Contents

1 Introduction

2 Theoretical Background

2.1 localization with distances

2.2 distance measurements base on UWB signal

2.2.1 UWB

2.2.2 distance measurements

2.3 KF

2.4 EKF

2.5 Self-Calibrations for Anchor-Nodes

2.6 State of the Art

1. Improvement of hardware

Loop jumper(tag), timing, state machine(loop between nodes)

Sampling rate

Sampling measurement #

4 Measurements

4.1.1 Calibration

Set up

Measurements Distributions

Calibration results

4.1.2 Data Collections

5 Experiments Base on Simulations data

5.1 generating moving trajectories

5.2 choosing Positions of Anchor-Nodes

5.3 EKF without noisy distance data

5.3.1 choosing the right parameter for EKF

5.3.2 different strategies of processing incoming data

5.3.2.1 evenly distributed sampling in time domain

5.3.2.2 uneven distributed sampling in time domain

5.3.3 Results

5.4 EKF with noisy distance data

5.4.1 choosing the right parameter for EKF

5.4.2 Results

5.5 Self-Calibrations for Anchor-Nodes

5.5.1 performance effected factors

5.5.1.1 number of trajectory points and Anchor-Nodes

5.5.1.2 distributions of the Anchor-Nodes and the trajectory

6 Experiments based on measurement data

6.1 EKF with Measurement data

6.1.1 choosing the right parameter for EKF

6.1.2 Results

6.2 Self-Calibrations for Anchor-Nodes

6.2.1 Results

6.3 25ms40Hz

6.3.1 data mitigation