Conn€cthor

TU/e
EINDHOVEN UNIVERSITY OF TECHNOLOGY

Maart 2008 **1** — Juni 2008 **2** — September 2008 **3** — December 2008 **4** — Maart 2009 **5** — Juni 2009 **6** — September 2009 **7**

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Life after EE

Working from **home**

IEEE Aerospace **conference**

50th edition

50
June 2020

❙EDITORIAL

Since the beginning of March, we have been dealing with a totally different working environment. Due to the Corona virus (COVID-19), we were all forced to work from home. Not ever have we experienced something like this. Thanks to technology we were able to get things done. Online meetings, whether in MS Teams or Skype for Business have become the new normal. Even though working from home can be very efficient, we miss the personal contact with our colleagues and fellow students. The chats at the coffee corners have been replaced by online coffee get-togethers, to keep in touch with each other. It's fine for the meantime, but not in the long run.

Co-workers and students share their workplace and their feelings of working from home with you on four pages within this Connecthor.

Niels Vertegaal was able to go to the IEEE Aerospace Conference in Montana, USA right before the worldwide travel lockdown. On pages 12 and 13 you can read all about it.

Ruud van Sloun got interviewed by Jan Vleeshouwers about life after EE. Since completing his master in 2014, his career within TU/e took off. Read about it on page 23.

Bart van Erp was lucky enough to do his internship abroad in Pisa, Italy. More about his experiences can be read on pages 19, 20 and 21.

Sander Verdiesen celebrated his birthday in Lebanon. Read about his experiences in his travel column on pages 28 and 29.

As you can see, this Connecthor has a remarkable cover. On the cover you see 49 cover shots of our previous editions. That means that this magazine you are reading online or holding in your hands right now is the 50th edition. The first Connecthor came out in March 2008. Now the Connecthor has become a household name.

We are proud to present to you the June 2020 issue. We hope you enjoy reading it.

Take care and stay safe!

The Connecthor editorial board

Internship Abroad
Still wondering where to go for your internship? You can read all about Bart van Erp's experiences on page 19

IEEE Aerospace Conference
Read more about Niels Vertegaal's trip to the IEEE Aerospace Conference on page 12

Travel column
Not sure where to go on holiday after Corona? Perhaps Sander will give you some inspiration on page 28

Working from home
Read more about how everyone has been working from home on page 8, 9, 24 and 25

Board Issues

By: Bart Smolders

The past months have been a real rollercoaster due to the Corona virus. Suddenly our Flux building was closed, and we all had to improvize quite a lot in order to get things running again from our home environment. Thanks to the flexibility of our EE staff and students, we have been able to transform our Bachelor and Master courses within one week into online courses. In addition, we even managed to realize online examination. We all learned in detail the possibilities and major limitations of various tools, like Skype for Business, MS Teams and Zoom. You could say that we implemented the educational strategy 2030 within a couple of weeks!

In the strategy 2030 of the TU/e, the idea is to use online education as much as possible, in order to replace the classical lectures and tutorials. This is what we did, and which worked out quite well. Tools like Zoom offer a lot of possibilities which are not available in a classical lecture-hall setting, for example by using the chat option to increase the interactivity (even for very introvert students) or by directly recording the online lecture for later use by students. I used Zoom for my own master course with about 35 students. It appears to be very stable and useful to

me. After a few lectures it already feels like the new normal. However, something is missing, of course. The crucial part of the strategy 2030 that we did not implement yet is the on-campus educational program, which would include items like challenge-based learning, in which students work on open-ended projects, both individual as well as in team projects. This part of the strategy should enable system-level thinking, which we all recognize as an important value for academic engineers in an international labor market.

In the past year, several committees in our department have put a lot of effort in analyzing our current Bachelor curriculum. Based on this, proposals have been made for a major curriculum revision, originally planned to start in September 2021. Due to the current situation, we decided to postpone this curriculum revision to September 2022. This also allows us to include the lessons learned from the past months, and to define a new curriculum that is in line with the strategy 2030. We should embrace the online lecturing and tutoring, and invest our time to further develop the on-campus challenge-based learning activities. After the Corona period, we should not go

back to our traditional way of lecturing. Let's use this crisis to make a major step forward!

Thanks again for the great work during the past period, and I hope to see you soon in Flux again! Please do not hesitate to contact me personally if you have a question or suggestion related to this topic.

Bart Smolders, a.b.smolders@tue.nl ∎

From the President

By: Sanne van den Aker

People are running in and out the Board room all day. A lot of them quite excited about the fact they are going to China in the summer, the preparations for the trip have started. Most of them are not too happy with all the vaccines, but the group bonding trip to Ouwehands zoo to see some actual pandas makes everything better.

Others are bundles of joy, because they just passed some hard exams from the third quartile, so they can finally get some good night's sleep again. First however, they are all ready to go to Het Walhalla to celebrate this fact. Just before the exam weeks everyone got a chance to see all the other pubs on the campus, as ACCI organized an amazing pub crawl, but now it is time to come home again in Het Walhalla.

Are you confused yet? This is what I most likely would have written for the June edition if the university was still open. Unfortunately, the activities described above never happened. The summer trip to China, Shen Long, is sadly canceled, just as most ACCI activities that were to happen to relax everyone right before the exams. The exams themselves looked quite different as well for everyone.

Instead of a room chockful with students, you are in your own room, making an exam via proctoring or one of the innovative ideas your teachers came up with.

It was a real switch in everyone's daily life. From seeing tons of people every day, to being stuck in one house with your roommates or parents is a big difference. Not to mention all the daily activities you normally do. From studying in Flux to going to your sports club or visiting Het Walhalla at half past four, none of these things will happen for a while. Even just doing groceries has become a whole new experience.

Luckily, we are slowly getting used to this new world we live in. Even though you can't visit your friend's house, we all find new ways to keep in touch. Pretty soon after it started, we set up a Discord server, so all Thor members can still talk to each other. Within this server Het Walhalla can be found, as well as your favorite floor six spots, such as the Board room, the 'gezelligheidshok' and the workspaces. Aside from still being able to visit these spots virtually and talk to your friends, activities still take place here as well.

For example, a pub quiz and bingo have already taken place, and there even is a beer tasting coming up! For people who can't visit at a certain time, we have also had a crazy88. This proved that some people really needed some distraction, as this is the first time in my experience that someone finished all the assignments. And it was not just one person, but two!

I can see a lot more fun activities coming up and everyone will definitely find a way to cope with these strange times. The past few weeks have really shown how adaptive everyone can be. Just look at how fast courses went completely online and all the new ways we have found to stay in touch with others. Just hang in there and before we know it, we can slowly go back to normal!

Veel gedonder!

Sanne van den Aker

President of e.t.s.v. Thor ■

Introducing...

Hi everyone! My name is Irene Suriani, and I have recently started my PhD within the EE-SPS group, in collaboration with Philips Research. I am working on hemodynamic modelling of the cardiovascular system, for the purpose of monitoring vital parameters such as cardiac output during surgery using non-invasive wearable ultrasound. I am very excited both about the project as well as to be working within this very nice group at TU/e.

I grew up in the beautiful and chaotic city of Rome in Italy, where I studied for my Bachelor's in mechanical engineering at the University of Tor Vergata. It was during those years that I developed a strong interest for the biomedical field, which led me to choose a thesis topic dealing with the in-vitro study of left-ventricular hemodynamics in presence of different types of mitral valve prostheses. Afterwards, I decided to study for my Master's in Biomedical Engineering at the Technical University of Delft, and ended up in Eindhoven to carry out my final project at Philips Research, where I investigated a novel unobtrusive technique of monitoring fluid accumulations in the body (such as internal bleeding) using Ballistocardiography.

