Lesson 6
Design Thinking - Empathize

...and this...

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Lessons 6 to 10

What we'll be doing...

- Learn about design thinking

- Start on ALP project

- Learn a new sensor / device every week
 - More options for your ALP project prototype

Target for Today!

- Intro to "Active Living" ALP project

- Design Thinking: Start on "Empathize"

    – Complete by next week, work outside class hours

- Learn how to use Ultrasonic Distance Sensor

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Active Living

- Integrates physical activities into everyday life

- Includes:
  - Functional activities (eg. Cycling to school)
  - Recreational activities (eg. Jogging, Zumba)

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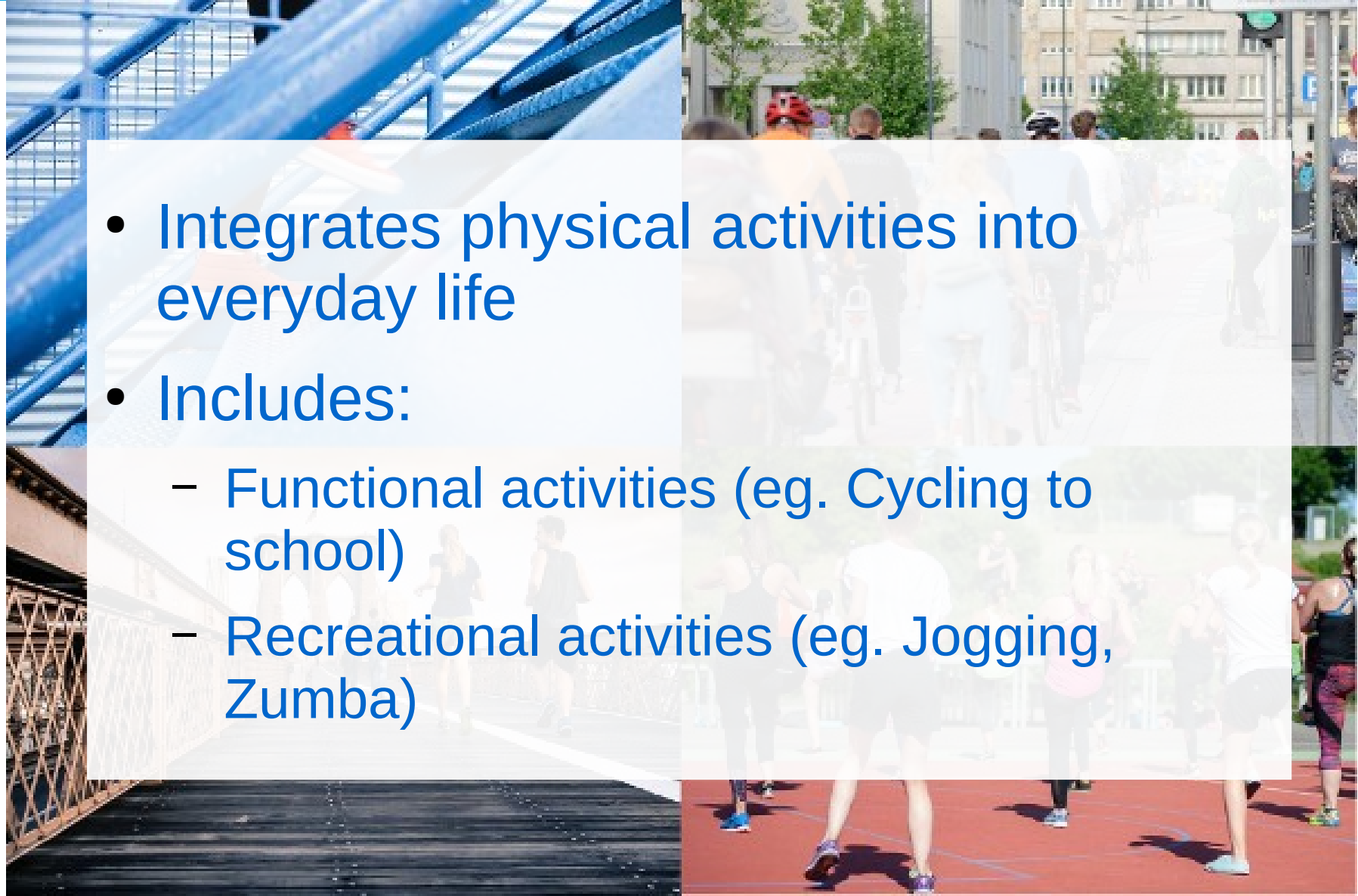
ALP Project

