TU/e Connecthor 40

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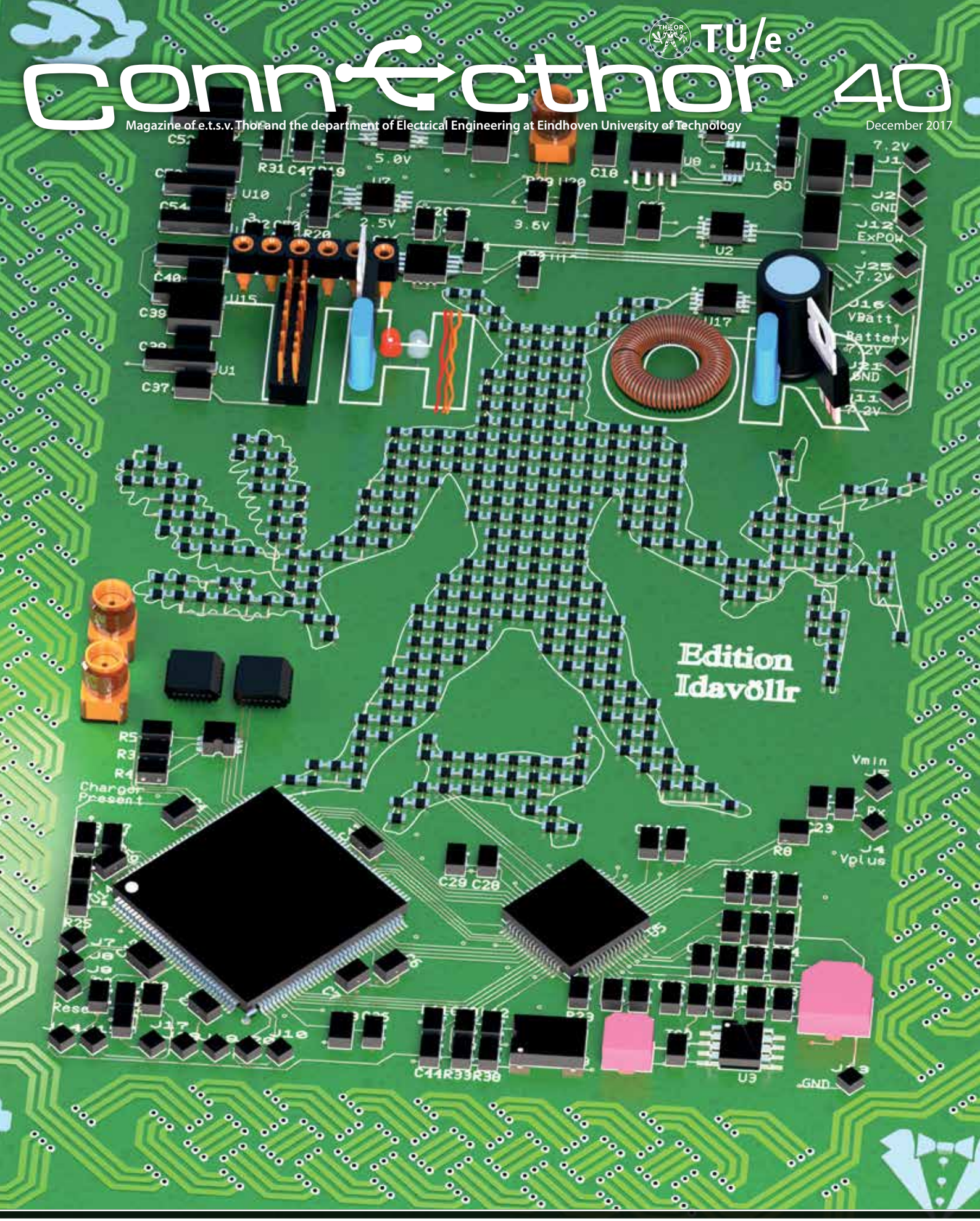
December 2017



Thor **Freshmen** Weekend | **Automotive** v2.0 |
Mythology | Thor **Lustrum** | Internship abroad

Connecthor

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Again a year has gone by so very quickly. Time flies when you are having fun, one would say. This certainly is the case for study association Thor, which is celebrating its 60th anniversary. Sixty student boards running their association with much devotion, hard work and – let's not forget – fun. To mark this special occasion a lot of festivities have been arranged, as you will have noticed by now. We hereby take the opportunity to congratulate study association Thor. We say cheers to many more anniversaries to come.

We are proud to present to you this extra festive looking December edition (please notice the cover, an amazing piece of art, made by Elles Raaijmakers). Within this new edition you will find an article written by Bart Smolders, our dean. It's about the evaluation of the research groups in our department by an international committee of experts. Sjoerd Hulshof wrote about the educational changes in the Automotive program. Rianne Sanders shares her experiences of the Holland Days Tour, a 4-day international study information fair in Bulgaria and Rumania.

Achievements of the scientific staff in our department and their work are represented in different articles. We have a PDEng article by Verónica Marcela Gómez Medina, about her work in a healthcare design project in the Signal Processing group with the title 'Detecting patients' turns, and postures during sleep'. Muhammad Babar, PhD within the Electrical Energy Systems group, wrote an article about his research on Agile Demand Response.

This time five new staff members introduce themselves to you: Alvaro Morales, Apostolos Boukoulos, Herman Groot, Marko Delchev, and Tom Steentjes. Idelfonso Tafur Monroy is re-introduced as he is no stranger to our department.

If you are looking for inspiration for an internship abroad, please have a look at the article by Steven Beumer about his internship in South Africa at the University of Stellenbosch.

We hope you enjoy reading this new edition and your leave from work. We wish you a wonderful and joyous season together with your loved ones. Merry Christmas and a Happy and Healthy New Year.

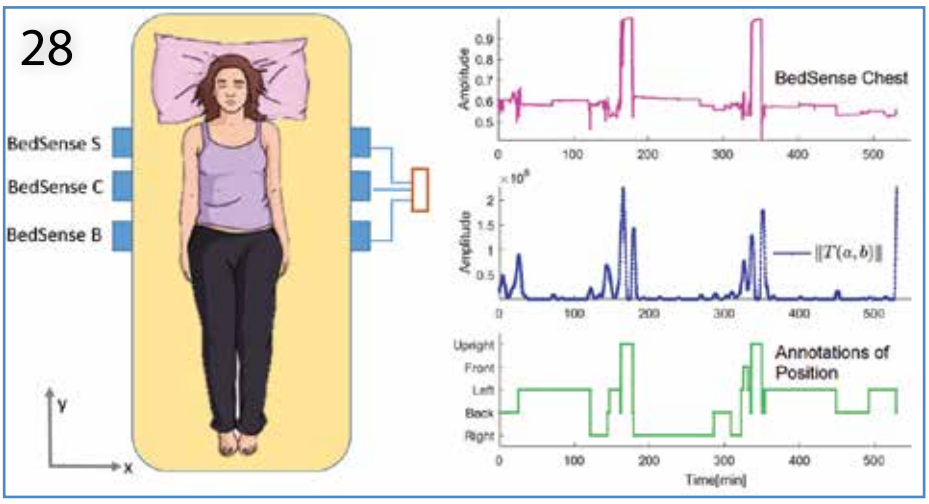
The Connecthor editorial board

P.S.: The Connecthor editorial board has positions open for creative and enthusiastic employees of the Department of Electrical Engineering interested in joining us to make the Connecthor magazine. Up for a new challenge? Please contact us!! As always, we will be glad to receive your suggestions and nominations for the 'vlaai' and ideas for upcoming editions. You can contact us via connecthor@tue.nl. ■

Bulgarian and Romanian students are eager to study in the Netherlands
Find out why the Netherlands attracts these students on page 26

Thor's XXII[th] Lustrum
Thor is already 60 years old, check out the remaining program for the lustrum month on page 14.

Intership Abroad
Still wondering where to go for your internship? You can find a good example on page 32



It's all about PDEng
Verónica Marcela Gómez Medina will tell you her about her experience with PDEng on page 28.

Research assessment of our Department

By: Prof. dr. ir. Bart Smolders

In December 2017, the research groups in our department will be evaluated by an international committee of experts. This assessment is done every six years and the outcome is an important measure of the quality of our research activities. It will also provide valuable feedback for further improvements. The committee will review the period 2010-2016. In this period, we were able to increase the level of research funding by extending the cooperation with industry. Our research centers (CWTe, C3TE, CEETSe and COBRA/IPI) played an important role in this process. Due to the strong growth of the number of students since 2012, we were able to recruit new scientific staff members in the last two years. The good news is that we will be able to grow further in the upcoming years.

In our preparation of the research assessment, we visited the Electrical Engineering (EE) department of the RWTH Aachen University in Germany, together with our colleagues from Delft and Twente. Although the number of first year students in Aachen is significantly higher as compared to our department (600 vs. 270), the number of permanent scientific staff members is much lower in Aachen (30 fte vs. 80 fte). The research at RWTH is organized in chairs operating in institutes. A chair comprises only one full professor, a (part-time) secretary, lab space and a large number of PhD students and some postdocs. The university funds a chair directly and permanently. Teaching (giving lectures) is the duty of a full professor (typically 9 hours per week). The department of EE at RWTH consists of 30 full professors and 350 PhDs. PhDs are responsible for their thesis work, for defining and participating in projects (possibly not directly related to their thesis work), and for support of tutorial lectures, coaching of graduation project and correction of exams. The postdocs also have administrative and educational duties. The main difference between RWTH and TU/e is the absence of assistant (UD) and associate professor (UHD) positions at RWTH. This means that a lot of educational tasks are being done by PhD students and postdocs. As an example, we found out that the professors are hardly involved in coaching graduation students. As a result, the education workload of a typical PhD student in Aachen is much higher than our maximum of 10%. Typically, a PhD in Aachen takes about 5 years before completion. The academic career path in Germany is also different. After completing a PhD, it is expected from future professors to work in an industrial environment for at least 5-10 years. As a result of this, RWTH has strong ties to industry with a lot of direct funding from the industrial partners.

I expect that the outcome of the research assessment will become available by mid-2018. Once available, we will share the results with you all, so that you can discuss the outcome in your research group.

Bart Smolders

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From the President

By: Laurens Kok

So this is it, the start of my year as President of e.t.s.v. Thor and with that my first "From the President". I am glad my Board and I have gotten the chance to be the Board in this really challenging but extremely exciting year. Thor is, just as the entire department of Electrical Engineering, growing quite quickly, not only in total members but also in the number of active members. From our 240 first-year students, 32 have become enthusiastic about Thor and joined our freshman committee, Ivaldi. We will offer them the opportunity to organize events like a parent day, a party or anything else they would like.

Furthermore, as you are reading this, our Lustrum month has just started. This month will be full of fun and interesting activities, like our pie reception on the 28th of November and our symposium about smart grids on the 6th of December.

I recently was pointed to an article in the Slash (the corporate magazine of the TU/e) which was written by professor Bart Smolders, our dean. He said that he is happy with the work Thor does, but he thinks that the workload should be lower so the Board members have the opportunity to obtain more ECTS. However, this year sixteen people were interested in becoming the next Board. Therefor I think finding enthusiastic Board members has not been a problem for quite some time.

What is often forgotten is how incredibly much you learn in a Board year as a Board member. Whereas Professor Smolders overcame his shyness as a DJ in his drive-in disco, I have learned to speak to groups at Thor. I have learned how to lead and prepare meetings for a Board, I have learned ways to remain up to date of what is happening in my association, I have learned how to negotiate with my fellow chairmen to get the best outcome for the EE and AU students, I have learned how to manage my Board and how to handle all kinds of different personalities. This list continues, and as I am writing this I have only been President for a couple of weeks, so imagine how long this list will be next year, when my year has finished.

We can apply these skills for the better of Thor, to help the association to get to higher levels. In the same fashion as Professor Smolders has sky-high ambitions in the field of wireless networks, we have sky-high ambitions for our study association. Thor will keep providing a lot of opportunities for students, but a lot of work is required from our Board members to do that. This year, with eight Board members, my Board is able to pick up tasks that previous Boards had no time for. We are able to start new projects that will improve the atmosphere and connection within Thor. We will make sure that Thor is ready for a continued growth of our department.

So in conclusion, professor Smolders has a point. Being a Board member does indeed mean that your studies get delayed for a year. However, as a Board member you obtain priceless skills, skills you do not learn in a two hour long professional skills class or in Engineering Design. Now I don't want to say that without a Board year your chances on the labor market are bad, there are of course plenty of other opportunities to obtain these skills. I just want to help you understand why there are eight people in Flux 6.184 who sacrifice a year in the interest of the students at our department.

Veel gedonder!
Laurens Kok
President of Thor ■

Information days – October 20 and 21, 2017

The first Information days of this year were again fully booked and thus successful. Because of the new furniture which couldn't be removed from the Auditorium, the booths of the different majors were more widely spread. This time the Senaatzaal was used to house a few too. Electrical Engineering and Automotive stood in front of the Blauwe Zaal where we had a lot of room to show our demos and to talk to people about our programs.

The in-depth programs in Flux were well-visited too.

Honorary Membership of the Hungarian Academy of Sciences awarded to prof. Paul van den Hof

The Hungarian Academy of Sciences has awarded an honorary membership to prof. Paul van den Hof (EE-CS), for his research on system identification (data-driven modelling) of dynamical systems. For this prestigious award, every three years only one candidate can be nominated in the field of engineering sciences. On October 2, after his inauguration speech in Budapest, the diploma related to this honorary membership was handed over to him by prof. László Kollár, President of the Section Engineering Sciences of the Academy.

Goodbye Jeroen

As of the September 2014 issue, Jeroen van Oorschot has been a very active member of the Connecthor team as one of our layout editors. After three years of hard work, Jeroen has decided to step down from the board. We thank him for his ongoing dedication to help make our Connecthor successful.

Appointment Idelfonso Tafur Monroy

As of July 1, 2017, dr.ir. Idelfonso Tafur Monroy has been appointed professor 'Terahertz Photonic Systems' for 0.2 fte within Electro-Optical Communications (ECO) and for 0.8 fte within Integrated Photonics Institute (IPI).

Congratulations!

Appointment Pieter Harpe

On July 1, 2017 dr.ir. P.J.A. (Pieter) Harpe has been appointed Associate Professor within the MsM group. Congratulations!

Webinar month 2017

The month November has been chosen as the webinar month to present our bachelor's and master's degree programs to the world. On November 6, Sjoerd Hulshof and Anouk Hubrechsen informed listeners from all over the world about the Electrical Engineering bachelor program. An hour later it was Chigo Okonkwo and Sjoerd van der Heide's turn to inform a new group of listeners about our master's degree program. The next day, Gijs Dubbelman and Quinten Oostvogel gave a presentation on the Automotive bachelor's degree program. The recorded webinars can be watched here: https://www.tue.nl/en/education/study-information-activities/tue-webinars/

EE poster awards 2017

The EE Poster Contest 2017 on 10 October 2017, was a great success with a record number of 48 submissions.