In my spare time I like reading, painting, visiting art museums, playing sports such as volleyball, tennis or squash, practicing yoga and, most of all, spending time in the nature (hiking, camping, swimming in lakes, rivers or the sea). I also have a lifelong plan to explore every single part of the world. ∎

Hi everyone. My name is Maryem Tanveer, and in March 2020 I joined the Integrated Circuits group as a PhD candidate within the framework of the European-funded My Wave Project. I received my Master's degree from National University of Sciences and Technology, Islamabad, Pakistan, in 2015, specializing in RF/microwave engineering.

For four years I worked as design engineer, during which responsibilities encompassed areas of microwave field; ranging from research tasks to managing development and integration of RF front ends. My PhD builds upon this technical exposure. My research interests include reconfigurable filters, EMC/EMI analysis, power amplifiers and phase-locked loops.

The objective of the My Wave project is to enable a Beyond 5G network by implementing a massive distribute MIMO system, exceeding data throughput of 10 Gigabit/sec, providing energy efficient and robust communications operating at 40 GHz. Within this context, my PhD project deals with the issue of synchronization, as it is critical for coherent beamforming, but still a major challenge for the cost-driven wireless infrastructure market. My research will focus on local oscillator synchronization schemes at hardware level for achieving synchronization between various channels at single base station; and based on user-scenarios, developing distributive MIMO architecture to achieve local oscillator synchronization between various base stations.

I spend my free time in writing blogs and poetry, exploring cultures, visiting museums, meeting new people, reading non-fiction and watching anime. I look forward to meet new friends at TU/e and share experiences with them. ∎

Hello everyone. My name is Marzieh Hashemipour, and I've recently joined the Electronic Systems (ES) group as a PhD student. I'm from Iran, and I received my bachelor's and master's degrees in Computer Engineering from an Iranian university. Both of my MSc and BSc theses were focused on hardware architecture design and implementation of complex and high-speed algorithms on the all-programmable system on chip platforms. Besides, I have over three years of work experience as a computer engineer in a wide range of digital design projects. I've always been looking for new challenges as a curious adventurer, so I decided to leave my comfort zone, and go abroad. To pursue higher education, I started my PhD at TU/e in March 2020. Now, in the ES group, I'm working on modern error-correction coding theories and algorithms as well as corresponding hardware implementation for ultra-reliable low-latency communications (URLLC) systems.

When I'm away from the computer keyboard, I spend most of my time cooking and reading books. I also enjoy playing harmonica, watching (non-horror) movies, and traveling to discover new places. ∎

Who's afraid of Artificial Intelligence

By: Jan Vleeshouwers

Does face recognition technology invade your privacy? Are you worried about software that analyzes your behavior? What do you think of algorithms that decide whether or not you are an insurance risk? Are you afraid you might lose your job because of artificial intelligence? Many applications of artificial intelligence at least raise eyebrows, and some of them actually scare many people. Is artificial intelligence a technology to fear?

Step back for a moment. If artificial intelligence (AI) is actually dangerous, it is in good company. Most technology applied and adopted by humans can be harmful to a degree, and that never caused humanity to abstain from its use. A certain amount of fear or awe for technological tools is natural. Take a look at other dangerous technologies. There is fire, the mother of all technology. Somewhat related, but more ominously purposeful, there are arms. Then there is technology which humans hardly master,

such as gene modification, which leaves room for a large amount of unforeseen and possibly harmful side-effects. And to complete the picture, technology always alters human society, and change is cause of fear all by itself.

A crucial aspect of fearfulness is being able to get out of control, like fire. AI misses this physical mechanism. There are imaginative minds who attribute to AI a biological mechanism to get out of hand. They picture a world where it has evolved to be able to feed, reproduce and grow autonomously. Reaching this level of ingenuity would be quite an accomplishment, but in such a world it wouldn't just be smart robots which would have come to 'life'. Human technology, including AI, is still far from having real autonomy.

Still, AI is in good company if it comes to dangerous technologies. AI is a man-made threat, so less similar to fire and living threats such as viruses, than to

arms and genetics. AI differs from both arms and genetic manipulation in important aspects. AI is not designed to inflict immediate harm, as are arms. It is also not part of the biological domain, which is notorious for its complexity and intricate internal balances. On the other hand, there are clear similarities: they are all technologies designed and applied by humans, without thorough grasp of their potential and consequences.

So if we are afraid of AI, we are essentially afraid of something man-made. Although AI is not made to physically overpower others, it certainly has a potential to do so, and humans certainly also lack the ability to oversee the consequences. So we actually are not afraid of technology *per se*, but we are afraid of other human beings, of humanity, and of our innate propensity to apply technology without knowing its full capabilities and side effects.

What we have to do is what we always do in these circumstances: discern good from bad. Accept the progress AI brings, and oppose misuse by our fellow human beings. You might heed the Roman saying: "lupus est homo homini", but you may also realize that caring for global human life has brought much more prosperity than wars and other conflicts. So don't panic, watch out and be human. ∎
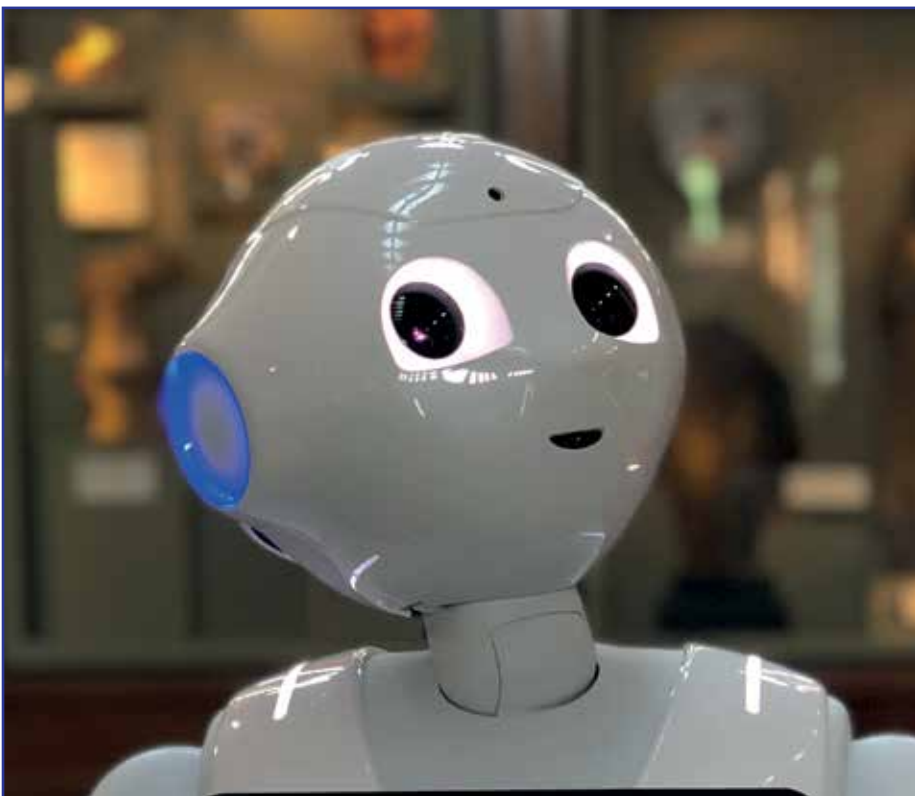
Working from home

