

# **MASTER THESIS**

Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Engineering at the University of Applied Sciences Technikum Wien - Degree Program Mechatronics/Robotics

## **EKF Slam based on manually selected point-cloud landmarks in a VR Application**

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Vienna, October 9, 2023

# Declaration

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Vienna, October 9, 2023

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# Kurzfassung

Hier kommt meine Kurzfassung.

**Schlagworte:** EKF Salm, VR, Punktwolken, Landmarken

# Abstract

This will be my Abstract.

**Keywords:** EKF Salm, VR, Pointclouds, Landmarks

# Contents

# 1 Erste Überschrift der Ebene 1 (chapter)

## 2 Heading on Level 0 (chapter)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

### 2.1 Heading on Level 1 (section)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

#### 2.1.1 Heading on Level 2 (subsection)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

### **Heading on Level 3 (subsubsection)**

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

**Heading on Level 4 (paragraph)** Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

## **2.2 Lists**

### **2.2.1 Example for list (itemize)**

- First item in a list
- Second item in a list
- Third item in a list
- Fourth item in a list
- Fifth item in a list

### **Example for list (4\*itemize)**

- First item in a list
  - First item in a list
    - \* First item in a list
      - First item in a list
      - Second item in a list
    - \* Second item in a list
  - Second item in a list

- Second item in a list

### 2.2.2 Example for list (enumerate)

1. First item in a list
2. Second item in a list
3. Third item in a list
4. Fourth item in a list
5. Fifth item in a list

#### Example for list (4\*enumerate)

1. First item in a list
  - a) First item in a list
    - i. First item in a list
      - A. First item in a list
      - B. Second item in a list
    - ii. Second item in a list
  - b) Second item in a list
2. Second item in a list

### 2.2.3 Example for list (description)

**First** item in a list

**Second** item in a list

**Third** item in a list

**Fourth** item in a list

**Fifth** item in a list

#### Example for list (4\*description)

**First** item in a list

**First** item in a list

**First** item in a list



**First** item in a list

**Second** item in a list

**Second** item in a list

**Second** item in a list

**Second** item in a list

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{i=n} x_i = \frac{x_1 + x_2 + \dots + x_n}{n}$$

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$$\int_0^{\infty} e^{-\alpha x^2} dx = \frac{1}{2} \sqrt{\int_{-\infty}^{\infty} e^{-\alpha x^2} dx \int_{-\infty}^{\infty} e^{-\alpha y^2} dy} = \frac{1}{2} \sqrt{\frac{\pi}{\alpha}}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

$$\sum_{k=0}^{\infty} a_0 q^k = \lim_{n \rightarrow \infty} \sum_{k=0}^n a_0 q^k = \lim_{n \rightarrow \infty} a_0 \frac{1 - q^{n+1}}{1 - q} = \frac{a_0}{1 - q}$$

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gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-p \pm \sqrt{p^2 - 4q}}{2}$$

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$$\frac{\partial^2 \Phi}{\partial x^2} + \frac{\partial^2 \Phi}{\partial y^2} + \frac{\partial^2 \Phi}{\partial z^2} = \frac{1}{c^2} \frac{\partial^2 \Phi}{\partial t^2}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

## 2.3 Erste Überschrift Tiefe 2 (section)

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### 2.3.1 Erste Überschrift Tiefe 3 (subsection)

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#### **Erste Überschrift Tiefe 4 (subsubsection)**

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## **3 Zweite Überschrift der Tiefe 1 (chapter)**

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### **3.1 Zweite Überschrift Tiefe 2 (section)**

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## 3.2 Zweite Überschrift Tiefe 2 (section)

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### 3.2.1 Zweite Überschrift Tiefe 3 (subsection)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

### 3.2.2 Dritte Überschrift Tiefe 3 (subsection)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

#### **Zweite Überschrift Tiefe 4 (subsubsection)**

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Querverweise werden in  $\text{\LaTeX}$  automatisch erzeugt und verwaltet, damit sie leicht aktualisiert werden können. Hier wird zum Beispiel auf Abbildung ?? verwiesen.

**Einstein Albert 2008**

Figure 1: Beispiel für die Beschriftung eines Buchrückens.

**Einstein Albert 2008**

Figure 2: 2. Beispiel für die Beschriftung eines Buchrückens.

Und hier ist ein Verweis auf Tabelle ???. Das gezeigte Tabellenformat ist nur ein Beispiel. Tabellen können individuell gestaltet werden.

Table 1: Semesterplan der Lehrveranstaltung „Angewandte Mathematik“.

Datum	Thema	Raum
20.08.2008	Graphentheorie	HS 3.13
01.10.2008	Biomathematik	HS 1.05

Table 2: 2. Semesterplan der Lehrveranstaltung „Angewandte Mathematik“.

Datum	Thema	Raum
20.08.2008	Graphentheorie	HS 3.13
01.10.2008	Biomathematik	HS 1.05

Hier wird auf die Formel ?? verwiesen.

$$x = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - q} \quad (1)$$

$$x = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - q} \quad (2)$$

```

1 #include <iostream>
2
3 void SayHello(void)
4 {
5     // Kommentar
6     cout << "Hello_World!" << endl;
7 }
8
9 int main(int argc, char **argv)
10 {
11     SayHello();
12     return 0;

```

## Code 1: 1. Beispiel

Literaturverweise sollten automatisch verwaltet werden, vor allem, wenn es viele Quellenverweise gibt. Beispiele sind [Ko05a], [Ko05b], [MiGo05], [TeGo14], [HuHa07], [HuZi10], [ZiKu07], [He07], [SIE11], [SIE14], [ISO98], [ATM11], [Hu11], [Po10]. Das verwendete Zitierformat (bzw. das Format des Literaturverzeichnisses) ist entsprechend der Vorgaben der Studiengänge zu wählen. Es wird dringend empfohlen, BibTeX zu verwenden (wie in diesem Beispiel).

## 4 Dritte Überschrift der Tiefe 1 (chapter)

**Einstein Albert** **2008**

Figure 3: 3. Beispiel für die Beschriftung eines Buchrückens.

**Einstein Albert** **2008**

Figure 4: 4. Beispiel für die Beschriftung eines Buchrückens.

Table 3: 3. Semesterplan der Lehrveranstaltung „Angewandte Mathematik“.

Datum	Thema	Raum
20.08.2008	Graphentheorie	HS 3.13
01.10.2008	Biomathematik	HS 1.05

Table 4: 4. Semesterplan der Lehrveranstaltung „Angewandte Mathematik“.

Datum	Thema	Raum
20.08.2008	Graphentheorie	HS 3.13
01.10.2008	Biomathematik	HS 1.05

$$x = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - q} \quad (3)$$

$$x = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - q} \quad (4)$$

```

1 #include <iostream>
2
3 void SayHello(void)
4 {
5     // Kommentar
6     cout << "Hello_World!" << endl;
7 }
8
9 int main(int argc, char **argv)
10 {
11     SayHello();
12     return 0;
13 }

```

Code 2: 2. Beispiel

## List of Figures



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# List of Abbreviations

**ABC**    Alphabet

**WWW**    world wide web

**ROFL**    Rolling on floor laughing

## A Anhang A

## B Anhang B