The winners of this contest were Koen Bastiaens (Automotive), Sjef Settels (Smart & Sustainable Society), Cheng Li (The Connected World), and Rogier Wildeboer (Care & Cure).

Miccai 2017 Endovis challenge

The VCA research group, through Farhad Ghazvinian Zanjani and Joost van der Putten, has won third prize (100 euro) at the MICCAI 2017 EndoVis Challenge in the Angiodysplasia Detection and Localization category.

Appointment Marion Matters

As of July 1, 2017, dr. Marion Matters-Kammerer has been appointed professor "Millimeter wave to THz: Electronic circuit and system design" within the MsM (Mixed-Signal Microelectronics) group. Congratulations!

Appointment Nico Baken

As of the September 1th, Nico Baken has been appointed professor in the area of 'Multidisciplinary telecommunication technology and applications' within our research group ECO.

Graduates September and October

Graduates MSc. Electrical Engineering – September 5, 2017

Groot, H.G.J. (Herman)
Heide, S.P. van der (Sjoerd)
Li, Y. (Yue)
Taalman, E.P. (Elise)
Boddaert, M. (Mathijs)
Hoseini, E. (Ehsan)
Ngo, M.P. (Minh Phuong)
Roos, M.H. (Martijn)
Pavesi, M. (Marco)
Şahin, Ozan
Bagus, Christiandha
Hilal Tawab, Taufiq

Congratulations!

Graduates MSc. Electrical Engineering - September 5, 2017

Donkers, A.A.J. (Antwan)
Drabbe, M.C.M. (Marco
Jongen, M.H. (Martinus Hubertina)
Roebroek, J.J.M (Jozef Johannes Margaretha)
Zavala Mondragon, L.A. (Luis Albert)
Elenes Uriarte, J. (Julian)
Jin, W. (Wei)
Kaul, P. (Piyush)
Li, Z. (Zheyi)
Platsikoudis, C. (Christos)
Yu, L. (Lifeng)
Srinivas, D. (Deepthi)
Zhou, M. (Meiyi)
Diesveld, K.H.T. (Koen)
Fu, Q. (Qinyi)
Hanenberg, S.J.M. van den (Stephan)
Schulpen, R. (Robbert)

Congratulations!

Graduates MSc. Electrical Engineering - October 31, 2017

Şenöz, İ. (İsmail)
Stoevelaar, L.P. (Lajos Pjotr)
Reniers, S.F.G. (Sander)
Ding, B. (Beijing)
Huang, Y. (Yizhou)
Xu, Y. (Yu)
Min, X (Xiaowen)
Wang, C (Chu)
Zhai, R. (Rongpeng)
Xue, S. (Shuang)
Boeijkens, D.A.G. (Daniel)
Meurs, T.B. (Thomas)
Anrooij, P. van (Peter)
Ludlage, B.J.T. (Bernard)
Eerdewijk, R. van (Robert)

Congratulations!

Automotive v2.0

By: Sjoerd Hulshof

In 2011 our department started the bachelor program Automotive, which was presented as a track within the Electrical Engineering program. At that time, the Bachelor College had not yet been implemented, so the department had a lot of freedom in designing the program from scratch while maintaining the learning goals of a bachelor program in Electrical Engineering. Furthermore, one of the main arguments to have the Automotive program under the wings of Electrical Engineering was the fact that nowadays a car is more or less an iPad on wheels; cars are intelligent high-tech systems. The main idea has therefore always been to offer an automotive program from an electrical engineering point of view.

The 2011 program was in fact a nicely balanced program, where the main aspects of electrical engineering, mechanical engineering, software architecture and human-machine interaction were all represented, together with a number of integrating DBL (Design-Based Learning) projects. Of course there were some minor issues you will always have when starting a new curriculum, but the main challenge was to attract students for this new program. That year we started with 30 students.

Meanwhile, preparations for the Bachelor College had been started already, as all bachelor programs within TU/e had to start in the new structure in September 2012. The first substantial changes for our Automotive program were a fact.

During these first years, the drop-out rates of our students in the first year were not satisfactory: above 30% and not stable (see figure 1a). The funny thing is, fifteen years ago we wouldn't have cared at all (after all, a drop-out rate of 50% was more or less considered as a constant of nature), but we had already proved that we could reduce the drop-out rate for Electrical Engineering students to a percentage below 30 (see figure 1a). Most important however is the fact that drop-out rates of 50% are no longer acceptable nowadays. Of course we will always have students who drop out due to the choice of a wrong studies or because they are better off at a university of applied sciences (HBO), but this cannot be half of the students. Fortunately, on the other hand the influx of students increased slowly but surely. While we only started with 30 students in 2011, the influx of students has increased to 100 in 2017 (see figure 1b). The drop-out rates still fluctuates around 40% in the first year however, and that is not acceptable in my opinion.

Figure 1b: influx numbers from 2012 and on; the 2017 numbers are still a prognosis

So, along with my appointment as program director of our BSc programs in Electrical Engineering and Automotive back in March 2016, my main challenge was to come up with a renewed/updated curriculum for our Automotive students. Goals for this challenge were 1) A more coherent program where the car is still the major topic of discussion and 2) maintain the influx of at least 90 students yearly and reduce the drop-out rate significantly (<25%). This led to the introduction of a renewed first year which already started last September. Last October, the Education Committee (OC) has given a positive advice for the remaining two years of the new program.

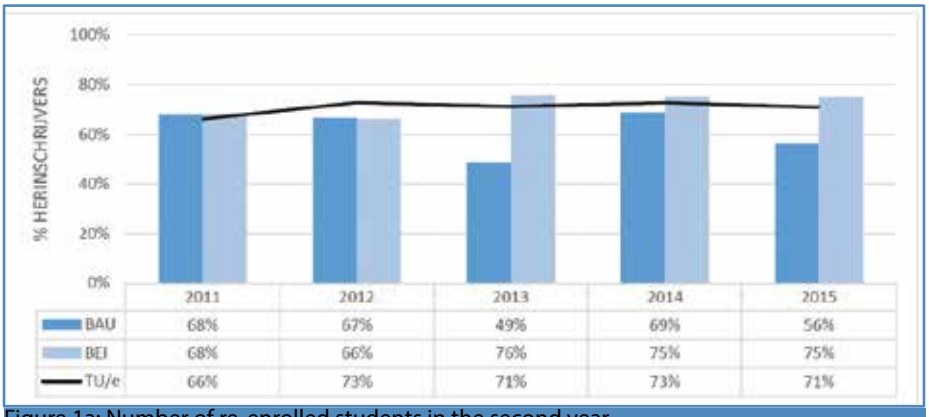


Figure 1a: Number of re-enrolled students in the second year

Our new program is shown in figure 2. What we have tried to accomplish is to make the four main pillars in automotive technology (Autonomous driving, Vehicle mechanics & dynamics, Power trains and Software architecture) clearly visible in the program, while maintaining the basic elements of Electrical Engineering (circuits, signals, systems, programming, computer architecture and electromagnetics). Furthermore, an advanced integrating DBL project has been added in the third year. As can be seen in the curriculum, there is only limited space (95 credits) for major courses. Therefore, specific choices with respect to content have to be made. This has had the consequence that there are no longer major courses about human-machine interaction. Also, traffic models (part of the former course Automobility) are not covered by the

Automotive major anymore. Fortunately, these topics can still be chosen in the elective space: a USE track 'Future of Mobility' is chosen by the majority of Automotive students. Furthermore, another coherent package called 'Smart Mobility Design' is quite interesting in this context.

Finally, an updated program also recalls the discussion about the most suitable name for this major. The suggestion for this name as done by the curriculum workgroup has been enthusiastically welcomed by the Education Committee and has been approved accordingly by the Departmental Board. From now on, the bachelor program will be called Automotive Technology, just like the connecting Master program as offered by the Department of Mechanical Engineering.

I am convinced that we will keep more enthusiastic students within our renewed program. The first positive sounds have already reached us via the new course 'Spectrum of Automotive', where all four main pillars in Automotive Technology are introduced to our first year students. ■

Calculus	Applied Natural Sciences	Data Engineering	USE Basis
Computation I	Signals I	Dynamics	Systems
Spectrum of Automotive	Elective	Math I	Elective
Design	Fundamentals of Electronics	Power Electronics	Sensing, Computing & Actuating
Electromagnetics I	Electromechanics	Power Trains (incl. Combustion Engines)	Vehicle Dynamics
Elective/USE	Elective/USE	Elective/USE	Elective/USE
Vehicle Networking	Automotive Software Engineering	BEP	BEP2
Control Systems	DBL in Automotive Technology	Elective	Elective/BEP Extension
Elective/USE	Elective/USE	Elective/USE	Elective/USE

Figure 2: Update program BSc Automotive Technology

BEP and Master Marketplaces

By: Jeroen van Oorschot and Frank Boerman

Every student who did the bachelor project last year, or just started a master in Electrical Engineering will have seen a new administration system. These BEP and master marketplaces are introduced to help students and staff with better overviews and administration.

Little more than a year ago, the idea started to make the Bachelor Final Projects (BEP) more future-proof and efficient. The main drive for this was the massive growth of students in Electrical Engineering which makes change necessary. Plans were made to make a website to exhibit all BEP projects for students. Instead of many different pdf and word files, the website would force the project proposals in a specific format, to be filled in by staff members. This system was approved by the department board, and soon after that we could start building the system.

The first year was a pilot year, and new features were added and improved on demand. It started with a simple project marketplace. A little later, students could apply to projects and around Christmas the possibility was added to automatically distribute the students that had applied to projects to the projects of their choice. While the BEP projects started, the system kept expanding. First the option to hand in professional skills documents was added, and later the semi-automatic planning of the presentations. At the end of the year the pilot was evaluated, and everyone was very enthusiastic. The BEP Marketplace will thus probably stay around for the coming years.

While the BEP Marketplace is still being improved and maintained, another project has started. This time with focus on the master. This master marketplace has a similar task, but then for internship and graduation projects. Some capacity groups already have a kind of marketplace for their projects, and some do everything manually. This new website system aims to unify the master projects exhibitions and provide a single unified interface to students of the whole department. This will make the administration of the master easier and more resilient for the future.

Because these systems are becoming bigger and better every day, we decided to create our own spin-off company to streamline the maintenance and development of these systems.

All in all it was, and still is, a lot of fun to design and implement these systems and to see the positive effect that it can have on our department. ■

Introducing...

Hello everyone! My name is Alvaro Morales and I am 25 years old. I am from León, a small town in the northwest of Spain. I received my BSc and MSc degrees in Telecommunications Engineering from the University of Valladolid, also in Spain. During my MSc program, I pursued my master thesis as an exchange student at the Technical University of Denmark (DTU). I enjoyed my research in Copenhagen so much that I decided to continue working at DTU as a research assistant.

Afterwards, I had the opportunity to start my PhD project on beam steering techniques at millimeter wave and sub-terahertz frequencies for wireless communications. My research is part of a European project, called CELTA, where there are eleven European institutions involved. This summer, the project coordination was transferred to TU/e. I also decided to move to Eindhoven to continue my work at the Electrical Engineering department.

In my spare time I like playing and watching sports including soccer, basketball and handball. I also like travelling, I think that it is a wonderful way of getting to know new people and discovering different cultures. One of my newest hobbies is dancing, in particular Latin styles like Cuban Salsa or Bachata. I look forward to meeting a lot of new people at TU/e during the following years! ■

Hallo allemaal! Hello lovely people of TU Eindhoven! My name is Apostolos Bouloukos and I am from Greece. My hometown, called Glyfada, is located in the southern suburbs of Athens, the capital city of Greece. After receiving my M.Eng. degree in Electrical and Computer Engineering from University of Patras in Greece, I decided to move to the Netherlands for my postgraduate studies at Eindhoven University of Technology in the field of Sustainable Energy Technology.

During the SET MSc program, I followed the specialization of Electromechanics and Power Electronics (EPE) Research Group within the Electrical Engineering department. My last year as a graduate student of the EPE Group, I had the opportunity to transfer for nine months to the north of the Netherlands and specifically in the beautiful city of Groningen.

There, I worked on the completion of my graduation project "Modeling and Loss Performance Analysis of a 50kW Isolated AC/AC Shore Power Converter" at the company Eekels Technology B.V. Last June I returned to Eindhoven to join the Electromechanics and Power Electronics Group, where I am currently working as a researcher.

In my spare time, I love cooking, listening to music and watching cinema movies with my friends. As far as my outdoor hobbies are concerned, I run and recently I started crossfit. I am looking forward to meet you all. See you around! ■

Hello everyone! My name is Herman Groot, and I have recently started as a PhD. When I grew up in Amstelveen, I had no idea that I would end up at the position where I am at right now. But then again, that is probably the case for most of us.

As I grew older, I started to discover the beauty of electricity, its magic and hence the endless opportunities that Electrical Engineering has to offer. Long stories short, I wound up here at the TU/e and before I knew it, I received my Electrical Engineering BSc degree and I had to decide my specialization topic. At that time, I realized that space exploration has always fascinated me, but that none of the standard Master tracks has any focus on this. Eventually, I was introduced to the Image Processing expertise and realized that this could nicely combine the EE and Aerospace fields, and also really interests me. As such, I graduated in Image Processing, while widening my EE Master by doing elective courses related to Space Engineering at the TU Delft. Long before I finished my graduation project, Prof. de With offered me a position as PhD within the VCA research group. As I really enjoyed my time here at the TU/e and because of the limited number of space exploration opportunities, I found that starting a PhD would be beneficial. As of mid-August, I am working on re-identifying people as they walk from one surveillance camera to another, which is still a really challenging topic. ■

My name is Tom Steentjes. I live in Tilburg, a city west of Eindhoven, where I was born in 1993. After finishing high school, I started at TU/e in 2011. I received my BSc degree in Electrical Engineering (Automotive) in 2014, from the department of Electrical Engineering. In 2016, I completed the Systems and Control Master's program at the TU/e. I performed both my internship and MSc thesis at the Control Systems group, under supervision of dr. Alina Doban and dr. Mircea Lazar. During my internship and MSc thesis, I studied the stability and stabilization of nonlinear systems, with an extension to practical applications in the latter.

I recently started as a PhD student in the Control Systems group, working on quite a different topic. I am involved in the ERC project on system identification in dynamical networks, by prof.dr.ir. Paul van den Hof.

In my spare time, I like to collect and repair vintage objects. I have two old mopeds, a Puch from 1956 and a Tomos from 1967. I have also had several old cars, among which a few DAFs, Volkswagens, a Triumph Spitfire and I own my fifth Volvo now.

