



CSCI 1108

Introduction to Experimental Robotics

Intro to the course format
Robotics Overview



My video collection:

Asimo <https://www.youtube.com/watch?v=OvgLJTpoVc0>

Boston Dynamic Big Dog: https://www.youtube.com/watch?v=QDI6_V697mk

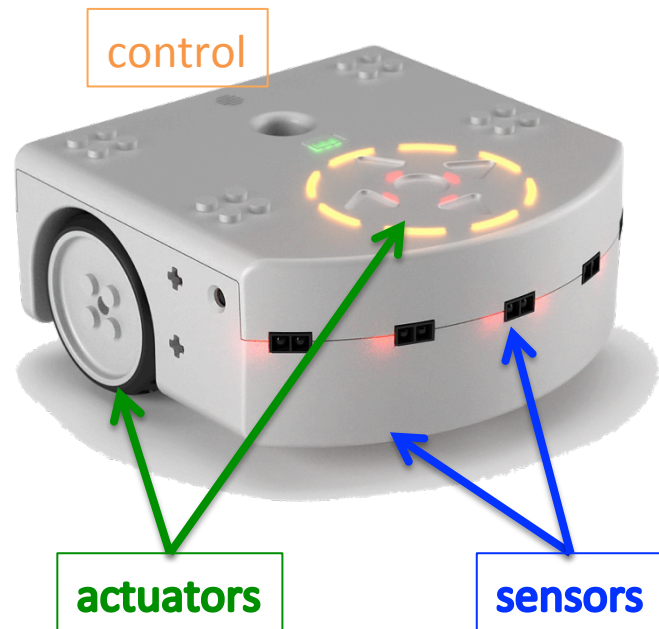
Starfish <https://www.youtube.com/watch?v=ehno85yl-sA>

Thrun

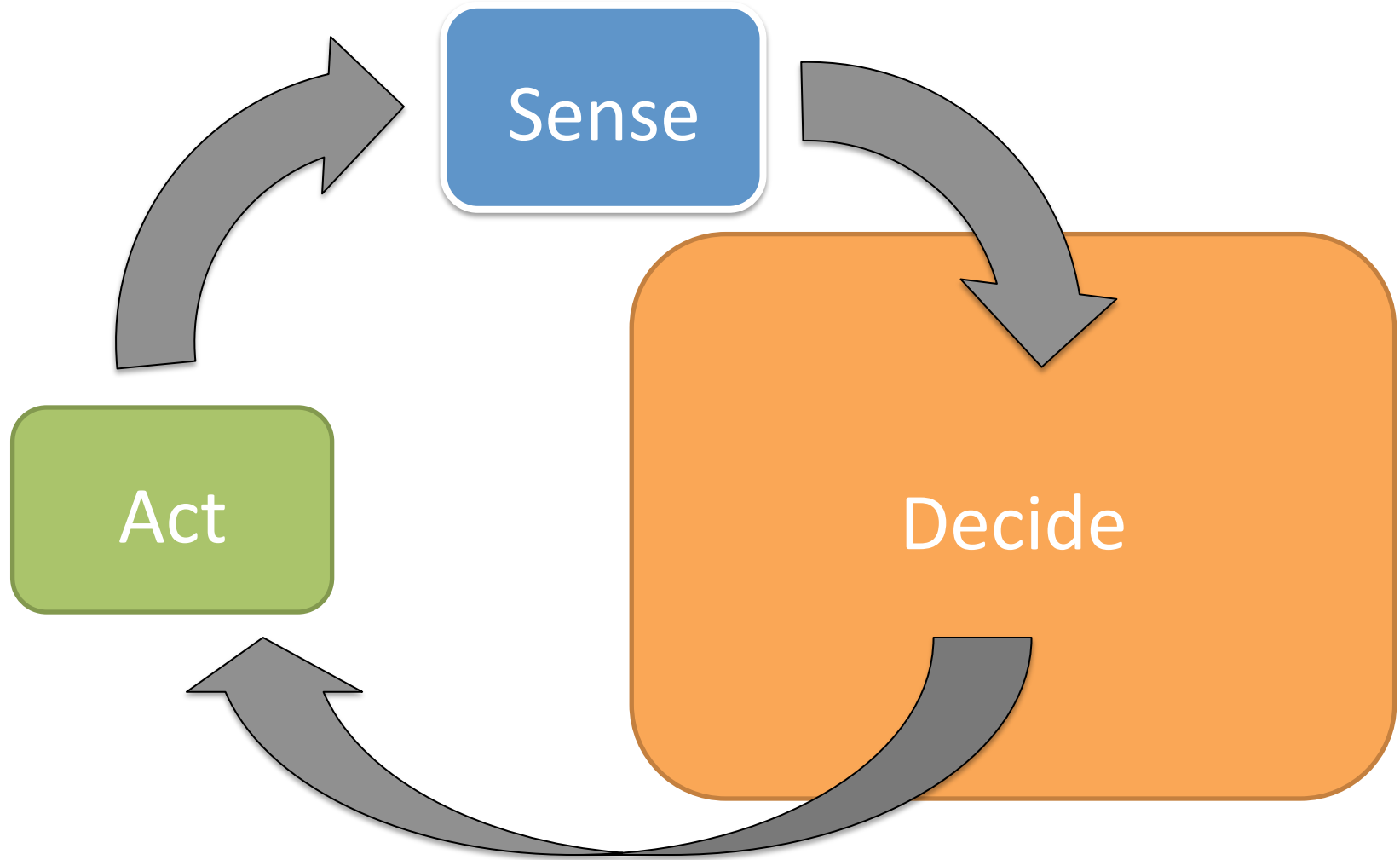
https://www.ted.com/talks/sebastian_thrun_google_s_driverless_car?language=en

