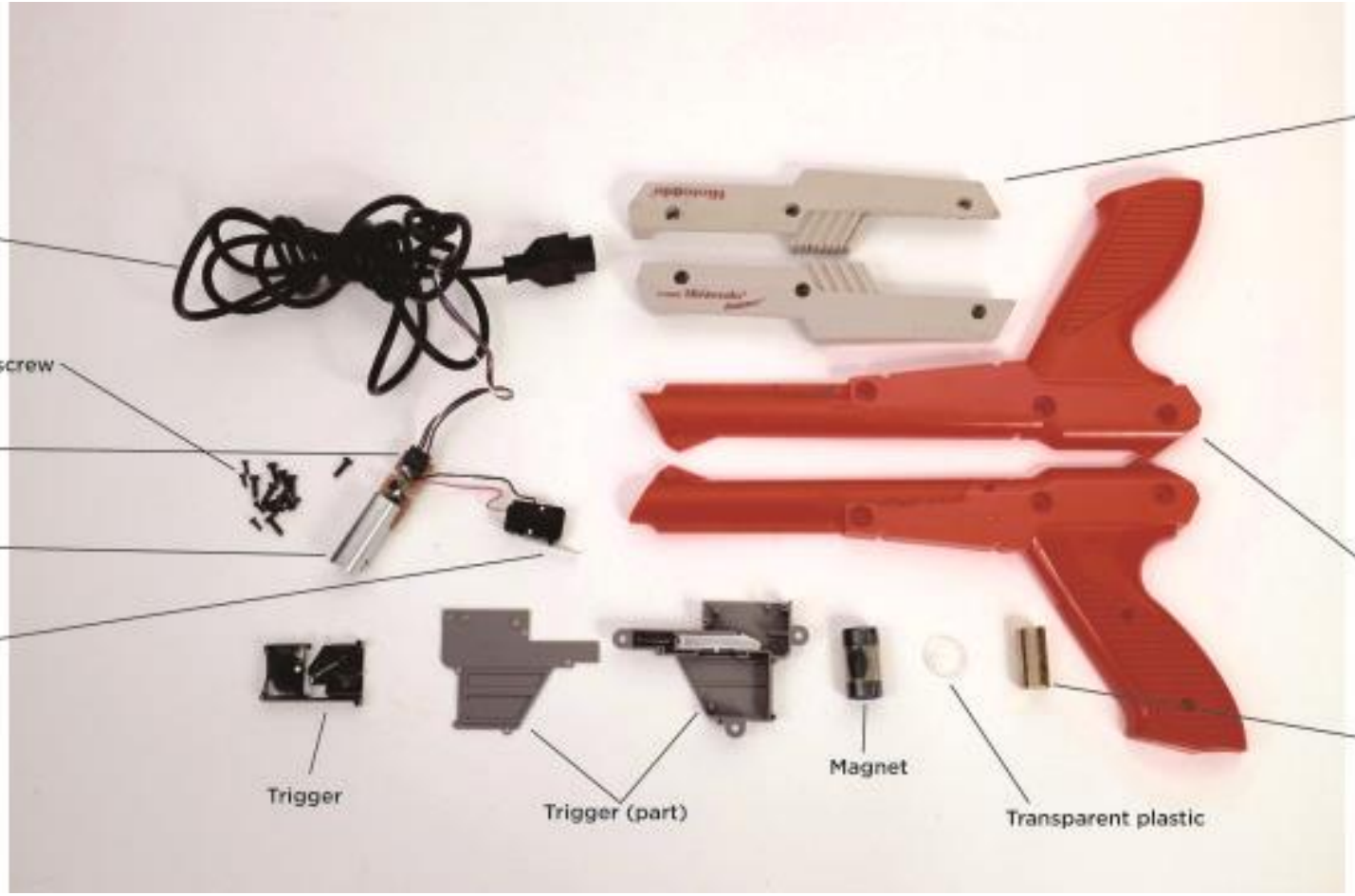
Technical Designs

The Light Gun

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

Classic: NES Zapper

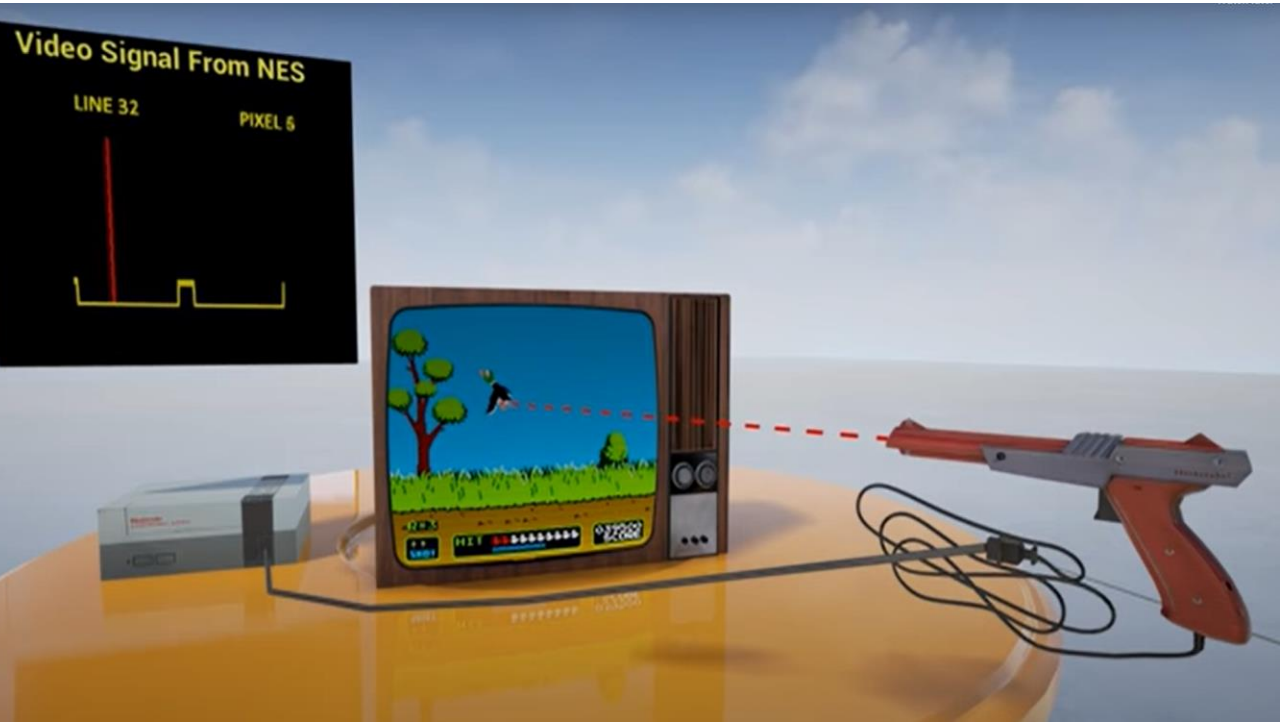
The Light Gun (first glance)