I am looking forward to continue at the TU/e for the next four years! ■

Hello everyone! My name is Marko Delchev and I am 27 years old. I was born and raised in the capital of the Republic of Macedonia, Skopje. My profound interest in electrical engineering has provided me with a focus in my life that many people search for a lifetime but never find it.

After receiving my BSc diploma from Ss. Cyril and Methodius in Skopje, I was more motivated to learn more about energy efficiency and thus I enrolled to a Master program in the same university within the Electrical Machines and Automation Chair. My master thesis is related to vector control of permanent magnet machines with higher energy efficiency. In addition, I also participated in a project from EU for Nearly Zero Energy Efficiency Buildings (NZEB).

From professional aspect I had a full time position for one and a half year as electromagnetic motor designer for synchronous and induction high speed machines in a German company.

Recently I've moved to Eindhoven to join EPE group as a PDEng trainee, since the Netherlands is one of few world leader countries in education and technology and is most certainly the place where I can best apply my talents to reach my full potential.

Even with an incredible passion pursuing my interests, I cannot imagine being interested in only one thing in my entire life. During my university studies, I became increasingly fascinated by various fields. In terms of sports, I enthusiastically took part in each event I could find myself in, such as running, hiking and swimming. In my free time I like to watch football matches, snooker and movies. My favorite series is "Friends", and indeed I like making new friends and hearing successfully stories of their life. ■

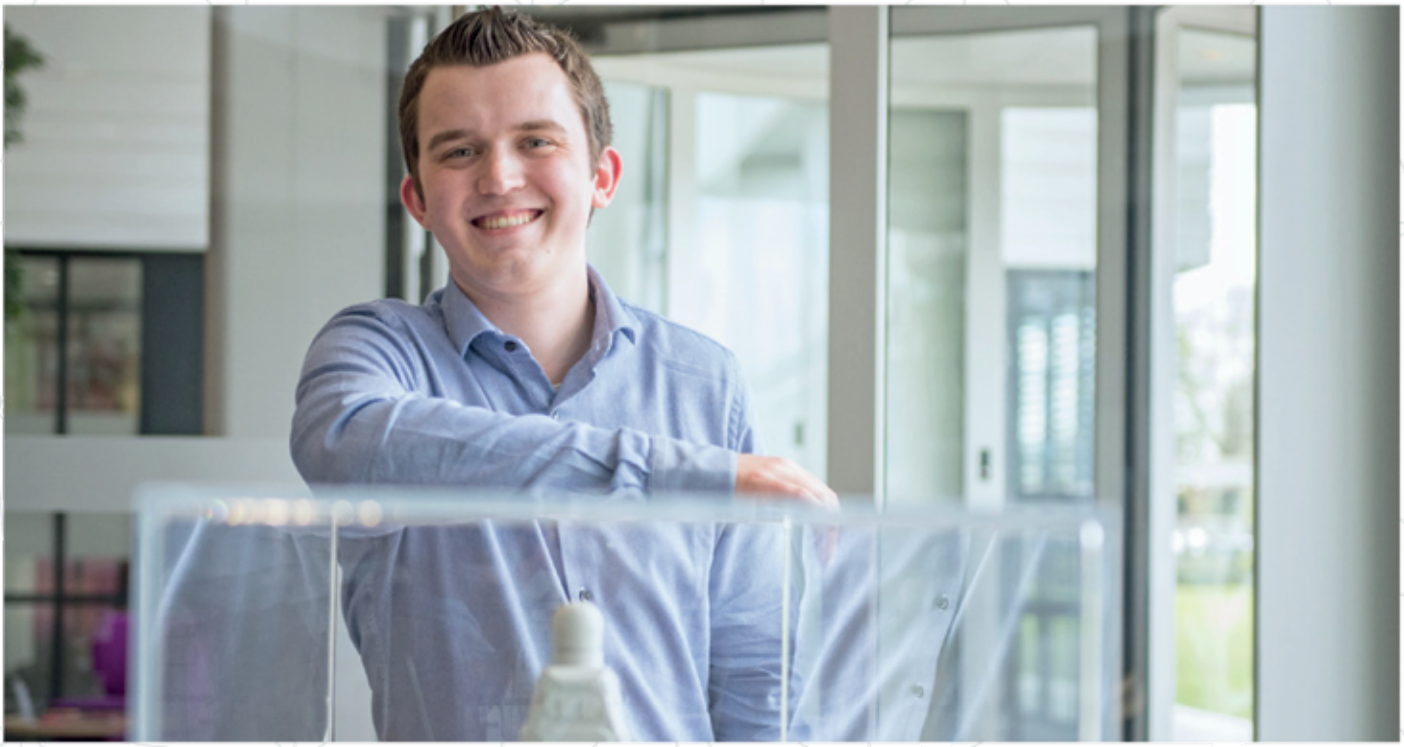
Idelfonso Tafur Monroy returns to the Department of Electrical Engineering after having worked at the Danmarks Tekniske Universitet (DTU) for more than ten years. He obtained his PhD degree in Eindhoven in 1999, for which Djan Khoe and Huug de Waardt were promotor and co-promotor respectively. Afterwards he worked as an assistant professor in the field of Optical Wireless Technology. He continued that in Denmark, and now he has returned to Eindhoven, to be professor in the ECO group for one day a week, and to be technical director of the Photonic Integration Technology Center (PITC) for the rest of the time.

The most remarkable difference between now and back then? The number of students! Idelfonso remembers the small groups he taught in his course on Optical Communication Networks, and this is a huge difference with the situation now – many students all over the faculty and the campus. He is very pleased with this development, as he also is with the new Flux building and all its new facilities.

Idelfonso's engineering heart lies in building systems, also as a figure of speech. In the PITC he is going to build bridges from research to industry on the level of photonic systems. These systems involve THz research, for which he will connect to the work of Marion Matters and Jaime Gómez Rivas. For security topics, there will also be cooperation with the Department of Applied Physics, to obtain European funding for quantum-security research.

A more tangible part of his work will be in the Smart Cities project, where a new village is being built in Brandevoort (Helmond). Tests will be carried out at the TU/e-campus, using the light of light posts as 5G infrastructure – quantum-enabled if Idelfonso has his say.

Although Idelfonso is a traveler, with a multi-national career and a hobby in visiting cities all over the world, he has settled as a Vugtenaar, where he is living now for almost 20 years, and all through his Denmark years as well. ■



Pak **jouw kans** bij Thales

"Hallo, mijn naam is Colin Heppener. Ik ben 20 jaar oud. Ik ben derdejaarsstudent Informatica aan de Haagse Hogeschool. Ik heb net mijn stage bij Thales afgerond. Ik kende Thales niet, maar toen ik op het HBO-i-job evenement in Rotterdam was, kwam ik in gesprek met ze en toen ik hoorde dat ze zich bezig houden met allerlei gave technologie voor onder andere de Koninklijke Marine werd ik steeds enthousiaster. Ik stuurde daarom een open sollicitatie en kreeg al snel een reactie terug met een aantal mogelijke stageopdrachten.

HIGH TECH CAMPUS

Ik ben in november gestart op de afdeling Application System Engineering bij Thales op de vestiging in Hengelo. Ik had weinig van de stad Hengelo verwacht, maar ook door de omgeving werd ik verrast. Thales is gevestigd op een campusterrein met allerlei high tech bedrijven en heeft zelfs een eigen Starbucks. Van Thales kreeg ik naast een stagevergoeding ook een vergoeding voor mijn huurkosten, daardoor reisde ik enkel nog in de weekenden naar huis.

VEEL ANDERE STAGIAIRES

Ik werd goed ontvangen door de afdeling en voorgesteld aan veel andere stagiairs. Bij Thales hebben ze zo'n 150 studenten per jaar die stage lopen en afstuderen. Ze hebben ook hun eigen studentenvereniging die allerlei activiteiten organiseert. Heel leuk om zo andere studenten te leren kennen en te horen wat er bij verschillende vestigingen en afdelingen gebeurt. In de stageopdracht die ik heb gekozen zorg ik voor de uitbreiding van een bestaande game genaamd Naval Robocode. Het is een game waar het gedrag van een schip geprogrammeerd wordt om het vervolgens op te nemen in een missie tegen andere schepen. Het doel van de game is om zowel met de Java-taal te oefenen als strategische beslissingen te nemen. Ik mocht nadenken over extra functionaliteiten in de game, dus het was een vrij open opdracht. Ik koos ervoor om missiles toe te voegen aan boord van de schepen. Daarvoor moest ik eerst een aantal nieuwe dingen in Java onder de knie zien te krijgen, voordat ik kon starten met bouwen. Toen ik dat eenmaal onder de knie had, begon voor mij het leukste gedeelte van de opdracht: het visueel programmeren middels blokken slepen in plaats van code tikken.

MIJN EIGEN STUDENTENCOMPETITIE

Elke twee weken presenteerde ik de voortgang aan de afdeling en toen we zagen dat de game een volwassen niveau had bereikt hebben we een competitie georganiseerd onder de Thales collega's. We hebben een avond georganiseerd waarin ruim twintig collega's op zogenaamde mocks meespeelden. Het eerste uur waren we nog druk met programmeren, het tweede uur met gamen, daarna nog met het maken van aanpassingen en in de laatste ronde speelden we de game in het Thales klanten democentrum; een ruimte waarin de combat management ruimte van een schip is nagebouwd. De collega's reageerden enorm enthousiast op de game en inmiddels is besloten om de game met mijn uitbreiding later dit jaar als competitie aan studenten aan te bieden!

GOEIE BEGELEIDING

Op mijn afdeling werd ik heel serieus betrokken bij alles wat er speelde en doordat er met een Scrum methode wordt gewerkt krijg je een goed beeld van waar collega's op een system engineering afdeling zich allemaal mee bezig houden. De sfeer was trouwens heel informeel, alle collega's namen de tijd voor me om dingen uit te leggen en ik kreeg de ruimte om mezelf te zijn. Het was voor mij absoluut de moeite waard om naar de andere kant van het land te reizen. Bovendien is Nederland eigenlijk ook weer niet zo groot. Ik ga nu weer even aan de slag met mijn studie, maar zodra ik mijn papiertje heb gehaald ga ik zeker kijken of ik mijn eerste baan bij Thales kan scoren."

EN NU JIJ

Wil je ook stage lopen bij Thales of ben je op zoek naar je eerste baan? Kijk dan snel op **www.thalescareers.nl!**

THALES

Prodrive excursion

By: Christopher Smaak

Prodrive, maybe you have already heard of this name before. For many of us freshmen, however, this name will not instantly ring a bell. One of the reasons for this could very well be that the company has just recently been transitioning into a huge expansion. Later on, this will be discussed in further detail. Thanks to our study association we got the chance to take a look behind the scenes at the headquarters of these innovators.

At Prodrive they value a very unique philosophy compared to other companies. Firstly, they do not believe in hierarchy in the workplace. Every employee is responsible for their own part of a particular project and is effectively their own boss. Secondly, the products that this company delivers differ from most other companies. The reason for this is that they do not just focus on one part of the process. When a customer contacts them with a certain wish for a product, Prodrive will make sure that the design, all of the individual parts and the maintenance is taken care of. This all happens in-house as close as possible to where the final product is needed.

"But what kind of products are you talking about?" I can already hear you wondering. Mostly these products appeal to a vast number of us, as future engineers. For example MRI scanners (and further advancements in this field) and new solutions within the automotive industry. The latter is mainly the reason for the amazing growth the company is now experiencing. Currently they are busy working on quite a big project which concerns wireless charging of electric cars. When they manage to finish this technology, the number of implementations is unlimited. It could for example be implemented into parking lots. Imagine doing the groceries and charging your car at the same time, sounds great right?

The tour and presentation we attended were very neatly executed. They provided quite a lot of information through these means. During the presentation we learned about the company and her ideals. During the tour we could see most of the equipment up close and even see many of them in action. The employees were working on their projects as we proceeded with the tour, this provided the unique chance to witness the way they use

all of the equipment and also what kind of products they could produce with a particular piece of machinery. Many of the machines produce PCBs, others solder chips on PCBs by employing various techniques, depending on the chip size. There is also a room which is completely closed off from radiation of any kind (this means: no cellular connection either!). This is where many pieces of equipment are tested.

In short, the tour and presentation really gave a great insight of a company which could very well be your workplace in a few years' time. This company is absolutely a stayer and I am certain we will hear so much more about them in the future! ■

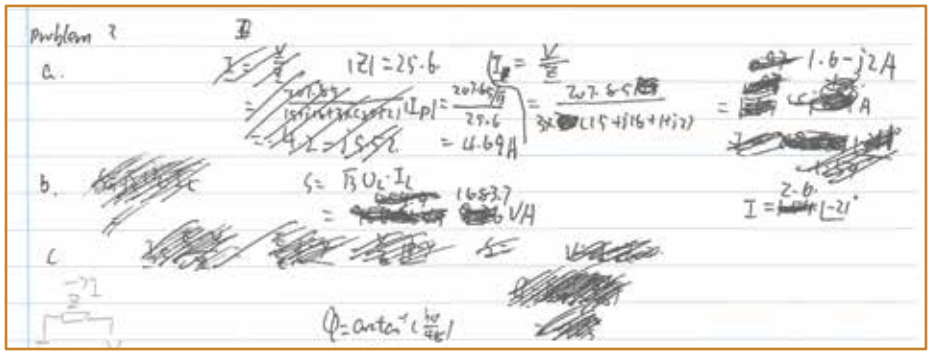
Remarkable examination work

By: Jan Vleeshouwers

Examination work is a source of unused potential, insights and humor, currently only available to the privileged staff reviewing the work. This series shares some of the most remarkable work, with permission of the authors of the work.

Sometimes a problem given during an examination remains a problem, although it looks as if a student answered it. This is an example from an examination of the bachelor course on Power Engineering, given by Guus Pemen.

This answer actually consists of six parts. If you don't believe it, take a close look. There are results for an impedance, three currents, a power and an angle. All calculated to at least three digits of precision.The mutual relationship between the six results is unclear, and that also pertains to the small drawing in pencil, which looks as if it ended up in section c of the problem by accident. None of the calculations seem to have any relationship with the quantities in the drawing.



At closer inspection, that appears not to be completely true. The more lightly crossed-out equations in section c show these same quantities: E, V, Z and I. Those crossed-out parts are remarkable, aren't they? They take up more than half of the writing, and range from lightly hatched to almost completely blacked out. The impression they make is unmistakable: Ector was very uncertain of how to answer the questions, and at the same time pressed for answering, perhaps impulsive but more likely because he felt time was not on his side in the exam.

Did Ector get back to Guus Pemen after the exam, to get feedback on his work? "I don't remember exactly, but I don't think so.", says Guus, "It is quite uncommon for students to check their examination work, although it is such a good source for feedback and for improvement."