- [Research](#) the problem

- [Design](#) a device that encourages Active Living

- [Build](#) a prototype

- [Write](#) a report for your idea

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ALP Project

- Your project can target...

Working Adults

Teenagers

Couch Potatoes

Elderly

Disabled

Everyone

Exercise Freaks

Students

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ALP Project

- Encourage Active Living by making it...

Easier to track

Safer

More fun

Convenient

Rewarding

More Accessible

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Design Thinking

Steve Jobs

Tim Brown

Design Thinking isn't about "Art"

It's about understanding what people need.

Most people make the mistake of thinking design is what it looks like....

It's not just what it looks like and feels like. Design is how it works.

Design thinking can be described as a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible...

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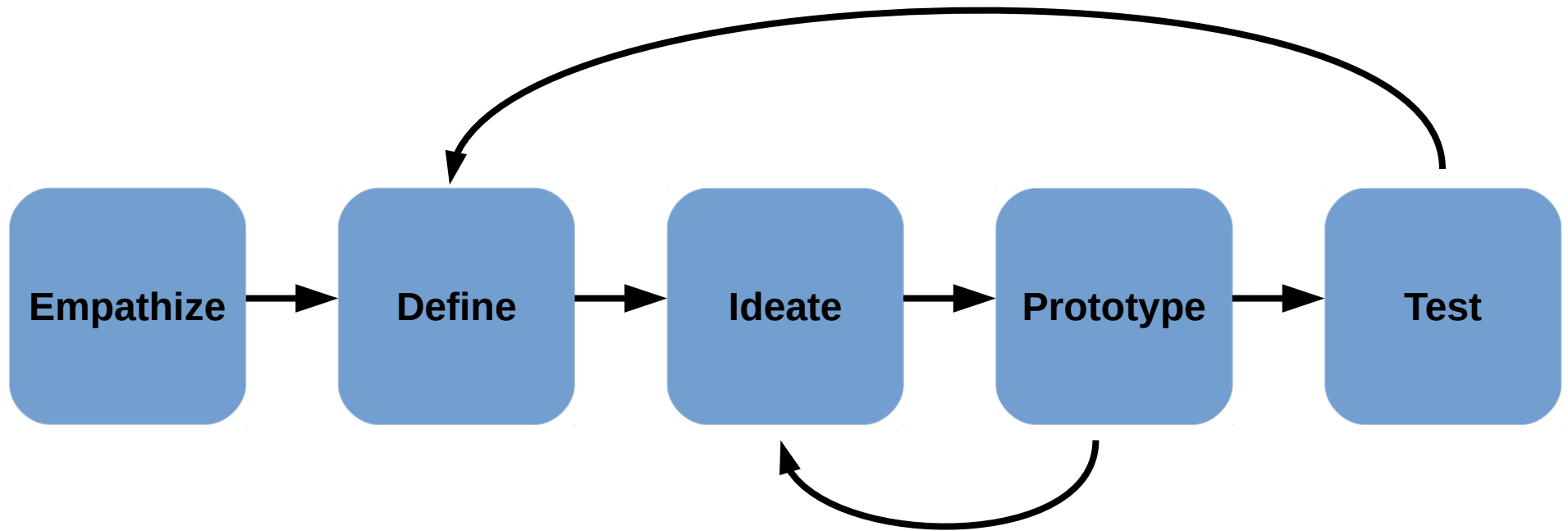**Slides available at: http://a9i.sg/huayi**