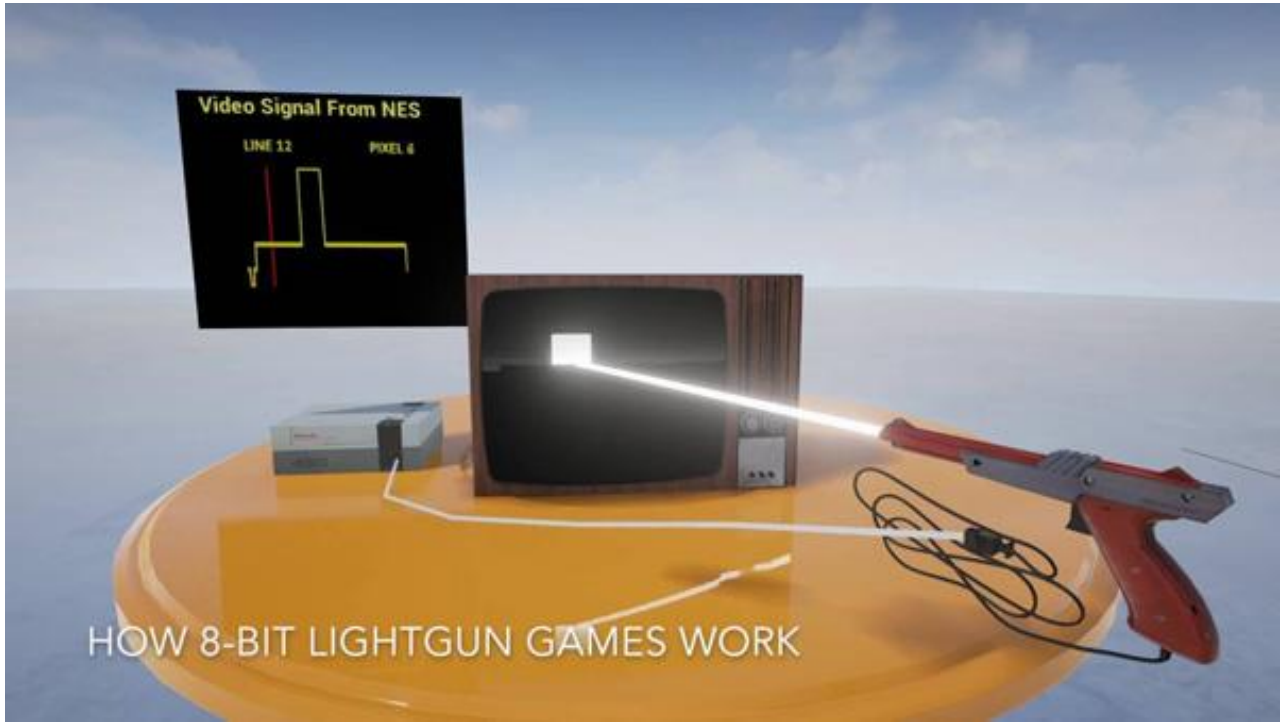
- ***a laser?!***

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

Principle I: Black&white target



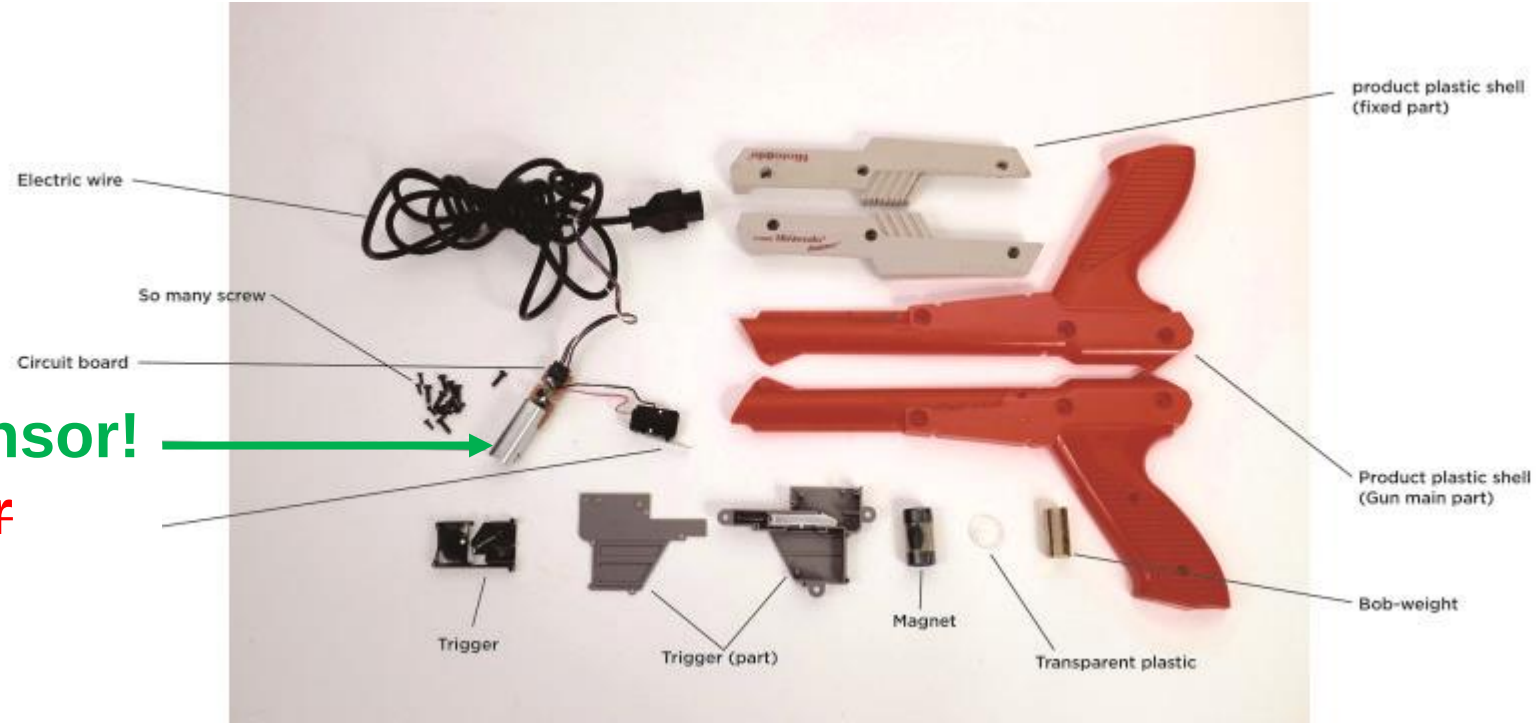
Normal frame



Flash

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

The Light Gun

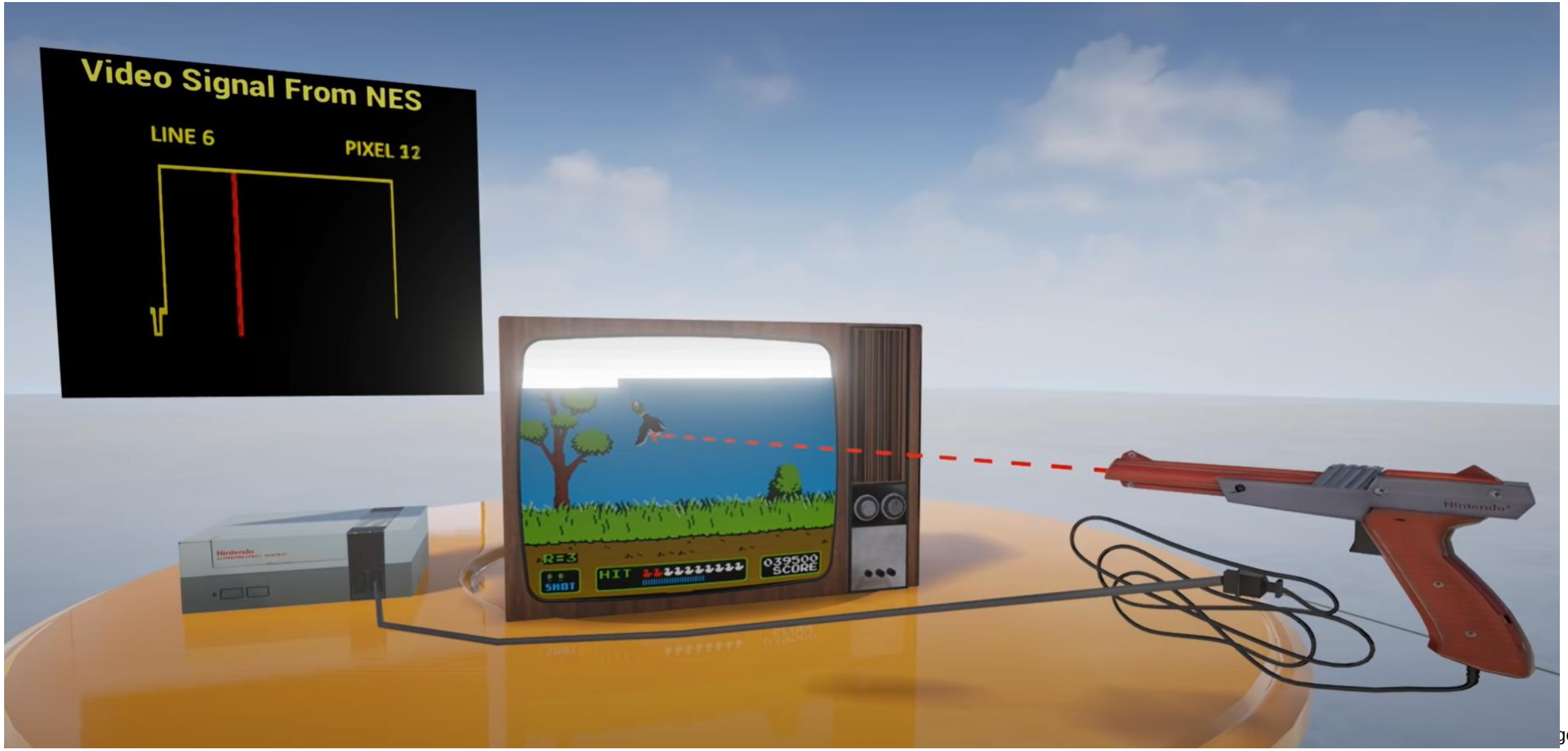


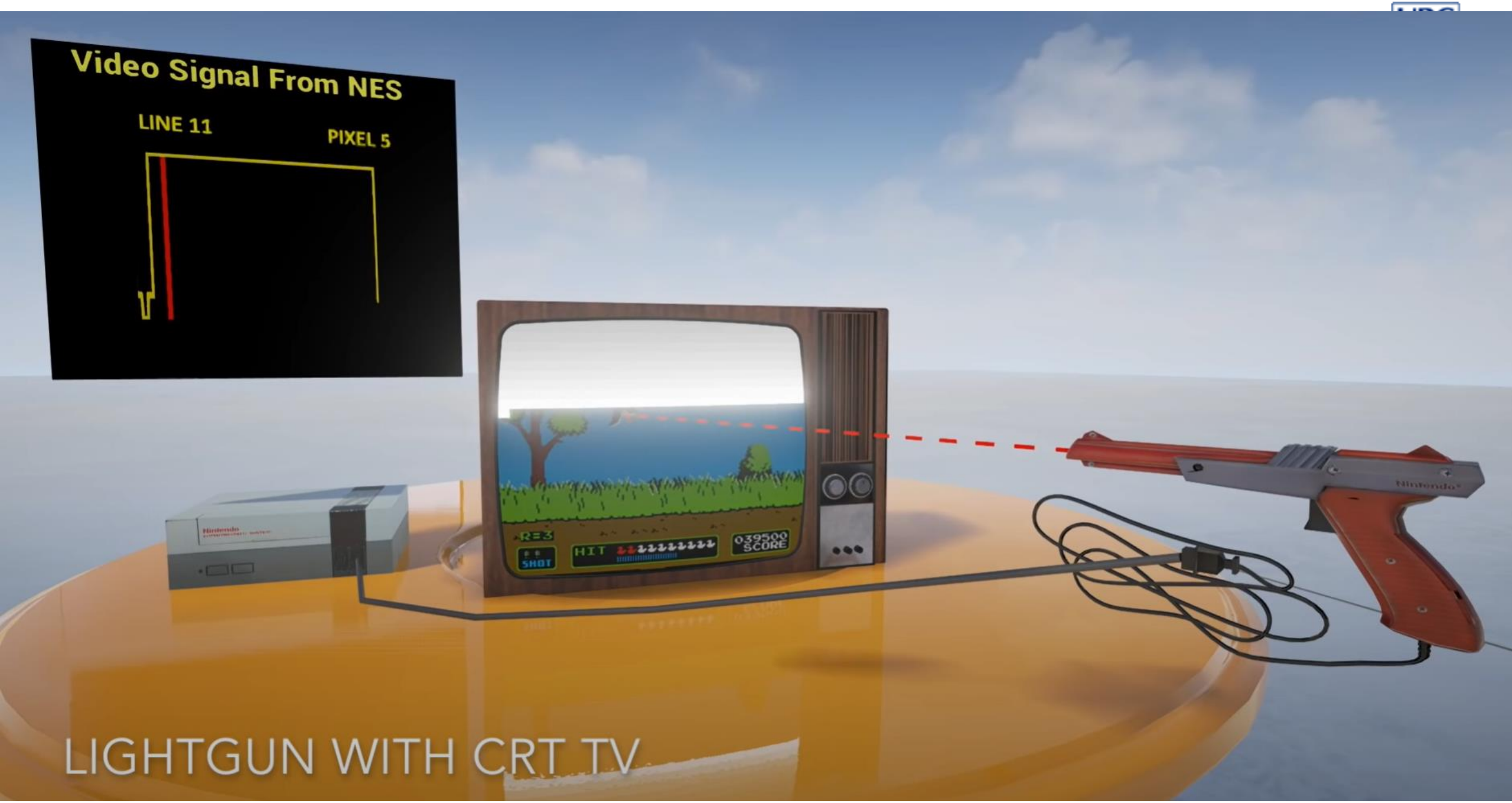
Light sensor!

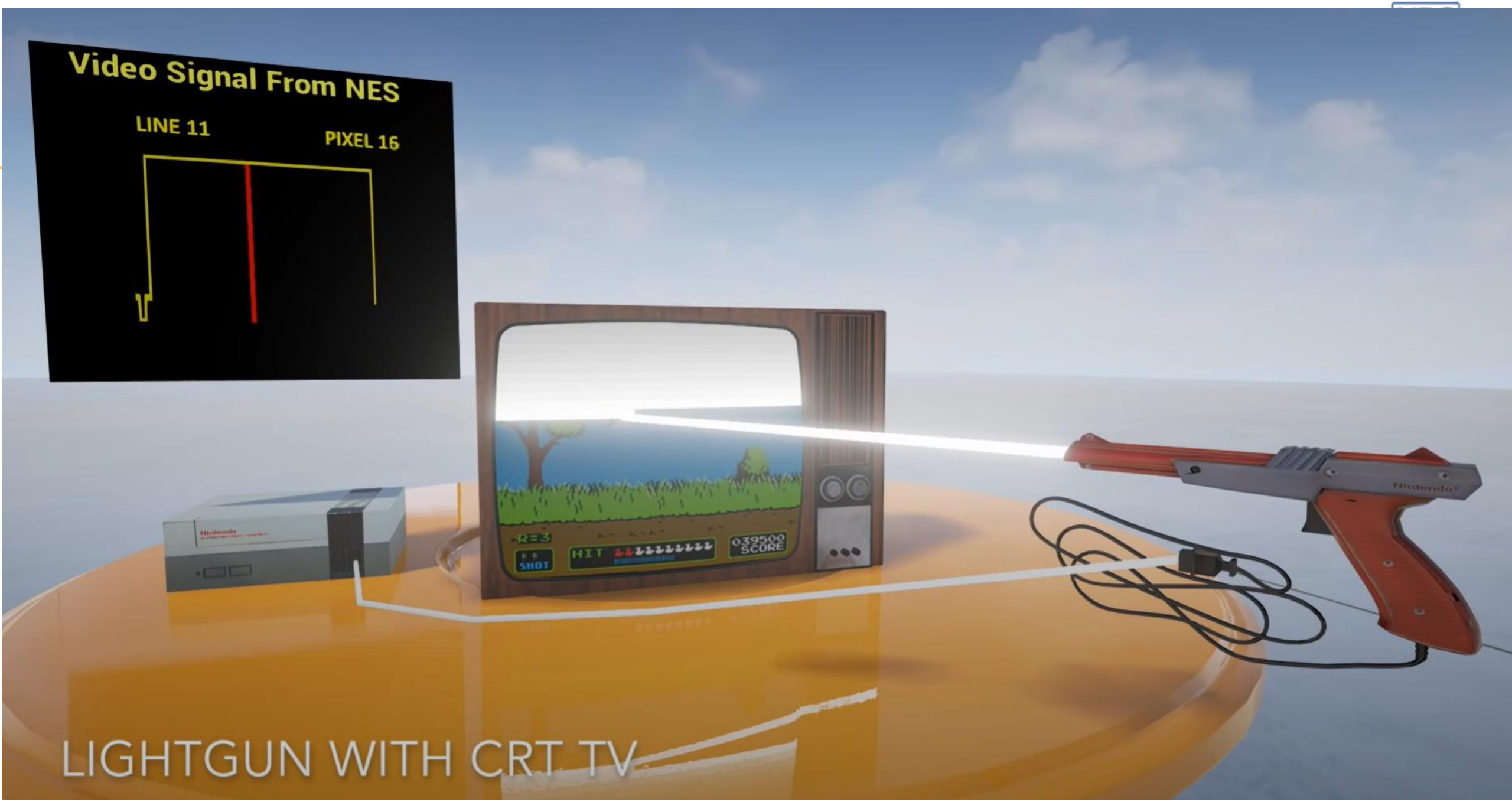
