Duckumentation documentation

This book describes the features of our documentation system and the procedures to update it.
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PART A
Contributing to the documentation

This part describes the workflow for contributing to our documentation.

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UNIT A-1

Overview

1.1. Where the documentation is

The documentation is contained in a series of repositories called docs- short name:

For example:

- docs-duckumentation (this book)
- docs-AIDO

1.2. Documentation format

The documentation is written as a series of small files in Markdown format.

It is then processed by a series of scripts to create publication-quality PDF and an online HTML version.

You can find all these artifacts produced at the site https://docs.duckietown.org.
UNIT A-2

The simple way to edit the documentation

The simplest way to contribute to the documentation is to click any of the ”✎” icons next to the headers, in the book itself.

UNIT A-2

The simple way to edit the documentation

The simplest way to contribute to the documentation is to click any of the ”✎” icons next to the headers.

They link to the “edit” page in Github. There, one can make and commit the edits in only a few seconds. When committing, please choose “create branch”.

TODO for volunteer: add screenshot of process

No questions found. You can ask a question on the website.

prev next

Figure 2.1. Click on edit button.

They link to the “edit” page in Github. One can make and commit the edits in only a few seconds.

If you are in the Duckietown organization, then you can just “edit” the page then and there. Otherwise, you need to “fork” the repo. Don’t worry, it’s a one click process.

Figure 2.2. You will land on GitHub

Do your edits where appropriate.

Figure 2.3. Editing the docs.
You can check the outcome by clicking on **Preview changes**, note that not all functionalities are visible by the preview. For large changes refer to Unit A-3 - Second method: local editing+docker.

![Figure 2.4. A preview of the changes.](image)

Then after your edits, in the bottom part of the webpage, describe your commit and click on **Propose file change**. When committing, please choose “create branch”.

![Figure 2.5. Describe and commit.](image)

Then, click on **Create pull request**, as you probably don’t have rights to push directly.

![Figure 2.6. Create a pull request.](image)

Again you need to confirm that you want to open the pull request.
Figure 2.7. Confirm a pull request.
UNIT A-3
Second method: local editing+docker

This section describes the workflow to edit the documentation for one single book.

In a nutshell:
- You fork the repos to your Github account.
- You compile locally using a Docker container (no installation necessary).
- You contribute by opening a pull request.

3.1. Workflow

1) Github setup

We assume that you have setup a Github account with working public keys.

- Basic SSH config.
- Key pair creation.
- Adding public key on Github.

2) Install Docker

Before you start, make sure that you have installed Docker.

3) Install the Duckietown Shell

Install the Duckietown Shell using these instructions.

4) Fork the docs- book repo on the Github site

Fork one of the docs- book repos on the Github site (Figure 3.1).

This will create a new repo on your account that is linked to the original one.

Figure 3.1

5) Checkout your fork locally
Check out the forked repository as you would do normally.

6) Initialize your folder

Go into the folder:

```bash
$ cd docs/book
```

When compiling a book for the first time, you need to run:

```bash
$ git submodule init
```

And:

```bash
$ git submodule update
```

7) Do your edits

Do your edits on your local copy. The source files are in the directory `book/book`. The file and folder names start with numbers, these are used to determine the order that things show up in output.

8) Compile

Compile using the `docs` commands in the Duckietown Shell:

```bash
$ dts docs build
```

Re-compile from scratch using:

```bash
$ dts docs clean
$ dts docs build
```

If there are errors you should open `duckuments-dist/errors.html` and look at them and fix them.

9) Look at the local copy

Open the file `index.html` and navigate to whichever pages you have changed to make sure that they look the way you want them to.

10) Commit and push

Commit and push as you would do normally.

11) Make a pull request

Create a pull request to the original repository.
Option 1: Use the Github website:
Github offers a nice interface to create a pull request.

Option 2: Use the command-line program hub:
You can create a pull request from the command-line using hub:

```
$ hub pull-request
```

3.2. Using CircleCI
Circle CI makes it easier to check whether there are problems to be fixed.

1) Sign up on Circle

Sign up on the Circle CI service, at the link circleci.com.

2) Activate your build on Circle

Activate the building at the link:

https://circleci.com/setup-project/gh/ username /duckuments

where `username` is your Github username.

Click “start building”.

Make sure everything compiles on Circle:
Go to the URL:

https://circleci.com/gh/ username /duckuments

to see the status of your build.