By: Various authors

This is my temporary colorful workplace. I'm starting to get used to working from home, but I miss my colleagues and the social contacts. I hope to see you in Flux again soon.

by: Yvonne van Bokhoven ▪

Here is my working from home routine where I have to combine the babysitting (or toddler sitting) together with Skype / MS Teams meetings. I guess I am not the only one that has to combine these two activities and make sure they are in harmony. Sometimes it gets as fun as you can see in the picture, but most of the time I can actually focus and do some work.

by: Mitrofan Curti ▪

We are missing the cleanroom so much that we have to remind ourselves how it feels from time to time by dressing up.

by: Valeria Rustichelli ▪

Like most students, I can't afford to rent a large place to live, which means that most of my hobbies (can you spot them all?) take place in one room. Since the closing of Flux, I use this desk for studying as well. However, distraction is always dangerously close if I'm trying to study while surrounded by my musical instruments, "beun"-materials and more, which is one of the reasons I used to flee to Flux if I needed to get things done (the other reason is Het Walhalla of course).

by: Renate Debets ▪

It's crazy, having only digital contact with colleagues. Luckily for me, I have reached a part of my PhD research that is purely theoretical, so I don't rely on labs for now. As you can see, my home office is not too bad, I'm not complaining.

To keep me off the street in my (abundance of) spare time, I started growing various plants on our balcony, which is starting to look quite nice. I've also invested in an electric drum kit, so I can keep practicing without annoying the neighbors too much.

by: Tom van Nunen ▪

Now I'm working from home I have a lot more space to study. The only thing that I am still missing is talking to my friends and having lunch together. Therefore I'm glad that we have the Discord server from Thor, so we can still socialize together.

by: Meeuwis van den Hoek ■

Having temporarely moved in with my girlfriend, we have come to realise that 14m² is not a lot of space for two people to live. Working with extra monitors, headsets and clear rules about who gets to have meetings when is a must in this sort of situation.
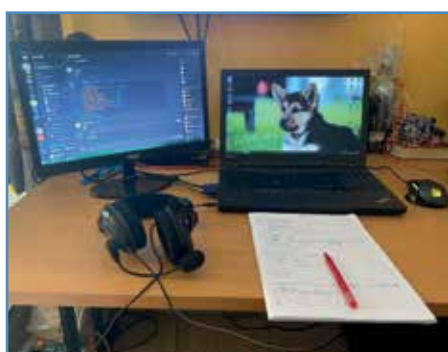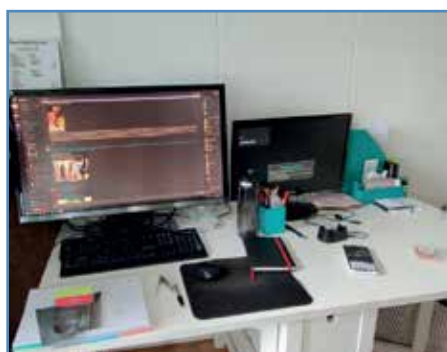
by: Ivo Kraayeveld ■

Working from home is a nice change from the usually more dynamic office environment. It was fun for a couple of weeks, but slowly and gradually I'm starting to miss the more direct and easy face-to-face inter-action with my colleagues and students. On the other hand, being able to tweak the start and ending of a working day a bit more for personal preference is a bonus and doing some physical exercises to keep in shape is something I would not really consider doing in the office. All in all, it's nice, but for me it should be more of an exception than a regular thing.

by: Martijn van Beurden ■

Although my workplace at my room would have been ready for it all along, no hassle for me regarding online lectures and exams, as I already finished all the courses for my master. Nevertheless, I am grateful that I can join the master council meetings to stay informed via other master students, and through that still have a sense of how the situation is tackled in practice education-wise.

by: Mark Legters ■

In the peaceful and quiet ambiance of my home, I miss the pleasant activity and background noises of the office. I take life day by day, everyday I'm grateful for what I have and I make the best of it. It is stated that you learn from difficult times and currently I even appreciate making a phone call.

by: Noortje Bax ■

Delivering internal food quality in difficult times

By: Ellips

A canceled Career Expo is a sign of different times ahead. In light of COVID-19, many governments around the world have taken measures that affect daily life, routines and practices. Because of that, manual sorting and inspection no longer meet current safety regulations in the fresh produce industry. Therefore, it is more important than ever, to properly automate these procedures in order to safely obtain healthy fresh produce

Automatic harvesting and post-harvest quality control can aid in reducing food waste. Products with minor external cosmetic blemishes can still be of good quality overall. To guarantee this quality, we can use internal scanning systems to check for taste and internal defects.

Ellips develops and supplies vision and control systems for food grading systems to machine manufacturers worldwide. A team of over 25 developers builds custom hardware, our TrueSort™ software framework, and dedicated computer vision algorithms.
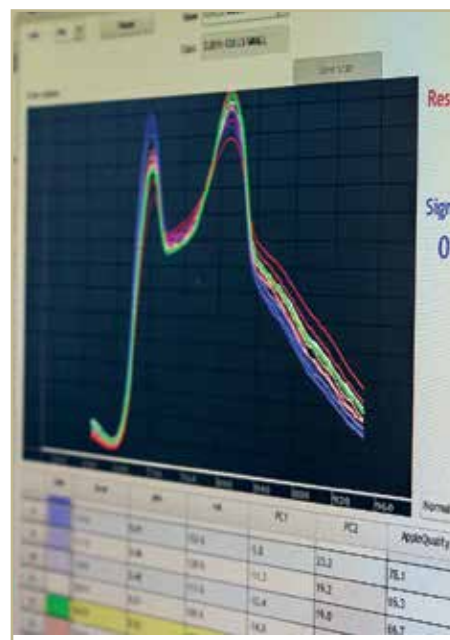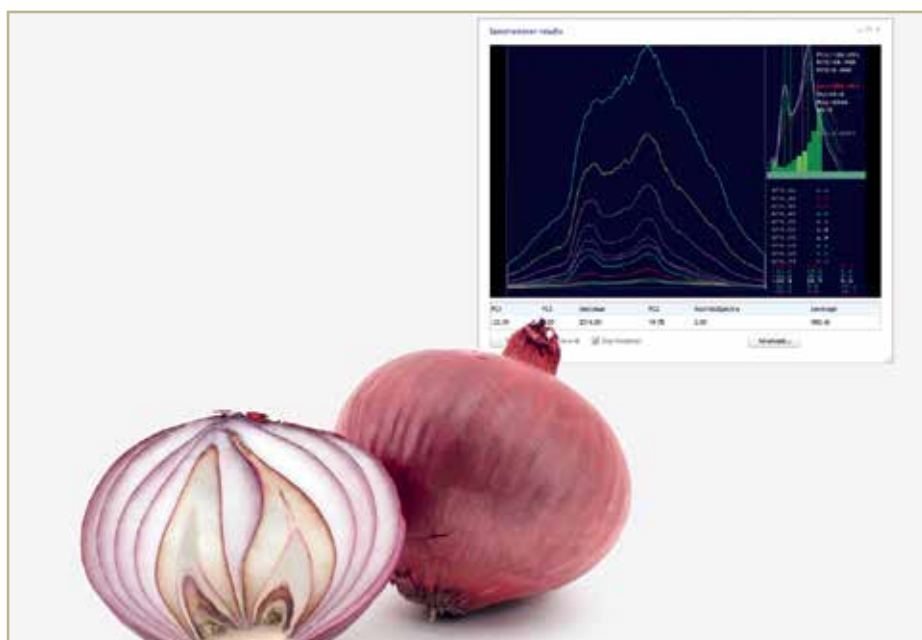
We use full transmittance spectroscopy for non-destructive internal quality assessment of fruits and vegetables. When projecting an intense broadband light beam onto a product, approximately

1/10000 of this light penetrates the whole fruit and emits at the other side. Depending on the physical and chemical composition of the fruit, some wavelengths are absorbed more than others. Hence the spectrum of the light passing through the fruit carries information of its internal composition. We can use this method to detect internal defects, ripeness, as well as taste characteristics like sweetness, acidity, firmness, crispness, and juiciness.