An opportunity crossed out, if you ask me. ■

Thor's 12th Lustrum

By: Elwin Hameleers

Thor turned 60

Thor turned 60 on November 28 2017, and this is celebrated with a Lustrum month. You, the reader, might have already noticed some of it in the past two weeks. Although this article is written before the Lustrum started I, the Chairman of the Lustrum Committee, am very sure the Lustrum month was and will be a great success! This month full of festivities started on November 27 with a Stunt. Through augmented reality Mario Kart, everyone passing through the Markthal could race his or her friends. Someone even won a grand prize on Wednesday November 29! The anniversary month of Thor was officially opened on November 28 by treating everyone with cake (or 'vlaai' in Dutch). On December 6, a Symposium on Smart Grids was organized in honor of the 60 anniversary of the study association for Electrical Engineering. During this symposium different subtopics concerning integrating sustainable renewable energy, the control of such systems and power electronics related to smart grids were discussed. Furthermore, a lunch lecture, a workshop, a cantus and more were organized and a great success! Luckily, more activities are coming in the next weeks until the Christmas break! Keep checking the Thor website (thor.edu) to remain updated on all the activities. ■

Seriously interesting: Lunch Lecture

A Lustrum is the ideal moment to ask different companies to come to the university to tell Electrical Engineering and Automotive students (maybe their future employees) about their company. In total, Arcadis, Cisco, and Ellips will come to Flux. Arcadis, for example, is a Dutch Design & Consultancy firm that is working on infrastructure, built environment, and much more. Join us for a lunch lecture by Arcadis, where the speaker will talk about a project he is currently working on. In this project he is working on contributing to the development of the Suez Canal area. Next to the Arcadis lunch lecture, Cisco will also come to Flux to talk about their involvement in the 'Internet of Things' developments. Internet of Things is the network of different devices and applications all connected to a network so they can exchange data. Cisco will tell participants all about Internet of Things. ■

Birthday Party

When it's your birthday, you should give a party! On Wednesday December 13, the Lustrum will be properly celebrated with a Lustrum Party! Het Walhalla will be equipped with a stage where a DJ and a live band will perform. Furthermore, the party will continue in Het Walhalla until midnight. There will be lights, entertainment and food to celebrate the 12 Lustrum of Thor. To be sure the party will be one to never forget, Thor will provide one keg of beer every hour from 17:00h onwards! Come to Het Walhalla from 16:30h onwards and enjoy yourself! ■

Christmas Party

It's almost Christmas time! Santa is coming to Eindhoven and he brought his reindeers and Christmas beers! On Thursday December 21st, Thor, Van der Waals and IEEE SBE will organize a Christmas party combining the two bars of Thor and Van der Waals. The Tappers and Borreltenders will be tending to your thirsty needs in Het Walhalla and the 'Salon' to make it possible to discuss 2017 with your fellow students, or with employees of the Electrical Engineering department. Or maybe look forward to 2018. Both employees of the Electrical Engineering department and students are invited. Everyone is welcome to attend this drink, where our department bars are transformed to the ideal location to hold a Christmas party! ■

To Winter Wonderland

Every student deserves a truly relaxing getaway. The Lustrum Committee invites all Thor members to join them in an enchanting winter full of sparkling little lights, ice fun and warming bonfires in the winter Efteling. There the Thor members who give that little extra for the study association will enjoy the many attractions in the wintry landscape in the World of Wonders. After visiting the Efteling, all participants can go to Het Walhalla, where we will discuss the active members day whilst enjoying a pizza and a beer. ■

Gala

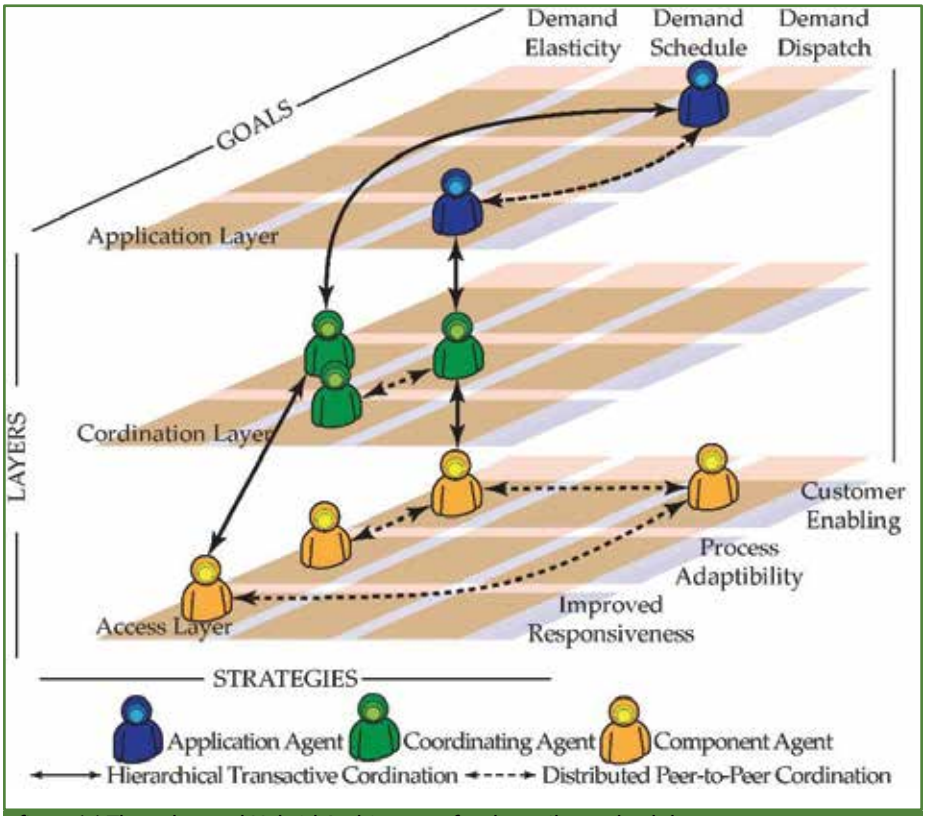
To make the Lustrum something really special, something extraordinary needs to be organized. The last festivity of the Lustrum XII will therefore be a gala in a real castle! This magical evening will start in Het Walhalla. All old Board Members (we call them 'Oude Bokken') as well as Honorary Members and benefactors are invited to close the activity-packed four weeks. All participants of the evening program will then go to Kasteel Maurick in Vught to enjoy a luxurious dinner followed by a dance. During this unique evening, everyone will look at his upmost in dress, suit or gala dress to make it a true fairy tale experience. ■

Agile Demand Response

By: Muhammad Babar

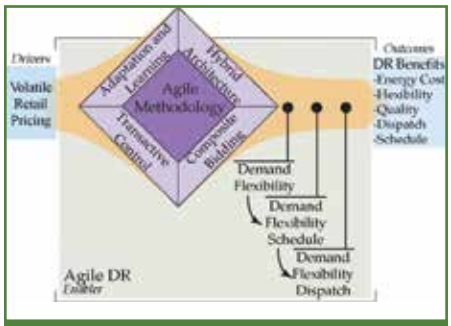
This work is supervised by prof. dr. I.G. Kamphuis, dr. H.P. Nguyen, and dr. V. Cuk from the Eindhoven University of Technology, Eindhoven and prof. dr. Z. Hanzelka from the AGH University of Science and Technology, Krakow Poland. It is a part of The SELECT+ (Environomical pathways for sustainable energy services) research program. It is the European Union funded fellowships for doctoral programmes. The project was partially supported by Alliander, which is one of the largest distribution network operators in the Netherlands, and AutBudNet Lab in AGH University of Science and Technology, Krakow, Poland. The contribution of this work is quadfold. Firstly, it presents the status of demand response developments in the EU across member states, which implies that there is room for improvement and further innovative ideas including the concept of agility in DR. Secondly, it discusses the conceptual understanding of AGILE Demand Response in Europe. Thirdly, it comprehends the details of Agile Demand Response's design and development. Finally, it presents the proof of concept in the light of simulations and experimentations.

In the roadmap to a successful energy transition, the European Union (EU) considers Demand Response (DR) as one of the key enablers to reach emission reduction targets by more efficient operation of the electricity systems. Now, the EU at its core sees that a future DR paradigm cannot and should not be a replacement of the existing DR, but a complement to it. In other words, the paradigm would and should coexist with current DR strategies, thus adding functionalities by using an evolutionary path. This complementary approach necessitates an agility in DR paradigm that should provide solutions to improve the compatibility of different DR strategies and improve the involvement of customer. Therefore, in this work, we define the concept, design, and model of the Agile DR paradigm.



figure(1) Three-layered Hybrid Architecture for the agile methodology.

To be precise, the design of the Agile DR paradigm is defined as a multi-agent system forming a three-layered hybrid architecture. The three layers are referred to application, coordination and access layers, as shown in Figure 1. Each layer consists of strategic processes to achieve one or more objectives, using a transactive control mechanism. In this way, agents within the same layer have peer-to-peer interactions, whereas agent interactions between the layers are confined to two signals. The first signal is known as a bid, whereas the second signal is known as a price signal. In order to standardize these signals for data abstraction and reduction in communication burden, this study proposes the composite bidding rules.



A conceptual model of Agile Demand Response

Moreover, the design supports continuous integration, which is a method that uses artificial intelligence to have DR automatically scheduled and dispatched. By characterizing the design in four prime agility enablers, the agile methodology is defined. In light of literature, the four prime agility enablers are the three-layered hybrid architecture, the transactive control, the composite bidding and the adaptation and learning, as shown in Figure 2.

Firstly, the study attempted to estimate demand flexibility from the agents in the access layer. Agents in the coordinating layer, in association with an agent in the application layer, are responsible for monitoring the behavior of access agents. The Model-free Learning Technique is proposed for strategic decision making at coordination layer. Secondly, the demand flexibility scheduling problem is solved as a multi-stage decision-making problem in the coordinating agents. The techniques use Reinforcement Learning approach to learn demand schedules, and then they control the access agents accordingly. However, the Pursuit Reinforcement Learning algorithm is proposed for reaching a relatively stable schedule during day-ahead as well as real-time operation. The algorithm is based on online learning that allows clustering of the data into several groups for the similar kind of access agents.

Finally, application agents are open to build either single or multiple strategies to improve the system responsiveness to the change. However, this study only focuses on two strategies; (i) demand flexibility scheduling; and (ii) demand flexibility dispatch. These two strategies are distributed across two application agents, namely: the aggregator and network agent. The research considers these strategies from two perspectives: a global perspective and a local perspective.

A global perspective to DR is to maximize the net social welfare of the stakeholders. The challenges associated with the demand flexibility scheduling problem in the Agile DR paradigm are high and have been addressed. Although in practice there could be countless issues that the Agile DR paradigm can encounter regarding the scheduling problem, herein the main contribution is the provision of a comprehensive scheduling strategy with a global perspective. The strategy that can be used not only to obtain a particular objective but also to scale up to cope other issues. In order to achieve scalability, the main strategic tasks were distributed among three agents, namely the domotic, allocation and grouping. With respect to the agents, the main tasks are (i) recognizing the constraints of appliance agents, (2) scheduling of different types of appliances and (3) grouping of homogeneous appliance agents if required. Furthermore, three algorithms for the proposed strategic scheduling have been developed for this purpose.

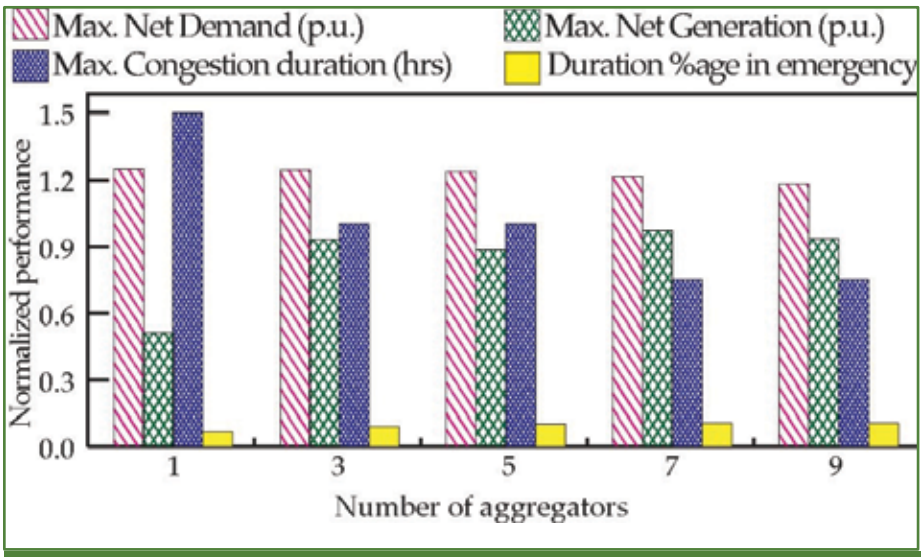


figure (4) Performance of Agile DR in multiple aggregators scenario

On the other hand, a local perspective is to mitigate network issues. The first strategy resides in the aggregator agent and provides the global perspective to the Agile DR. The second strategy resides in the network agent and provides the local perspective to Agile DR that is to be used by network operators. The prime contribution in this study is the detailed formulation of a learning framework for a real-time network management. Although a model-free approach is designed and developed specifically for congestion management, other objectives (like over or under voltage issues) can easily be incorporated in the presented Markov decision process.

The study also shows how the two perspectives intertwine and are mutually supportive. For this reason, to observe the efficacy of the strategies, a co-simulation model of the architecture has been developed for a Dutch LV network, as shown in Figure 3. Figure 4 draws the performance of Agile Net for the different number of aggregators. This depicts that Agile DR mitigates an amount of congestion throughout the network much better if there are more than one aggregator. However, after some point, an increase in the number of aggregators per hosting network will not make any significant effect. In summary, Agile DR successfully coordinated competing aggregators to use the DR more efficiently for congestion management and resource allocation for the given host network.