What is Design Thinking?
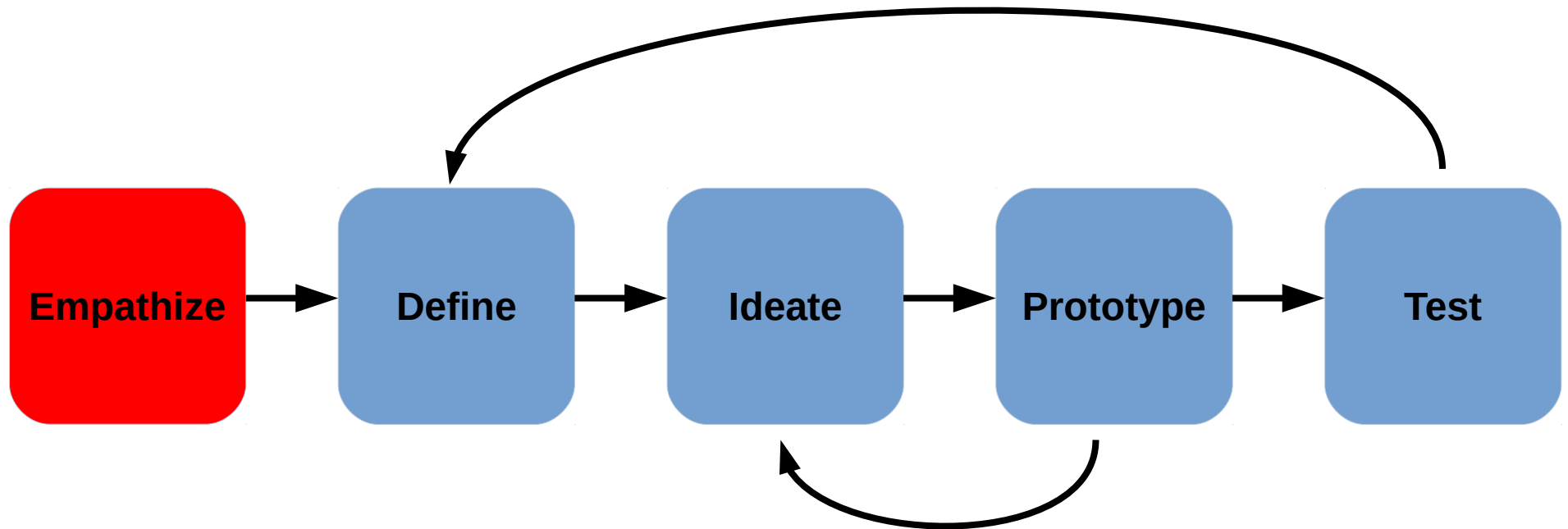
Design Thinking is an <u>iterative</u> process in which we seek to <u>understand</u> the user, <u>challenge assumptions</u>, and <u>redefine problems</u> in an attempt to <u>identify solutions</u>.

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Design Thinking Process

Empathize → Define → Ideate → Prototype → Test

5 Phases of Design Thinking

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Design Thinking Process

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Empathize

- <u>Understand</u> the human needs involved.
  - Research and consult experts
  - Observe, engage, empathize with users
  - Immerse yourself in the same environment as the user (body storming)

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Empathy Techniques

- Interviews
  - Prepare questions: How? What? Why?
    (eg. How often do you exercise? What exercise do you do? Why do you exercise?)
  - Test your questions on a team mate before actual interview
  - Avoid negative questions
    Bad: Why don't you exercise more?
    Good: What did you enjoy most from your last exercise session?

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Empathy Techniques

- Bodystorming
  - Act out the situation or role that you are targeting
  - Understand the problem and avoid assumptions
  - Example:
    - Using exercise equipment while seated to understand difficulties faced by wheelchair users
    - Try jogging with foggy glasses to simulate the difficulties faced by people with poor vision

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Empathize

Worksheet

Discuss and fill in your worksheet (20 mins)...

Who?
Who is your target group. (eg. teens, elderly, adults)

How?
How do you plan to understand them. (eg. interviews, observation, bodystorming)

Plan!
Prepare your interview questions, observation plan, etc.

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Keep what you have written!