Signal analysis
The near-infrared band (from 600 to 1000nm) is best suited for this task, because of light penetration depth, and availability of affordable high-speed sensors. In this band only higher harmonics of the actual chemical signatures can be observed, making it necessary to use advanced signal processing and multivariate statistics. This task can be compared to recovering the bass of a song if only the tweeter can be heard.
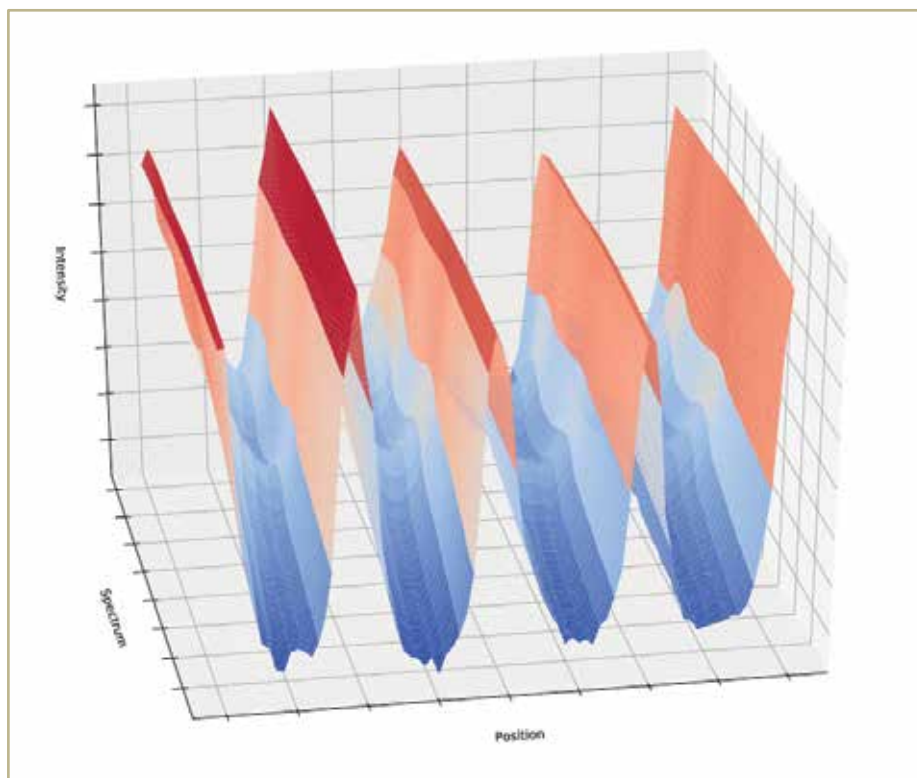
A sequence of transmittance spectra for two bad (left) and two good (right) onions.

designed from scratch, using our library of 8 eight years' worth of collected field data from hundreds of installed systems.

Hardware challenges ahead

The scanning system also poses hardware challenges. Until now, a tungsten-halogen broadband illuminator is used as a light source. Although special-purpose incandescent light bulbs are exempt from the European ban, an alternative solid-state broadband NIR light source would be very welcome. A possible solution could be based on laser and LED in conjunction with remote phosphors. We are constantly looking for ways to make our products future proof and take fruit and vegetable grading to the next level!

Sounds interesting? If you have a background in Data Science or Optical-Electro engineering and are interested in joining a multidisciplinary team of developers, do not hesitate to contact us.

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www.ellips.com ▪

A whole fruit or vegetable is a highly turbid medium as far as light penetration is concerned. Despite heavy scattering, information can be recovered on local defects by performing multiple measurements as the fruit passes the scanning beam. The signal processing required for unscrambling the information from multiple scans is beyond standard chemometric processing, which is normally associated with spectroscopy.

Deep learning offers us a method to recover minute details from a sequence of transmittance spectra. Due to the specific nature of our signal processing, we cannot simply use transfer learning on proven existing models. Instead, architectures and model building must be

IEEE Aerospace Conference

By: Niels Vertegaal

One of the benefits of being a PhD student is the fact that an accepted conference paper means that you get to visit conferences across the world. For readers who do not yet know what a conference is: 'a formal meeting of people with a shared interest, typically one that takes place over several days.' In this case, it was the IEEE Aerospace Conference, which is focused on, well… Aerospace! People from all over the world gather here and present and discuss their work to their peers. For years, this conference has taken place at Big Sky, Montana, USA.

After a weeklong course on space antennas at the European Space Agency (ESA), I met up with Martijn de Kok. We flew on March 2nd at 11AM from Amsterdam Schiphol via Frankfurt [DE] and Denver [USA], to arrive a little twenty hours later at the destination Bozeman, Montana. Here we got transferred onto a shuttle towards the Big Sky village, where they promise the "Biggest Skiing in America". Here, we spent the first day skiing and there was a lot of snow. A lot! In Fig 5, Martijn can be seen on skis! The following day was the start of the conference. From this day onward, every day would start at 8:30AM with the first presentations, and end at around 10PM with ice cream!

Figure 1: Yellowstone Park.

Our presentations were both related to radio astronomy. Martijn presented his work done during his internship at the NASA Jet Propulsion Laboratory (JPL) in Los Angles. His paper included a mission concept that related to a constellation of satellites behind the moon, which, using interferometry, would do radio science. My research was towards the development of an inflatable antenna for ultra-low frequency radio astronomy, between ~80 kHz and ~30 MHz.

In the following paragraph, I will give a few examples a few interesting presentations that you would otherwise not get to see. One of the new rovers from NASA, the Mars 2020, now known as the Perseverance, will be launched this year (July 17th) on a mission towards the red planet, where it will do further research. To get this rover to the Martian surface, NASA will be using multiple descent stages, depicted in Fig. 2. The engineers figured that the rover would be too heavy for the usual approaches, and therefore requires a sky crane that slowly lowers the rover onto the surface. I really recommend you to look it up online!

Together with this new rover, they also want to send back samples from Mars to analyze them at Earth. A small Mars Rover from the ESA will retrieve these samples and load them back on the lander platform on the Mars Ascent Vehicle. The question is, how do you reliably and safely launch a rocket from a planet a few hundred million of kilometers away? It has never been done before, and you

Figure 2: NASA's multiple descent stages for the rover.

Figure 3: Presentation on inflatable antenna for ultra-low frequency radio astronomy.

can't just launch it as a normal rocket due to the lander structure not being rigid, and the force of the rocket would not help in a positive way. Use a slider compared to an aircraft carrier? The ignition can also damage the lander structure and stir up the ground too much. The easy solution of NASA is to throw the rocket in the air and quickly ignite it to avoid interaction with the surface.

