Engineering Summer Camp for the Elite 2016

Department of Computer Science

Walking robot

Introduction

This guide is also available at https://goo.gl/vXnVpF .

We are going to have a robot racing competition. You need to design your own walking sequence.

Step 1. Introducing functions

What is your code to set a leg to the up position? Won't it be better if we could do the following instead?

```
leg_up(0);
leg_up(1);
leg_up(2);
leg_up(3);
```

A function can hide the implementation details of an action or a sequence of actions, and improve the quality of the code.

Here is an example of how such function is defined.

```
                                                    // functions.ino
…
Servo servo[8];
int offsets[8];
void leg_up(int);

void setup() {
…
}
void loop() {
…
}

void leg_up(int leg) {
  if (leg == 0) {
    // move leg 0 up
  } else if (leg == 1) {
    // move leg 1 up
  } else if (leg == 2) {
    // move leg 2 up
  } else if (leg == 3) {
    // move leg 3 up
  }
}
```

We first declare that we will define a function.

```
void leg_up(int);
```

Then we define what the function does at the end of the code. You have to fill the code in yourselves.

```
void leg_up(int leg) {
  if (leg == 0) {
    // move leg 0 up
  } else if (leg == 1) {
    // move leg 1 up
  } else if (leg == 2) {
    // move leg 2 up
  } else if (leg == 3) {
    // move leg 3 up
  }
}
```

Test your code by replacing part of your previous code with this new function. If it goes well, define three more functions:

- **`void leg_down(int leg)`**: set a leg to the downward position
- **`void leg_initial(int leg)`**: move a leg to its initial position
- **`void leg_alternate(int leg)`**: move a leg to its alternate position

Step 2. Trying to walking

To move forward. Legs have to move backward when they are on the ground:

- Front legs have to move from the alternate position to the initial position.
- Back legs have to move from the initial position to the alternate position.
- To lift a leg off the ground, you need some other legs on the ground.

To help you getting started, here is a very simple sequence you could try (again, remember to add delay):

1. Leg 0 up and moves to alternate position
2. Leg 0 down
3. Leg 1 up and moves to initial position
4. Leg 1 down
5. Leg 0 moves to the initial position, leg 1 moves to the alternate position
6. Leg 3 up and moves to alternative position
7. Leg 3 down
8. Leg 2 up and moves to initial position
9. Leg 2 down
10. Leg 2 moves to alternate position, leg 3 moves to initial position.

You are on your own now, try to improve how your robot walk. Note that you can always:

- define new leg positions.
- move many servos at the same time.
- adjust the delay between action, just make sure that you have at least 50ms delay between each action on the same servo.
- be creative!