You'll need to include it in your
ALP Project write-up

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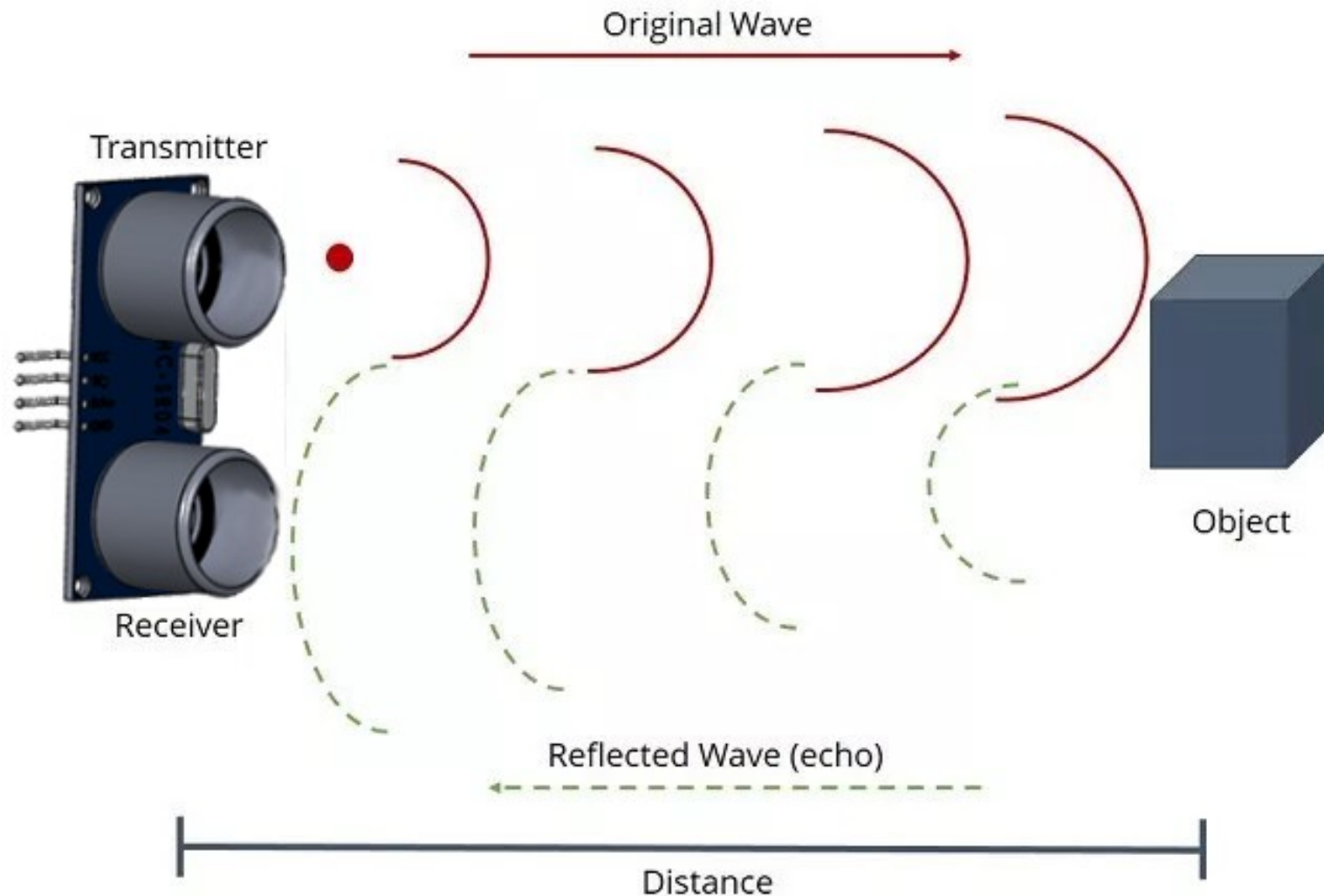**Slides available at: http://a9i.sg/huayi**

Ultrasonic Distance Sensor

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Ultrasonic Distance Sensor

- Works by sending pulse of sound and measuring how long it takes for echo to return