~~laser~~

- *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

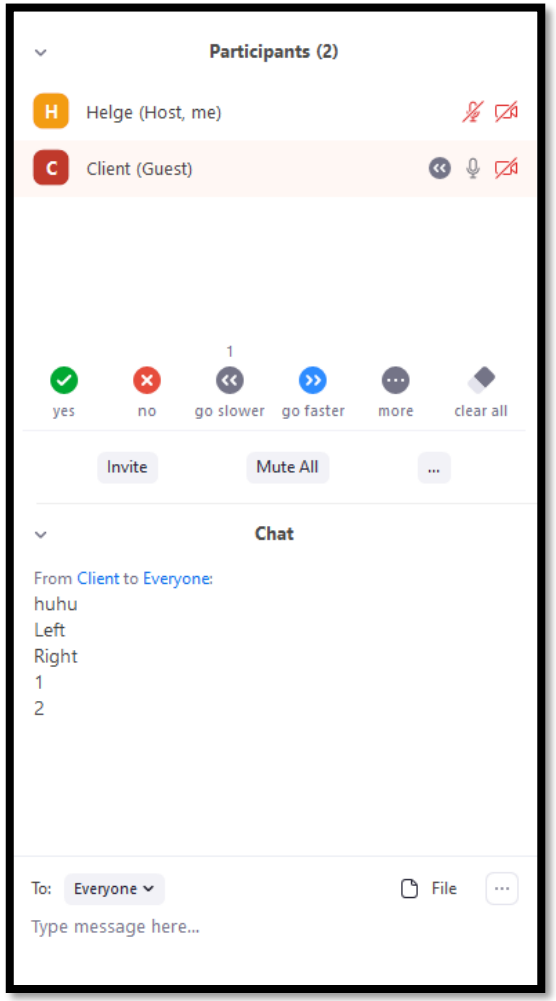
- ***does optical character recognition***
- ***works with c++***
- ***works on windows and linux (not sure about mac)***
- ***might be too slow?!***

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***

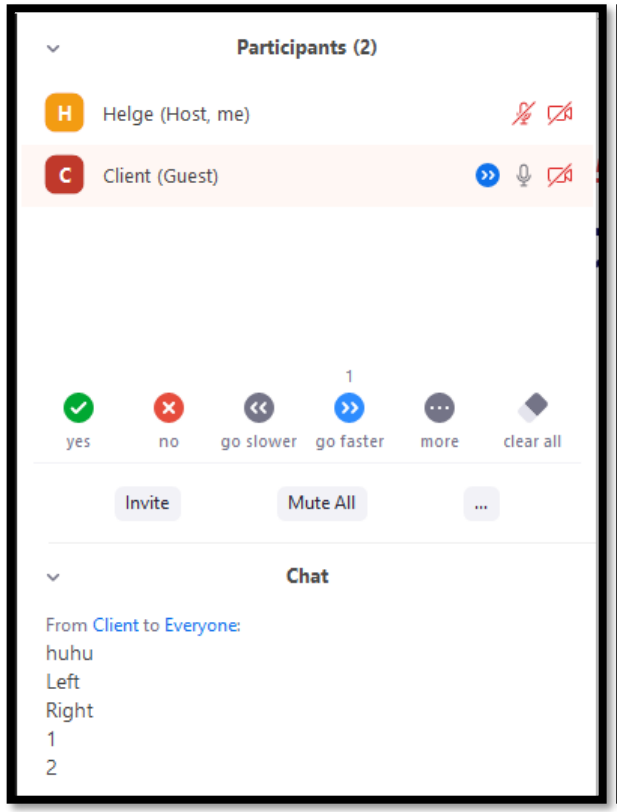
Can we exploit the Zoom window?