Anatomy of a Robot

- Thymio II robot
 - <https://aseba.wikidot.com>
- Components:
 - Sensors
 - Controller
 - Actuators



The Sense-Decide-Act Framework



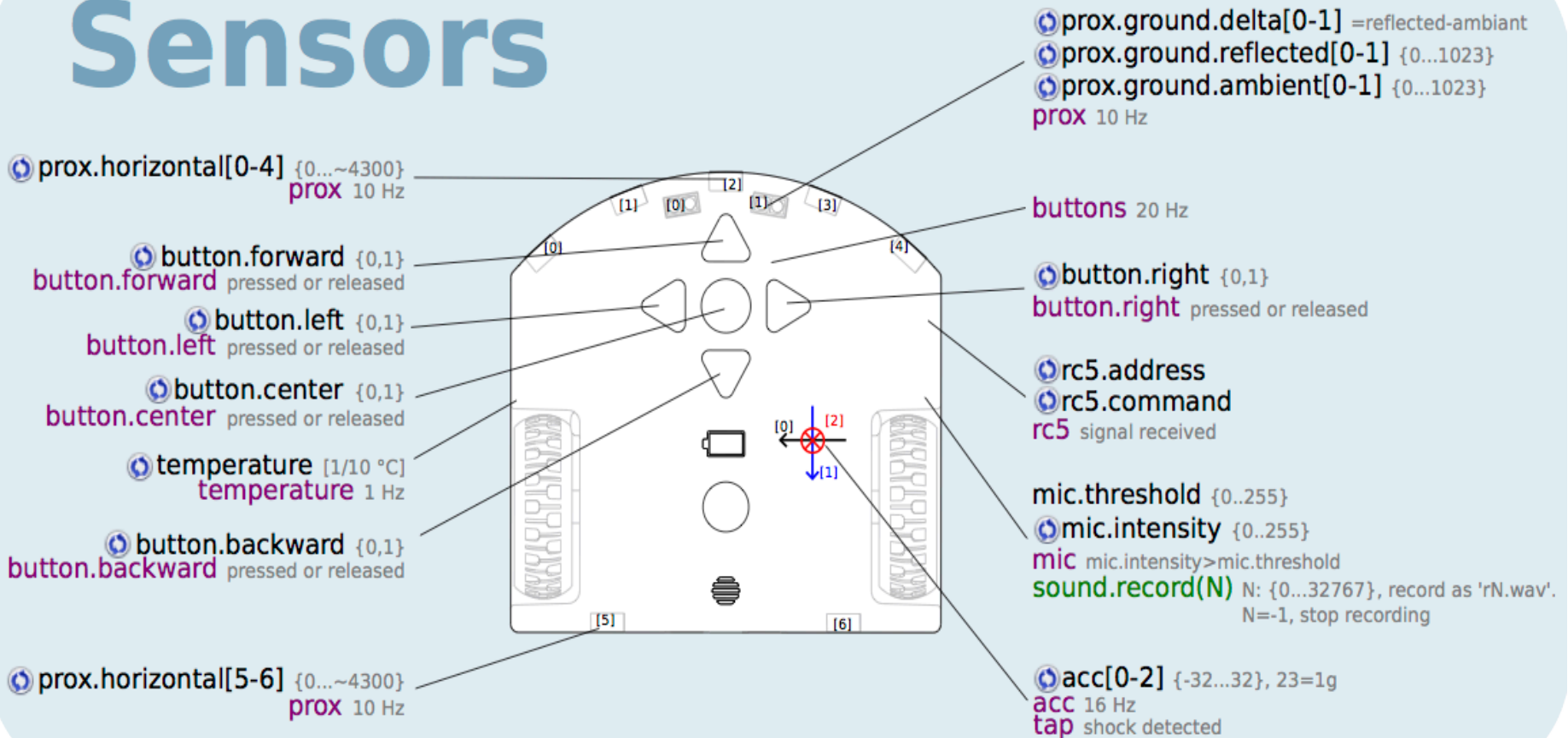
Controller:

