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# Path follower(TM)

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Bachelor of Engineering

Information Technology

11.04.2018

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Title	Path follower(TM)
Number of Pages	7 pages + 2 appendices
Date	11. huhtikuuta 2018
Degree	Bachelor of Engineering
Degree Programme	Information Technology
Specialisation option	Smart Systems / Devices
Instructor(s)	Joseph Hotchkiss, Project Engineer Keijo Lämsikunnas, Senior Lecturer
<p>Projects aim is to develop an embedded software for Zumo robot controll. This documentation covers the theoretical and practical aspects required during development. Necessary mathematical, physical and electronic concepts also presented.</p>	
Keywords	Devices, Smart Systems, Embedded systems, Electronics

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## Abbreviation

AC	Alternating current
DC	Direct current
IR	Infrared
NiMH	Nickel-metal hydride
PID	Proportional, Integral, Derivate (control)
PWM	Pulse-width modulation

## 1 Introduction

## 2 Background

This chapter gives insight to technical background

### 2.1 Electronic basics

#### 2.1.1 Pulse Width Modulation

#### 2.1.2 Infra red sensor

Infrared light sensor operation.

### 2.2 Cypress CY8 modeling kit

### 2.3 Zumo robot

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### 2.3.1 Battery management

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### 2.3.2 Motor control

### 2.3.3 Sensor reading

## 3 Realization

### 3.1 The embedded software

#### Flow charts

#### 3.1.1 Software mechanics

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## 3.2 Timing

Gantt charts

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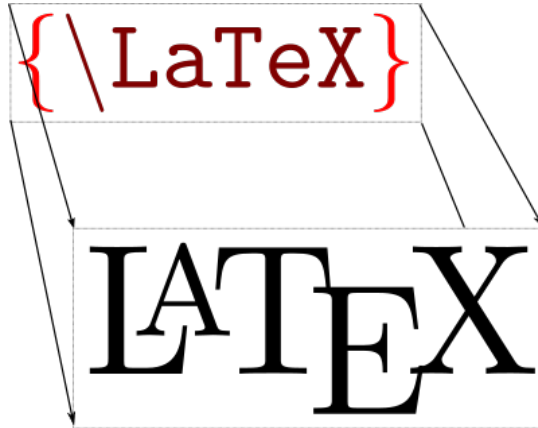
## 4 Latex formatting helplet

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### 4.1 Section

Here is an example how to add biblio entry [1] using the “cite” [2, section 4.2]. Note that a paragraph is added by forcing a new line.

And let also try the figure (see figure 1) and internal reference (with label and ref or vref). The reference can be done to any label, for example why not to appendix 1 or to appendix 2? To note,  $\text{\LaTeX}$  will place the figure to the best place (except with forcing). Let them float till the final of final edit... then force them to not break a paragraph.



Kuva 1:  $\text{\LaTeX}$  cover image (Copied from wikibooks.org (2012) [3]).

Let's also try a long quote: From the Universal Declaration of Human Rights:

- (1) Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.
- (2) Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.
- (3) Parents have a prior right to choose the kind of education that shall be given to their children. [4, article 26]

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- **A small hack** with list
- is to force the vertical space
- before and after the list

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#### 4.1.1 Subsection

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#### 4.1.2 Subsection with Math

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Ionivahvuus lasketaan kaavalla.

$$I = \frac{1}{2} \cdot \sum z_i^2 c_i \quad (1)$$

$$z_i = \text{ionin varausluku} \quad (2)$$

$$c_i = \text{ionin konsentraatio} \quad (3)$$

Aktiivisuuserroin  $\gamma_{\pm}$  lasketaan kaavalla.

$$\log \gamma_{\pm} = - |z_+ \cdot z_-| A \cdot I^{\frac{1}{2}} \quad (4)$$

$$A = 0,509 \text{ (lämpötilassa } 25^{\circ}\text{C)} \quad (5)$$

$$I = \text{ionivahvuus} \quad (6)$$

$$z = \text{ionien varaus} \quad (7)$$

#### 4.2 Section with Source Code

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dui non tortor pellentesque consequat non eget urna. Cras in sapien dui, a tincidunt velit.

```

1
2 <?php
3 $userName = $_POST["usern"];
4 //maybe not?
5 if ($userName){
6     ?>
7     <h2>Hello <?php echo $userName; ?>!</h2>
8     <p>your message got received.</p>
9     <?php
10 }
11 ?>

```

Listing 1: Descriptive Caption Text

As see in listing 1: Donec et sapien ac leo condimentum vulputate id et tellus. Maecenas hendrerit malesuada interdum. Aenean dignissim sem faucibus elit congue faucibus id non risus. Morbi at dui non tortor pellentesque consequat non eget urna. Cras in sapien dui, a tincidunt velit.

#### 4.3 Section with Table

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Taulukko 1: Some data

Test 1	test 1234 test
Some more date comes here	with more values and if the text is very long it will disappear out of the box unless you force the column size :(

As presented in table 1: Donec et sapien ac leo condimentum vulputate id et tellus. Maecenas hendrerit malesuada interdum. Aenean dignissim sem faucibus elit congue faucibus id non risus. Morbi at dui non tortor pellentesque consequat non eget urna. Cras in sapien dui, a tincidunt velit.

As presented in table 2: Donec et sapien ac leo condimentum vulputate id et tellus. Maecenas hendrerit malesuada interdum. Aenean dignissim sem faucibus elit congue faucibus

Taulukko 2: Another table with tabularx

Test 1	test 1234 test
Some more data comes here	with more values and if the text is very long it will disappear out of the box unless you force the table size :(

id non risus. Morbi at dui non tortor pellentesque consequat non eget urna. Cras in sapien dui, a tincidunt velit.

## Lähteet

- 1 Kopka, Helmut. Guide to  $\text{\LaTeX}$ . Boston: Addison-Wesley; 2004.
- 2 Tobias Oetiker, Hubert Partl, Irene Hyna, Elisabeth Schlegl. The Not So Short Introduction to  $\text{\LaTeX}$ 2e. Switzerland; 2011.
- 3  $\text{\LaTeX}$ . wikibooks.org; 2012. Available from: <http://en.wikibooks.org/wiki/LaTeX> [cited November 05, 2012].
- 4 international community UN. The Universal Declaration of Human Rights. 1948; Available from: <http://www.un.org/en/documents/udhr>.

## 1 Mathematics

Note that every appendix will be a chapter.

Sorry for the ugly hack on how to count the total pages per appendix.

Of course with section and subsection.

### 1.1 Appendix Section

And you can cite [2] stuff, it will go into the main bibliography.

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#### 1.1.1 With a Subsection

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## **2 Physics**

### **2.1 Kinematics**

### **2.2 Electricity**

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### **2.3 Infrared light**

Infrared light (IR) is 700nm to 1mm section of light spectrum. The wavelength of IR is longer than that visible by human eye. This invisibility gives IR light wide range of purpose.