You can also preview the results by clicking the “artifacts” tab and selecting `index.html` from the list.
SECOND METHOD: LOCAL EDITING + DOCKER

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Queue (00:01)</th>
<th>Artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container: 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ duckuments-dist/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ AX_driving_olympics/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ all_crosref.html</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ class_fall2017/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ class_fall2017_projects/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ code_docs/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ deprecated/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ drafts/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ duckumentation/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ errors.html</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ errors_and_warnings.manifest.yaml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ errors_and_warnings.pickle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ exercises/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ guide_for_instructors/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ index.html</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ learning_materials/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ manual_ducketom/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ manual_ducketom/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ preliminaris/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ software_architecture/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ software_carpentry/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ software_devel/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ summary.html</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ summary.manifest.yaml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ tasks.html</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ the_ducketown_project/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ warnings.html</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ wtf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>∘ package.tgz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.2
UNIT A-4
Troubleshooting for Duckumentation

4.1. Markduck problems
First, see the section Unit B-5 - Troubleshooting for common problems and their resolu-
tion.
Please report problems with the duckuments using the duckuments issue tracker.
Special notes:
• If you have a problem with a generated PDF, please attach the offending PDF.
• If you say something like “This happens for Figure 3”, then it is hard to know which
figure you are referencing exactly, because numbering changes from commit to com-
mit.
If you want to refer to specific parts of the text, please commit all your work on your
branch, and obtain the name of the commit using the following commands:

$ git rev-parse HEAD

4.2. Problem: The building hangs
1) Cause: insufficient memory
This might be due to insufficient memory.
For example, on Mac, the default setting is 2GB of RAM. Try increasing it (Figure 4.1).
A workaround is to stop and restart the process (but without doing `dts docs clean`).

2) **Cause: downloading in the background**

Sometimes the problem is that the code is downloading something in the background, for example a Git repository.

Currently this is hard to debug.
UNIT A-5
Markdown editors

We suggest the following:

- Find a visual Markdown editor that you like.
- Complement with a superb text-only editor.

5.1. Graphical Markdown editors

1) Typhora

Typhora is our favorite because it allows to preview LaTeX formulas.

5.2. Text editors good for Markdown

5.3. Atom

- Unit B-2 - Atom

5.4. PyCharm

- (unknown ref software_reference/pycharm)

warning (1 of 1) index

<table>
<thead>
<tr>
<th>warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>I will ignore this because it is an external link.</td>
</tr>
<tr>
<td>&gt; I do not know what is indicated by the link '#software_reference/pycharm'.</td>
</tr>
</tbody>
</table>

Location not known more precisely.
Created by function n/a in module n/a.
This part describes the Markdown dialect that is used in the documentation.

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UNIT B-1
Basic Markduck guide

The Duckiebooks are written in Markduck, a Markdown dialect.
It supports many features that make it possible to create publication-worthy materials.

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1.1. Markdown
The Duckiebook are written in a Markdown dialect.

→ A tutorial on Markdown.

1.2. Comments
You can insert comments using the HTML syntax for comments: any text between “<!–” and “–>” is ignored.

# My section

<!-- this text is ignored -->

Let's start by...

1.3. Variables in command lines and command output
Use the syntax “! [name] ” for describing the variables in the code.

example For example, to obtain:
Use the following:

For example, to obtain:

```bash
$ ssh ![robot name].local
```

Make sure to quote (with 4 spaces) all command lines. Otherwise, the dollar symbol confuses the LaTeX interpreter.

### 1.4. Character escapes

Use the string “\&#36;” to write the dollar symbol “$”, otherwise it gets confused with LaTeX math materials. Also notice that you should probably use “USD” to refer to U.S. dollars.

Other symbols to escape are shown in Table 1.1.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Escape</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>&amp;#36;</td>
</tr>
<tr>
<td>`</td>
<td>&amp;#96;</td>
</tr>
<tr>
<td>&lt;</td>
<td>&amp;lt;</td>
</tr>
<tr>
<td>&gt;</td>
<td>&amp;gt;</td>
</tr>
</tbody>
</table>

### 1.5. Keyboard keys

Use the `kbd` element for keystrokes.

```html
<kbd>a</kbd> then <kbd>Ctrl</kbd>-<kbd>C</kbd>
```

### 1.6. Figures

To create a figure, use the element `figure`:

```html
<figure>
  <figcaption>Hello</figcaption>
  <img style='width:8em' src="duckietown-logo-transparent.png"/>
</figure>
```
Figure 1.1. Hello

1) More attributes

Use `class="caption-left"` to have the caption show up on the left rather than on the bottom:

```html
<figure class="caption-left">
   <figcaption>Hello</figcaption>
   <img style='width:8em' src="duckietown-logo-transparent.png"/>
</figure>
```