A controller decides what action to take based on input from sensors. Our task is to write a control program for the Thymio II.

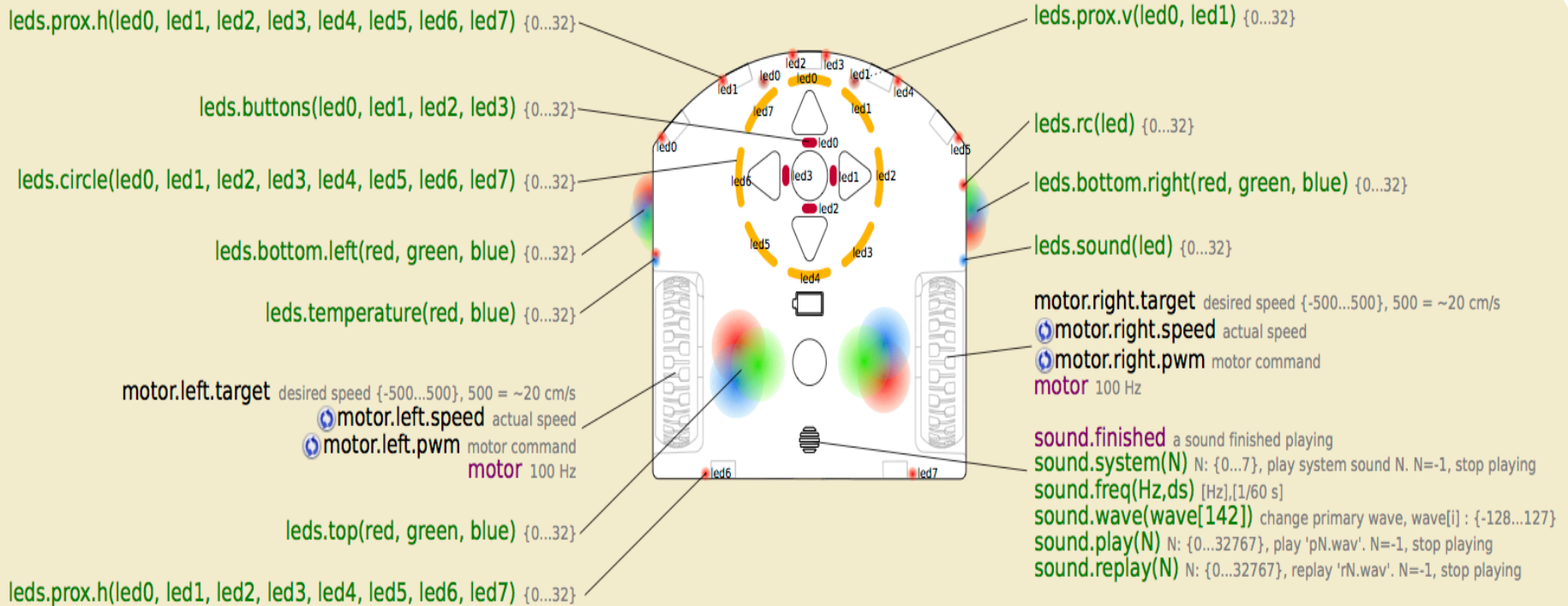
This is done in a special programming language called ASEBA

