Universität Leipzig

Fakultät für Mathematik und Informatik
Institut für Informatik

– Bachelorarbeit –

Programmierung eines Browser-Plugins zur Anzeige von Datenschutzinformationen im PlayStore sowie Evaluation der PlugIn-Performance

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Abstract

An abstract is a brief summary of a research article, thesis, review, conference proceeding or any in-depth analysis of a particular subject or discipline, and is often used to help the reader quickly ascertain the paper's purpose. When used, an abstract always appears at the beginning of a manuscript or typescript, acting as the point-of-entry for any given academic paper or patent application.

An academic abstract typically outlines four elements relevant to the completed work:

- The research focus (i.e. statement of the problem(s)/research issue(s) addressed);
- The research methods used (experimental research, case studies, questionnaires, etc.);
- The results/findings of the research; and
- The main conclusions and recommendations

It may also contain brief references,[8] although some publications' standard style omits references from the abstract, reserving them for the article body (which, by definition, treats the same topics but in more depth). Typical length ranges from 100 to 500 words.

(source: https://en.wikipedia.org/wiki/Abstract_%28summary%29)

Inhaltsverzeichnis

Kapitel 1

Introduction

A general introduction into the topic goes here. Here is the place to state problems, which should be solved with this thesis. Also background information and non-academic information can be writen here. This part should sensibilise the reader for the topic. Go from higher level into the specific topic of this thesis. Thus, give an embedding of this thesis into an overall context. State, why are you doing this (motivation) and what will be made better (reasons to conduct this research)

1.1 Purpose

The purpose of this work is to answer one or two or more major questions:

1. **"Question number 1"**
2. **"Question number 2"**

State here, what the work will be trying to answer. But also, what this work is NOT about. Thus, state the scope of this work.

1.2 Structure

This Bachelor/Master Thesis is structured as follows. First, chapter 1 gives some background information about ... which will be used throughout this work. Sequentially, chapter 2 presents proposed solutions and results for the beforehand stated questions. The setup and results for the first question are line out in section 3. The results for the second problem are stated in section 4. Finally, the obtained results are discussed and summed up in chapter 5. This chapter also gives suggestions for future research.

Kapitel 2

Preliminaries

The following chapter provides the interested reader with the basic information that is needed to understand this work. All topics are described in no more detail than needed to follow this work. If the reader is interested more in a specific topic necessary references are provided at the respective places to the respective textbooks and articles.

This chapter starts with a general view on … . After that, the … is explained. … as an important method is then described in detail. It follows an overview over state-of-the art algorithms that will be studied in this work. This chapter ends with a section about how the performance of algorithms could be quantified.

Also state in this chapter related work and the state-of the art.

2.1 Stuff One

A main part of this work is related towards …

2.2 Stuff Tow

A crucial part of this work is …

2.3 Stuff Three

more

2.3.1 Stuff Three.1

and more

2.3.2 Stuff Three.2

Something goes here.

2.3.2.1 Stuff Three.2.1

sub sub section

2.4 Stuff4

As stated in the previous sections ...

Kapitel 3

This is the first main part of the work

This chapter will first outline the problems that constitutes the main portion of this work. Each problem is described separately starting with the available data sources followed by a detailed description of the proposed solutions. After that, the proposed solutions are evaluated by empirical means and the results are presented. Performance studies are conducted to provide suitable recommendations concerning the real world application.

3.1 Problem Descriptions

There are two main problems researched in this Bachelor/Master Thesis.

As stated in the previous chapter 2...

"Question 1".

When ... the second question arises:

"Question 2"

This question will mainly be answered with the help of empirical data gathered from...

3.2 Problem 1 - Bla Bla

This subsection describes the solution for the first problem: "Question 1?". This problem is studied by using a simulation framework. Within the simulation it is possible to alter the configuration of t... . It is studied ... .

