MSE | MASTER OF SCIENCE IN ENGINEERING

OST Eastern Switzerland University of Applied Sciences

DB Change Management Techniques

by the Example of PostgreSQL

Seminar Database Systems
Master of Science in Engineering
Profile Data Science
Fall Semester 2022

Authors:
Conradin Kleinstein
Matriculation No. 18-156-703

Marco Fuchs
Matriculation No. 18-156-703

Supervisor:
Prof. Stefan Keller

23. October 2022

Abstract

Introduction

The abstract gives a concise overview of the work you have done. The reader shall be able to decide whether the work which has been done is interesting for him by reading the abstract. Provide a brief account on the following questions:

- What is the problem you worked on? (Introduction)
- How did you tackle the problem? (Materials and Methods)
- What were your results and findings? (Results)
- Why are your findings significant? (Conclusion)

The abstract should approximately cover half of a page, and does generally not contain citations.

Methods

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Conclusion

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis

nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Contents

1 Introduction

The following sections provide a brief introduction to database change management. This includes short summary of its history and focuses on the benefits database change management provides.

1.1. History

The purpose of this section is to provide a timeline of commonly used tactics for database change management.

1.2. Benefits of Database Change Management

This section aims to answer the question of why database change management is useful. Furthermore, advantages and disadvantages will be described.

1.3. Overview of Available Tools

This section will provide an overview of available change management tools. The list of tools should include the available programming languages, price / availability and the main advantage over their competitors.

2 Introduction to Flyway

2.1. Overview

Provide a detailed overview of the Flyway tool. XYZ

2.2. Functionality with Simplistic Example

Explain how the Flyway tool works and provide a simplistic example to demonstrate.

CLI

JAVA

3 Introduction to Liquibase

3.1. Overview

Provide a detailed overview of the Liquibase tool.

3.2. Functionality with Simplistic Example

Explain how the Liquibase tool works and provide a simplistic example to demonstrate.

4 Database Change Scenarios

4.1. Flyway Scenarios

This section shows how to handle the predefined scenarios for the given change management tool. This includes following scenarios:

- Rename an attribute.
- Add an attribute and set the value as a constant.
- Delete an attribute.
- Change an attribute type and add an SQL script to fill it from existing values.
- Rename a table and change a related view which uses this table.

4.2. Liquibase Scenarios

This section shows how to handle the predefined scenarios for the given change management tool. This includes following scenarios:

- Rename an attribute.
- Add an attribute and set the value as a constant.
- Delete an attribute.
- Change an attribute type and add an SQL script to fill it from existing values.
- Rename a table and change a related view which uses this table.

5 Flyway vs. Liquibase

Comparison

In this section we aim to compare Flyway and Liquibase on how they handled the defined scenarios. Advantages, Disadvantages, Restrictions are analyzed and a recommendation for the question: *When to use which?* will be given.

6 Results

The aims to summarize the tools and provide an overview on their strengths and weaknesses.

7 Lesson learned

This section will go over the learned lessons during this project.

8 Outlook

This section aims to provide an outlook on further tool / research and additional material.

9 Possible MSE Data Engineering Exercise

This section aims to provide a possible master program exercise for a lecture in the area of data engineering.

9.1. Task

9.2. Sample Solution

Bibliography

[1] P. Farindon, „The title of the work“, in *The title of the book*, ser. 5, T. editor, Ed., 3rd ed., vol. 4, An optional note, The address of the publisher: The name of the publisher, Jul. 1993, ch. 8, pp. 201–213.

[2] P. Gainsford, *The title of the work*, 3rd ed., An optional note, The organization, The address of the publisher, Jul. 1993.

Appendices

List of Figures

List of Tables

A Beispiel

This chapter is to demonstrate some of the capabilities of this LaTeX template. Please take a good look at this chapter and try to follow the guidelines.

GOAL OF THIS CHAPTER

A.1. Equations

A.1.1. some equations

Equations can easily be written using the *Equation* environment. Inline equations are inserted with $\sqrt{-1} = i$. Equations can also be labeled, so it is possible to reference them. This should be done for all important equations.