Sensors

Sensors



Actuators



Actuators

A Sample Program

```
var speed = 100
```

```
motor.left.target = 0  
motor.right.target = 0
```

```
onevent button.forward  
  motor.left.target = speed  
  motor.right.target = speed
```

```
onevent button.backward  
  motor.left.target = 0  
  motor.right.target = 0
```

```
onevent button.left  
  motor.left.target = -speed  
  motor.right.target = speed
```

```
onevent button.right  
  motor.left.target = speed  
  motor.right.target = -speed
```

Key Idea: Actuators are controlled by setting variables that represent them

Aseba Studio

The screenshot displays the Aseba Studio interface for a project named "thymio-II". The main window is titled "Untitled - Aseba Studio".

Execution Panel: Shows "unknown" status with buttons for "Load", "Run", "Reset", and "Next".

Variables Panel (highlighted with an orange border): Includes a "refresh" button and a table of variables:

names	values
_id	1
event.source	1
▶ event.args	(32)
▶ _fwversion	(2)
▶ _productId	8
▶ buttons._raw	(5)
button.backward	0
button.left	0
button.center	0
button.forward	0
button.right	0
▶ buttons._mean	(5)
▶ buttons._noise	(5)

Below the table is a "Filter:" input field.

Code Area: A large central window with the text "Code Area" in red. Above it is a "Keywords" menu with options: var, if, elseif, else, onevent, while, for, sub.

Constants Panel: Located on the right, it is currently empty.

Global Events Panel: Also on the right, it shows a list of events:

- 11:55:48.249 event 0 : 567 534
- 11:55:48.351 event 0 : 567 534
- 11:55:48.454 event 0 : 567 534
- 11:55:48.556 event 0 : 567 534
- 11:55:48.659 event 0 : 567 534

At the bottom of the interface, a status bar indicates "Compilation success. ✓" and "Memory usage : variables: 92 on 604 (15.2%), bytecode: 1 on 1534 (0.1%)". A "Launch VPL" button is visible in the bottom left, and a "Clear" button is in the bottom right of the Global Events panel.

<https://aseba.wikidot.com/en:thymioapi>

Classic Robotics themes

Actuators and movements:

Kinematics –basic movement geometry

without taking mass and forces into account

Differential movements - change in position

Dynamics – differential motions and movement mechanics

Sensor and object recognition:

Computer Vision

Localization:

Kalman filtering, SLAM, etc

Motion planning

A*, tangent bug, obstacle avoidance, etc



Objective of this course

- To learn about robotics
- To learn about computing in the real world
- To learn about working in a team
- To learn about project management
- ...
- and to have fun

Format:

- The course is to be highly interactive
- Some lectures in the first half of the course
- Tutorials with guided exercises
- Tutorial time and lecture time for project work

See details on web page:

[https://projects.cs.dal.ca/hallab/CSCI1108_\(2016\)](https://projects.cs.dal.ca/hallab/CSCI1108_(2016))

Working Together



creative teamwork