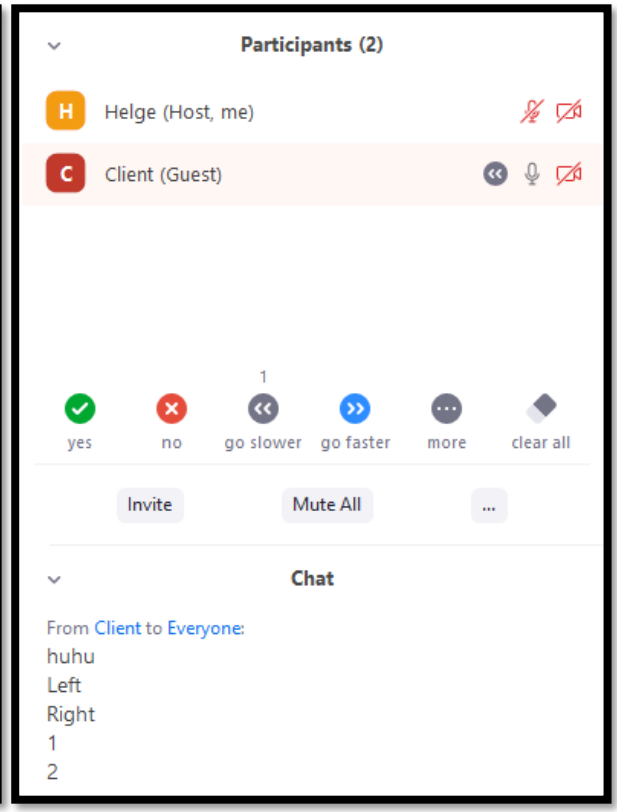
- ***Multi player?***



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?

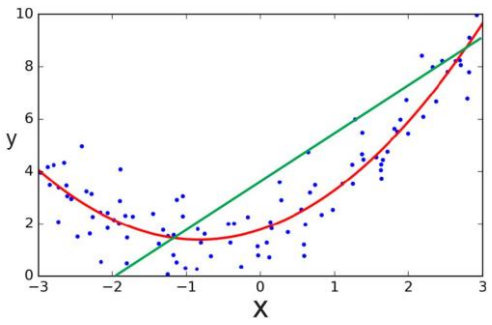


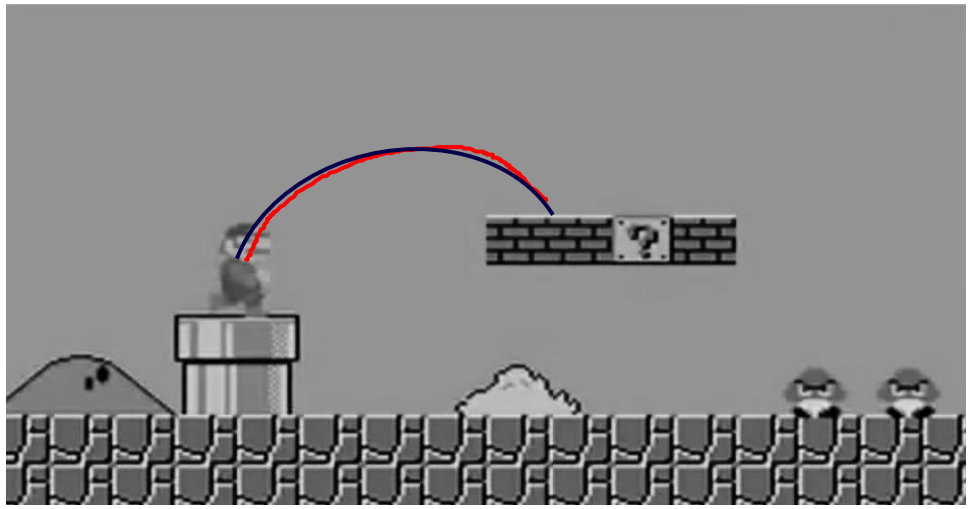


Mouse gestures

Regression

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



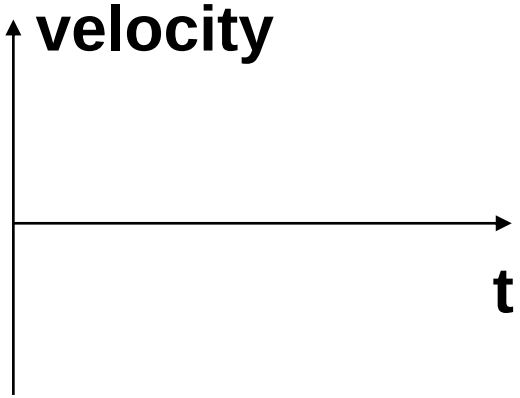


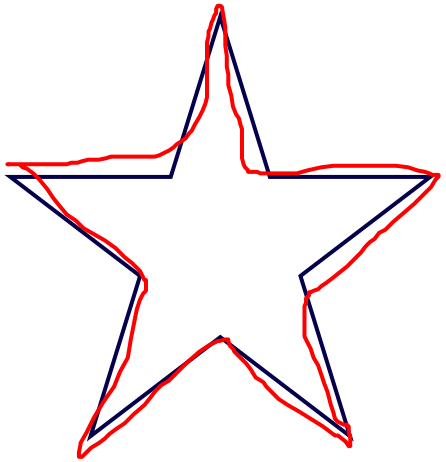
Search

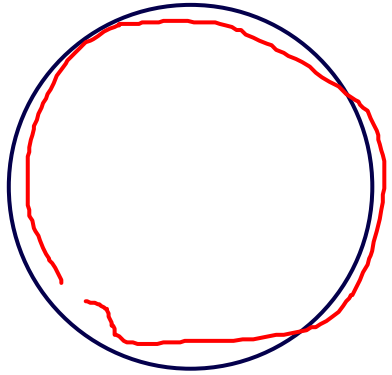
- brute force?
- binary search?