EQUATIONS

$$x^2 + y^2 = 1 \tag{A.1}$$

```
# include "hoi.h"
int i = 0;
```

LISTING A.1 bsp

```
import cv2
import numpy as np
from pyzbar.pyzbar import decode
```

LISTING A.2 bsp

There are several environments for multi line equations. A very useful one is *align*, see equation

$$\oint \vec{E} \cdot d\vec{A} = \frac{q}{\epsilon_0} \tag{A.2}$$

$$\oint \vec{B} \cdot d\vec{A} = 0 \tag{A.3}$$

$$\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_B}{dt} \tag{A.4}$$

FIGURE A.1. An example image

some	text	is shown	here
there is more	text here	and here	cool.
and	even	more	here.

TABLE A.1. A sample table

$$W_{V12} = 4 \cdot 10^5 \ Pa \cdot 4 \ m^3 \cdot \ln(\frac{4 \ bar}{4 \ bar})$$
$$W_{V12} \approx 4 \ J \tag{A.5}$$

FIGURES AND TABLES

Images are always inserted inside a *figure* environment. If possible, it is advisable to use `[tb]` as position. Always remember to add a caption and a label, so you can reference the image like this: Fig. A.1. If possible, images should be inserted as vector graphics, e.g. `eps` or `pdf` - or even drawn manually in TikZ.

Tables can be used quite similarly. They are inserted inside a *table* environment, as shown in Tab. A.1.

Another useful tool is the *tabularx* environment. It lets the user specify the total width of the table, instead of each column. An example is shown in Tab. A.2.

Augmenter	Parameter	Beschreibung
Rotate	$\pm$ 5°	Bilder werden zufällag bis zu fünf Grad nach links oder rechts um den Bildmittelpunkt gedreht.
LinearContrast	α = 0.5-1.5	Erhöht oder verringert Kontrast der Bilder um den Faktor Alpha der pro Bild zufällig aus einem Intervall gewählt wird.

TABLE A.3. Beispieltabelle

some	text	is shown here
there is more and	text here even	and here. more here.

TABLE A.2. Tabularx example

Please read the documentation of the *booktabs*[1] package to find information on how to create good tables. Always remember the first two guidelines and try also to stick to the other three:

1. Never, ever use vertical rules.
2. Never use double rules.
3. Put the units in the column heading (not in the body of the table).
4. Always precede a decimal point by a digit; thus 0.1 *not* just .1.
5. Do not use „ditto“ signs to repeate a value. In many circumstances a blank will serve just as well. If it won't, then repeat the value.

PARAGRAPHS

Note that each paragraph is ended with an empty line. *Never* use `\\` to end paragraphs – this is a new line, not a new paragraph. Also try to keep your source code clean: about 80 characters per line. Using source control makes your life much easier

QUOTES

Quotes can easily be made using the „csquotes“ package. Citing text passages is easily done: „First argument: citation, second argument: terminal punctuation!“ (me) Whole block quotes are also easily possible.

> Formal requirements in academic writing frequently demand that quotations be embedded in the text if they are short but set oV as a distinct and typically indented paragraph, a so-called block quotation, if they are longer than a certain number of lines or words. In the latter case no quotation marks are inserted.

SI UNITS

Any numbers and units should by typed using the siunitx package. Numbers are written as 1234 3.45×10^{-5} 1, 2 and 4 4 to 30 10° 5°3′2″. Units are written with $\mathrm{kg\,m/s^2}$ or $14\,\mathrm{F}^4$. Of course also possible is 10 m, 40 m and 12 m or −40 °C to 125 °C Almost every unit you could possibly think of is implemented!

BIBLIOGRAPHY

The bibliography is created using *Bibtex*. The standard format is set to `ieeetr`, which is the IEEE Standard. There are example entries for different types of in the separate

[1] `http://www.ctan.org/pkg/booktabs`

bibliography file [1] [2]

Cite a page: [1, p. 435]
Cite several pages: [1, pp. 436-440]

INDEX & GLOSSARY

All glossary entries are made in the separate file `glossary.tex`. They can then be used with Equation. Acronyms are defined as shown there and used similarly. The first time, it will be *support vector machine (SVM)*. The second time: *SVM*. The glossary has to be created manually by invoking `makeindex -s doku.ist -t doku.glg -o doku.gls doku.glo`. The index is simply created by using `index{text}`. It is generated automatically.