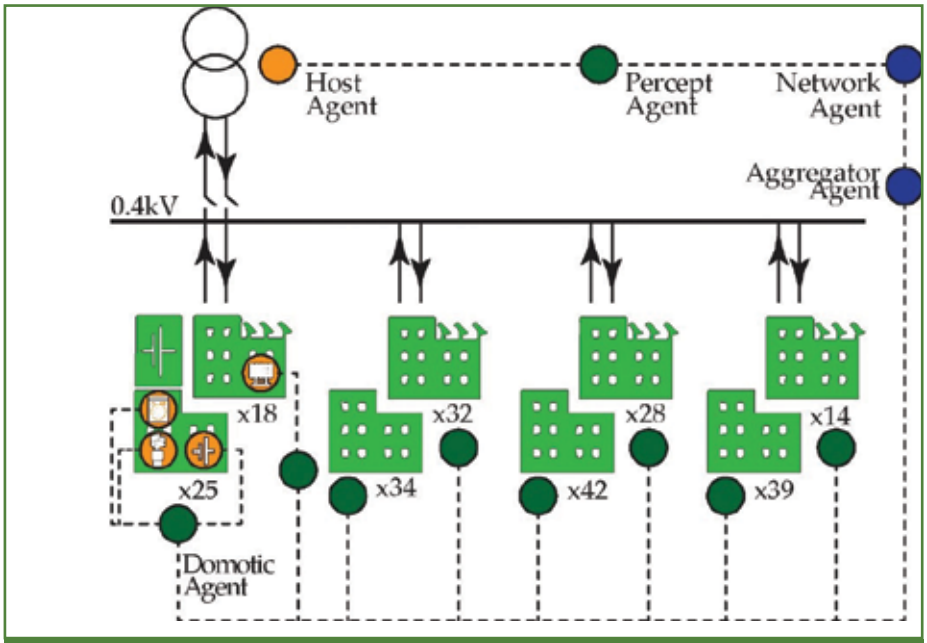


figure (3) Imaging Agile DR paradigm to a Dutch LV Network

The design provides strategic as well as architectural scalability with least complexity and a minimum of distributed intelligence, which are the prime attributes of an agile approach. The agile methodology is also found suitable for solving the demand flexibility scheduling problem within the Agile DR paradigm. Furthermore, the strategic needs for demand dispatch are adapted to the Netherlands grid settings for congestion management.

In conclusion, this research shows evidence that Agile DR is a complementary approach to traditional demand response. It has created mechanisms, agents, and learning techniques to respond quickly to customer needs and market changes while optimizing energy cost and network congestion. However, Agile DR is also capable of combining further strategies in a way that enhances social welfare of a community or emphasizes the power quality in a network. ■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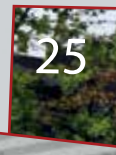
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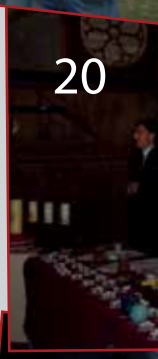
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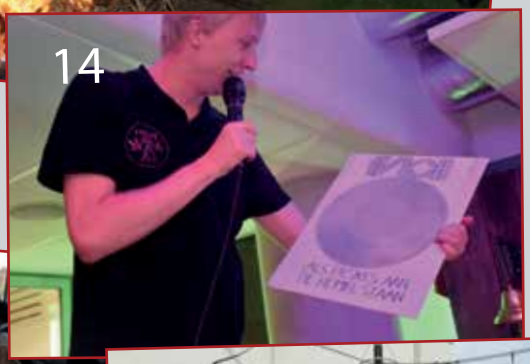
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1. Ivaldi Skelter race
2 till 4. SPARK
5. Notebook drink
6. Thew
7 & 8. OkThorberfest
9 & 10. Constitutional Drink
11 & 12. Candidates drink
13 & 14. LANCo Mario Kart Evening
15 & 16. TenneT Excursion
17 & 18. Assault Course
19. Alliander Lunch Lecture
20 till 22. wALV
23 & 24. After Introparty
25 till 27. Introduction Week

The Battle of Finnsburg

By: Fer Radstake

Besides being named after the Norse god of thunder, e.t.s.v. Thor has much more to do with the Vikings. The names of committees like Ivaldi and Kvasir, our file-server Mjolnir and our pub Het Walhalla all come from Norse mythology. Our members like to behave like a bunch of Vikings too, loudly chanting the Thorlied on every occasion and cheerfully raiding the "constitutieborrels" of the other associations, never returning without some kind of loot. In short, we're a real Viking association.

We're not, however, the first Vikings to have called the Netherlands our home. That title belongs to the Danish nobleman Hrœrekr and his men, who ruled the area around Dorestad (Wijk bij Duurstede) and Utrecht from 841 to 873. We should not forget, however, that we Dutchmen come from the same cultural base as the Danes ("Vikings"), and that right until the 7th to mid-8th century we didn't differ much from them in culture, religion and language.

We have to look across the sea for a "Viking" story possibly taking place in our country though. To the Anglo-Saxons of Britain to be precise, who left us such poems as Beowulf, The Wanderer and The battle of Maldon. Like other Germanic cultures, the Anglo-Saxons had a mostly oral literary tradition. "Scops" would perform at banquets and sing alliterative poems about the great deeds of the many famous heroes. It was not until the advent of Christianity and monastic life, that some of these tales were written down.

One of these tales is the Finnsburg fragment, a story which quite possibly takes place in what's currently the Netherlands and which gives us an especially vivid and action-oriented image of warfare in those times. As its name suggests, we unfortunately know only part of the poem. The end is described in the famous Beowulf saga though, where a scop narrates the events of the Finnsburg Fragment, although in a very compact way. This compactness suggests that the story was widely known, something corroborated by the fact that the Beowulf describes the poem as "oft recited". Nevertheless, we know only little about the events or characters in the poem. The only character that we know more of is Hengest who, if this identification is correct, is the same Hengest as the commander who is said to have conquered much of current England from the Romano-Britons in the 5th century. Given the problems of dealing with (semi-)legendary figures, this date is tentative at best however (but the battle must naturally have taken place before the compilation of the Beowulf in the 8th century).

Although it's hard to connect the Battle of Finnsburg with a historical period, let alone a war, it almost certainly takes place in the historical region of Frisia, which comprises modern Zeeland, Holland, Utrecht, Friesland, Groningen and the German coast west of the Weser. This means that in all likelihood these events occur in what we'd now recognise as the Netherlands.

Very fitting for the December edition of the Connecthor, the battle of Finnsburg takes place in the beginning of winter, somewhere in Frisia, where a Danish contingent of sixty men under prince Hnæf is staying as guests of the Frisian king Finn. Somehow war breaks out between the two sides, and the Danes take refuge in the apparently unoccupied Finnsburg fort. This is where the remaining part of the fragment starts:

[…] | Burning horns[1]?"
The young king | proclaimed then:
"That's not the dawn-red | nor a dragon
Nor do this hall's | horns[1] burn[2].
Startled by soldiers | screech the birds:
those wolfs are marching. | The war-wood[3] clashes,
shield against shaft. | The shining moon
brightens the clouds: | the killing is near
as is made to happen | by hate 'twixt our tribes.
Awake my heroes, | warriors rise!
Head for your shields | and show courage;
be high of spirit! | Now head for the vanguard!"

The gold-laden thegns[4] | girded their swords,
then neared the door, | those noble champions.
Swords were drawn | by Sigeferð and Éaha.
At the other gate | were Ordláf and Gúþláf
and Hengest himself | stood behind them.
Gúðere told Gárulf[5] | not to give away his life,
which he so savoured, | by storming as first
to the doors of the hall | although he was armoured,
since someone much loathed | would like to slay him.
The brave hero | boldly asked

1: Probably the gables, as horn-shaped projections were often attached to the ends of the roof.
2: If it's not anything else, the lights outside must be the torches of the oncoming attackers.
3: Spears.
4: Thane, a noble rank of Anglo-Saxon Britain.
5: Alternatively, Gárulf told Gúðere
6: Another tribe. How a Sedgean warrior would end up in Danish service is not mentioned.

Fibula (Brooch) of a typefound in Frisia in the period of the Finnsburg Saga.

for all to hear | who held the door:
"Sigeferþ's my name, | of the Sedgean[6] am I.
A well-known foreigner, | I fought many battles
and sorrow I know. | But now, against me,
you will attain | triumph or death.

Then resounded | the sound of war
- brave heroes | bashing their shields,
creaking floorboards | and cracking skulls -
till in battle fell | the brave Gárulf.
Of the Frisian folk | the first of all,
Gúðláf's lad | now lay amongst many dead bodies. | The dark-brown, black raven[7] soared. Swords sparked
like flames filling | Finnsburg's hall.
I've hardly heard | of heroes braver
than those sixty | daring warriors,
nor of men who for mead | gave more in return[8]
than these heroes | did to Hnæf.
None of them fell | as for five days they fought.
From Danish doors | they didn't retreat!

Then the warrior[9] was wounded. | As he went from this life
he told that his byrnie | had broken in two;
his war-garb was weak, | as well as his helmet.
The people's protector[10] | bade him to tell how well the warriors | their wounds survived
or which of the lads | […]

Sadly, the Finnsburg Fragment suddenly breaks off here. The ending of the story is described in the famous Beowulf epic though. Hnæf was eventually killed, but Finn's armies were too weakened to defeat the Danes, or force them out of the hall. Thus, the two sides were forced to make peace. This is where the Beowulf picks up the story, with a vivid description of the funeral pyres consuming the dead on both sides:

The pyre prepared, | pretty gold
was raised from the hoard. | The royal warrior
lay on the bier, | the brave king.
At the pyre | 'twas easy to see
his blood-stained armour, | the boar of gold[11],
the hard hog. | The hero had killed many by wounds; | the mighty had fallen.
Hildeburh[12] had | there at Hnæf's pyre
her own son | consumed by the flames.
His body burned | on the bier as the lady
- the poor creature - | cried and sang songs of sorrow. | The soldier's body spiralled to the sky. | Aside the mound roared the blaze. | As bodies melted blood spurted | from the searing wounds and blisters burst | as the blaze swallowed
the brave slain | from both tribes,
their spirits dispersed | by the storm of flames.

With Hnæf dead, Hengest took over command as the Frisians welcomed them to their halls to spend the winter. However, the peace turned out to be only temporary. As soon as the weather cleared enough for the Danes to return to their homeland, Hengest and his men killed Finn and all of his retainers present in the hall[13]. ■

7: Perhaps alluding to Odin, the god who rules half of dead heroes and who's associated with ravens. Alternatively it could be a raven banner, known to be flown by the Danes.
8: The drinking of mead was part of an oath-swearing ritual.
9: Either a wounded Frisian, or a Dane questioned by the Frisians.
10: Probably Finn
11:Perhaps referencing the boar-figures that sometimes adorn helmets from the period.
12: Hnæf's brother and wife of Finn, her son died in the battle.
13:The reasons for this are not entirely clear, often mentioned are to avenge Hnæf, or that Danish reinforcements arrive, eager to pillage the now disadvantaged Frisians.

Source: Rijksmuseum van Oudheden

Candidates Drink

By: Thomas van der Werff

Traditions. It is a concept that is well-known within the world of most students. It occurs on many different occasions that lay broadly among the interest of the people that spend their days here at the Eindhoven University of Technology. Also within Thor, I often experience how people love to harbor, or even (re)initiate, new and old traditions that make us remember and enjoy the many things that lay in the past. Most of the time, these moments are represented by fun and enjoyable events, like for example, the annual Thor freshmen weekend that forges many friendships at the start of a new period in life. But there are also more serious cases, like the exam training moments that keep the students sharp and well-prepared for upcoming exams throughout the academic year. This shows that traditions can not only be fun and recreational but also helpful or informative to the people that are involved, even when it does not always seem that way.

Understanding the principal of this concept can proof to be quite useful when we start talking about a certain drink that has occurred in the first quartile of this year. A drink that for some people may have looked like nothing more than a wild cluster of white shirts, black vests and brawling students. However, the true meaning behind this event has a bit more to the eye than that particular image likes to describe.

The drink I am talking about is of course the "kandiborrel" that took place late September. The drink took place on the field just south of Flux and earned its deviant location because of the semi-rough nature of the activity that was involved. A large inflatable fence was present and accompanied by two large tents and a BBQ. In the back of the bouncy construction a few small passages could be found that led to one of the tents. It was around 16:30 when several older students, dressed in shirts, jackets and red ties, began to gather in and around the enclosed area. Maybe from a distance it could have been mistaken that they were wearing fancy outfits, however, when closing in on one of these students it would become quite fast apparent that the jackets where old, partly ripped and only semi-decent at the most. So why where we dressed like this?

Around 17:15 the time had come for the main activity to take place, and eight underdressed students walked onto the field. The supposedly upcoming new board of the association, in short. the kandi's, stood there dressed in soiled and ripped clothing that only a few months earlier had been decent outfits consisting of clean white shirts, black vests and blue ties. In the meantime the older students that were already present had gathered at the front entrance of the construction. Two parties, dressed accordingly to their side, were standing face to face with each other having a seemingly innocent conversation. Then, finally, it was time for action. ►

The older students braced themselves as the kandies took a step back after which they ran forward as they tried to force themselves through the wall of students that seemed to be well prepared for the moment. With this first action the activity had now finally begun.

For the readers that are interested in what the two hours that followed exactly contained I can do nothing but invite you to join the event next year. However, it is good to mention that one by one each of the kandies managed to get into the tent at the end of the track where some more of Thor's traditions took place and where they got some time to calmly talk with a few of the older students, that turned out to be former Board members. When the point had been reached, where everybody had made it at least once, the kandies retreaded back into Flux in order to give them their well-deserved rest. They returned thirty minutes later, but this time they were properly dressed and had undergone the symbolic transformation from kandi's to candidate board of this year. The song of our association sounded loudly over the campus as the candidate-president started the well-known lyrics. One by one each of the former kandies got congratulated with their achievements of that day and the night continued so that know everybody could enjoy the cheerful and relaxing side of the event.

The weather was great, the drinks were cold and thanks to one of Thor's new committees, the FoodCo, there was some delicious food to enjoy as well. It might have been tiring for some of the participants, but with the nice conditions and the joyful ambiance after the activity it was certainly a successful event. While I'm typing this the new Board is already installed and all eight of the former kandies are now busy running the association as its new Board members. I wish them good luck with the upcoming year and hope to see all of them at the end of this year, but than on the other side of the field. ■

TenneT exursion

By: Joep Gevaert

On the 12th of October, at 8:30, a few Thor members with a heavy head, but a light heart embarked on a journey to the Maasvlakte, where they were about to visit one of the world's largest HVDC converters: an installation that converts high-voltage alternating current to DC in order to send it to England. When everybody arrived in Rotterdam, we were taken by bus to the legendary TenneT doorbell, which impeded our way. After having overcome these dire impediments, and having equipped safety gear, we commenced our journey on foot towards the actual HVDC site, through fields of insulators, connectors and filters. We arrived to a warm welcome, and enjoyed lunch as well as a presentation given by what turned out to be a former Thor Board member, the Commissioner of Het Walhalla on the 22nd Board. During the presentation, he explained everything about TenneT, its company structure, HVDC converters, cables and insulation, and different long-distance projects they had running. The converter we visited first converted the 3-phase 380kv voltage to 6 single phases, after which Thyristor banks switched in a very sophisticated manner, in order to generate a DC voltage of +480kV on one cable and -480kV on the other. Furthermore, it had a switch to connect one cable to the ground, in case one part of the converter decided to take a day off. We visited one side of these switches, which was also the place where the cable submerged. This entire spectacle made our hairs stand on end – quite literally. Our tour was completed by a contest to lift one meter of the cable (which weighed ~40 kg), as well as a view of the spare transformer – so an employee could replace a broken one with his forklift.