3.2.1 Method

describe the used method. how is the experiment conducted. which means were used

3.2.2 Data Source

how is the data obtained. what are the properties of the data.

3.2.3 Results

This section will state and discuss the results obtained … . First, the results for … are presented. Thereafter, the results for … are shown. After that, the obtained results will be discussed. Hints for … will be given.

3.2.4 Discussion

discuss the obtained results here in detail. what is promising, what is not so good. what could be done better. limitations of the used methods. suggest future research (sub-)topics.

3.3 Problem 2- Blub

This subsection describes the solution for the first problem: ”Question 1?”. This problem is studied by using a simulation framework. Within the simulation it is possible to alter the configuration of t… . It is studied … .

3.3.1 Method

describe the used method. how is the experiment conducted. which means were used

3.3.2 Data Source

how is the data obtained. what are the properties of the data.

3.3.3 Results

This section will state and discuss the results obtained ... . First, the results for ... are presented. Thereafter, the results for ... are shown. After that, the obtained results will be discussed. Hints for ... will be given.

3.3.4 Discussion

discuss the obtained results here in detail. what is promising, what is not so good. what could be done better. limitations of the used methods. suggest future research (sub-)topics.

Kapitel 4

LaTeX snippets

4.1 Basics

Here is some stuff with bullet points, aka lists

- measurement time
- sensor-id
- raw measurement
  - sub items
  - even more
  - of those
- more stuff

Here is an enumeration with the same data

1. measurement time
2. sensor-id
3. raw measurement
   (a) sub items
   (b) even more
   (c) of those
4. more stuff

4.2 Images

You can control, where this image could(!) be floating by altering the "[hpbt]list. It means:

- h = Place the float here, i.e., approximately at the same point it occurs in the source text (however, not exactly at the spot)
- p = Put on a special page for floats only.
- b = Position at the bottom of the page.
- t = Position at the top of the page.
- ! = Override internal parameters LaTeX uses for determining "goodfloat positions.
- H = Places the float at precisely the location in the LaTeX code. Requires the float package. This is somewhat equivalent to h!.

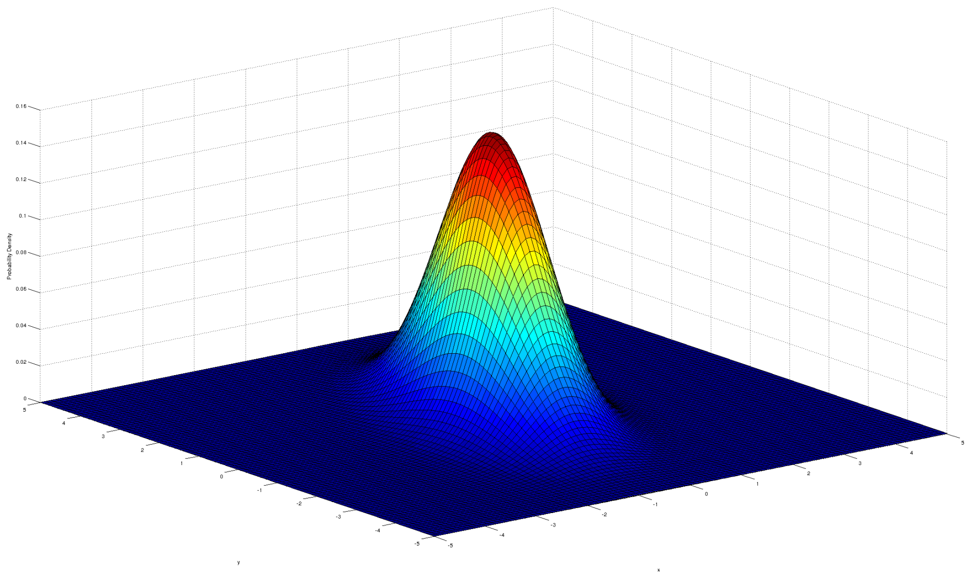
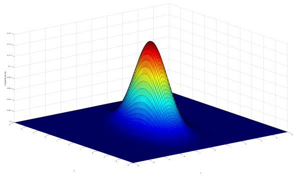
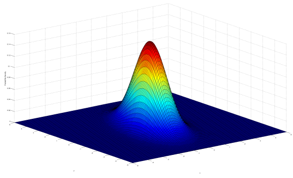