Detection

- key events
- pattern matching

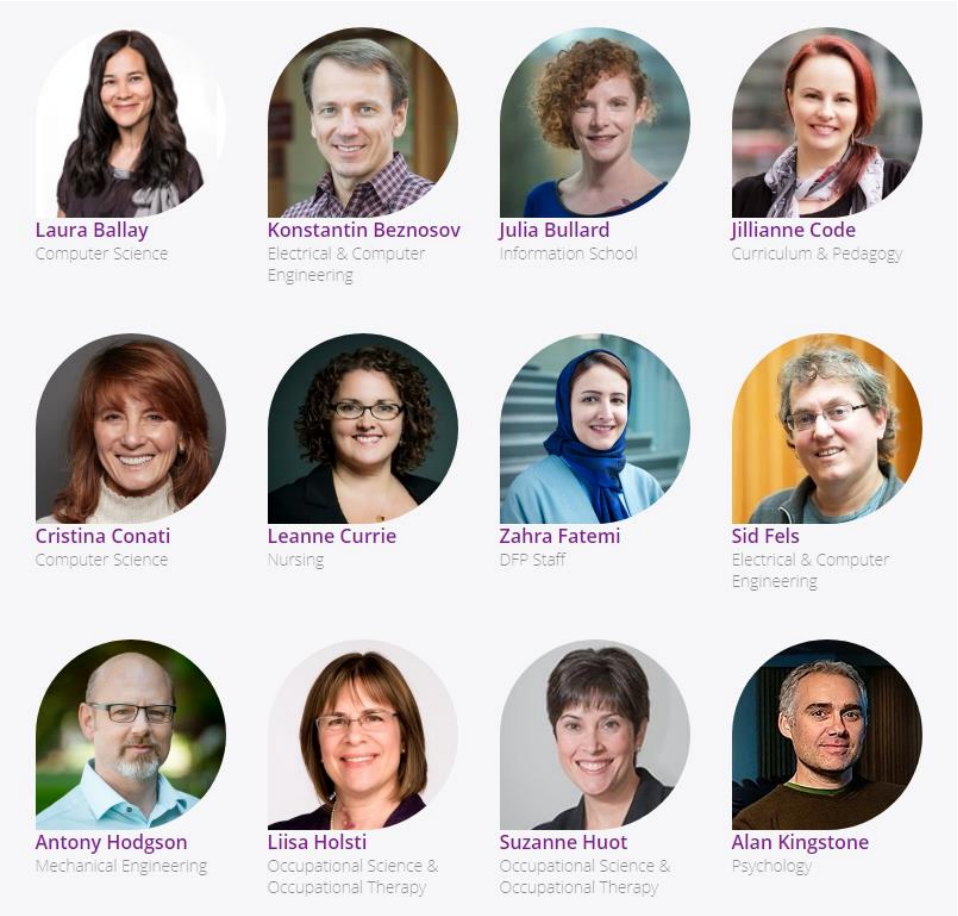


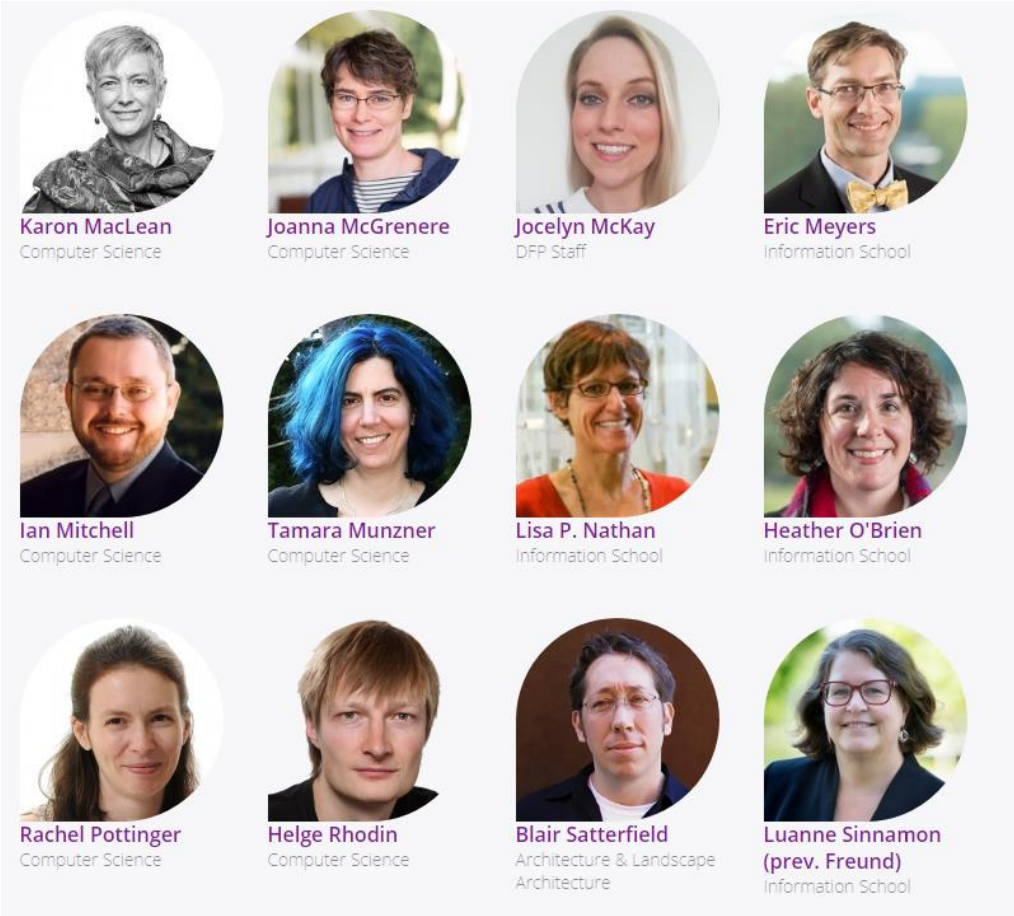




Designing for People (DFP)

