Energy Efficient 2D and 3D Localization in Wireless Sensor Networks using Single Anchor Node

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy
in
(Electronics and Communication Engineering)

by

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June 2021

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Undertaking

I declare that the work presented in this thesis titled "***Energy Efficient 2D and 3D Localization in Wireless Sensor Networks using Single Anchor Node***", submitted to the Department of Electronics and Communication Engineering, **Motilal Nehru National Institute of Technology Allahabad, Prayagraj, India 211004**, for the award of the **Doctor of Philosophy** degree in **Department of Electronics and Communication Engineering**, is my original work. I neither have plagiarized any part of the thesis nor submitted the same work for the award of any other degree anywhere. In case this undertaking is found incorrect, the degree shall be withdrawn unconditionally.

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Certificate

This is to certify that the thesis entitled "**Energy Efficient 2D and 3D Localization in Wireless Sensor Networks using Single Anchor Node**" being submitted by **Prateek Raj Gautam** (registration number: 2016REL01) in the Electronics and Communication Engineering Department, Motilal Nehru National Institute of Technology Allahabad, Prayagraj, India 211004, in fulfillment of the requirement for the award of the Doctor of Philosophy, is a record of bonafide work carried out by him, under my supervision. This work has not been submitted in parts or in full to any other university or institute for the award of any degree or diploma or for any other purpose.

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Acknowledgment

The present doctoral thesis would not be possible without the support, encouragement, and contributions of so many remarkable individuals.

First and foremost, I would like to thank my supervisor **Dr. Arvind Kumar** *(Associate Professor, ECED, MNNIT Allahabad)*. Without his guidance and dedicated involvement in every step throughout the process, this thesis would have never been accomplished. It's an honor and blessing to work under his supervision. I would like to thank you very much for your kind support and understanding. I would like to thank the members of my student research committee **Dr. Y. K. Prajapati** *(ECED, MNNIT Allahabad)*, and **Prof. D. K. Yadav** *(CSED, MNNIT Allahabad)*.

I am also extremely grateful to **Prof. Amit Dhawan** *(HOD ECED, MNNIT)*, **Prof. Rajeev Tripathi** *(Director, MNNIT Allahabad)*, **Dr. Manish Tiwari** *(Convenor DDPC, ECED, MNNIT Allahabad)*, **Prof. Vijay Shankar Tripathi** *(ECED, MNNIT Allahabad)*, and **Dr. Arun Prakash** *(ECED, MNNIT Allahabad)*, for their sincere cooperation and continuous encouragement. I would like to thank the other respected faculty members and staff of ECED MNNIT Allahabad for their support in the fulfillment of the Ph.D. work.

Getting through my thesis required more than academic support, and I have many, many people to thank for listening to and, at times, having to tolerate me in the up and down in this journey. I cannot begin to express my gratitude and appreciation for their friendship. I also appreciate all the contributions from my friends and teammates ***Tarique Rashid***, ***Akshay Verma***, and especially ***Sunil Kumar*** for motivating me from time to time. For many memorable evenings out and in, I must thank everyone above as well as ***Satya Prakash***, ***Pushpender Gupta***, and ***Vikrant Varhney***.

...

Sign

Prateek Raj Gautam

Abstract

Wireless Sensor Networks (WSNs) is a sub-class of wireless Ad-hoc networks where sensor nodes are randomly deployed to gather some specific type of information about physical phenomena such as temperature, pressure, humidity, rainfall, etc. The nodes in an ad-hoc network are small battery-operated devices with limited computational capabilities and transceivers to communicate with nearby nodes and the base station (BS) or a gateway to another network. However, in WSNs, these nodes also have additional sensor/transducer modules to measure some desired physical phenomenons, hence, called sensor nodes or sensors. The lifetime of a WSN can be defined as the functional duration of nodes in WSNs. The lifetime of the network (or nodes in the network) depends on the initially installed battery and power consumption of the nodes. To prolong the lifetime of network operation like routing, sensing, communications protocols are planned differently.

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Contents

List of Figures

MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY
ALLAHABAD (INDIA)
सिद्धिर्भवति कर्मजा

List of Tables

MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY
ALLAHABAD (INDIA)
सिद्धिर्भवति कर्मजा

MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY
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सिद्धिर्भवति कर्मजा

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Chapter 1

How To Use thesisMNNIT class

1.1 REMOVE After Finalizing

to remove this chapter remove comment \printHelp from the template file

1.2 how to compile

It uses biber (insted of bibtex) for bibliography compilation.