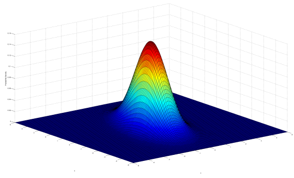
Abbildung 4.1: caption goes here



(a) caption

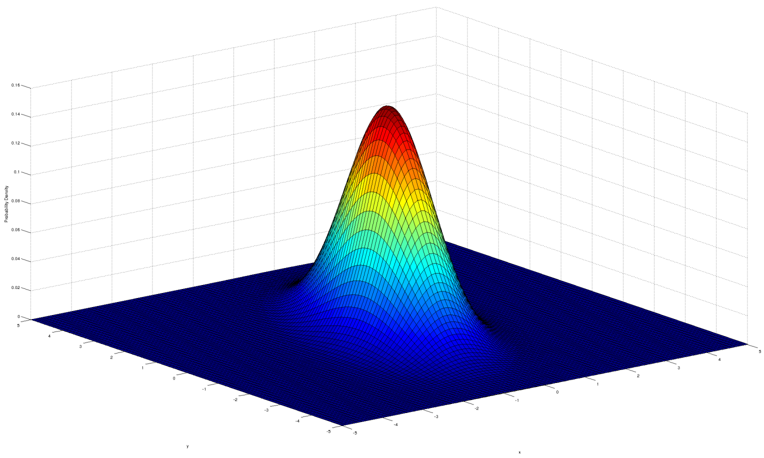


(b) caption

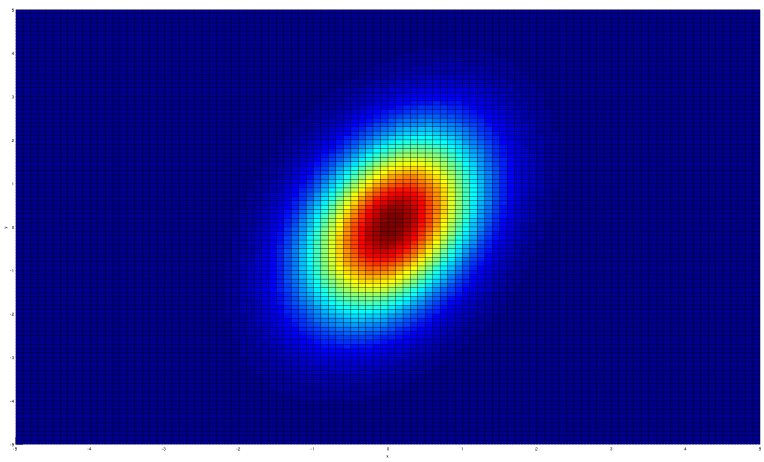


(c) caption

Abbildung 4.2: Pictures of something, horizontally



(a) isometric perspective



(b) bird's eye view

Abbildung 4.3: MVN with $\mu = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ and $\Sigma = \begin{bmatrix} 0.6 & 0.4 \\ 0.4 & 2.0 \end{bmatrix}$

4.3 Math-Stuff

Equations with explanations:

$$p\left(x(k) \mid X^{k-1}, Z^{k-1}, U^k\right) \tag{4.1}$$

Where:

$$\begin{aligned}
X^{k-1} &:= \{x(k-1), x(k-2), ..., x(0)\} : \text{all previous states} \\
Z^{k-1} &:= \{z(k-1), z(k-2), ..., z(0)\} : \text{all previous measurements} \\
U^k &:= \{u(k), u(k-1), ..., u(0)\} : \text{all previous control inputs}
\end{aligned}$$

You can automatically refer to the beforehand stated equation 4.1. Pages with only math stuff sometimes looks strange. So make sure to add some nice text.