A.1.2. Listings

Listings are created by the `lstlistings` package.

TODO This is a simple ToDo note

TODO This is a small note [Citation needed]
TODO

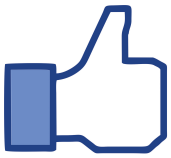
hello

A.1.3. Algoruthms

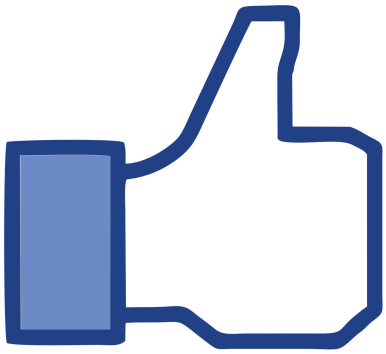
Algorithm 1: How to write algorithms

Result: Write here the result
initialization;
while *While condition* **do**
    instructions;
    if *condition* **then**
        instructions1;
        instructions2;
    else
        instructions3;
    end
end

A.1.4. Images



(A) bla bla



(B) bla bla2

FIGURE A.2. bla bla bla bla

B Cheat Sheet

Nachdem das Kamerabild eingelesen worden ist, sollen die entsprechenden Objekte gefunden werden. Mit diesen Informationen soll dann der Abstand zum Objekt ermittelt werden und via serielle Schnittstelle an die Fahrplattform übertragen werden. FUNKTION

B.1. Listing

(a) Pixelwert wird unterdrückt (Wert = 0), da es sich nicht um das Maximum in die Gradientenrichtung $-\pi$ handelt

(b) Bildet das lokale Maximum in Gradientenrichtung $\frac{3\pi}{4}$, Pixelwert wird nicht verändert

(c) Bildet auch das lokale Maximum in Gradientenrichtung, Pixelwert wird nicht verändert

B.2. Cite and reference and format

Reference: Fig. B.2b

Cite: **xlinuxai**

Package: *`TFLite Model Maker`*

Footnote: [1]

[1] https://www.tensorflow.org/lite/guide/model_maker

B.3. Images

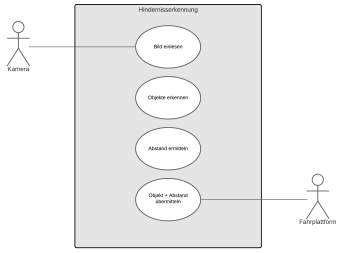
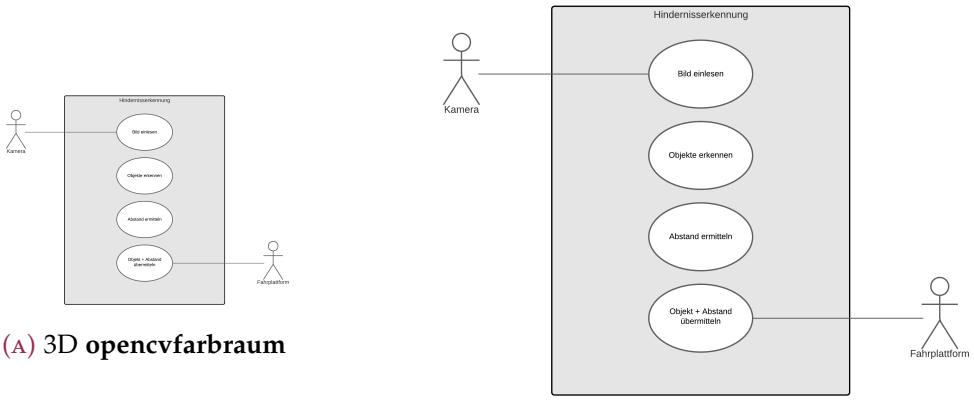