- ***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**

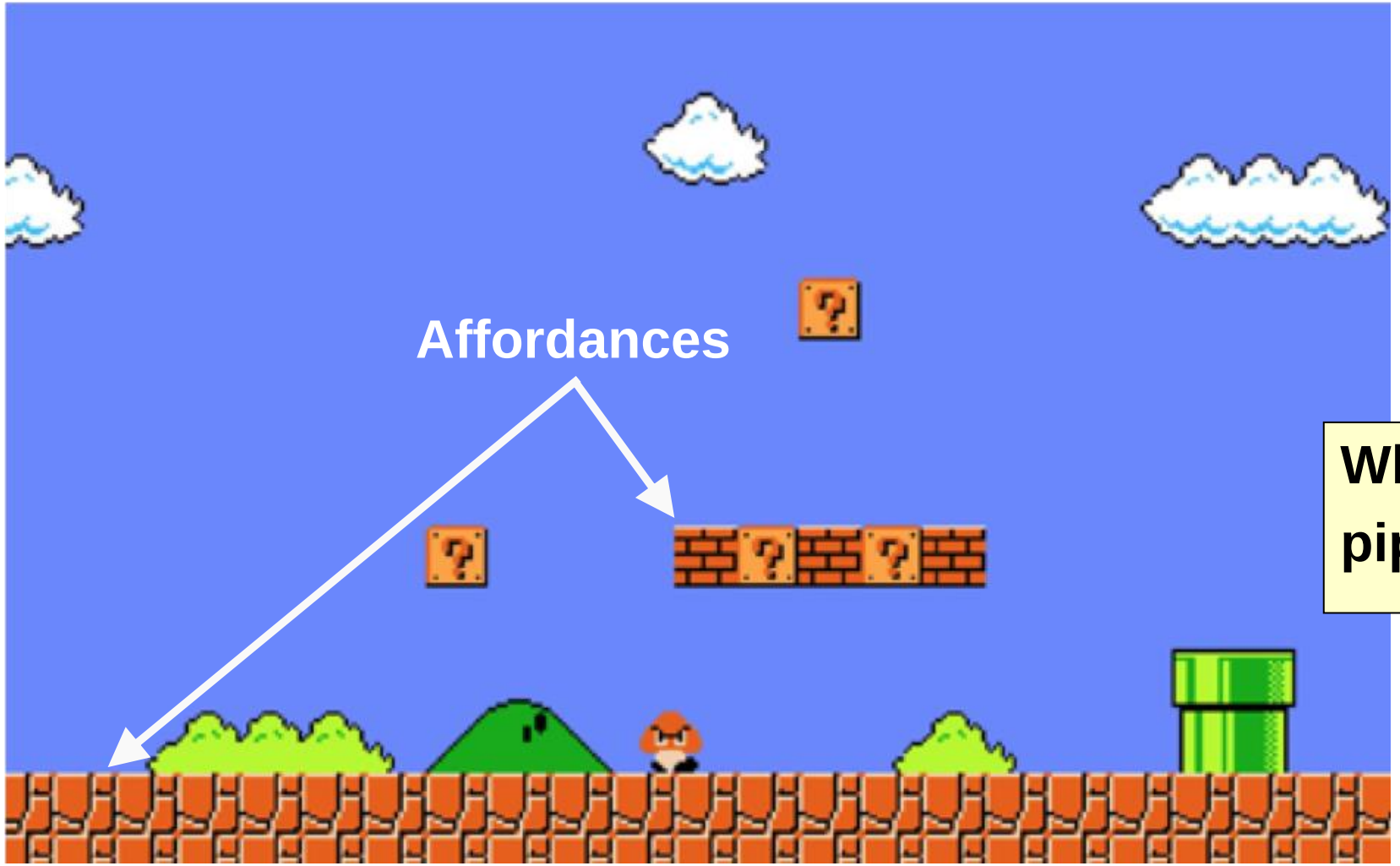
Affordances

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

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

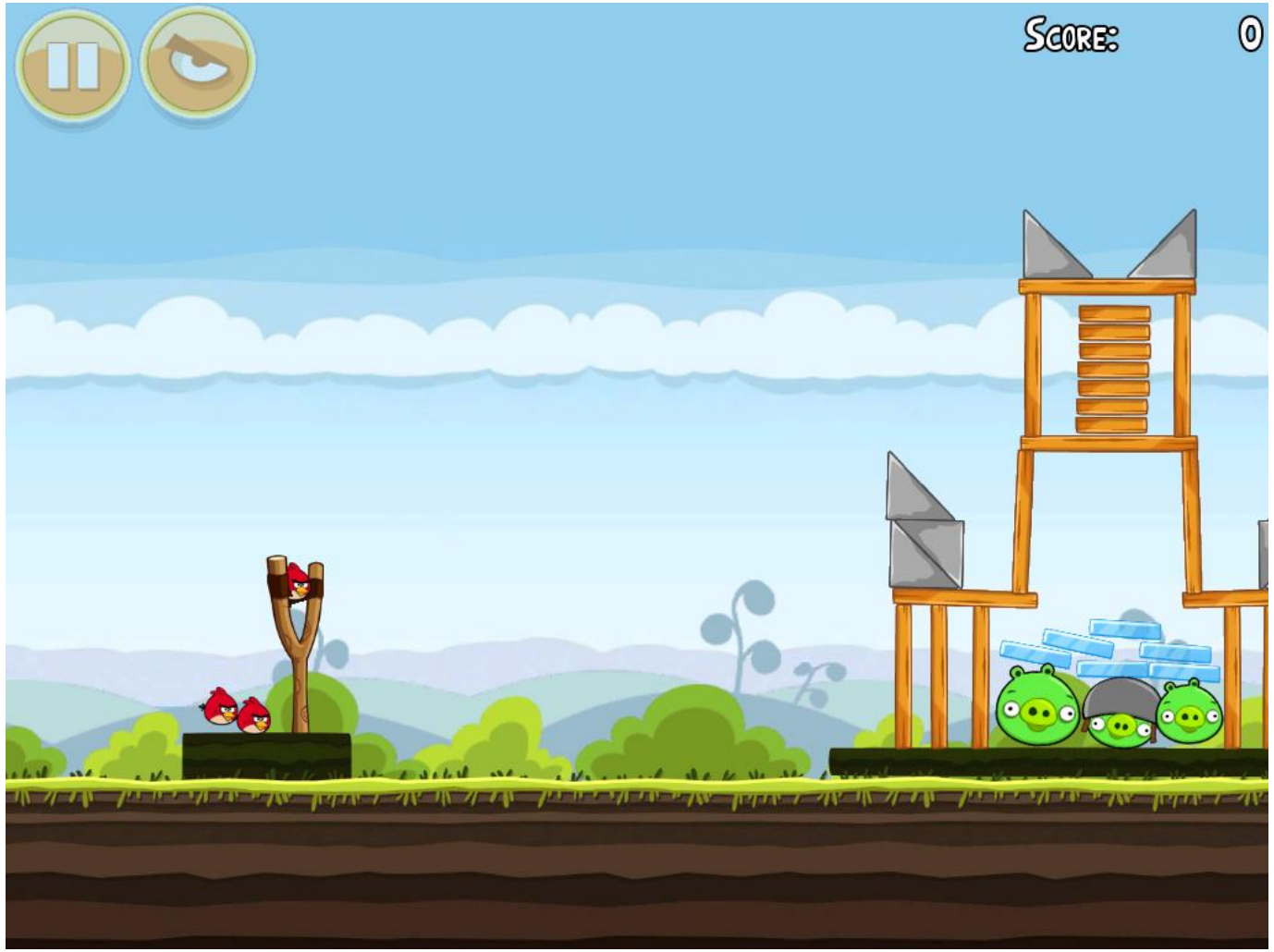



Example of Affordances in Games



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?**

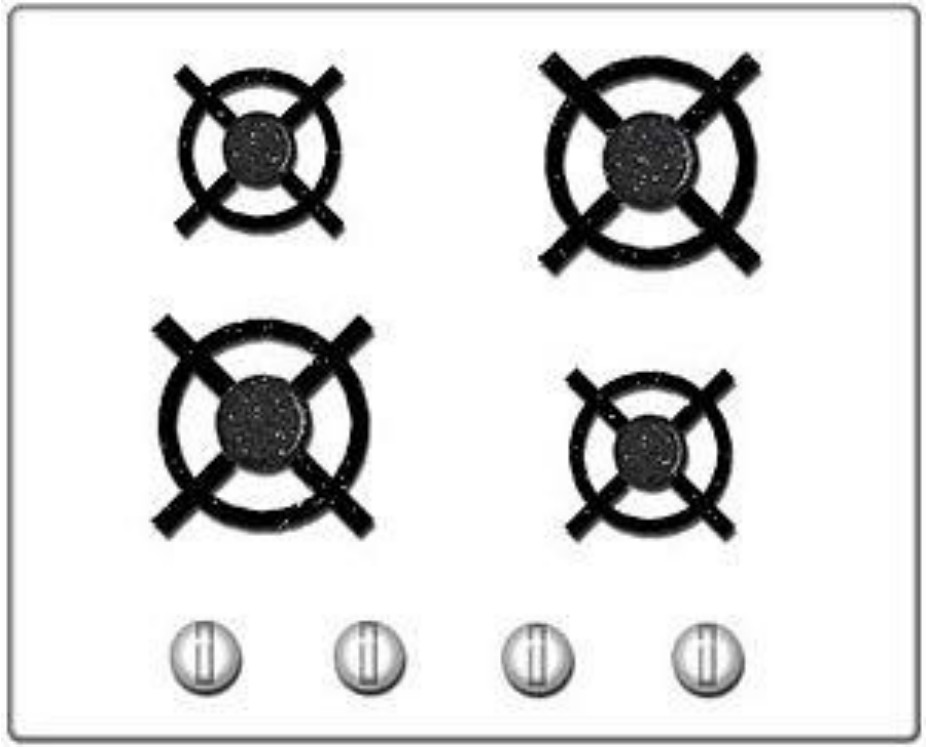
Mapping

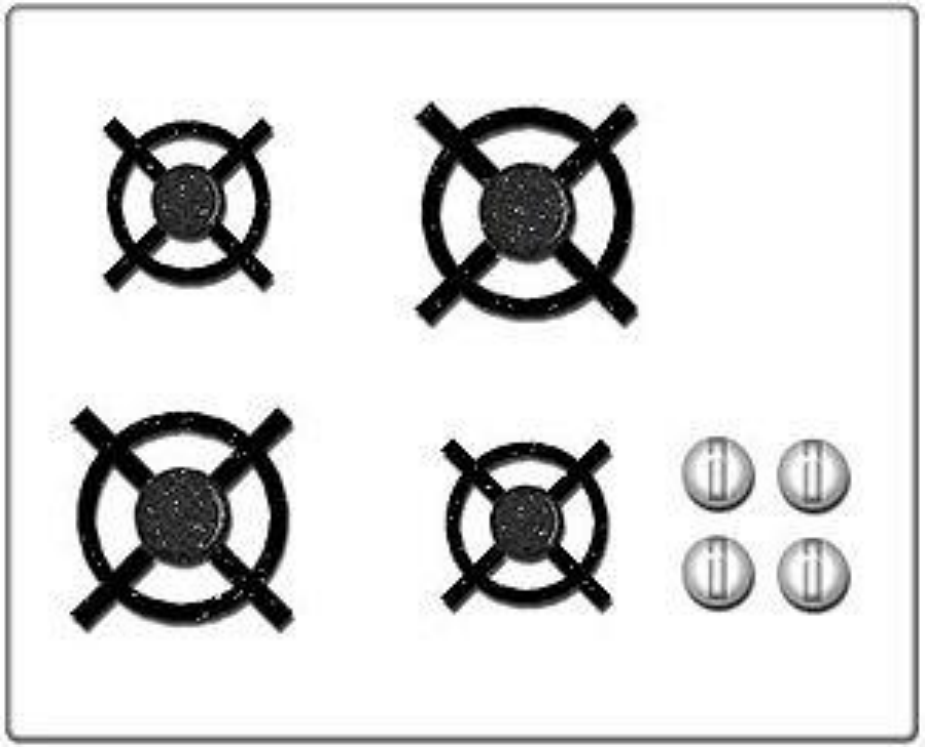
- Some controls are direct (slingshot), some indirect (button)
- Mapping is the relationship between look/feel of indirect controls & their implied actions