- Max range: 400cm
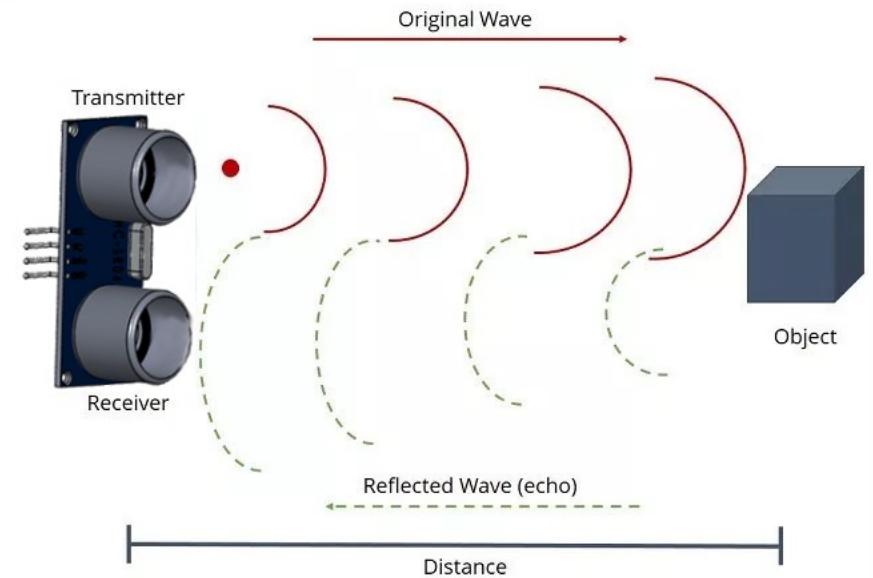
- **Doesn't work in "Live" mode**

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Ultrasonic Distance Sensor

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Ultrasonic Distance Sensor

- Total distance
  - **Time x Speed of sound**
- Distance to object
  - **Total distance / 2**

Original Wave

Transmitter

Object

Receiver

Reflected Wave (echo)

Distance

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Ultrasonic Distance Sensor

- In mBlock:

  Retrieve **distance in cm** using...