A second interesting presentation was also from NASA, but was related to the Curiosity rover, which was launched in 2011. The last couple of years it had seen increased damage on the wheels as seen in Fig 4. Although the rim of the wheels is strong enough, it is expected that with enough damage the unconstrained portions of the wheel could damage the cable running from the motor assembly to the wheel's drive actuator. As they never expected the rover to last this long, the cable wasn't properly secured (which is fixed in the new Perseverance rover). In half a year, they did research at JPL on how they could instruct the rover to shed its own tires by using rocks on the surface as frictional object. Test results indicate that if wheel shedding could be successfully executed in flight, Curiosity could continue to drive indefinitely on rimmed wheels.

In general, the conference was very well-arranged. Every day would include a buffet, and there was enough time to enjoy the snow and slopes. There were less people than usual due to the situation that started to arise in the USA, and all corresponding travel bans. On Saturday we were able to visit Yellowstone Park (Fig. 1) and on Sunday morning at 3AM we had to get ready to leave. Fortunately, it wasn't over yet as the de-icing truck of our airport broke down, so we got to spend a few more hours in Bozeman. They wanted to de-plane us, but unfortunately the jetway was stuck in the snow. As we were all stuck in the airplane, we were able to look and sit inside the cockpit! On return in Amsterdam, it was unexpectedly busy, although many flights had already been canceled. ■

Figure 4: Collective damage on the rover's wheel during the last couple of years.
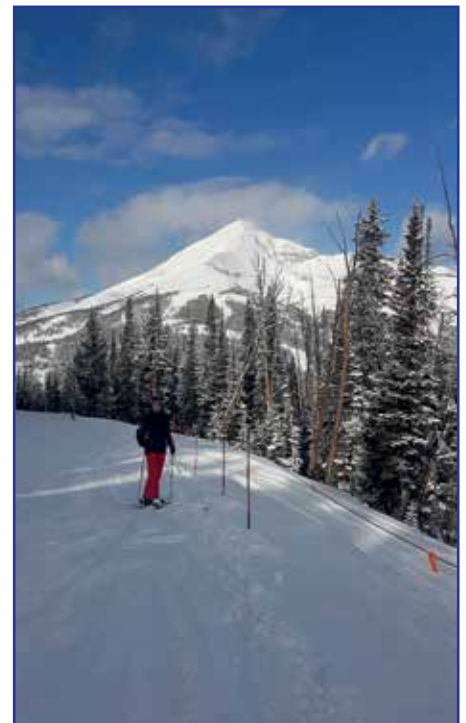

Figure 5: Skiing in the Big Sky village

Lighting in tunnels

By: Witteveen+Bos

Tunnels are used in places where regular roads are difficult to build (for example in mountain areas) or where space is very limited (for example in large and crowded cities).

Tunnels are equipped with many installations to ensure traffic can pass safely and incidents can be handled. Installations such as ventilation, fire detection, fire extinguishing, communication systems and traffic management systems. One of the most obvious, but also important installations is the tunnel lighting.

Design of tunnel lighting

Everyone is familiar with regular street lighting on highways and in residential areas, which is switched on at sunset and switched off at sunrise. Not many people know that tunnel lighting, on the other hand, is mainly used during the day. This is due to the fact that the human eye can not adapt very well to a transition from light to dark, which would happen when you enter a tunnel without lighting. Just imagine how long it takes your eyes to see the contours of your bedroom again after switching off the light.

The lighting in tunnels is designed by taking a few aspects of the tunnel into account:

- the traffic type (cars/bicycles/pedestrians) and the speed limit;

- the ratio of the visible exit divided by the visible entrance, as viewed from a stopping distance from the tunnel entrance;

Figure 1: Daylight cave inside the Laerdal Tunnel in Norway

- the amount of light a road user 'sees' when closing in on the tunnel entrance, also seen from the stopping distance.

When the tunnel is only used by 'slow traffic', such as cyclists and pedestrians, not much lighting is necessary for traffic safety. Lighting is in this case however necessary to obtain social safety (people don't feel safe at night in a dark area), but we won't go into that in this article.

When the tunnel is used by cars, a basic luminance is required, similar to the street lighting outside of the tunnel at night. Whether this lighting is also switched on during the day, depends on the ratio of which you can see the exit from a stopping distance from the entrance. When this ratio is lower than 15%, the third bullet comes into action, and the tunnel must be equipped with a full and complex lighting system. In this case, the lighting consists of the basic luminance throughout the tunnel, but also extra luminance in the entrance
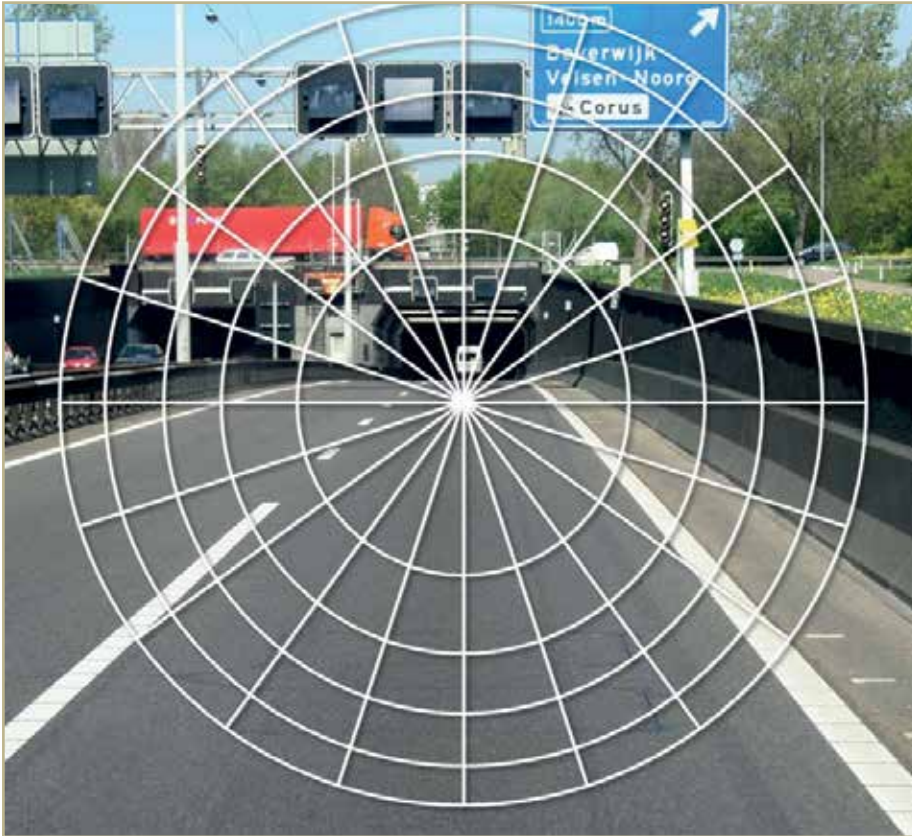
Figure 2: The L-20 Circle

Or bright walls and roads within a tunnel van be used, in order to optimize reflections of the light and therefor reduce the amount of light that needs to be installed to achieve the required luminance.

Conclusion

Tunnel lighting is very important for traffic to safely pass a tunnel, but it also consumes a lot of energy. It is therefor important for designers to optimize the tunnel design both to improve safety and reduce energy consumption. At Witteveen+Bos we do this by having an integral approach in the design process, in which multidisciplinary teams of civil, electrical and mechanical engineers collaborate intensively to achieve optimal results. ∎

zone of the tunnel to counteract the luminance outside of the tunnel and give the human eye time to adapt.

L20-method

The amount of luminance necessary at the entrance of the tunnel depends on the exact situation of the tunnel, and can be calculated with the 'L20-method'. In this method, one must place himself at a stopping distance from the tunnel, which is dependent on the speed limit. For a velocity of 100 km/h this distance is about 150 meter, for example.