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

Mapping Example

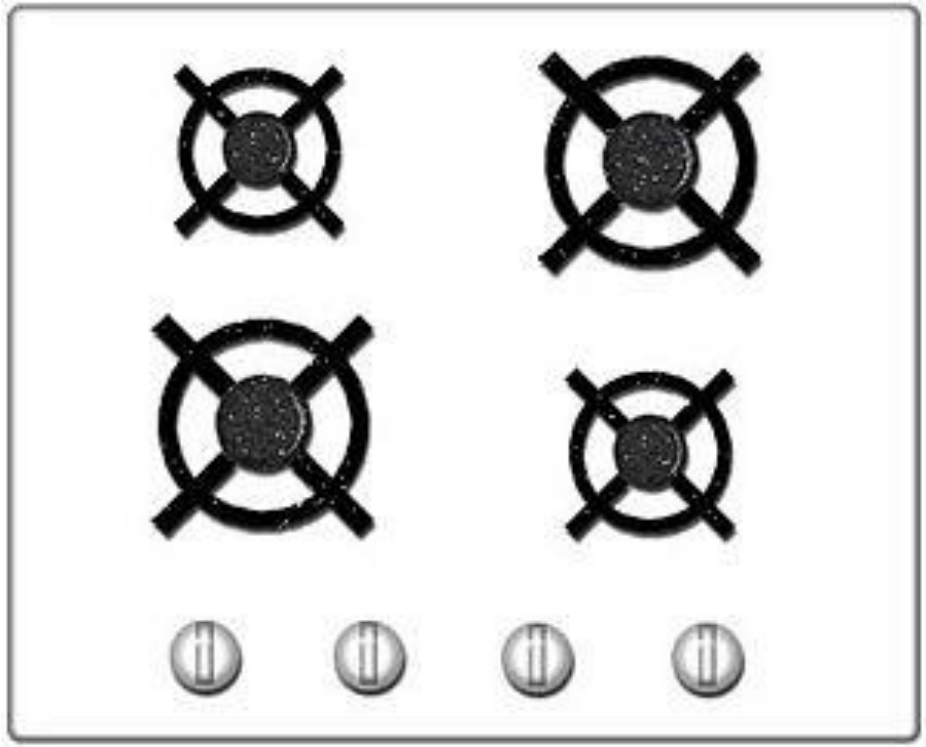
- **Which is better?**

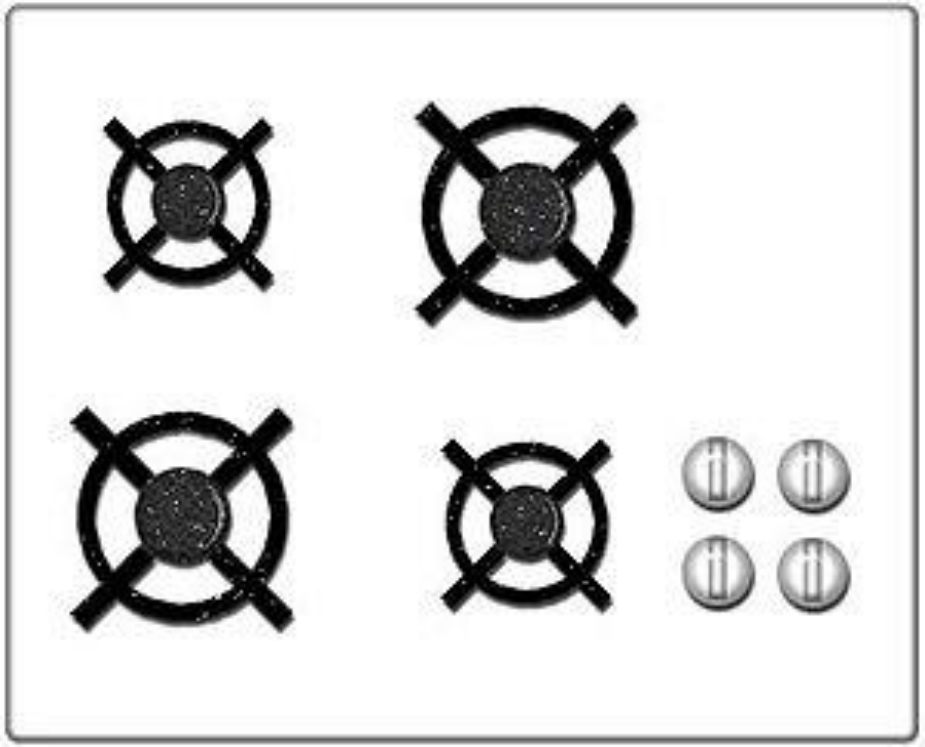




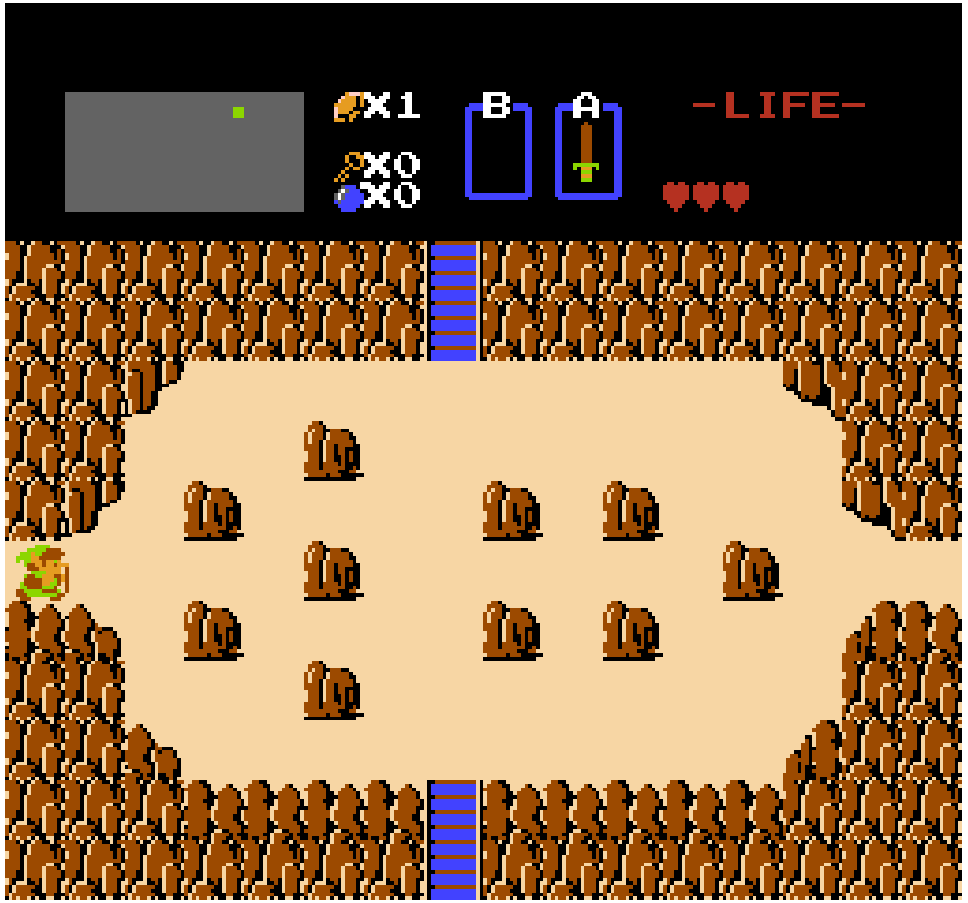
Mapping Example

- **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**

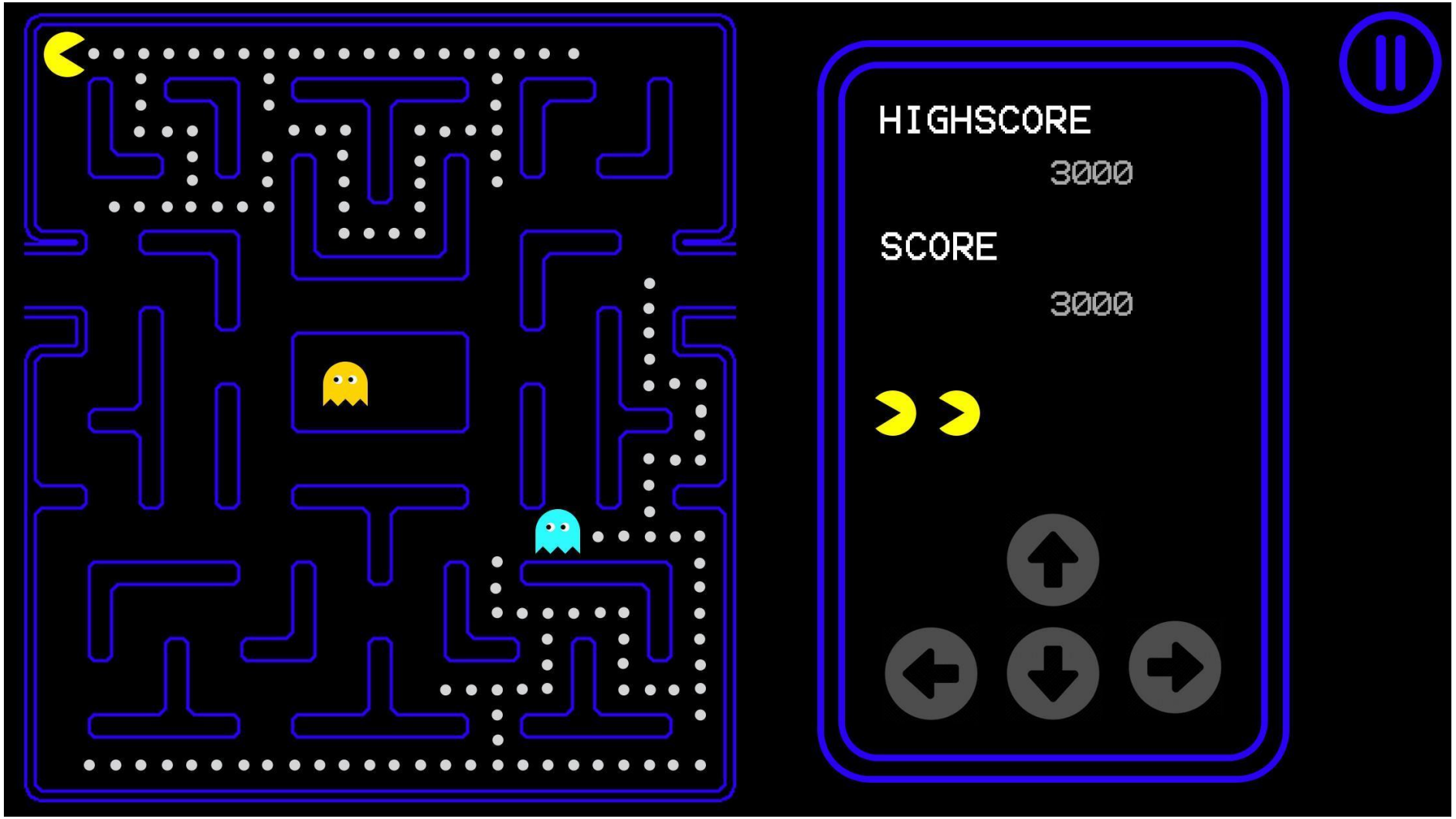
- **Visual**
  - ***interaction between sprites***
- **Sound**
  - ***music on defeat***
- **Touch**
  - ***controller vibrating***

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?