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.

A list of equations aligned at the -ßymbol.

$$x(k+1|k) = F(k) \cdot x(k|k) + G(k) \cdot u(k) \tag{4.2}$$

$$P(k+1|k) = F(k) \cdot P(k|k) \cdot F(k)^T + Q(k) \tag{4.3}$$

$$\hat{z}(k+1|k) = H(k+1) \cdot x(k+1|k) \tag{4.4}$$

$$S(k+1) = H(k+1) \cdot P(k+1|k) \cdot H(k+1)^T + R(k+1) \tag{4.5}$$

References to Equation 4.2 and Equation 4.4

Write some matrices: $x = \begin{bmatrix} x_{pos} \\ x_{vel} \\ y_{pos} \\ y_{vel} \end{bmatrix}$ and $F = \begin{bmatrix} 1 & T & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & T \\ 0 & 0 & 0 & 1 \end{bmatrix}$.

4.4 citing stuff

You can cite stuff. For example an online resource [?]. Make sure to add a laste visitedïn JabRef. This has to appear in the bibliography. But you can also cite from a book, including the page number: [? , p. 175]. And also inproceedings [?] and articles [?]. And technical manuals [?].

4.5 Tables

Property	**Stereo Camera**	**Multi-Mode Radar (near / far)**
meas. principle	CMOS sensor	FMCW
cycle time	60ms	66ms
latency	42ms	198ms
frequency	16fps	76 - 77 Ghz
bandwidth	—	187 Mhz
opening angle	45°	60° / 18°
range	500m (3D-vision: 50m)	60m / 200m
angle accuracy (3σ)	—	± 1° / ± 0.1°
distance accuracy (3σ)	—	± 0.25m
velocity accuracy (3σ)	—	$\pm 0.278\frac{m}{s}$ / $\pm 0.139\frac{m}{s}$

Tabelle 4.1: Overview of the properties of several sensors

	full			**diag**		
	RMSE	PVol	NEES	RMSE	PVol	NEES
sensor-1	1.63	0.69	3.79	1.63	1.27	3.90
sensor-2	1.14	0.85	4.23	1.14	1.56	4.28
CMF	0.84	0.15	3.82	0.84	0.15	3.82
Naive	1.37	1.80	2.24	1.37	2.70	2.43
CI-trace	1.26	0.62	2.68	1.27	1.12	2.77
CI-det	1.37	0.61	3.31	1.34	1.11	3.16
Bar-Shalom-0.0	1.25	0.16	4.90	1.25	0.29	5.12
Bar-Shalom-0.4	1.21	0.25	4.04	1.22	0.46	4.09
Bar-Shalom-0.7	1.19	0.21	5.86	1.19	0.41	5.27
IMF	1.05	0.22	3.85	0.93	0.14	5.34
KF-T2T	1.80	12.17	7.15	1.64	11.76	5.32
IMF-sub	1.18	0.12	12.75	1.18	0.21	13.35

Tabelle 4.2: some random numbers

trainings set	**validation set**
$P_C = \begin{bmatrix} 0.307 & 0.574 & 0 & 0 \\ 0.574 & 4.926 & 0 & 0 \\ 0 & 0 & 0.052 & 0.080 \\ 0 & 0 & 0.080 & 0.384 \end{bmatrix}$	$P_C = \begin{bmatrix} 0.301 & 0.536 & 0 & 0 \\ 0.536 & 4.886 & 0 & 0 \\ 0 & 0 & 0.054 & 0.087 \\ 0 & 0 & 0.087 & 0.403 \end{bmatrix}$
$P_R = \begin{bmatrix} 0.066 & 0.168 & 0 & 0 \\ 0.168 & 3.025 & 0 & 0 \\ 0 & 0 & 0.360 & 0.298 \\ 0 & 0 & 0.298 & 0.725 \end{bmatrix}$	$P_R = \begin{bmatrix} 0.071 & 0.182 & 0 & 0 \\ 0.182 & 3.151 & 0 & 0 \\ 0 & 0 & 0.356 & 0.298 \\ 0 & 0 & 0.298 & 0.699 \end{bmatrix}$