When positioned at this distance, a mesh is projected on the view of the driver, see figure 2. For each part in the mesh (100 parts), the type of surface is determined (such as sky, grass or concrete). Measurements have been done to obtain luminance values for these surfaces, which are also different when viewed in different orientations. For example, a clear sky seen in a south direction accounts for 15.000 cd/m2, when seen in a north direction this is only 5.500 cd/m2. Concrete has a value of 720 cd/m2 (south) and 3.780 cd/m2 (north). The surfaces seen by the driver are then averaged out to come to the 'L20-luminance'. This L20-luminance is then scaled by the so-called k-factor, which is a factor dependent on the type of lighting (whether the light bundles shine towards traffic, with traffic or symmetrical) and preferences of the tunnel operator (such as Rijkswaterstaat), to come to the required entrance luminance (with Pi the parts of the L20-mesh, and Li the luminance of the surface on that part of the L20-mesh):

$$L_{entrance} = k \cdot \sum_{i=1}^{100} \frac{P_i \cdot L_i}{100}$$

Energy consumption

Tunnels consume a lot of electrical energy, especially due to lighting. COB Netherlands estimates that the average tunnel uses about the same amount of energy as the average city district, which is about 1,5 to 2 million kWh per year, of which lighting uses about 50 percent. A few things can be done to reduce the amount of (entrance) light within tunnels. First of all, the design of the entrance can be done in such a way, that the road users don't see much light when closing in on the tunnel. For example, trees can be places on top of the tunnel entrance to reduce the amount of visible (bright) sky.
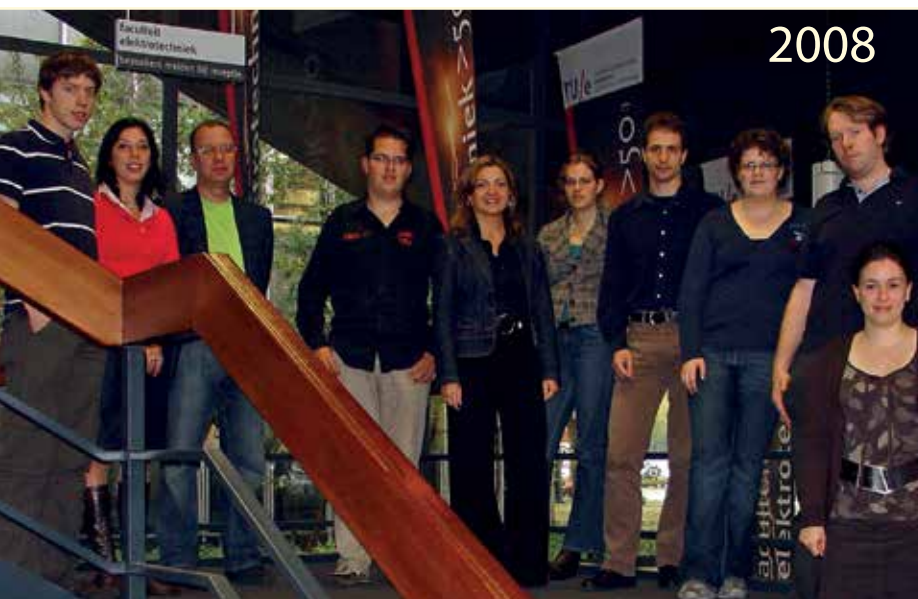
Editorial Teams over the 50 editions

2016

2017

2020

2018

2019

Hardware hacking of the modern car

By: AME

"A couple of years ago I never imagined that I would be designing an alternative fuel controller for cars." Quirijn (22) is a master student Electrical Engineering who has been working at Applied Micro Electronics "AME" B.V. since 2016, where he works as an Electronic Hardware Engineer at the RD&D department. "I first got to know AME during a first-year course, where we had to visit companies to interview electrical engineers working in the industry. I was immediately impressed by AME's vision and process, so much in fact that after acquiring the propaedeutic diploma I applied for a job as part-time hardware engineer. This provided me with a great way to put the theoretical knowledge taught at the university into practice and develop myself as an engineer."

AME is a developer and manufacturer of high quality innovative products commissioned by customers. Interdisciplinary teams, consisting of Electrical, Mechanical and Software engineers, work on turning the customer's wish into a reality. This process involves specifying, designing and qualifying the new product, often in multiple iterations. Once a design is ready for the market, it is transferred to AME's largely automated factory, where the product is assembled and tested before being shipped to the customer.

"The type of products that we manufacture is very broad, since our customers come from different backgrounds. As a result, the work you do is diverse and you are challenged to keep learning about new technologies and improve the skills involved. For instance, since beginning at AME I've worked on a (commercial) projector frame which could automatically align itself using linear actuators, a heat recovery unit for residential housing,

and now an alternative fuel controller for cars and trucks. These all involved technologies that I had no prior knowledge and experience in, but nowadays I can tell you all about them. I find this very exciting, since I'm always interested to learn more about the world around me."

Quirijn's latest project involves the design and qualification of a controller to allow petrol cars and trucks to run on LPG and CNG. This controller is part of an aftermarket conversion kit, as such it has to 'trick' the petrol engine control unit (ECU) to think that it is still running on petrol while at the same time disabling the petrol injectors. Furthermore, it must control the systems associated with driving on LPG/CNG, for example the gas injectors, valves and evaporator. As all products around us are getting smarter, Quirijn tells us the modern car is no exception.

"Modern cars are equipped with all kind of sensors and safety systems to make sure the car is working exactly as designed by the manufacturer. This makes converting it to run of an alternative fuel quite challenging. For instance, the ECU checks if the current through and the voltage over the injector coils is following the right pattern, hence to disable the injector without putting the car in an error state we must emulate this same pattern on our product. The same goes for sensor values, injection timings and many more checks, which often require creative solutions. In the end there is this back and forth between designing something, testing it on multiple cars and finding out how they behave, and adapting the solution based on the measurement data. In essence you could say that we are (hardware) hacking the modern car."

Currently the project is getting close to finished. "I still remember the first time seeing and especially hearing the board working as designed. It was such a great feeling to see the hard months of designing result in a working product and seeing the smile on everyone's face as the car started to drive on LPG. Now it is only a matter of a couple more weeks to get the product certified at the official testing instances before it well be

available on the market." To the question about what his next project would be Quirijn could not provide a concrete answer. "I'm not sure what kind of system I'll be designing next, however I'm sure it will be challenging and forcing me to develop my skills further which already makes me excited."

If you would like to know more about AME you can visit our website https://ame.nu/. ■

A render of the final product

Internship abroad

By: Bart van Erp

An internship is not only an opportunity to explore beyond the university, but also to explore beyond yourself. With Pisa as destination I have been working on functional brain analysis and I have submerged myself in the Italian culture.

Ciao a tutti! Mi chiamo Bart e ho studiato a Pisa in Italia per tre mesi. I hope you could all understand this! If so, you have learned some Italian and if not, feel free to Google it.

At the beginning of this academic year, right after the summer holiday, I had the amazing opportunity to elongate my summer during my traineeship in Pisa, Italy.

Research topic

With a broad interest in the field of signal processing, my goal was to work on something that I had never worked on before, preferably out of my comfort zone here in the Netherlands. Luckily this opportunity was offered to me with Italy as destination.