All in all it was a very pleasant trip, much to the enjoyment of its partakers, who gained a lot of knowledge, as well as interest into HVDC converters. ■

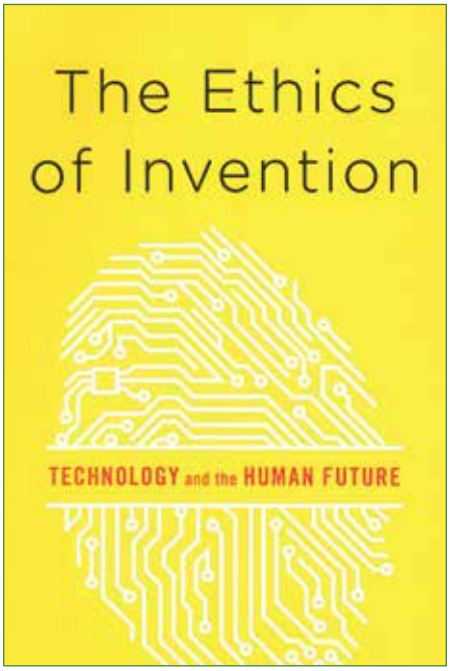
The ethics of invention

By: Jan Vleeshouwers

Harvard ethics professor Sheila Jasanoff was keynote speaker at a small symposium on the ethical limits of innovation, which the Rathenau Institute organized on November 9. She wrote a book called "The Ethics of Invention", which I read in preparation.

I have to admit that the book is a bit disappointing. We all know that technology is a powerful force shaping societies and nature all over the globe, and that technology can be used in good ways, in bad ways and in all shades in between. We also know that controlling technology use is necessary but difficult, given the multitude of actors who use technology and who all have different interests. The book essentially conveys this message, and nothing more.

Jasanoff illustrates the risks of technology with a large number of examples, most of which are very well known. Some may seem long ago, such as the eruption of poisonous gas from the Union Carbide factory in Bhopal, India, in 1984, or the dioxin disaster in Seveso in 1976, but the more recent nuclear plant crisis in Fukushima, after the tsunami in March 2011, or the collapse of the Rana Plaza building in 2013, which killed over 1000 textile workers, must still be fresh in your memory. In separate chapters, other examples from bio-technology, from human embryos and stem-cells and from internet and big data illustrate how technology affects life on earth. According to the author: to an inacceptable degree.



In all the examples, Jasanoff describes technology as an actor: she identifies technology as the main reason for the disasters, the negative effects and the resulting injustice. In fact, she says, "technology rules us". This may be a powerful image, but it does not seem right. I would have expected her to attribute responsibility to the humans using the technology. In some of the stories she recounts, it takes years or even decades before all legal procedures have come to an end, but it seems as if technology is still to blame. This is the author's explicit position (p36/37): although "technological risk is the product of humans and nonhumans acting together", "failure to aggregate a technology's harmful effects on individual lives may cause significant risks to go unnoticed for a long period of time. "Those who put all responsibility to humans, are said to think in analogy to the US National Rifle Association, which claims that "guns don't kill people, people kill people".

I think that this point of view is not helpful in finding ways to prevent future detrimental technological effects. I have two objections, a principal one and a more pragmatic one. The principal objection is that one cannot attribute responsibility to technological creations, even if they are animated, or, perhaps, in a distant future, human. The more pragmatic one is that by attributing responsibility to technology, you are hiding the actual human actors, and all their motives and interests; and it is precisely these that you need to understand to address negative consequences of technology.

In addition, the NRA analogy is not actually an analogy. Even if responsibility for the use of a gun (or in fact any technology) is attributed to the people applying it, that still does not imply that anyone is allowed to use a gun (technology) freely. It is a non-sequitur.

The example stories are accompanied by an analysis of risk assessment, which she criticizes for being narrow-minded. A fair criticism, given that standard risk assessments are often carried out by people involved in developing or deploying a technology, and start from known risks. But the author does not provide any further perspective; there are no insights in how to proceed from there, and that is disappointing.

In the introduction to the book, Sheila Jasanoff sets out to falsify three ideas of conventional wisdom. The first is *technological determinism*, which is the idea that a new technological finding takes its own course into the world and into society, "reshaping society to fit its insatiable demands". The second idea is *technocracy*: technology can only be managed by those with specialist knowledge and skills. The third is that wherever technologies fail, create damage or plain catastrophes, these were *unintended consequences* of applying the technology. The author addresses these conventional ideas implicitly, by all the examples she describes, and only returns to them in the concluding chapter, where she merely repeats what she states in the introduction: that these ideas are incorrect. That again is a dissatisfying aspect about the book; I expected much more.

I agree with her for a large part: effects of technology are certainly not predisposed; people's *use* of technology changes society. Neither is managing technology something that must be limited to specialists. But it is an unsolved problem how to create a wider involvement of people who may be affected but are grossly unaware of what is coming. Finally, I think unintended consequences exist – not just on the negative side but on the positive side as well. In fact, I have little illusions that humans can assess more than the most trivial consequences of technology.

All in all, the book is valuable in presenting a large body of concrete examples of where technology does not do what its inventors imagined, and most of them are never to be repeated. But it does not provide a bigger picture of how humanity should control technology. The most essential reason why the book doesn't get there is, that it considers technology as an actor in itself. This hides where the trouble really comes from: human action. Admittedly amplified by technology – but still human action. ■

ThEW 2017

By: Mayke Scheffer

The Thor Freshmen Weekend started on Friday the 8th of September. We gathered in Flux and after dinner we got the instructions to get to the accommodation. Or actually: Lester, President of thor at that time, shouted the address once, everyone got a couple of Thor stickers and there were enough beers for the hour-long bicycle ride.

After two hours of cycling, leaving stickers everywhere (it was as if we were setting up a treasure hunt) and drinking beer, we finally arrived at the accommodation.

Once there, a couple of guys in suit were looking at us quite angrily. They tried to get us to form a line on the alphabetical order of our last names without speaking to one another. That first assignment was a challenge, the second was hopeless. Afterwards we had to wait in silence in front of the door of the accommodation. One by one we were allowed to enter, we had to hand in our phones and we all got one egg which we had to take care of. Shortly after that the cantus started. At first it was noticeable that a couple of us found it a bit uncomfortable, but that quickly changed once the beer started flowing. Some of them became a bit too boisterous, to the delight of the "Strafmeester". During the Thor song, the 60th Board walked out of the sleeping chambers. They would keep us company for the rest of the weekend.

The cantus ended around 11 o'clock and we were allowed to go to bed. Nobody really trusted this, but because I was somewhat tired I eventually went to bed anyway. Around 3 o'clock some brute woke us up. We had to

dress up in warm clothes, had to take a flashlight with us and were ushered into a white van. Once we arrived in the woods, we got a paper with a vague instruction that should lead us back to the accommodation. During the dropping we passed four campfires, one with the active members of Thor, one with the master associations, one with the 'Tappers' of Het Walhalla, and one with the former Thor Board members, or 'Oude Bokken'. To hold on to our good mood in between the different posts we had taken one of the books, with the lyrics to all the songs of the cantus, with us and kept all the forest animals awake with our singing. Around 7 o'clock in the morning we arrived back at the accommodation where Lester was waiting for us with tomato soup. On Saturday morning not a lot was expected of us. In the afternoon we went to a nearby village and had to do challenges from a crazy 88 at a fun fair. We had to climb in trees, crawl over a zebra crossing, take a picture with an expensive car, cut the hair of a hairdresser, make a human pyramid and make fun of a tree. I never knew it was so hard to find a zebra crossing in a village.

When we got back we had to write songs about the candidate board members. With the aid of a couple of Oude Bokken we wrot some lyrics about each candidate. The result was beautiful. When it got dark outside and we were peacefully drinking beer around the campfire, the candidate board members showed up one by one and we sang them our songs. I don't remember much of the rest of the evening, I only know that I was brought to bed around half past 1 in the morning. You should never drink with Oude Bokken…

The next morning I was woken up by 'wakker worden', a song by Jochem Myjer, and a way too happy, dancing Lester. Everyone had breakfast and packed up their belongings before we cycled to the place where we would go canoeing. After the first turn in the Dommel, everyone was thrown out of their canoe and into the water by the candidate board members, with the exception of two boats. We had lifted our boat and walked a bit through the meadow beside the water. We were all in a great mood and we sang a lot of songs including our own parody on the song 'kandi's zijn kut', titled 'kano's zijn kut' and we enjoyed ourselves thoroughly.

After the canoe trip we were taken back to our bicycles and the ThEW came to an end. It was a great weekend, one to never forget. ■

Bulgarian and Romanian Students are eager to study in the Netherlands

By: Rianne Sanders

With the ambition to become a multicultural university, the Communication Expertise Center (CEC) launched an online campaign in 2014 aimed at recruiting students from the countries Bulgaria, Romania, Spain, Italy, Indonesia and Mexico. These countries were targeted by Communication Bureau Youngworks. From 2017, this campaign will be supported by

visiting fairs in those countries. As Romania and Bulgaria are interesting countries for our department and as we visited these countries before, it was more than logical that we should also take on this central initiative. This time we chose the Holland Days Tour organized by UNIFY (University For You), a 4-day tour of Dutch Universities of Applied Sciences and Research Universities throughout Bulgaria and Romania. The visitors were fully informed about 'Studying in Holland', spoke very well English and had the required maths level. On Saturday October 14th we started at the Hilton Hotel in Sofia. Fortunately, we were with three representatives of TU/e (Sjoerd Hulshof, 2nd year Architecture student Mihaela Tomova and I), because after a general opening presentation of host Frans de Jong, the hall was full in no time. The temperature rose to unprecedented height, the syrup waffles were gone before we knew it and our throats became raw. We spoke with almost 500 students in five hours. In the evening we enjoyed UNIFY's invitation for a lovely folklore dinner, and in the morning at 10:00h we jumped into a propeller plane to Bucharest where all was repeated in the local Hilton. Even with the Bucharest marathon on

October 15th an amount of 250 visitors was a success after all. Host Frans de Jong was in great form, so the opening presentation full of humor set the tone for a successful day. "Why are we still angry with Germans after all those years? Because they bombed Rotterdam without any announcement, kept Holland occupied for nearly 5 years, stole our bicycles or all our famous paintings? And the right answer... because they have stolen all of our bikes".

Working at the Holland High Tech House at the Hannover Messe during my previous Brainport period, I have already experienced that this concept really works. Together under the Dutch flag we stand strong. Here too we were joking around with our tulips, syrup waffles and mini-clogs, nevertheless excellent follow-up education with beautiful career opportunities is an extremely strong collective.

One day later, the timing was also tight, after breakfast we were driven back to Bulgaria to Ruse in a bus. A try-out with 180 visitors that did not turn out bad at all. We ended the day with again a traditional folkore dinner. I would like to take note of the fact that Bulgarian cuisine is undervalued. If you believe me, you can experience this in, for example, Restaurant Bolyari in The Hague. Start especially with Parlenka accompanied by Rakia. On Tuesday October 17th we travelled by bus to Varna port with 280 visitors. Again a very good turnout.

In summary, this was a very successful event. Unfortunately, nothing is yet to be said about what this event really brings TU/e, but we already know that the influx on the Bachelor this year was 26 Bulgarians and 4 in the Master. For Romania, that is 48 and 7. And they are all performing well. ■

Whose desk is this?

By: Jan Vleeshouwers

This desk is kind of a give-way. You see a family picture, and one of the faces must be familiar to you. He is expecting his second child, his wife is due on December 6th.

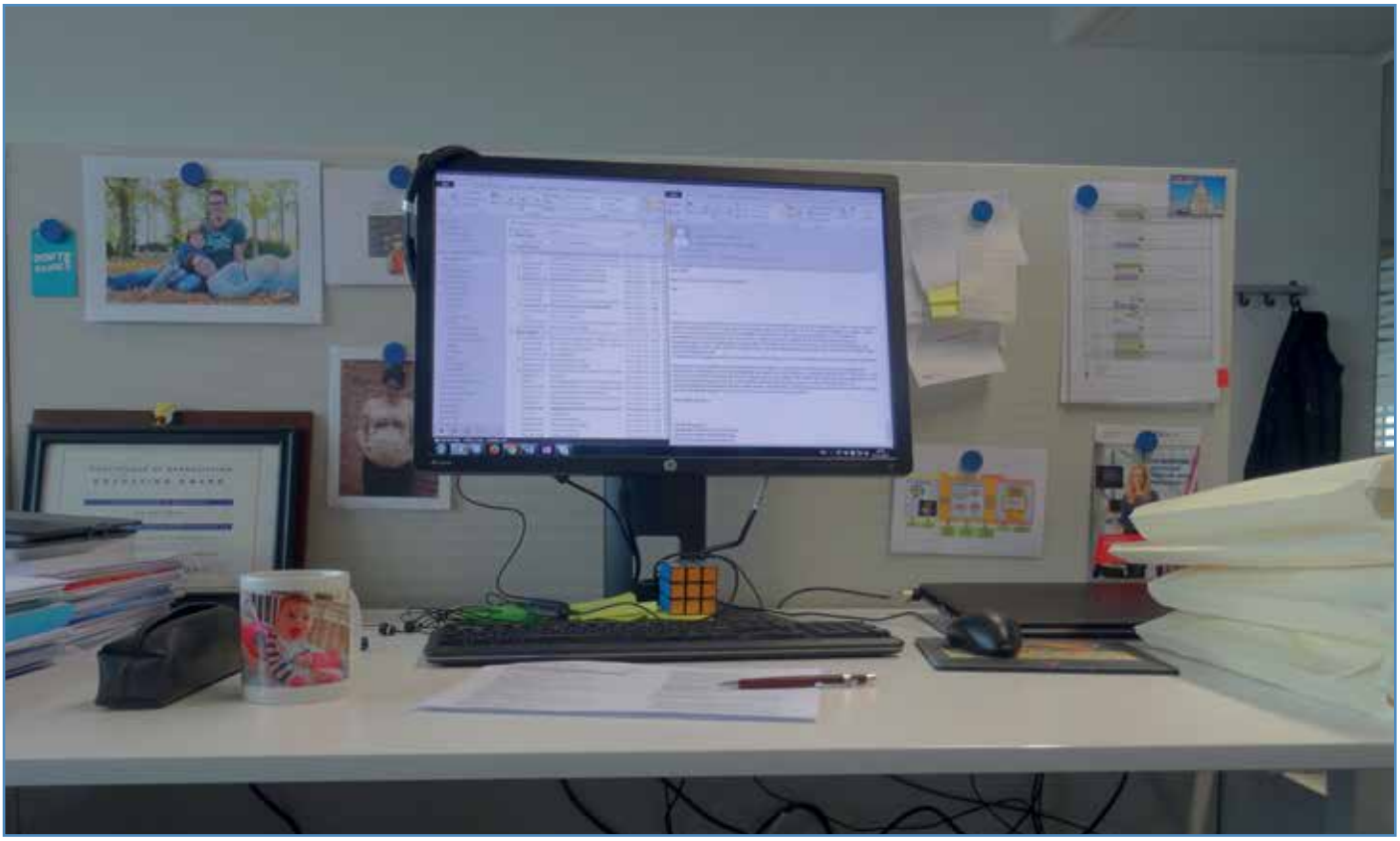
The other picture of a pregnant belly is older. He saw a henna belly-paint once, and he liked it so much that he asked his wife to have one too. In his case, the Maxwell equations were a logical choice, and his wife agreed immediately.