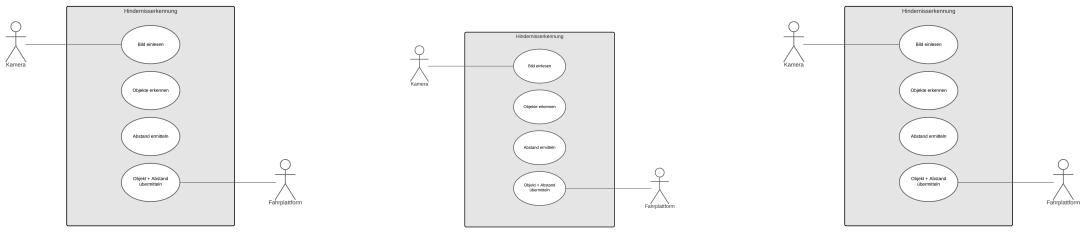
FIGURE B.1. Use Case Diagramm



(A) 3D **opencvfarbraum**

(B) 2D **hsv1**

FIGURE B.2. HSV Farbraum



(A) Box mit höchster p_c ist möglicherweise nicht der beste Treffer **quickintro**

(B) Kann Objekte in der Nähe verwerfen **quickintro**

(C) Verwirft keine False-Positives **quickintro**

FIGURE B.3. Probleme NMS

YOLO
Im YOLO-Format wird eine Bounding-Box durch vier Werte [x_center, y_center, width, height] dargestellt. Dabei sind x_center und y_center die normalisierten Koordinaten des Mittelpunkts der Bounding Box. Um die Koordinaten zu normalisieren, werden die Pixelwerte von x und y durch die Bildbreite x_max beizehungsweise die Höhe y_max geteilt.

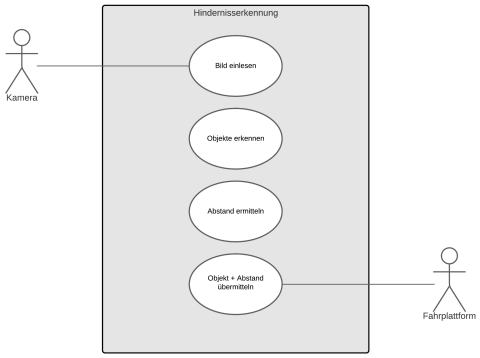


FIGURE B.4. Format YOLO

B.4. Formulas

$$\mathbf{g}(\mathbf{x},\mathbf{y})_x = \begin{bmatrix} +1 & 0 & -1 \\ +2 & 0 & -2 \\ +1 & 0 & -1 \end{bmatrix} * \mathbf{f}(\mathbf{x},\mathbf{y}) \quad \text{(B.1)} \qquad \mathbf{g}(\mathbf{x},\mathbf{y})_y = \begin{bmatrix} +1 & +2 & +1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} * \mathbf{f}(\mathbf{x},\mathbf{y}) \quad \text{(B.2)}$$

$$d = \frac{f \cdot G}{B}$$

G = Gegenstandhöhe in Echt in cm
B = Gegenstandhöhe im Bild in Pixel
d = Abstand in cm
f = Brennweite in Pixel

(B.3)

B.5. Tables

Augmenter	Parameter	Beschreibung
Rotate	$\pm$ 5°	Bilder werden zufällig bis zu fünf Grad nach links oder rechts um den Bildmittelpunkt gedreht.
Linear Contrast	α = 0.5-1.5	Erhöht oder verringert Kontrast der Bilder um den Faktor Alpha, der pro Bild zufällig aus einem Intervall gewählt wird.
Motion blur	Kernel = 3x10, horizontal	Den Bildern wird eine horizontale Bewegungsunschärfe hinzugefügt.
Flip	50%, horizontal	Bild wird mit einer Wahrscheinlichkeit von 50% horizontal gespiegelt.

TABLE B.1. Funktionen der Augmentationspipeline

Phase:	Median	Mittelwert	Standardabweichung
Preprocessing:	-	-	-
Inference:	211 ms	212 ms	6 ms
Postprocessing:	19 ms	35 ms	158 ms
Gesamt:	230 ms	247 ms	158.11 ms

TABLE B.2. Performancemessung YoloV5s Pytorch, Auflösung 640x640

B.6. Code

```
%cd /home/$user/yolov5
!python train.py --img 640 --batch 20 --epochs 600
--data '../streetsigns.yaml'
--cfg ./models/yolov5s.yaml
--weights 'yolov5s.pt'
--name yolov5s_streetsigns150521_results  --cache
```

LISTING B.1 Training starten

C Questions

- [x] Item1
- [ ] Item2
- [x] Item3