Robotics Project I

Firstname Lastname, Group 0

IN.2022 Robotics 2019, BSc Course, 2nd Sem.
University of Fribourg
firstname.lastname@unifr.ch

Abstract

Brief description of the content (5-10 lines). Helps people decide whether the report is relevant for them or not. Usually written at the end.

Keywords: add, keywords, for, indexing

The use of LaTeX is mandatory for the Project I report. Apart from the examples in the appendix below, this template may not be modified. A good introduction to scientific writing is given by [1]

Contents

Chapter 1

Introduction

Objectives of this project, and brief description of the structure of the report.

Chapter 2

Sensors

Chapter about the sensors that will be used during Project I

2.1 Proximity infra-red sensors

Description of the sensors and graphs of measurements

2.2 Infra-red ground sensor

Description of the sensor and graphs of measurements

2.3 Camera

Description of the camera and graphs of measurements

Chapter 3

Behaviours

Chapter about the behaviours that will be implemented for the assignments

3.1 Braitenberg vehicle

Description of the braitenberg behaviours

3.1.1 LOVER

3.1.2 EXPLORER

3.2 Line-following

Description of the line following behaviour using a braitenberg (reactive) controller

3.3 Wall-following

Description of the wall-following behaviour using a PID controller (including a description of the PID in general)

3.4 Color recognition

Description of the color recognition behaviour

3.5 Multi-robot coordination

Description of the Multi-robot coordination using communication between robots

Chapter 4

Conclusion

Synthesis of the report and outlook for further work.

Bibliography

[1] Justin Zobel. *Writing for Computer Science*, 2nd edition. Springer-Verlag, London, 2004, 275 pages.

[2] Valentino Braitenberg. *Vehicles: Experiments in Synthetic Psychology*. MIT Press, 1986.

[3] *Webots Reference Manual*. `https://www.cyberbotics.com/reference.pdf` version 2019a Last visited: 11.02.2019.

Appendix

Appendix A Experimental Results

Place to list the gathered data.

Appendix B Source Code

Place to list source code.

B.1 IR sensors calibration procedure

The code below shows the IR sensor calibration procedure.

```
// get the correction values for prox sensors
void get_prox_corr_vals() {
  int i, j;

  // init array for calibration values
  for (i=0; i<PROX_SENSORS_NUMBER; i++) {
    prox_corr_vals[i] = 0;
  }

  // get multiple readings for each sensor
  for (j=0; j<NBR_CALIB && wb_robot_step(TIME_STEP)!=-1; j++) {
    for (i=0; i<PROX_SENSORS_NUMBER; i++) {
      prox_corr_vals[i] += wb_distance_sensor_get_value(prox_sensor_tags[i]);
    }
  }

  // calculate average for each sensor
  for (i=0; i<PROX_SENSORS_NUMBER; i++) {
    prox_corr_vals[i] = prox_corr_vals[i] / NBR_CALIB;
  }
}
```

Appendix C LaTeX Examples

This section shows some common uses of LaTeX features.

C.1 Images

Example of how to include an image can be seen in Figure 4.1. All figures must be referenced somewhere in the report.

C.2 Tables

Example of how to include a table can be seen in Figure 4.2. All figures must be referenced somewhere in the report.

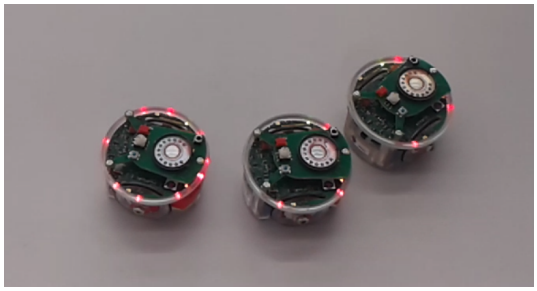

Figure 4.1: Including an image.

Title 1	Title 2
item 11	item 12
item 21	item 22

Figure 4.2: Table with caption.

C.3 Listings

Example of how to include listing can be seen in Figure 4.3 and Figure 4.4. All figures must be referenced somewhere in the report.

```
// get the correction values for prox sensors
void get_prox_corr_vals() {
  int i, j;

  // init array for calibration values
  for (i=0; i<PROX_SENSORS_NUMBER; i++) {
    prox_corr_vals[i] = 0;
  }

  // get multiple readings for each sensor
  for (j=0; j<NBR_CALIB && wb_robot_step(TIME_STEP)!=-1; j++) {
    for (i=0; i<PROX_SENSORS_NUMBER; i++) {
      prox_corr_vals[i] += wb_distance_sensor_get_value(prox_sensor_tags[i]);
    }
  }

  // calculate average for each sensor
  for (i=0; i<PROX_SENSORS_NUMBER; i++) {
    prox_corr_vals[i] = prox_corr_vals[i] / NBR_CALIB;
  }
}
```

Figure 4.3: Listing included from file.

```
// constrain speed to +/- MAX_SPEED
double bounded_speed(double speed) {
  if (speed > MAX_SPEED) return MAX_SPEED;
  else if (speed < -MAX_SPEED) return -MAX_SPEED;
  else return speed;
}
```

Figure 4.4: Listing within LaTeX.

C.4 Font Style and Text Size

The font style may be modified: **bold**, *italic*, *Emphasis*, CAPITALS, `verbatim`, etc.
The text size can be changed: tiny, small, large, huge, etc.

C.5 Enumerations and Other Lists

Enumerations are easy, there is the `enumerate` environment:

1. First item
2. Second item
3. Third item

For lists, there is the `itemize` environment:

- First item
- Second item
- Third item

For definitions lists, there is the `description` environment:

First term – Description of the first term

Second term – Description of the second term

C.6 Quotations and References

Books and other documentation can be referenced as [2] and websites as [3].

C.7 FSM diagram

In Figure 4.5 is depicted a Finite State Automata diagram as presented in Lecture 02.

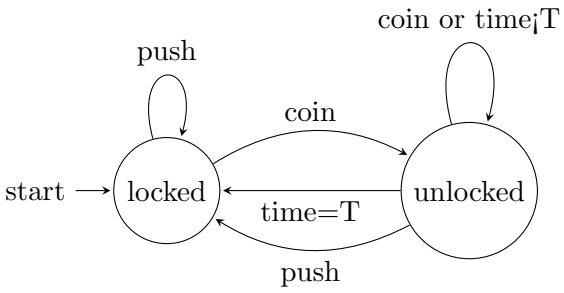

Figure 4.5: FSM diagram in LaTeX.