You see a couple of piles of work on the desk, which are a sign of busy times. To the right are the envelopes with examination work for the Electromagnetics I course. Blank still, but by the end of the afternoon of this writing, there will be lots of answers to correct.

A bit hidden behind the piles are one, no two, educational awards for his courses. He doesn't feel like hanging them on the wall behind him and they take up too much space on his desk-board – so they ended up standing here, in a modest corner of his desk awaiting better times. The small SpongeBob was earned at his BKO-course.

Below the monitor there is an ordered Rubic's Cube. He has been a Cube-fanatic for some time, but he currently picks it up for a pause, mainly. It is never returned to his monitor stand in a scrambled state.

Top right is the education schedule for this year – very important. To the left of the monitor there is a drawing by Elles (Raaijmakers) for his 34th birthday. At the far left a small "Don't Panic" note, reminder of the 2016 Quiz-Night in which he and his team finished 10th. It is also more or less his life motto for surviving at university. ■



It's all about PDEng

By: Verónica Marcela Gómez Medina

I am a PDEng trainee from the Health-Care Systems Design (HSD) track. From my point of view, the Professional Doctorate in Engineering (PDEng) focuses on developing design, presentation, and management skills. These skills are unbelievably important for any engineer who wants to collaborate in teams where not only technical skills are important.

The reason I chose the HSD track was that, having a Bachelor's degree in Mechatronics, and a Master from TU/e in Systems and Control was not enough to get a position in the area of robotics for prosthetic/bionic applications (something I have always dreamt of) because I lacked practical experience in the area of Biomedical Engineering. The HSD program would allow me to gain experience by having a healthcare design project, a set of workshops for healthcare applications, and trainings to improve my soft skills.

Many students do not get the chance to develop these skills. Sometimes, graduated engineers are good in design or theory, but they do not come across as good professionals because they lack some or all of the soft skills. The PDEng HSD/ICT program has a challenging two year design project at a company for each trainee. Usually, with a prototype as a result. Workshops to develop presentation, management and other skills, are spread over the two year PDEng program. An extra project with a high-tech company is normally part of the curricula: the team project in which the PDEng HSD/ICT trainees (of mixed generations) must work together as a team, in collaboration with the company. During that time, the trainees must cope with managing their own "main" design project, and the team project.

Figure 2: the multidisciplinary team

Figure 1: platooning trucks

In the autumn of 2016, we, the PDEng ICT/HSD family, had the challenge to collaborate with NXP to design a communication protocol for Trucks Platooning (Figure 1). NXP Senior Principals Gerardo Daalderop and Joost van Doorn provided us with close guidance and supervision, as well as prof. Kees Goossens from the Electronic Systems group. Thanks to the fact that some trainees had experience in antennas, wireless communication, and programming we could find a solution for the problem. The main challenge of this collaboration was learning to work in a team that consisted of multidisciplinary members with different cultural backgrounds (Figure 2). The PDEng trainees are very thankful to NXP, and TU/e coaches & supervisors for making this experience possible

I have to say, that at the beginning, the PDEng program already sounded challenging, but as time passed, the challenge turned out to be bigger than expected. I was hired in an open PDEng position for the HSD track in Faculty of Electrical Engineering. I did not have a "main" project at the start of the PDEng, and I kept myself busy with the PDEng workshops and extra master courses that every PDEng must take. After some time, I was assigned to 2M Engineering, a company in Valkenswaard that develops sensors for healthcare and industrial applications. In the introductory meeting at the company, they asked me to help them with a project they were having trouble with. The nature of this project took me completely by surprise: "A Finite Element Model of a Fibre Optic cable" that required a deep knowledge in mechanics of materials and FEM software tools.

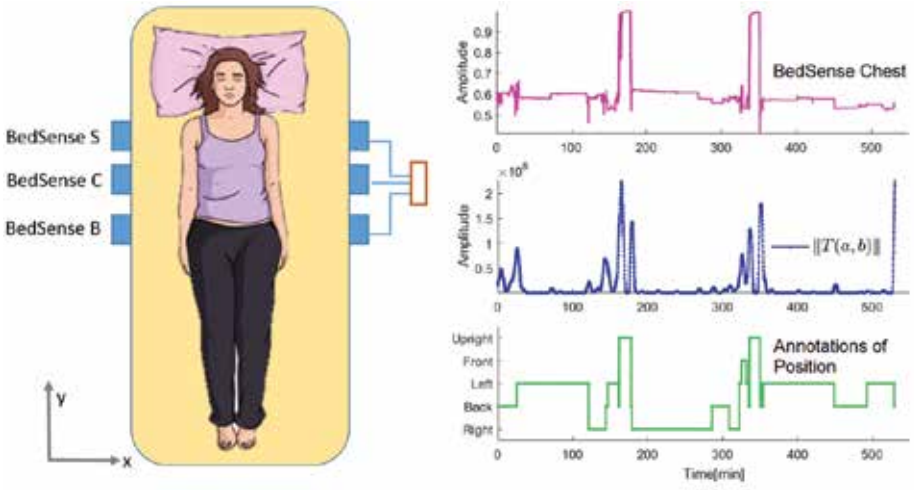
I stopped my research about healthcare, medical ethics and so on. And started figuring out how I could approach this challenge. As a mechanical engineer, I gained experience in mechanisms, control, and other stuff… but not in "meshes" for FEM analysis.

I understood that this is something that happens in companies, where all of sudden some projects have more priority, and this is part of the PDEng dynamics. Things keep changing to challenge the PDEng trainees!

For my last half year as a PDEng, I have got the chance to work in a healthcare design project in the Signal Processing group with the title, Detecting patients' turns, and postures during sleep.

Monitoring turns and posture during sleep can provide information about position dependent sleep disorders such as sleep apnea, patients with Parkinson's, who have difficulty turning and an overall index of sleep quality. In literature [1-2], studies have been done using under-mattress pressure sensor grids to characterize respiration and body postures during sleep. Past studies lacked validation with more datasets and using fewer sensors. The sensor used in this project, called BedSense, is developed by 2M Engineering. It is a contactless fibre optic sensor that acts as a highly sensitive pressure sensor, giving information about small and big movements, such as heart rate, respiration, and motion of larger body parts.

Kempenhaeghe Sleep Centre, provides the clinical expertise, the locations where the overnight polysomnogram (PSG) takes place, and creates the anonymized datasets. The BedSensor is placed under the mattress as shown in Figure 3.a, with the fibre gratings placed below the shoulder, chest, and belly of the patient. The datasets contain recordings of the BedSense unit for a night's sleep of a patient, a selection of the PSG study, and manual annotations by a clinician about the



patients' postures during sleep. BedSense and PSG recordings are synchronized with help of synchronization pulses. Body anatomy, weight, and length of the patient may differ. This is why a very robust detection algorithm is required.

Digital signal processing methods

A Mexican Hat wavelet φ(t/a) decomposition has been proposed to extract candidate features that characterize a posture or a turn. The dilated continuous Mexican Hat wavelet (1) is considered, to evaluate the performance at different scales. The wavelet transform is depicted in (2)

$$\psi\left(\frac{t}{a}\right) = \left(1 - \left(\frac{t}{a}\right)^2\right) e^{\left(\frac{t^2}{2a^2}\right)} (1)$$

$$T(a) = \frac{1}{\sqrt{a}} \int_{-\infty}^{\infty} x(t) \times \psi^{\frac{t}{a}} dt \ (2)$$

Figure 3.b shows the chest recording of BedSense, the absolute value of its wavelet transform, and annotated posture changes. Different scales of ψ(t⁄a) were evaluated, and in T(a) a peak extraction was performed. By varying the scales, changes in the correlation with the annotated positions are observed. For each detected peak a posture change is evaluated within a window length.

Results

The results varied depending on the wavelet characteristics t, and a . A detection ratio of 60% to 70% of the turns were achieved by the wavelet decomposition when a longer time span was allowed for the wavelet.

Active Research

Evaluation of wavelet decomposition: analysis on new data sets is being performed to determine if certain wavelet parameters need to be adaptable, and in what degree.

- Feature extraction: candidate turns are being studied, to extract statistical information regarding their frequency content, variance, energy, etc., in order to collect features that will correctly identify turns and postures.

- Classifiers: a number of classifiers will be studied to find out their suitability to solve the posture detection problem.

The dynamic nature of the PDEng in HSD/ICT is what has been the most valuable experience for me. All trainees are expected to cope with their main company, the extra Team Project with another company, and university requirements, preparations for the workshops, and communication between parties. This is why PDEng trainees are highly skilled at the end of the program.

The other life as a PDEng

Life as an international PDEng can be tough, due to the complicated schedules, there is few time to meet other PDEngs at the TU/e. It is also hard to integrate into the Dutch community, and into the university community because we are not full-time at TU/e or at the company. So, our chances to make long term, and sincere friendships, are fewer… There are also other difficulties that are hard to cope with, such as the weather, culture, language, food, and many supervisors we deal with. This is why I have always been interested in ways to connect with people.

In support of community building inside TU/e, Professor Jan Fransoo (Dean of the Graduate School at the time) initiated a PDEng Council at TU/e. The goal of this council is to understand better what the needs of the PDEng community at TU/e are. Soon after we (Marco Pellegrini, Asaf Kedem, and I) developed the policy for a new PDEng association. We also recruited potential PDEng trainees for the PDEng association board, and proposed a planning to the graduate school to approve the new PDEng association at TU/e.

The PDEng association was approved and it is called ATMOS PDEng association. It operates in collaboration with COSMOS, the International Students Association. We organized a launch event for this association on the 29th of June 2017, where approximately 80 trainees from 10 different PDEng programs at TU/e could enjoy the official presentation of the PDEng Association board. This was followed by the performance of the AERIS Brass Music band, and a drinks network session at the Zwarte Doos Filmzaal and lounge. Joost Fijn, a trainee in the PDEng ICT program, is part of the ATMOS association board, and together with other four PDEng trainees from other faculties he will be organizing activities to bring the PDEng community together, broadening the PDEng's network, and helping the international PDEng trainees to integrate in the Netherlands. Furthermore they will spread the word about the PDEng program, for example: at the Master kick-off event. Future events that the ATMOS PDEng association plans to organize are career events, sport events, and social events such as BBQs. Visit their social media to find out next events! (Figure 5). ■

[1] D. I. Townsend et al., "Preliminary Results on the Effect of Sensor Position on Unobtrusive Rollover Detection for Sleep Monitoring in Smart Homes," in IEEE EMBS, 2009, pp. 6135–6138.
[2] W.-Y. Chang, et al., "Design of a Novel Flexible Capacitive Sensing Mattress for Monitoring Sleeping Respiratory," Sensors, vol. 14, no. 11, pp. 22021–22038, Nov. 2014.

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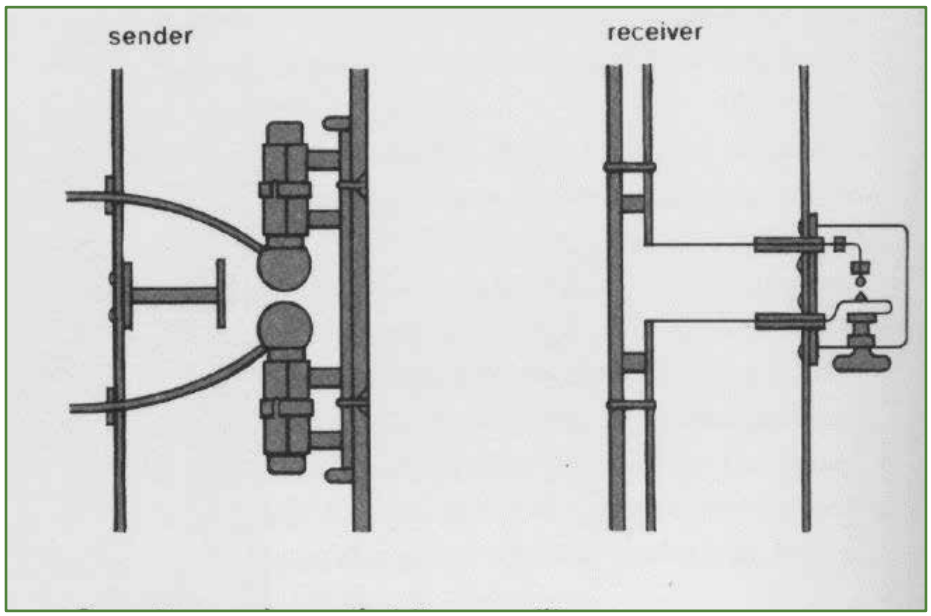
Icons of EE: Heinrich Rudolf Hertz

By: Matthijs van Oort

Every electrical engineer who at least attended some course in Electromagnetism, should be familiar with the famous Maxwell equations. These equations founded the basics of wireless communication and much more. However, the Maxwell equations would not have been popular nowadays when they would not have been proven right. For quite some time, there was no hard evidence in physics for the mathematically stated equations. Until a guy named Heinrich Rudolf Hertz found a way to produce and receive these electromagnetic waves.

Heinrich was born in Hamburg in the year 1857, as the first-born son of Custav Ferdinand Hertz and Anna Elisabeth Pfefferkorn. Because his father was a well-known lawyer in the region, he was able to attend a high level of education throughout his whole life. During his grammar school period, Heinrich was very good in the field of science and mathematics (like most electrical engineers), but he also had some interest in foreign languages. He therefore learned the Arabic and Sanskrit languages. After leaving grammar school, Hertz went on studying science and engineering in three different cities: Dresden, Munich and Berlin. In this last city he stayed for his doctoral work, which was supervised by two other icons in electrical engineering: Gustav Kirchhoff and Hermann von Helmholtz. Heinrich married Elisabeth Doll in 1886 and had two daughters. Unfortunately, Heinrich died at the young age of 36 in 1894 due to a blood disease.



After obtaining his doctoral degree, Heinrich went on working as an assistant of Helmholtz. Helmholtz suggested that Hertz would work on testing the Maxwell equations of electromagnetic waves. Next to this, Helmholtz thought that Hertz was the best candidate to prove polarization of insulators, which was the 'Berlin Prize' problem of the year 1879 (already 14 years after Maxwell's published work). But Heinrich thought this topic was too hard to tackle, so he focused on electromagnetic induction instead.