During my traineeship I worked on a research project in collaboration with the university of Pisa and the national research council of Italy, with the goal to identify regions in the brainstem related to apneas. Apneas are involuntary cessations of breathing and usually occur during sleep. These apneas can be caused by a physical obstruction or

Figure 1: A visit to Cinque Terre

by the inadequate response of the brain to high arterial CO_2 levels. The latter one was the main focus of the research project. The brain regions responsible for controlling the central breathing are located within the brainstem, which is roughly the lower-middle part of the brain being surrounded by the cortices. Using functional magnetic resonance imaging (fMRI), a three-dimensional image of the brain can be created over time. This image shows the levels of blood oxygenation, which is an indirect marker for brain activity. Using this imaging technique, the goal is to identify the region in the brainstem which causes the apneas. Research in this region of the brain is extremely challenging, mainly because of all the physiological noise, and location and structure of the brainstem.

In these three months I have been introduced to the field on functional brain analysis and have been working with the entire processing chain of the fMRI data. Besides this, I have also been present during several experiments with patients. ▶

Figure 2: The famous Piazza dei Miracoli of Pisa

Figure 3: A beautiful view over Firenze.

The Italian way of life

The Italian way of life is incredibly fun, but as someone from the Netherlands it definitely takes some time to get used to. The structured organization that we are used to is replaced by flexibility and impulsivity. From a professional point of view this was sometimes regarded as annoying, but from a personal point of view it introduced a completely new way of life. The performance-driven rush of everyday life is being replaced by an enjoyable sense of living in the moment. I was told that making plans for the future is good in some cases, but it also limits your own flexibility in being impulsive and taking part in the awesome unplannable activities that life throws at you. This mindset is definitely something that most people can learn from, being it for their own well-being and sense of happiness.

Of course, it also helps that the weather in Italy is incredibly lovely during the summer period. Personally, I really loved to chill out on the grass field next to the leaning tower with a good book or with some friends. In the evenings and the weekends, we usually met up with some people on the street next to the Arno river to enjoy some drinks. Even during working days, the sunshine makes you think you are actually on a holiday. This weather, however, was not always that sunny. The last month it rained a lot unfortunately, similar to in the Netherlands. At a certain moment the rain was so intense that the Arno river was almost flooding. This was pretty scary, and the city was completely disrupted. Even the military was helping to prevent the flooding by placing sandbags along the river. Luckily the Arno did not flow over, but it was definitely an experience.

Besides the drastically different way of life, the Italian culture is also surrounded by plenty of culinary gems. After a single day in Italy you are forced to abandon the Dutch bread culture and are stimulated to try and experience the Italian cuisine. This cuisine already becomes evident during breakfast. Italians typically go to a bar for breakfast a couple of times a week. Here they enjoy their espresso and sweet whilst standing up. These sweets are incredibly delicious and also calorie-rich. Just to give an example, once I had a sugar-glazed croissant, filled with vanilla cream and cherries.

Continuing to the lunch, Italians do usually not eat a sandwich quickly in between meetings. Everyone (including students) goes to the canteen to enjoy a large hot meal for prices in the range of a typical sandwich in the Netherlands. The very first time I had lunch I was

Figure 4: After a day of Firenze, it was time for a break

Figure 5: The day that the Arno river almost flooded Pisa

Figure 6: A beautiful sunset over the Arno river

Figure 7: Our classroom during the Italian course

completely stuffed for the rest of the entire day. With a proper lunch you do not even have to cook extensively in the evening, and many students make use of this.

Erasmus Student Network

In Pisa there is a fraction of the Erasmus Student Network (ESN). This is an organization which organizes many events for international students. During the first couple of weeks they organized an introduction week, where I met so many new people during the many fun activities. Especially the first night it was incredibly fun to meet all these new people from

all around the world. Amongst us I think there were about ten students from the Netherlands.

Besides this introduction week they organized many parties and trips to neighboring cities, during which I made a lot of new friends. In the Tuscany region there are a lot of places to discover and explore. Pisa is located relatively close to the beach and other well-known Italian cities. The train network is organized quite well and not really expensive.

Language courses

As a student following an English Bachelor program, I honestly underestimated the need to learn the Italian language. The Italian language is a beautiful language, but it is very different from the Dutch language. Where the Dutch language can be very direct and efficient, the Italian language is romantic and can be compared to a piece of music. Luckily for me, the Erasmus program allowed me to follow a free Italian language course. This language course was so incredibly fun that I would recommend it to everyone! The teacher was always enthusiastic and energetic, and the class was very practically oriented. Not only did we work on the boring grammar, but we also sang typical Italian songs and did silly dances. And I must say that even though I am a very technical person, I honestly really enjoyed learning a completely new language. ∎

Figure 8: A guided tour of the Piazza dei Miracoli with ESN

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Life after EE - Ruud van Sloun

By: Jan Vleeshouwers

After completing his EE master in 2014, Ruud started a PhD-project with Hessel Wijkstra and Massimo Mischi as promotors, on ultrasound markers for cancer. It was more or less a continuation of his graduation project, although the focus changed from cardiac to cancer.

Ruud obtained his doctorate degree in January 2018 and continued to work in medical imaging, now as an Assistant Professor in the Signal Processing Group working on sensor networks and Artificial Intelligence.

Currently, he is one of the first to use the Kickstart AI initiative, a Dutch program to help companies accelerate their involvement in AI. The idea is to have more people work at a university as well as in a company, resulting in a faster absorption of development in industry and a more effective feedback of needs to academia. So, Ruud currently also works one day a week at Philips, involving himself in a range of imaging technologies and products, and is enthusiastic about it.

Picture by Brigit Span

And if that does not sound like sufficient professional activity, Ruud has also been exploiting his AI expertise to fight Corona. A research team at Eindhoven and Trento, Italy, has been training a program to assess lung damage from ultrasound images, helping doctors to diagnose much faster and more accurately. The AI aspect makes sure that with every set of images and every diagnosis by a doctor, the program becomes more robust and accurate in distinguishing the lung damage which matters in treating Corona. Actually, what the team did was connecting existing expertise on ultrasound imaging and the subsequent smart processing, and applying it in a new area, with success. On top of that, the tool is easy and cheap to apply.

This specific aspect, turning complex knowledge into something really useful, is the core of what motivates Ruud's work. The enthusiasm easily makes up for the additional time this takes. Time is not an issue, Ruud says: he even finds time for playing in rock band 'Come On Hero', which gets air-play at 3FM and KINK. Too

often, academic research looks and reads impressive, but does not exceed the level of toy problems, does not really work and does not contribute to what is really needed. He wants to rise above that level and make a real difference.

In his current combination of jobs he experiences a large amount of synergy, which strengthens his conviction that he is on the right track. It is of tremendous help to know industrial as well as academic perspective for keeping focus, and for separating real importance from mere buzz.

Ruud mentions one more fact that makes him love his work. That is that he has found a lively and stimulating community of smart and likeminded people with whom he feels connected. He especially mentions the group of Yonina Eldar at the Israeli Weizman Institute. Her power to bring people together has been very important in combining ultrasound and AI, and Ruud's cooperation with this group has been key to the large developments in this area. At the end of his PhD

project, Ruud did his first investigations into using AI for ultrasound imaging, but it remained an isolated idea and he was not in a position to create momentum until he met Eldar.