Figure 1.2. Hello

1.7. Subfigures

You can create subfigures by nesting `figure` elements:

```html
<figure>
   <figcaption>Main caption</figcaption>
   <figure>
      <figcaption>Hello</figcaption>
      <img style='width:8em' src="duckietown-logo-transparent.png"/>
   </figure>
   <figure>
      <figcaption>second</figcaption>
      <img style='width:8em' src="duckietown-logo-transparent.png"/>
   </figure>
</figure>
```
Figure 1.3. Main caption

By default, they are displayed one per block. To make them flow horizontally, add `class="flow-subfigures"` to the external figure:

```html
<figure class="flow-subfigures">
  <figcaption>Main caption</figcaption>
  <figure>
    <figcaption>Hello</figcaption>
    <img style='width:8em' src="duckietown-logo-transparent.png"/>
  </figure>
  <figure>
    <figcaption>second</figcaption>
    <img style='width:8em' src="duckietown-logo-transparent.png"/>
  </figure>
</figure>
```

Figure 1.4. Main caption

For any element, adding an attribute called `figure-id` with value `fig: figure ID` or `tab: table ID` will create a figure that wraps the element.

1.8. Shortcut for tables

The shortcuts `col2`, `col3`, `col4`, `col5` are expanded in tables with 2, 3, 4 or 5 columns.
The following code:

```html
<col2 figure-id="tab:mytable" figure-caption="My table">
  <span>A</span>
  <span>B</span>
  <span>C</span>
  <span>D</span>
</col2>
```

gives the following result:

Table 1.2. My table

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

1) `labels-row1` and `labels-row1`

Use the classes `labels-row1` and `labels-row1` to make pretty tables like the following.

- `labels-row1`: the first row is the headers.
- `labels-col1`: the first column is the headers.

Table 1.3. Using class="labels-col1"

<table>
<thead>
<tr>
<th>header A</th>
<th>B</th>
<th>C</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>header A</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>header B</td>
<td>E</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>header C</td>
<td>H</td>
<td>I</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 1.4. Using class="labels-row1"

<table>
<thead>
<tr>
<th>header A</th>
<th>header B</th>
<th>header C</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>G</td>
<td>H</td>
<td>I</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

1.9. Linking to documentation

1) Establishing names of headers

You give IDs to headers using the format:

```mermaid
### header title {#topic ID}
```

For example, for this subsection, we have used:

```mermaid
### Establishing names of headers {#establishing}
```

With this, we have given this header the ID “establishing”.

By convention, we use consistently dashes rather than underscores. For example, in-
stead of using the ID  #my_cool_section, use  #my-cool-section.

2) How to name IDs - and why it’s not automated

Some time ago, if there was a section called

```markdown
## My section
```

then it would be assigned the ID “my-section”.  
This behavior has been removed, for several reasons.  
One is that if you don’t see the ID then you will be tempted to just change the name:

```markdown
## My better section
```

and silently the ID will be changed to “my-better-section” and all the previous links will be invalidated.
The current behavior is to generate an ugly link like “autoid-209u31j”.
This will make it clear that you cannot link using the PURL if you don't assign an ID.
Also, I would like to clarify that all IDs are global (so it’s easy to link stuff, without thinking about namespaces, etc.).
Therefore, please choose descriptive IDs, with at least two IDs.
E.g. if you make a section called

```markdown
## Localization  {#localization}
```

that’s certainly a no-no, because “localization” is too generic.

✔

```markdown
## Localization  {#intro-localization}
```

Also note that you don’t need to add IDs to everything, only the things that people could link to. (e.g. not subsubsections)

3) Linking from the documentation to the documentation

You can use the syntax:

```markdown
[](# topic ID )
```

to refer to the header.
You can also use some slightly more complex syntax that also allows to link to only the name, only the number or both (Table 1.5).
See Subsection 1.9.1 - Establishing names of headers

See Subsection 1.9.1 - Establishing names of headers.

See Subsection 1.9.1 - Establishing names of headers.

1.10. Linking to other books

It is possible to link from one book to another.

The syntax is a slightly extended syntax. Instead of using something like

See this [interesting section](#interesting-section).

You need to use add +other-book-id before the #:

See this [interesting section in another book](+other-book-id#interesting-section).

To find out what is the book ID, go to the current index of all the books, which, for daffy, is https://docs.duckietown.org/daffy/. Go to the book you want to link, and note the URL. The book ID is the part after daffy.

For example, this book is published at

https://docs.duckietown.org/daffy/duckumentation/out/index.html

The book ID is duckumentation.

To link to the entire book, use something like +BOOKID#book. (By convention, each book will have the main header assigned the header #book:book.)