While working on magnetic induction, he started experimenting with a pair of Riess spirals in 1886. During these experiments he noticed that a spark in the first coil could produce a spark in the second coil as well. With Hertz's background with the Maxwell equation, he found a link between the induced spark and an electromagnetic wave. This is where he regained his interest in the Berlin prize of 1879, and started working on a device which could produce an electromagnetic wave at one side and could receive it on the other side. The device produced the wave by the means of a small spark gap which acts as a simple half-wave dipole antenna. These waves would than induce a current across another spark gap, resulting in an arc. Depending on the angle between the transmitting and receiving antenna, the arc would have a certain brightness. This was the proof of the Berlin prize problem stated seven years earlier.

Next to his work on proving Maxwell's equations, Heinrich also had a great influence in the establishment of the photoelectric effect. During his experiments, Hertz noticed that a charged object discharged more rapidly when illuminated by ultraviolet light. He proved this phenomena by placing a UV-absorbing glass in front of the spark gap, which lead to an increase of spark intensity. While he was able to prove the phenomena, he was not able to describe where it came from and could translate it back to a physical theory. This has been later described by Albert Einstein in 1905.

Overall, Heinrich had a great impact on nowadays society. Without the solid proof of Maxwell's assumptions and prediction, the revolution in radio communication systems would not have taken place (or at least at a later time). While the discovery of electromagnetic waves looks like something big, Heinrich stayed sober by suggesting that the discovery was just trivial work. He even stated that it was just an experiment that proves that Maestro Maxwell was right and that we just have these mysterious electromagnetic waves that we cannot see with the naked eye. When he was asked about the potential practical implementations of the research he answered that he did not see any future in electromagnetic waves. He could not have been more wrong. ■

My internskap in Suid Afrika

By: Steven Beumer

Why South Africa? Why not some rich first world country where everything is perfect and living is easy? I get that question a lot, even from the native people. Well, the reason is simple, I like it here. I must admit it wasn't my first choice, but three months later I still have no regrets. As a student in the Electromagnetics research group you have quite a lot of options for going abroad, but unfortunately not in the Care and Cure direction.

The wish to go abroad was stronger than picking my favorite subject, so after the negotiations with the United States failed, South Africa won the competition. Luckily, I had some South African IEEE friends there to help me arrange everything. Getting a visa for the country is almost a mission impossible and could cost you your sanity. Luckily after a lot of trouble I got my visa. It was time to pack and go to Stellenbosch.

University life

The university of Stellenbosch is a solid 3-minute walk from my room and I don't know how, but I got one of the best offices of the engineering building: a penthouse room with a view on the mountains, a desk which makes professors jealous, a coffee machine and a fridge to store beers in for evening work. Life at the university is not much different from the Netherlands, although deadlines and time management are a little less strict here.

After one week of work I was already asked to be a teaching assistant for the Stellenbosch equivalent of Circuits and Electromagnetics I in one course. If you think that 300 students are a lot, then imagine a course with 1000 students split over three rooms. It is quite a challenge, but a welcome distraction from the regular work.

Just like Eindhoven there are a lot of societies here, which makes the spare time a lot more enjoyable. You are free to join for example the movie club, which has their own movie theater and shows movies every day. I also joined the ballroom and latin dance society for some dancing classes, as you never know when you will need them.

Maybe the best decision during my internship was to join the diving club, where you can do a PADI Open Water or Advanced Open Water course, and see a whole new world below the water in Cape Town. We even did a dive in the middle of the night, after changing clothes next to a train track still in use. In this dive we encountered a wreck, several small sharks and the beautiful effect of bioluminescence in the water.

The SKA project

The project that I'm involved in is the SKA project. SKA stands for "Square Kilometer Array" and it is a project involving multiple countries with the aim of building a phased array radio telescope with a collecting area of 1 km^2. Some goals are to test the theory of general relativity, to answer questions about cosmic magnetic fields, and the search for aliens.

As an intern you are only a very small part of such a huge project, but it is a nice thought that you contribute to something that big. My contribution is efficiently modeling and validating active noise figures due to the mutual coupling between the antennas, and looking at methods to suppress that. This means a lot of simulation work on high power computing clusters and some MATLAB coding. Unfortunately, this means no field work, which would have been really cool.

The country and the cultures

South Africa has eleven official languages and at least as many cultures. This makes the country quite diverse. However, as a Dutch student you don't have to worry about blending in, since South Africa has a rich history that originated from the Dutch colonization. This leads to one of the best things here: Afrikaans. Afrikaans is a language that is a combination of old Dutch, laziness and a little bit of Malayan and Portuguese.

For a Dutch student it is not hard to learn the language in one ortwo months, which helps quite a bit in general life. While people are very friendly and social, they are even more friendly and helpful when you can talk to them in their own language.

All the friendliness aside, it can be still quite dangerous. Especially violent riots are not uncommon in the neighboring Khayelitsha, which you can compare with the Brazilian favelas. They are also very keen on stealing your bike, even when locked with a cable. That reminded me of good old Eindhoven.

For those who can look behind the politics, corruption and crime, South Africa is a wonderful country. You can drive for a whole day and still be amazed by breathtaking views and roads. Yes, the national roads can be better than Belgian roads. The landscape varies between a lot of mountains, fields of grass and flowers, huge forests and plain nothing, but a beautiful nothing nonetheless.

That makes the country ideal to frequently travel in. I had the opportunity to visit the wild animals in the Kruger Park, the amazing views around the Drakensberg mountains, Cape Town, Table Mountain, Oudtshoorn and many more. There is even a little place called Eindhoven in the neighborhood, but I wouldn't dare to go there.

Along the roads you are greeted by people waving flags to signal roadworks, because they like to hire people to do stuff that machines also could do. You think I might be joking, but unemployment is so high that jobs are created for the most random things. Like using the "Watch out, wet" sign to speed up the drying of a mopped floor.

The South African food and wine are exceptionally good. Stellenbosch is the wine capital of South Africa, combine that with the countries favorite way of making food, "braaiing", which is a type of barbecuing, and you got yourself a recipe for a lot of chilled out nights and clothes that smell like smoke.

Summary

All in all, I had, and hopefully will still have, a great time here. Time really flies and I should carefully plan the last month with a lot of small trips and maybe even an excursion to Madagascar. There is so much to tell about my experiences here that it is impossible to compress it all in two pages, luckily photos count for more than 1000 words.

So, if you want some more regular stories or the crazy things that have happened here, just see me in Het Walhalla. I would recommend going abroad for an internship and get in touch with new cultures while you have the chance. During your internship you will learn a lot and not only about your research subject.

And to close, a few of my favorite words in Afrikaans.

- Doggy bag is a woefkardoos,
- Tipex is flaterwater,
- Software is zachte waren.

Dankie vir die opsie om oor my internskap te skryf en ek sal jou weer in Walhalla sien. ■

Puzzle

O	I	A	A	L	T	F
R	E	E	R	F	N	H
K	P	G	L	N	A	E
G	D	A	N	L	E	T
O	A	O	A	H	G	E
A	O	R	M	P	E	P
S	O	T	T	A	E	R

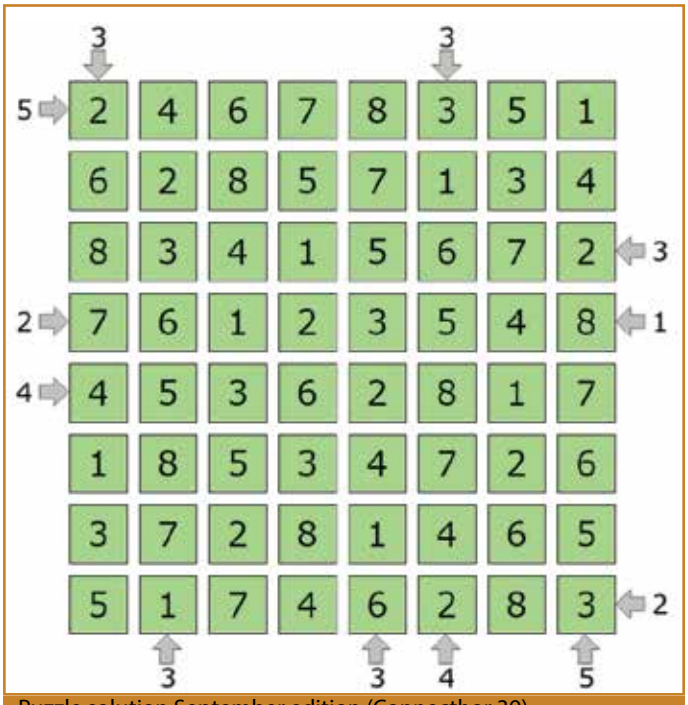
Objective / Rules

Hidden in the grid below are six hidden animals. Once you have crossed of the hidden animals, you should be left with seven letters, which spell another animal.

The letters are hidden in sequence using the move of a chess knight. For example, if the first letter of one of the animals was the top-right F, then the second letter could only be either F or A.

Winner previous puzzle

The winner of the previous puzzle is Tom van Nunen.

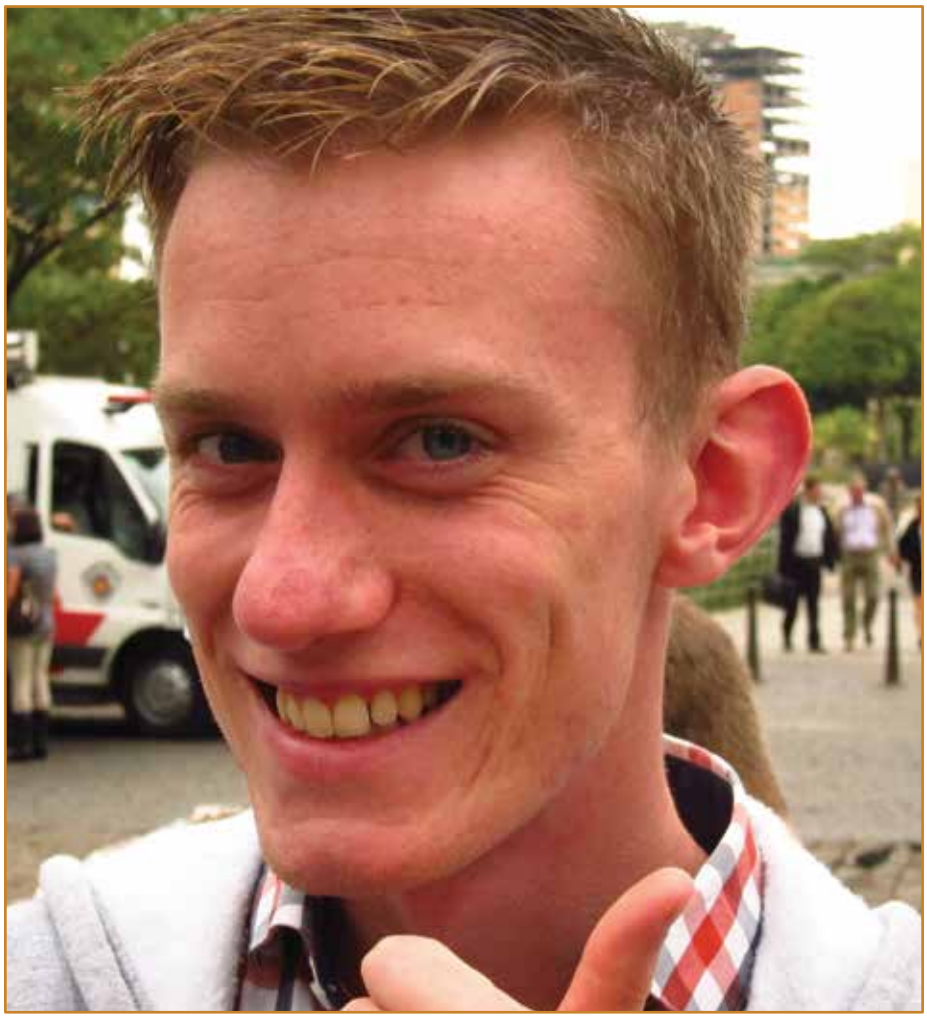


Puzzle solution September edition (Connecthor 39)

Tom with his prize

The end is near

By: Tom van Nunen



This is my final column as a student, my graduation is approaching. By the end of this year, I'll have finished my thesis and defended my work. Fortunately for you – or unfortunately, I'll leave that for you to decide – I won't be leaving our beautiful university yet. A new challenge appeared on my career path already this summer, and after some consideration I'vedecided to accept the offer. This means that I will pursue my doctoral degree at the EM group. I guess I'll be writing columns about that later, allow me to describe how my graduation might affect society this time.

Before something is put into the market, it should meet certain requirements, for example regarding temperature range, external vibrations, radiated RF emission and immunity to RF radiation. For all of those, there exist standards, designed for a specific parameter. These standards describe the limit values for the parameter, how to test compliance and how to determine whether the device in question is accepted or rejected. Depending on the industry you're targeting, different standards might apply, for example medical, army, aerospace or consumer standards, and different countries might have different standards. The standards are updated every now and then.

Let's say you want to put a new phone into the market. It shouldn't malfunction or break when you place it on the table with some force and its functionality shouldn't depend on the ambient temperature. When I use it next to my television, neither the television nor the phone should malfunction. To prove this is indeed the case, you should follow the standards that apply to your phone and test accordingly. The tests will result in a pass or a fail, and depending on that you can start selling, or you'll have to go back to the drawing board.

So far so good, nothing new. A major shortcoming of these standards, however, is that these standards are only designed to test one parameter at a time. A temperature test is conducted independent of vibration or radiation. Radiation tests are conducted at ambient temperature and with the device in question placed on a steady surface. It is already acknowledged by several important companies and institutes that a device can very well fail a combined test, while it passes the individual tests. To our knowledge, however, a test procedure that describes combined tests doesn't yet exist.

An airplane on the runway in Dubai could reach 50˚C, one hour later it's up in the sky and it will be -50˚C. Did someone mention turbulence? You want to be damn sure that all equipment onboard will operate correctly under all reasonably foreseeable circumstances. Of course everything on board is tested to withstand temperatures, vibration, external radiation etc., but these tests are not designed to verify correct functionality under the influence of multiple simultaneous parameters.

I will make a start in the testing of the effects of multiple simultaneous parameters by combining measuring radiated RF emission with varying ambient temperatures. This involves the design of a test setup and corresponding measurement procedure, an investigation of the possible effects of temperature on the RF emission of electronics, the choice of a suitable test object, the actual performance of measurements, and processing the data and drawing conclusions. Whilst this is officially an EES project, I'm also getting assistance from the EPE and EM groups, which is greatly appreciated. I hope for some interesting results that will be the foundation of lots of future research.

So now the final days of my student life are approaching. Two more months of hard work ahead, after which I will enjoy the last weeks of the 12th Lustrum of Thor before going on a holiday. And then, somewhere in January, I will move to my new office. I'm really curious about the results of my project and I'm looking forward to the challenges ahead of me. ■

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