

IN4316 – Wireless Sensor Networks

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Abstract

Advances in digital circuitry have brought us small computers (nodes) equipped with sensors, a microcontroller, a radio, and a power supply (battery). By networking the nodes a multitude of (monitoring & control) applications can be created. Realizing such wireless sensor networks, however, requires new protocols to manage and overcome the limited resources of individual nodes. In this course we will study the basics of wireless communications and power management, as well as advanced topics appearing in recent research papers.

1 Introduction

The objective of this MSc course is that participants acquire knowledge and understanding of Wireless Sensor Networks (WSNs), in particular, of how the inherent need for energy-efficient operation requires a new approach to distributed computing. Since the research area of WSNs is relatively young, the course adopts a seminar format in which participants have to familiarize themselves with a specific topic and present the state-of-the-art to other participants. As such, a participant is expected to read several papers published in recent conference proceedings and journals, prepare a presentation, and write a short paper documenting his findings and analysis of the selected works and incorporating any feedback from the audience. Anticipating that most MSc students in computer science have a limited background in wireless communication, the course starts off with two standard lectures in which the instructors will highlight the essentials needed for understanding basic WSN research problems and solutions.

2 Schedule

The course consists of seven lectures, featuring the following topics:

Lecture	Topic	Type
1	Introduction Wireless Networking	Class
2	Introduction Sensor Networks	Class
3	Medium Access Control	Seminar
4	Localization	Seminar
5	Routing	Seminar
6	Programming	Seminar
7	Systems	Seminar

See Blackboard for the exact schedule (time, place, location).

3 Requirements

In order to pass the course:

- Students must be present at all seminar-style lectures (3-7), and are expected to contribute to the discussions following each presentation;
- Students must familiarize themselves with each topic by reading two classic articles (see Blackboard for the exact reading list), and hand in a brief, written summary (400-600 words in total) at the start of each seminar lecture;
- Students must select, or will be assigned, a special topic for in-depth treatment. It is the student's task to propose a recent, technical paper that he likes to present in class (please coordinate with other students participating in the same seminar lecture). After the teacher has approved the paper, the student will prepare a Powerpoint presentation (20 min.) conveying the key innovation with respect to the classic works. The slides need to be discussed with the teacher, who will make recommendations for improving the presentation. Then the student will present the paper in class, and lead the discussion following it;
- Students must hand in a final report about their special topic. The report (1500-2000 words, 3-4 pages) should contain the knowledge acquired from reading the state-of-the-art literature. The report should NOT summarize individual papers, but rather present an overall discussion of the relations, commonalities, and differences between them, demonstrating the student's ability to put things into a broader perspective. As a minimum the report should cover all papers presented at the specific seminar and the corresponding classics on the reading list. Illustrations (figures and tables) are highly appreciated;
- Students are to complete a half day, hands-on labwork in which they will be introduced to the Darjeeling VM and requested to write a small program that runs on actual node hardware (i.e. our new 100+ node testbed).

All writing must be in English, and documents must be handed in as PDF files. Students must hand in original work, which means that **it is forbidden to copy&paste complete sentences from other works (papers, wikipedia, etc.) into the summaries and final report**. Violations will be reported to the exam committee according to the department's fraud policy.

4 Deadlines

The presentation must be approved – at the latest – two days before the seminar; please agree upon a preparation schedule with your teacher well before that date.

Topic	Teacher	e-mail
Medium Access Control	Marco Cattani	m.cattani@tudelft.nl
Localization	Venkat Iyer	v.g.iyer@tudelft.nl
Routing	Andreas Loukas	a.loukas@tudelft.nl
Programming	Chayan Sarkar	c.sarkar@tudelft.nl
Systems	Andrei Pruteanu	a.s.pruteanu@tudelft.nl

The final report must be handed in two weeks after your presentation.

5 Grading

Handing in the weekly summaries of the classic papers on the reading list is mandatory to pass this course, as well as completing the Darjeeling labwork. The grade is based on the presentation/discussion (30%) and the final report (70%).