Here is a list of some of the books as of August 2020:

- Book - Duckietown Developer
- Book - Duckiebot operation manual
1) (For developers) How to update the list of books that can be crossreferenced.

The dictionary between book ID and URL is maintained in the repo `docs-build` in the file `books.crossref.yaml`. When a new book is added, the list needs to be updated and the image `duckietown/docs-build` be updated.
UNIT B-2
Special paragraphs and environments

2.1. Special paragraphs tags
The system supports parsing of some special paragraphs.

1) Special paragraphs must be separated by a line
A special paragraph is marked by a special prefix. The list of special prefixes is given in the next section.
There must be an empty line before a special paragraph; this is because in Markdown a paragraph starts only after an empty line.
This is checked automatically, and the compilation will abort if the mistake is found.
For example, this is invalid:

See: this book
See: this other book

This is correct:

See: this book
See: this other book

Similarly, this is invalid:

Author: author
Maintainer: maintainer

and this is correct:

Author: author
Maintainer: maintainer

2) Todos, task markers
To write: towrite

Task: task

Assigned: assigned

Assigned to: assigned

3) Notes and remarks

Remark: remark

Remark: remark

Note: note

Note: note

Warning: warning

Warning: warning

4) Troubleshooting

Symptom: symptom

Symptom: symptom

Resolution: resolution

Resolution: resolution

5) Guidelines

Bad: bad
Beware of the following:

- bad

Better: better

✔ better

6) Questions and answers

Q: question

A: answer

Answer: answer

7) Authors, maintainers, Point of Contact

Maintainer: maintainer

 Assigned: AndreaCensi

8) References

See: see

Reference: reference

Requires: requires

| Requires: requires
Results: results

Next steps: next steps

Recommended: recommended

See also: see also

* see also

### 2.2. Other div environments

For these, note the rules:

- You must include `markdown="1"`.
- There must be an empty line after the first `div` and before the closing `/div`.

1) Example usage

```html
<div class='example-usage' markdown="1">
  This is how you can use `rosbag`:

  `$ rosbag play log.bag`

</div>
```

example

This is how you can use `rosbag`:

```
$ rosbag play log.bag
```

2) Check
3) Requirements

List of requirements at the beginning of setup chapter.

**2.3. Notes and questions**

There are three environments: “comment”, “question”, “doubt”, that result in boxes that can be expanded by the user.

These are the one-paragraph forms:

Comment: this is a comment on one paragraph.

```
# comment
this is a comment on one paragraph.
```

Question: this is a question on one paragraph.

```
# question
this is a question on one paragraph.
```

Doubt: I have my doubts on one paragraph.

```
# doubt
I have my doubts on one paragraph.
```

These are the multiple-paragraphs forms:
A comment...
A second paragraph...

A question...
A second paragraph...

Should it not be:

$ alternative command

A second paragraph...

A question...
Should it not be:

$ alternative command

A second paragraph...
UNIT B-3
Using LaTeX constructs in documentation

KNOWLEDGE AND ACTIVITY GRAPH

Requires: Working knowledge of LaTeX.

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Section 3.1 - Embedded LaTeX
  - Proposition 1 - Proposition example
  - Listing 3.1 - Use of LaTeX code.
  - Table 3.1 - LaTeX environments and label prefixes
  - Definition 1 - My definition
  - Proposition 2 - My proposition
  - Remark 1 - My remark
  - Problem 1 - My problem
  - Example 1 - My example
  - Theorem 1 - My theorem
  - Lemma 1 - My lemma

Section 3.2 - LaTeX equations

Section 3.3 - LaTeX symbols

Section 3.4 - Bibliography support

Section 3.5 - Embedding LaTeX in Figures through SVG
  - Figure 3.1 - Image saved as svg
  - Figure 3.1a - Image saved as svg
  - Figure 3.1b - Image as PDF after processing

Section 3.6 - Using the HTML equivalent of Latex environments
  - Exercise 1 - Exercise title
  - Exercise 2 - Second exercise

Section 3.7 - Alternative style
  - Exercise 3 - Another exercise
  - Exercise 4 - Another exercise

3.1. Embedded LaTeX
You can use \textit{LaTeX} math, environment, and references. For example, take a look at

$$x^2 = \int_0^\tau f(\tau) \, d\tau$$
or refer to Proposition 1 - Proposition example.

**Proposition 1.** (Proposition example) This is an example proposition: $2x = x + x$.

The above was written as in Listing 3.1.

You can use $\LaTeX$ math, environment, and references. For example, take a look at

```
x^2 = \int_0^t f(\tau) \text{d}\tau
```

or refer to \[\](#prop:example).

```
\begin{proposition}[Proposition example]\label{prop:example}
This is an example proposition: $2x = x + x$.
\end{proposition}
```

Listing 3.1. Use of LaTeX code.