It is a six step process and the sequence is

1. pdflatex
2. biber
3. makeindex
4. makeglossaries
5. pdflatex
6. pdflatex

1.2.1 customize texworks

go to texworks edit preferences typesetting processing tools

add makeglossaries to compiler

go to texworks edit preferences typesetting processing tools
click + to add new name makeglossaries browse to texlive bin directory where makeglossaries is located in the parameters add $basename and save

create custom after analyzing other scripts

Use this script to compile on linux or bash shell. similar sequence of commands can be used on windows.

1. pdflatex $1 $2 $3
2. biber $2
3. makeindex -s $2
4. makeglossaries $2
5. pdflatex $1 $2 $3
6. pdflatex $1 $2 $3

here $1 $2 $3 requires in arguments $filename, $basename and $synctexoptions

1.3 \documentclass [Final or Draft]{ thesisMNNIT }

You can use Draft option to compile chapter and bib only, Final option will compile all front matter and backmatter

1.4 to print author

\printAuthorWithSign

\printAuthorSign

\theauthor

1.5 Figure and figure ref

Figure 1.1: mnnitlogo

1.6 Cite and footcite

The Figure 1.1 default [1], [2][1] margins produced by small TEXT normalize TEXT

1.7 make Index list as

\index{Prateek} \index{Raj} \index{Refresh}

1.8 Define glossary and abbreviations

Define abbreviations as below and list will be generated Define definition

[1] 2.

\abbDef{WSN}{Wireless Sensor Network}

Define short form

\abb{Definition}{Short form, ABB, ot term}

Define short form for glosary but do not print

\abbNoPrint{P_t}{Power transmit}

\abbDef{rssi}{received signal strength indicator}

\abb{Wireless Sensor Network}{WSN}

\abb{ABB}{abbreviation}

\abb{P_t}{Power transmit}

results as received signal strength indicator (rssi)

Wireless Sensor Network (WSN)

ABB (abbreviation)

Separate list of symbols with \sym

\sym{Power transmit}{P_t}{pt} Power transmit (P_t)

To print use above defined terms use code as glossary package

\gls{WSN}

\glspl{ABB}

results appear as WSN rssis

List of publications

Journals

1) **P. R. Gautam** *et al.*, "Energy-efficient localization of sensor nodes in WSNs using beacons from rotating directional antenna", *IEEE Transactions on Industrial Informatics*, vol. 15, no. 11, pp. 5827–5836, 2019
DOI: 10.1109/TII.2019.2908437, **Impact Factor:** 9.112

2) **P. R. Gautam** *et al.*, "Energy-efficient localization of sensor nodes in WSNs using single beacon node", *IET Communications*, vol. 14, no. 9, pp. 1459–1466, 2020
DOI: 10.1049/iet-com.2019.1298, **Impact Factor:** 2.1

3) **P. R. Gautam** *et al.*, "Energy-efficient three dimensional localization in WSNs using directional beacons from single anchor node", *IEEE Wireless Communications*, 2021 **Under review**

4) **P. R. Gautam** *et al.*, "Industrial inventory monitoring with 3D localization of sensors in wireless sensor nodes", *IEEE Sensor Journal*, 2021 **Under review**

5) **P. R. Gautam** *et al.*, "Directional antenna design for experimentation in internet of things and wireless sensor networks", *IEEE Antenna and Wireless Propagation Letter*, 2021 **Under review**

Conferences and Book chapters

1) **P. R. Gautam** *et al.*, "Localization of Sensor Nodes in WSNs using Three Dimensional Angle of Arrival detection at BS", in *2019 International Conference on Electrical, Electronics and Computer Engineering (UPCON)*, IEEE, Nov. 2019, pp. 1–4
DOI: 10.1109/UPCON47278.2019.8980262

2) **P. R. Gautam** *et al.*, "Localization of sensor nodes in WSN using area between a node and two beacons", in *Advances in VLSI, Communication, and Signal Processing*, ser. Lecture Notes in Electrical Engineering, Springer, 2020, pp. 221–228
DOI: 10.1007/978-981-32-9775-3_22

3) **P. R. Gautam** *et al.*, "Sensor localization in WSNs using rotating directional - antenna at the base station", in *Advances in VLSI, Communication, and Signal Processing*, ser. Lecture Notes in Electrical Engineering, vol. 683, Springer, 2021, pp. 705–718
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Index

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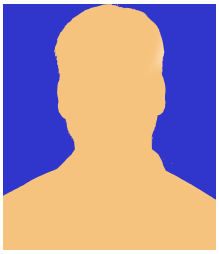
Author biography



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Ph.D. Thesis	Energy Efficient 2D and 3D Localization in Wireless Sensor Networks using Single Anchor Node	Prateek Raj Gautam	JUN 2021

Energy Efficient 2D and 3D Localization in Wireless Sensor Networks using Single Anchor Node

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy
in
(Electronics and Communication Engineering)

by

Prateek Raj Gautam
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June 2021