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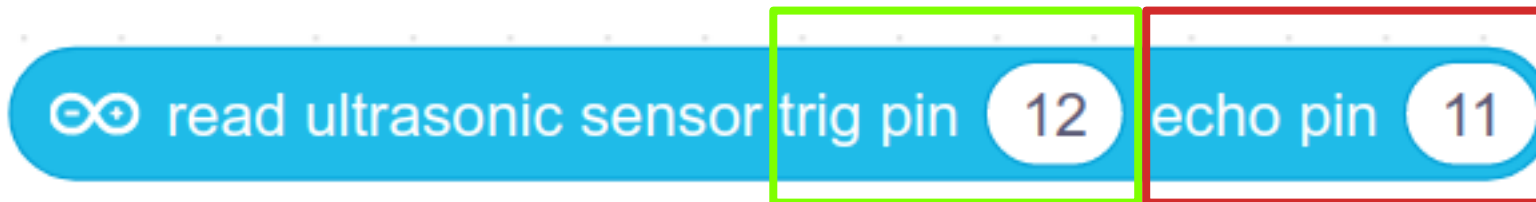
Ultrasonic Distance Sensor
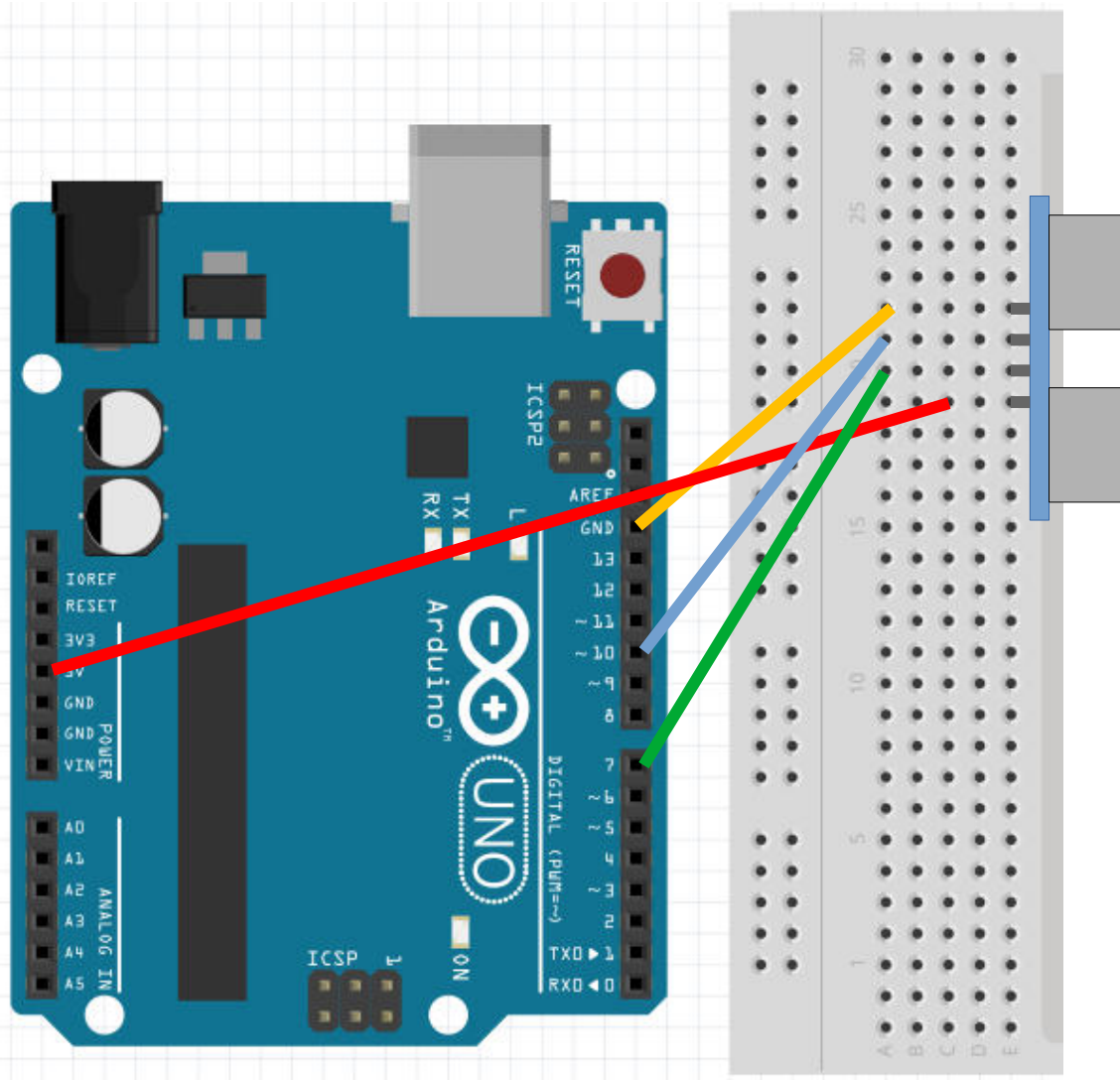
Pins Connections

Sensor	Arduino
Vcc	5V
Trig	Any I/O (Pin 2 to 12)
Echo	Any I/O (Pin 2 to 12)
Gnd	Gnd

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Start up mBlock

- Don't forget **mLink**

- Then go to **https://ide.mblock.cc**

- File → New

Get rid of this guy

Add this one instead

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Ultrasonic Distance Sensor

Runs automatically when the Arduino starts or reset

Repeats forever

Checks if distance is less than 20cm. IMPORTANT: Trig and echo pins must be set according to your connection

If true, turn on pin 13 (built-in LED), else turn it off.

