FLOW BLOCKS: SENSORS

Think back to the last time you played a video or sports game. Throughout the game, you probably made a series of decisions.

- "Should I run to objective A or objective B?" 🦵➡️🅱️
- "Who should I pass the ball to?" 🏉⁉️

Think of at least three decisions you made and keep them in your mind. 💭

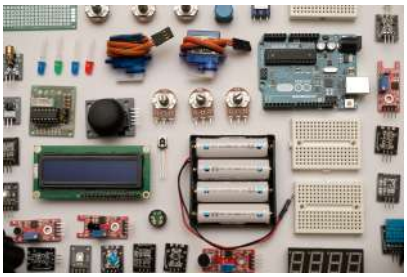
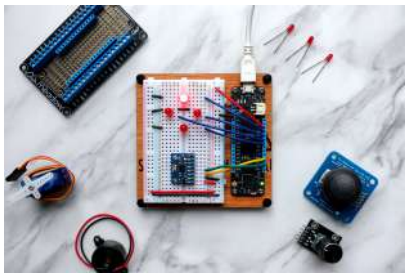
For each of these decisions, how did you know what option to choose? What physical elements of your body did you use? Your brain is one, but there was probably at least one other as well.

Hint: if you closed your eyes and covered your ears, would you still have been able to make your decision? Probably not. It is hard to decide who to pass the ball to without seeing or hearing where your teammates are. 🙈🙉

To make decisions, we first need to gather information from our surroundings. We make the decisions using our brain, but we gather this information using sensors. 📷 🎤 🌡️

A sensor is a device that detects or measures a physical property (light, sound, temperature etc.) from an environment.

Sensors can be found naturally in most living creatures, like an eye or an ear. Humans have also built artificial sensors, like a microphone, that can measure the same or even more information as natural sensors.


When carrying out a task, you use sensors to collect information from your environment so that your brain can make decisions. What about a robot designed to automate the same task? How would it be able to make decisions in the same situation?

Just like a human, robots use sensors to collect information so that their “brain” (a computer) can make decisions. Sensors are vital for both humans and robots as they act as a medium between internal decision making and the physical environment.

Our robot has access to various sensors that are constantly measuring data. We can retrieve the latest value of these sensors using a sensing function/block.

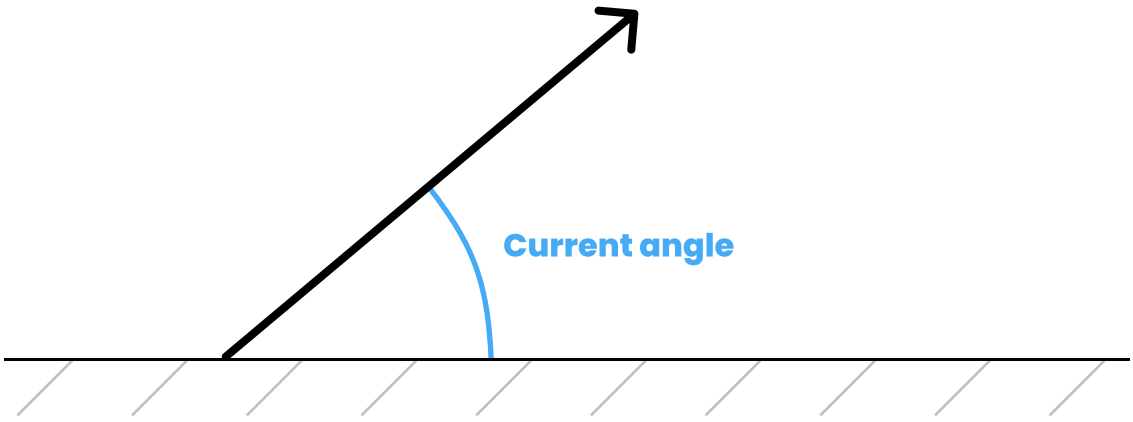
SENSING BLOCKS

Sensor blocks do not have any orange connectors. They are run whenever their value is required for a calculation or action block.

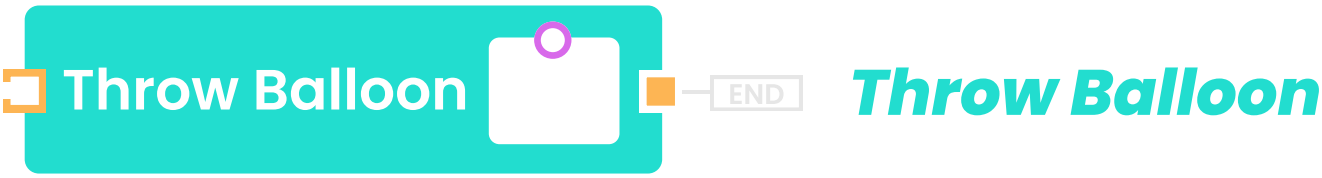
You can pass the output of one of these blocks to another block using the output handle. Although some handles accept multiple types of data, for most blocks, you can only connect handles if they share the same data type. The easiest way to check if two handles have the same data type is to check if the colour of the handles are the same.

Get Throw Constant

The Get Throw Constant sensor block will find the angle that the robot is currently aiming at, pass it through a series of equations, and then output the resulting number.



The output of the Get Throw Constant block is necessary to calculate how much power the robot should use to throw the balloon.



The Throw Balloon action block will instruct the robot to throw the balloon with the specified amount of power. If we want the robot to throw a balloon a distance of D metres, then the equation for the amount of power required is:

$$\text{Power} = \text{ThrowConstant} \times \frac{D}{\text{sqrt}(D + 1.7)}$$

We can use another sensor block to get the distance to the current target:

The Get Target Distance sensor block will find and output the distance to the current target. In the above equation, it can be used to find the value D.