Tabelle 4.3: covariances

4.6 Pseudo Algorithm

For computer scientists: Write some pseudo code:

Algorithm 1 Pseudocode of the optimization process for P_{ab}

```
Require: F, R, H, dt of the sensor
  while optimizing do
     select q
     calculate P using alpha-beta equation
     calculate NEES
     if current NEES better than best NEES then
        P_ab ← P
        best NEES ← current NEES
     end if
  end while
  return P_ab
```

And explain it afterwards.

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.

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4.7 Rotated Tables

	needed data	equations	optimal
CI	P_i, P_j $\omega \in (0,1)$	$P^{-1} = \omega P_i^{-1} + (1-\omega) P_j^{-1}$ $\hat{x} = P \cdot [\ \omega P_i^{-1} \hat{x}_i + (1-\omega) P_j^{-1} \hat{x}_j\ ]$	no
BarS. 1	$P_i\ , P_j$	$\hat{x} = P_j (P_i + P_j)^{-1} \hat{x}_i + P_i (P_i + P_j)^{-1} \hat{x}_j$ $P = P_1 (P_i + P_j)^{-1} P_j$	no
BarS. 2	$P_i, P_j, P_{ij},$ $P_{ji}, K_i, K_j,$ H_i, H_j, F, Q	$\hat{x} = \hat{x}_i + [P_i - P_{ij}][P_i + P_j - P_{ij} - P_{ji}]^{-1}[\hat{x}_j - \hat{x}_i]$ $P = P_i - [P_i - P_{ij}][P_i + P_j - P_{ij} - P_{ji}]^{-1}[P_i - P_{ji}]$ $P_{ij} \approx 0.4 \cdot \sqrt{P_i \circ P_j}$	yes
IMF	$\hat{x}_i(k\vert k-1)$ $\hat{x}_i(k\vert k)$ $P_i(k\vert k-1)$ $P_i(k\vert k)$ $\hat{x}(k\vert k-1)$ $P(k\vert k-1)$ F, Q	$P(k\vert k)^{-1} = \sum_{i=1}^{2} \left[P_i(k\vert k)^{-1} - P_i(k\vert k-1)^{-1} \right] + P(k\vert k-1)^{-1}$ $\hat{x}(k\vert k) = P(k\vert k) \cdot \{\ P(k\vert k-1)^{-1} \cdot \hat{x}(k\vert k-1)$ $+ \sum_{i=1}^{2} \left[P_i(k\vert k)^{-1} \hat{x}_i(k\vert k) - P_i(k\vert k-1)^{-1} \hat{x}_i(k\vert k-1) \right]\ \}$	yes

Tabelle 4.4: Summary of the used track-to-track fusion algorithms

Kapitel 5

Final Discussion

This chapter summarises the experimental results in an overall context and suggestions for further research are given.

5.1 Consolidation

Summary of the Thesis. What has been studied, what has been found. Be critical with you own results here once again. At the very end, sum your whole thesis up in 2 sentences

In this Master Thesis … has been studied. As a first experiment … . As a result … . However, … . Further research is needed … .

Furthermore, … .

To sum it up, … .

5.2 Future Research

Give suggestions about future research to overcome the limitations of this work. What could and should be done.

Kapitel 6

Appendix

supplementary material goes here.

6.1 Derivations

add some derivations here.