For the LaTeX environments to work properly you **must** add a `\label` declaration inside. Moreover, the label must have a prefix that is adequate to the environment. For example, for a proposition, you must insert `\label{prop: name}` inside.

The following table shows the list of the LaTeX environments supported and the label prefix that they need.

<table>
<thead>
<tr>
<th>Table 3.1. LaTeX environments and label prefixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>definition</td>
</tr>
<tr>
<td>proposition</td>
</tr>
<tr>
<td>remark</td>
</tr>
<tr>
<td>problem</td>
</tr>
<tr>
<td>theorem</td>
</tr>
<tr>
<td>lemma</td>
</tr>
</tbody>
</table>

Examples of all environments follow.

```
\begin{definition}[My definition]\label{def:lorem}
Lorem
\end{definition}
```

**Definition 1.** (My definition) Lorem

```
\begin{proposition}[My proposition]\label{prop:lorem}
Lorem
\end{proposition}
```

**Proposition 2.** (My proposition) Lorem
3.2. LaTeX equations

We can refer to equations, such as (1):
\[ 2a = a + a \]

This uses `align` and contains (2) and (???).

\[ a = b \]
\[ = c \]

We can refer to equations, such as \eqref{eq:one}:

\[
\begin{equation}
2a = a + a \label{eq:one}
\end{equation}
\]

This uses `align` and contains \eqref{eq:two} and \eqref{eq:three}.

\[
\begin{align}
a &= b \label{eq:two} \\ 
&= c \label{eq:three}
\end{align}
\]

Note that referring to the equations is done using the syntax \eqref{eq: name}, rather than \[(#eq: name)\].

### 3.3. LaTeX symbols

You can place any LaTeX symbols definition in files called *.*.symbols.tex. These will be included as preamble.

For example, this repository contains a file a.symbols.tex containing:

\[
\text{\newcommand\{\mysymbol\}\{This is defined in a.symbols.tex\}}
\]

So then when we create an equation with:

\[
\text{\$\mysymbol\$}
\]

It gets rendered as:

This is defined in a.symbols.tex

### 3.4. Bibliography support

You need to have installed bibtex2html.

The system supports Bibtex files.

Place *.*.bib files anywhere in the directory.

Then you can refer to them using the syntax:
For example:

Please see [[#bib:siciliano07handbook].

Will result in:

Please see [1].

Somewhere in the document, add the following:

```html
&lt;div id="put-bibliography-here"&gt;&lt;/div&gt;
```

### 3.5. Embedding LaTeX in Figures through SVG

#### Knowledge and activity graph

**Requires:** In order to compile the figures into PDFs you need to have Inkscape installed. Instructions to download and install Inkscape are here.

To embed LaTeX in your figures, you can add it directly to a file and save it as `filename.svg` file and save in the `/docs` directory in a subfolder called `assets/svg2pdf`.

You can then run:

```
$ make process-svg-figs
```

And the SVG file will be compiled into a PDF figure with the LaTeX commands properly interpreted.

You can then include the PDF file in a normal way (Section 1.6 - Figures) using `filename.pdf` as the filename in the `<img>` tag.

It can take a bit of work to get the positioning of the code to appear properly on the figure.
3.6. Using the HTML equivalent of LaTeX environments

Contents

Exercise 1 - Exercise title
Exercise 2 - Second exercise

You can create an exercise as follows:

```html
<div id="exercise:my-exercise" class="exercise" title="Exercise title">
   This is an exercise labeled "exercise:my-exercise".
</div>

<div class="exercise" title="Second exercise">
   This is an exercise not labeled.
</div>

Referring to the exercise: [](#exercise:my-exercise) or [](#my-exercise).

| Exercise 1. This is an exercise labeled "exercise:my-exercise".

| Exercise 2. This is an exercise not labeled.

Referring to the exercise: Exercise 1 - Exercise title or Exercise 1 - Exercise title.

3.7. Alternative style

If you have block content element (e.g. code blocks), you must use headers as html cannot contain block-level Markdown.

You must use something like the following. The marker `end` tells the system to stop the level 4 section.
### Another exercise {#exercise:another}

This is another exercise with block content:

```bash
$ echo hello
```

This is part of the level 2 section.

Another exercise starts for the rest of the section.

### Another exercise {#exercise:second}

contents

After the second exercise.

---

**Exercise 3. Another exercise.**

This is another exercise with block content:

```bash
$ echo hello
```

This is part of the level 2 section.

Another exercise starts for the rest of the section.

**Exercise 4. Another exercise.**

contents

After the second exercise.
It is possible to embed Vimeo videos in the documentation.

**Note:** Do not upload the videos to your personal Vimeo account; they must all be posted to the Duckietown Engineering account.

**Note:** The videos must be *public* for the embedding to work. If the video is not public the process will fail mentioning the video is not found (true, because it is not public). This is the syntax:

```html
<dtvideo src="vimeo:vimeo ID"/>
```

**example** For example, this code:

```html
<figure id="example-embed">
  <figcaption>Cool Duckietown by night</figcaption>
  <dtvideo src="vimeo:152825632"/>
</figure>
```

produces this result:

![Figure 4.1. Cool Duckietown by night](image)

Depending on the output media, the result will change:

- On the online book, the result is that a video player is embedded.
- On the e-book version, the result is that a thumbnail is produced, with a link to the video;
- (future improvement) On the dead-tree version, a thumbnail is produced with a QR code linking to the video.
UNIT B-5
Troubleshooting

Contents
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Section 5.3 - Forgetting markdown=1 .................................................................39
Section 5.4 - Code inside html..................................................................................39

5.1. Troubleshooting errors in the compilation process

<table>
<thead>
<tr>
<th>Symptom: “Invalid XML”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution: “Markdown” doesn’t mean that you can put anything in a file. Except for the code blocks, it must be valid XML. For example, if you use “&gt;” and “&lt;” without quoting, it will likely cause a compile error.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptom: “Tabs are evil”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution: Do not use tab characters. The error message in this case is quite helpful in telling you exactly where the tabs are.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptom: The error message contains ValueError: Suspicious math fragment 'KEYMATHS000ENDKEY'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution: You probably have forgotten to indent a command line by at least 4 spaces. The dollar in the command line is now being confused for a math formula.</td>
</tr>
</tbody>
</table>

5.2. Not properly starting a list
There must be an empty line before the list starts.
This is correct:

I want to learn:
- robotics
- computer vision
- underwater basket weaving

This is incorrect:

I want to learn:
- robotics
- computer vision
- underwater basket weaving

and it will be rendered as follows:
I want to learn: - robotics - computer vision - underwater basket weaving

5.3. Forgetting `markdown=1`

If you forget `markdown=1` the contents of the tag will not be processed.

For example, this:

```html
<div class="exercise" title="My exercise title">
  Open a new terminal and navigate to `~/.ssh` and open the file named `config`.
</div>
```

results in:

Exercise 5. Open a new terminal and navigate to `~/.ssh` and open the file named `config`.

5.4. Code inside html

Exercise 6. Here is a code block: $ code block Another block: `pythonomtyπnimp or tAny` After block: code block
6.1. Basics

Every page, on every book, should have a ‘Knowledge Box’ - also called ‘Knowledge and Activity Graph’. It’s the blue box you see above. In markdown, a knowledge box looks like this:

```markdown
<div class='requirements' markdown="1">
  Requires: Important prerequisite XY

  Requires: ...