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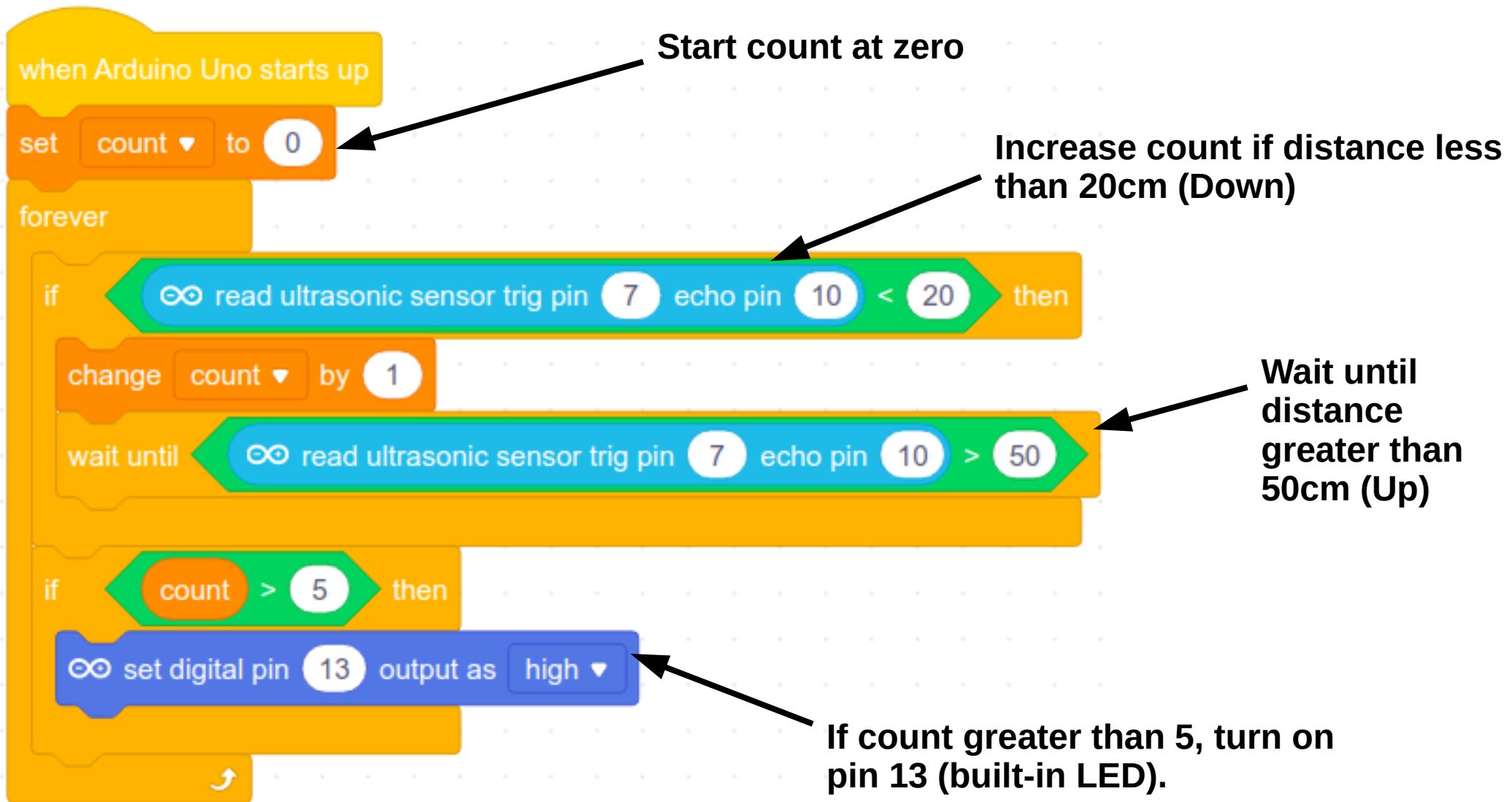
Push-Up Counter (v1)

- Test and make sure the built-in LED lights up when you perform a push-up

- Alternatively, you can also use it as a sit-up counter

- You may need to adjust the detection distance

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Push-Up Counter (v2)

- Version 1 can only detect push-up, but not count them

- A single push-up consists of two actions…
  - Going down
  - Returning up

- Our program should detect both of these

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Push-Up Counter (v2)

Start count at zero

Increase count if distance less than 20cm (Down)

Wait until distance greater than 50cm (Up)

If count greater than 5, turn on pin 13 (built-in LED).

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Push-Up Counter (v2)

- Adjust both the near and far distance to make it work reliably

- Press the red button on the Arduino to reset the program

- How else can you use the ultrasonic distance sensor to for active living?

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