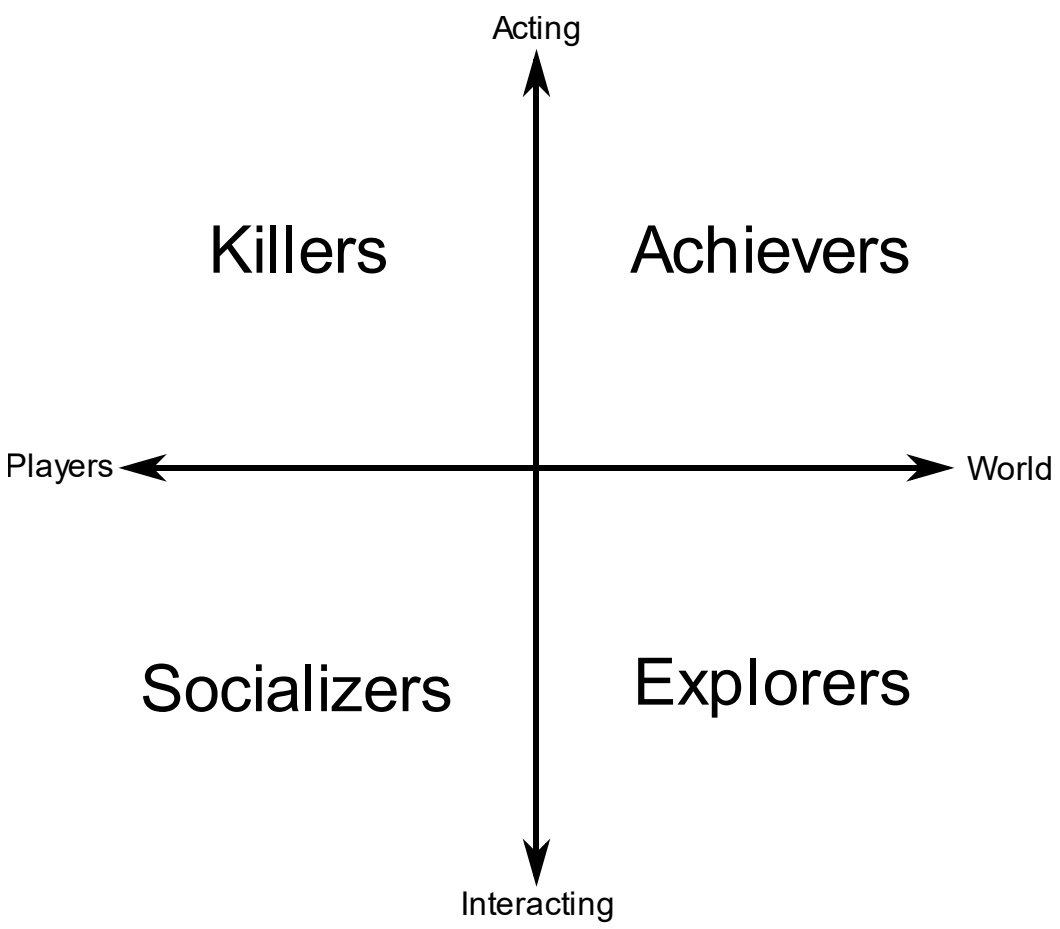
Examples

- **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**

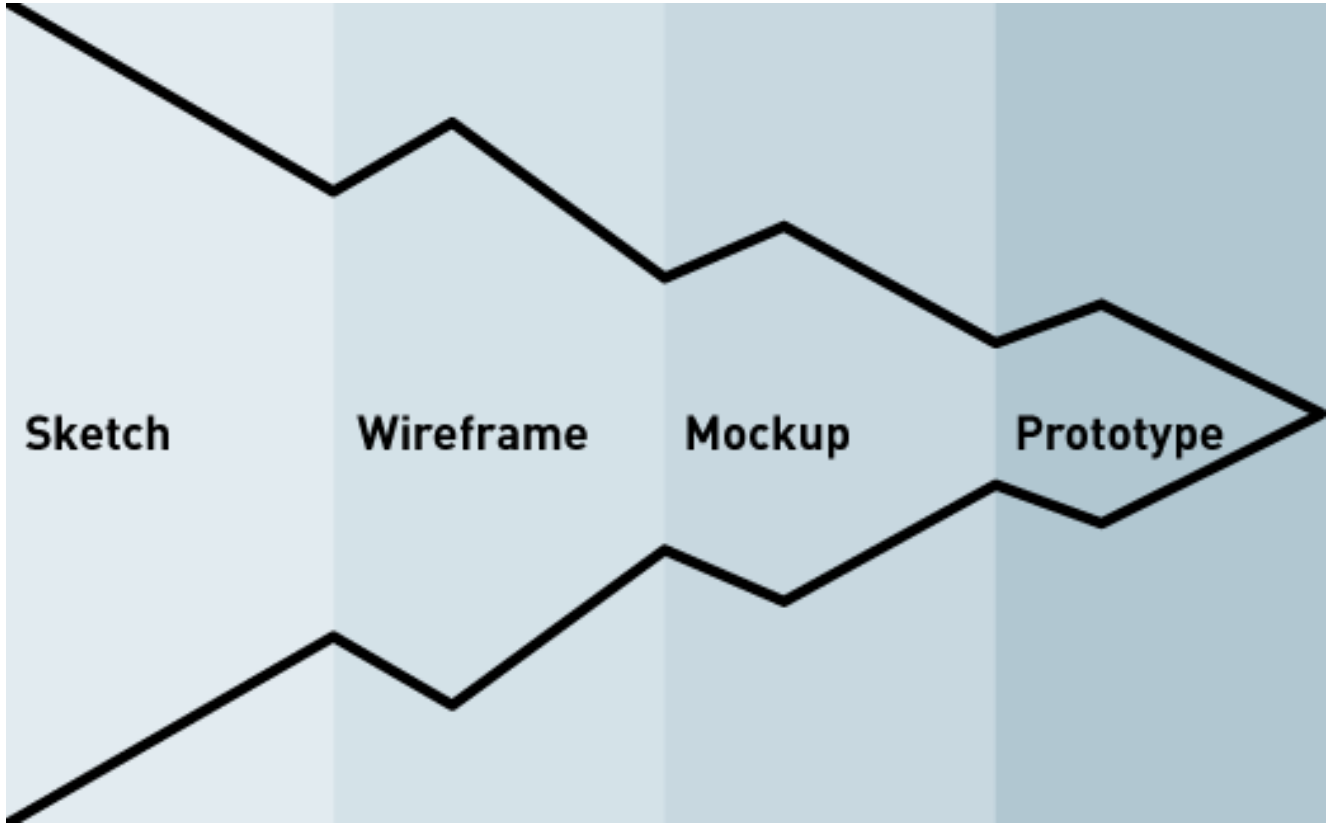


Think:

- 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

Brainstorming



Release

Low fidelity prototyping

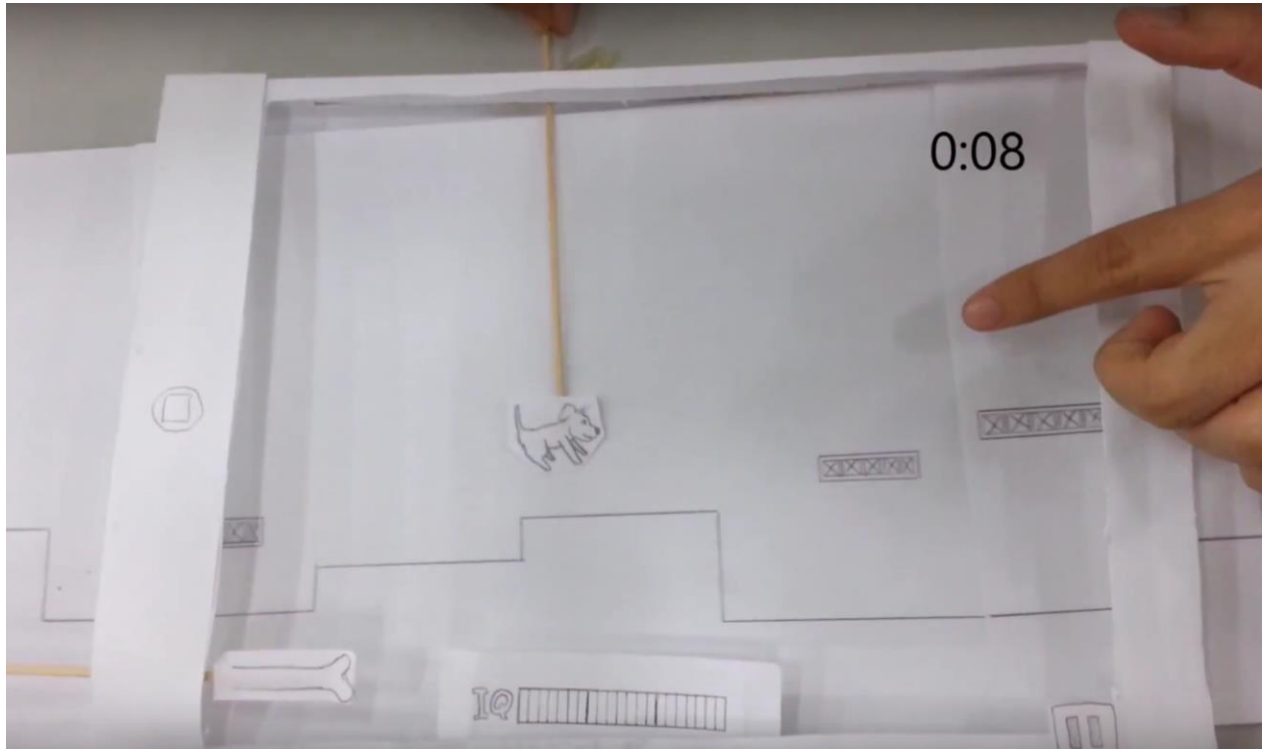
High fidelity prototyping

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**