  Results: Infinite wisdom
</div>
```

6.2. Purpose

Knowledge boxes give structure to the documentation. How do you know where to start? For example by following back links in knowledge boxes! Or by having an automated system follow back those references for you.

Also, imagine if dead references or circular dependencies were detected automatically. Authors could fix this right away, and you would have an easier time navigating the documentation. So: Add a knowledge box!

6.3. Guidelines

Here are dos and don’ts how to write useful knowledge boxes:

✔ One knowledge box per page. *(Might change in the future.)*

Organize your pages in a way that one knowledge box per page makes sense. Optimally, one page should be about one distinct topic, or describe how to create one distinct thing. You can use most of the existing documentation as reference for a good “topic granularity”.
✓ Use ‘Requires:’, ‘Recommended:’ and ‘Results:’ markers.
Start each line in a knowledge box with one of them.

✓ In “Requires:” lines, link to pages that provide the requirement whenever possible.

✓ Link only to CSS-identifiers of other pages, not specific sections on that page. (This might change in the future.)

✓ One requirement or result per line.

✗ A list of multiple requirements in one line.
Do not: Unit C-3 - Setup Duckiebot SD Card

✓ Use short descriptive texts, with good keywords that identify the requirement or result.

✓ Optimal: Use the same description as in other knowledge boxes, when referring to the same entity. (Exception: If the other page’s description violates these guidelines.)

✗ Long texts, with many unrelated keywords.
Do not:

Results: A correctly configured Duckiebot SD card in configuration DB18. After assembling the Duckiebot, this will allow you to start it, connect to the internet, and get going.

Requires: Software-X, with all requirements for the ROS example

✓ Put all text that does not directly describe the requirement between round brackets **. Omit unnecessary words.
Do:

Results: A configured Duckiebot SD card in configuration DB18. (After assembling the Duckiebot, this will allow you to start it, connect to the internet, and get going.)

Requires: Software-X (with all requirements for the ROS example)

✓ For estimated time needed, use a ‘Requires:’ marker.
For example:
Requires: Approximately 1 hour 30 minutes.

(“1h30”, or “1h, 30 min” works as well.)

✓ If you want, you can use the instructions here to pick a name of an entity that the EOD system knows already, from the data files, or add a new entity there via pull request.

** This might change in the future.

6.4. ‘How to speak the language of the graph’

To refer to an entity that is already known by the knowledge-box parsing algorithm:

- 1) First, open one of two files:
  - topics.yaml if you want to refer to a specific topic
  - stuff.yaml if you want to refer to an object (like a Duckiebot) or a piece of software.

- 2) Scan that file for the thing you are looking for. (ctrl-F for a few keywords.)
  - 2a) If it exists:
    - Copy the string after name: into your knowledge box line, after a Requires: or Results: marker (possibly in addition to a link to a page).
    - You can add the keyword “installed” or “installation” to refer to a (software) item. Add the word “knowledge” to ensure to refer to a topic. (This is crucial, for example, to distinguish knowing ROS vs. having ROS installed.)
    - In case you opened the second .yaml file in step 1: If your “item” needs to have one of the options listed after all_possible_options:, add the text of those options to your knowledge box line.
  - 2b) If what you are looking for does not exist yet:
    - Edit the respective file on GitHub, topics.yaml or stuff.yaml, to add the entity you need. Put something unique as `shortname` (only lowercase letters, numbers and underscores) and a good, short-ish name for it.
    - Open a pull request with your change. Write me at kellersu -at- student -dot- ethz -dot- ch in case it is not accepted soon.
    - Refer to the entity as described in 2a).

Explanation:

- The knowledge boxes are parsed into a graph. This can happen in multiple ways.
- Because text matching is currently fairly unreliable, a previous version of the graph is stored in .yaml and .csv files. This graph can be matched to the current knowledge boxes, to update it so that it maps the current version of the book.
• The data entries in “topics” (knowledge) and “items” (mostly physical objects or software) are what is matched to requirements and results in knowledge boxes. If you use the exact name of an entity listed there (the “name” field), plus the exact wording of any item options that you want to refer to, it is certain to be recognized by the system as that entity.

• To visualize the graph, see here (and here).

6.5. **Suggestion for an alternative knowledge box format**

See here
PART C

Documentation style guide

This part describes the style guide for our documentation.

Contents

  Unit C-1 - Style guide .................................................................45
This chapter describes the conventions for writing the technical documentation.

1.1. Organization
The documentation is divided into books, parts (labeled 'part:') and units (with no CSS prefix).
To create a new part, put `{#part:name status=STATUS}` after the header, like so:

```
## Safety `{#part:safety status=ready}
```

1.2. General guidelines for technical writing
The following holds for all technical writing.
- The documentation is written in correct English.
- Do not say “should” when you mean “must”. “Must” and “should” have precise meanings and they are not interchangeable. These meanings are explained in this document.
- “Please” is unnecessary in technical documentation.
  - “Please remove the SD card.”
  - “Remove the SD card”.
- Do not use colloquialisms or abbreviations.
  - “To create a ROS pkg...”
  - “To create a ROS package...”
- Python is capitalized when used as a name.
  - “If you are using python...”
  - “If you are using Python...”
- Do not use emojis.
- Do not use ALL CAPS.
- Make infrequent use of bold statements.
- Do not use exclamation points.

1.3. Style guide for the Duckietown documentation
- The English version of the documentation is written in American English. Please
note that your spell checker might be set to British English.

- behaviour
- behavior
- localisation
- localization

- It’s ok to use “it’s” instead of “it is”, “can’t” instead of “cannot”, etc.
- All the filenames and commands must be enclosed in code blocks using Markdown backticks.

- “Edit the ~/.ssh/config file using vi.”
- “Edit the ~/.ssh/config file using vi.”
- `Ctrl-C`, ssh etc. are not verbs.
  - “Use `Ctrl-C` from the command line”.
  - “Use `Ctrl-C` from the command line”.
- Subtle humor and puns about duckies are encouraged.

1.4. Writing command lines

Use either “laptop” or “duckiebot” (not capitalized, as a hostname) as the prefix for the command line.

For example, for a command that is supposed to run on the laptop, use:

```bash
laptop $ cd ~/duckietown
```

It will become:

```
$ cd ~/duckietown
```

For a command that must run on the Duckiebot, use:

```bash
duckiebot $ cd ~/duckietown
```

It will become:

```
$ cd ~/duckietown
```

If the command is supposed to be run on both, omit the hostname:

```
$ cd ~/duckietown
```

Other rules:
- For a container use `container`.
- For a container on a Duckiebot use `duckiebot-container`.
• For a container on the laptop use `laptop-container`.

This:

```
container $ command
```

will become:

```
$ command
```

This:

```
duckiebot-container $ command
```

will become:

```
$ command
```

This:

```
laptop-container $ command
```

will become:

```
$ command
```

1.5. Frequently misspelled words

• “Duckiebot” is always capitalized.
• Use “Raspberry Pi”, not “PI”, “raspi”, etc.
• These are other words frequently misspelled: 5 GHz WiFi

1.6. Other conventions

When the user must edit a file, just say: “edit `/this/file`”.

Writing down the command line for editing, like the following:

```
$ vi /this/file
```

is too much detail.

(If people need to be told how to edit a file, Duckietown is too advanced for them.)

1.7. Troubleshooting sections

Write the documentation as if every step succeeds.

Then, at the end, make a “Troubleshooting” section.
Organize the troubleshooting section as a list of symptom/resolution.
The following is an example of a troubleshooting section.

1) Troubleshooting

| Symptom: This strange thing happens. |
| Resolution: Maybe the camera is not inserted correctly. Remove and reconnect. |

| Symptom: This other strange thing happens. |
| Resolution: Maybe the plumbus is not working correctly. Try reformatting the plumbus. |
PART D
Slides

Contents

Unit D-1 - Creating slides ................................................................. 50
? Making slides .............................................................................. 51
UNIT D-1
Creating slides

See this presentation: ? Making slides
Making slides

To create slides, use `type=slides` for an H1 header:

```html
# Making slides {#making-slides type=slides status=ready nonumber=1}
```

To create slides, use the attribute `type=slides` for an H1 header:

```
To create slides, use `type=slides` for an H1 header:
```

```
... 
```

```
## Next slides

Use second-level headers to make subsequent slides:
```

```
# Making slides {#making-slides type=slides status=ready}
```

To create slides, use `type=slides` for an H1 header:

```
To create slides, use `type=slides` for an H1 header:
```

```
... 
```

```
## Next slides

Use second-level headers to make subsequent slides:
```

1.2. Stepping

Use the symbol ▶ to make the corresponding fragment appear on click.

- * Step 1 ▶
- * Step 2 ▶
- * Step 3 ▶

- • Step 1 ▶
- • Step 2 ▶
- • Step 3 ▶

1.3. Maths

Latex still works here.

A simple test for math:

\[ a + b \geq \sqrt{c} \]

1.4. Stepping through equations

You can also step through equations:
Consider: ▶

$$
a = b
$$

Then we get: ▶

$$
c = d
$$

Consider: ▶

$$
a = b
$$

Then we get: ▶

$$
c = d
$$

Stepping through partial parts of equations is not supported.

1.5. Sub-slides

You can have “sub slides” to make the presentation nonlinear.

**Defining subslides**: Create a subslide by using header `h3`:

```markdown
### Subslide 1
This is lower.

### Subslide 2
This is even lower.
```

**Showing subslides**: Press down to show the subslides.

**Showing the slides map**: Press `ESC` again to look at the slides map.

1) Subslide 1

This is lower.

2) Subslide 2

This is even lower.

1.6. Presentation mode

Press the key `S` to enter presenters mode.
Press **esc** to exit presenter mode.

### 1.7. Presenter notes

Use a blockquote at the end of a slide to encode the presenter notes.

```markdown
## Presenter notes

Use a blockquote at the end of a slide to encode the presenter notes:

> These are presenter notes that will appear in presenter mode.

These are presenter notes that will appear in presenter mode.
```

### 1.8. Under the hood

- All of this is built on top of reveal.js.
- Please see reveal.js for the complete list of features.

### 1.9. Figures

All other documents features work as expected.

Example of a figure:

![Duck](duckietown-logo-transparent.png)

**Figure 1.1**

```html
<figure class="stretch">
  <img style='width:8em' src="duckietown-logo-transparent.png"/>
</figure>
```

### 1.10. Subfigures

Subfigures with animation:
1.11. Cross references
You can link to chapters and vice-versa: Unit D-1 - Creating slides

You can link to chapters and vice-versa: [](#creating-slides)

Link to the previous slide.

1.12. References