6.1.1 Example Matlab Code

Add a sourcefile directly into LaTeX

```matlab
% simple Kalman Filter example:
% state "x" consists of position and velocity
% system model "F" is a cinematic model of constant velocity
% only the position is measured

clear     % clear all matlab variables

%%% declare matlab variables and asign default (randomly chosen) value
% simulation specifications
T = 1;                % make a measurement every T steps. also called \Delta t
                      % i.e. every 1, 2, 3, ... seconds
real_x = [0; 10];     % "real world" state, only needed in simulation context
                      % also called ground truth. start: position=0, velocity=10

% model specifications
model_F = [1, T ;     % the model we have about the real world
           0, 1];     % here: cinematic model of constant velocity
q = 9;                % controls the amount of process noise. is usually unknown
model_Q = [T^4/4, T^3/2;       % process noise
           T^3/2, T^2 ]*q;     % arises from the cinematic model

% estimations specifications
esti_x = [0; 10];     % estimated state: position and velocity
esti_P = [1, 0 ;      % estimated covariance of esti_x. refelcts
          0, 2];      % the uncertainty about the estimated state esti_x

esti_z = 0;     % estimated measured value. here: just depicting position-entry
                % of esti_x since we are only iterested in the position. Or
                % maybe it is only possible to measure position, but not velocity
esti_S = [0,0 ; % estimated covariance of esti_z. Will consist of process noise
          0,0]; % with added measurement noise

H = [1, 0;      % observation matrix. we only measure position values
     0, 0];     % this row could be left out, but then also modify R to 1x1
R = [1, 0 ;     % measurement noise. is usually unknown. reflects the
     0, 1];     % inaccuracy of the sensors
K = [0, 0];     % Kalman gain vector


%%% Initialization
esti_x = [0; 10];
esti_P = [1, 0 ;
          0, 2];

for step = 1:1000          % simulate for 1000 steps (simulate continuous time)
  if mod(step, T) == 0     % if it is time to take a new measurement
    % update the "real data". For simplicity: take the model F. But could be any
    % other function, possibly non-linear.
    % mvnrnd = multi variate normal random numbers
    real_x = model_F * real_x + transpose(mvnrnd([0,0], model_Q));

    %%% Step 1: Prediction Step
    esti_x = model_F * esti_x;   % estimate the new state according to the
                                 % system model since we do not have any
                                 % control inputs, this term is left out
    esti_P = model_F * esti_P * transpose(model_F) + model_Q;  % update the
                                 % covariance of estimated state esti_x
    esti_z = H * esti_x;         % depic position value from estimated state
    esti_S = H * esti_P * transpose(H) + R;  % estimation of the covariance of
                                 % the estimated measured value. inherits model
                                 % noise and measurement noise

    %%% make a measurement z
    z = H * real_x + transpose(mvnrnd([0,0], R)); % make a noisy measurement

    % Step 2: Innovation Step
    K = esti_P * transpose(H) * esti_S^-1;    % calculate Kalman gain vector by
                                              % comparing model and measurement
                                              % noise
    esti_x = esti_x + K * (z - esti_z);       % update the estimated state by an
                                              % weighted sum of the measurement
                                              % and the model-estimation
    esti_P = esti_P - K * esti_S * transpose(K);  % update covariance of
                                                  % estimated state
  end
end
```

Listing 6.1: Simple example of a Kalman Filter in Matlab

Acknowledgement

First of all, I would like to express my gratitude to ... for the aspiring guidance, useful comments and invaluably support throughout the whole process of this Master Thesis. Furthermore, I would like to thanks ..., ... and the other members of the research team for helpful discussions and constructive criticism. In addition, I would like to thank my University supervisor ... for all the helpful remarks, advises and discussions.

Also, I would like to thank my parents and ... who have supported me throughout the entire process by keeping me harmonious and motivated.

Last but not least, I like to thank ... for funding my research and providing me with the facilities being required.

Abbildungsverzeichnis

Proclamation

Hereby I confirm that I wrote this thesis independently and that I have not made use of any other resources or means than those indicated.

Forname Surname, Place, 26. März 2018