Looking back at the master program of Electrical Engineering, the most important aspect that helped his career was the breadth of the program. A master graduate needs breadth, in order to really contribute to society as an engineer. The breadth provides the basis you need to dive into a subject much deeper, to explore different perspectives and to connect to a supporting community. ∎

The Covid-19 work has been published: "Deep learning for classification and localization of COVID-19 markers in point-of-care lung ultrasound" Subhankar Roy e.a., (2020) IEEE Trans. Medical Imaging, May 2020. See: https://www.researchgate.net/publication/341284609_Deep_learning_for_classification_and_localization_of_COVID-19_markers_in_point-of-care_lung_ultrasound

Working from home

By: Various authors

Not all students suffer from the corona situation. The active student is way less distracted, and can actually focus. Days fly by here.

by: Daan Daverveld ▪

After moving a second screen and a coffee machine from my parents' home to my room, and using my study books as a laptop stand, my workplace was ready for use. It works fine but I hope to work in Flux again soon, just to see everyone in real life and drink a beer in Het Walhalla with them.

by: Laura Barendsz ▪

After some challenges in the first week, like getting your son to do his homework and cats walking on your keyboard, I must say that we are very structured now and all is up and running.

Every day we start off with team members joining a virtual coffee break. This way we keep in touch.

Working from home is working fine for me.

by: Jolande Bouma ▪

As coordinator of the H2020 5G blueSPACE and ITN CELTA projects we hold online meetings with over forty participants. Avoiding distractions on the background, capturing background noise from un-muted microphones and a flickering web cam and light issues is a challenge. We converted a corner of our living room into a small online work place with green background, that healed a bit.

by: Idelfonso Tafur Monroy ■

Now, a few weeks on, there's more rest. "I won't feel guilty if I don't make my eight o'clock one day. There are three children walking around here who need me regularly." The thank-you e-mail from the Board of Governors, in which the families that now also require the necessary attention were named, has certainly helped me.

by: Daniëlle van der Hagen ■

Picture of my home office with my partner at our dining table during my birthday.

by: Juliana Barros Carvalho ■

I am Aref from ECO group. Working from home is challenging, but we keep working and going on anyway and in any conditions.
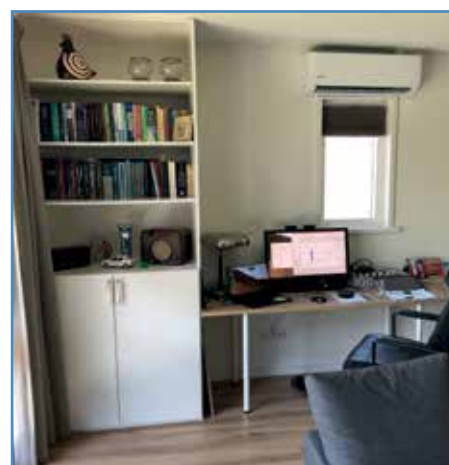
I Hope to go back to our lovely office and meet my mates soon.

by: Aref Rasoulzadehzali ■

Working from home is as balancing on a thread. You need to divide your attention over family and work. In reflection: it is as it is. Being creative in a small room for movement that you have.

by: Désy Block ■

"TNO's drive to know as much as possible is very contagious"

By: Nina Beschoor Plug

Nina Beschoor Plug is a junior innovator in the Electronic Defence department of TNO. Through her research, she contributes to ways in which the country can arm itself against electronic threats. She currently works one day a week at TNO while completing her Master's programme, and she already has the following challenge in her sights: doing her PhD at TNO.

"At Electronic Defence, we're engaged in everything on the electromagnetic spectrum – especially its use and misuse. Among other things, we look at electromagnetic signatures, such as those from a frigate of the Royal Netherlands Navy. Are these signatures detectable or not? Besides that, many of my colleagues are working on electronic warfare, a theme which is attracting increasing attention. For example, our department now determines the risks that will arise with 5G. I'm quite unique here because I'm still studying! After my internship at TNO, I've continued to work here. This is now one day a week, so I don't have a big role yet: I work on measurements and do theoretical research. In the meantime, I'm completing my Master's degree in Microelectronics at TU Delft."

Results applied immediately

"No, I certainly didn't have an affinity for technology from an early age. But I loved mathematics and went to the TU Delft to take a look around. Until then, I didn't even know that Electrical Engineering was a separate degree! I simply started the Bachelor's programme and it turned out to be a great success. The curriculum continues to adapt with what's going on in the world, which is what makes the degree so interesting. The themes of my Master's programme are also constantly changing in line with developments. Everything which is now changing at the university is also changing at TNO. This is hardly surprising, as the TU Delft and TNO work very closely together. Whether it was a logical choice for me to go work at TNO? There are plenty of career opportunities when studying Electrical Engineering, but I've always been fascinated by defence and aerospace. TNO has some very cool and exciting projects in this area of which I heard good stories during my bachelor. The work is also very topical: your results are applied immediately. That puts on the pressure as well!"

Compliment accepted with great pleasure

"During my internship, I worked on the optimisation of antennas. How can you use impedance, the type of control network and other parameters to determine the optimal matching network for the best possible power transfer? After my internship, I was asked if I wanted to stay – a big compliment that I accepted with great pleasure. This is really a great department that even our partners view as world-leading. But I did want to finish my Master's degree first. TNO supports this: the more knowledge you gain, the better. Initially, I continued with the subject of my internship. When that was done, it became part of a larger project. It's really cool that the product from my internship is still being used! Since then, I've worked on several other projects."

Knocking on anyone's door

"What strikes me about TNO is that everyone likes to help out with your problem. There's a huge drive to know as much as possible and to become as good as possible – and that's highly contagious. There's a very free atmosphere.

The working hours are flexible: it's more important that you finish your work on time so that others can build on it. If you're just starting out at TNO, you'll get good guidance. You always have a mentor, but you can actually knock on anyone's door. In addition, TNO offers lectures and courses for you to develop yourself. This could be on a technical level, but also broader – for example, an explanation of the way in which the army is organised."

After the Master's, a PhD

"My day is good when I've solved a big problem or really finished something. This is not just satisfying for myself; it's also nice that I've produced something that others can continue to use. I already know what I'm going to do after my Master's degree: I would absolutely love to do my PhD at TNO. I would then work full-time at TNO with supervision from TU Delft. Both TNO and the university are highly enthusiastic about this. We are currently discussing possible topics. In the same department again? I think so, because I really feel at home here." ■

Icons of EE: Hendrik Antoon Lorentz

By: Matthijs van Oort

Many students and researchers will still remember the name Lorentz from their high school exams in physics, where they tried to find the direction of the electromagnetic fields by holding their hands in strange positions. While he is most widely known for the Lorentz force, he contributed a lot more to the field of electrical engineering than this. He did a lot of research in the field of electromagnetism towards the optical domain, was one of the first to adopt the speed of light as the maximum achievable speed, and was one of the inspirations to Einstein for his law of special relativity. For all of this work, Hendrik received a Nobel Prize and might be one of the most famous Dutch scientists of all time.

Hendrik was born in 1853 in Arnhem. After finishing his primary school, he attended the French school, which acted as a bridge between the primary and high school education in the Netherlands at that time. Hendrik, who was often called "Hentje" by the people surrounding him, excelled not only in the abstract courses of his high school like physics, but also had a natural talent for language. He was able to speak English, French and German fluently, and was able to understand the classical languages. After his high school, Lorentz continued to study Mathematics and Physics at the University of Leiden. In 1873, just before turning twenty, he passed the doctoral exam in mathematics, physics and astronomy. Two years later he obtained his doctorate for his thesis about the reflections of light, which was the first theory on light that was based on Maxwell's equations.

After his study, he became a professor at the same university, after rejecting an offer from the university of Utrecht. He


Left-hand-rule   Right-hand-rule
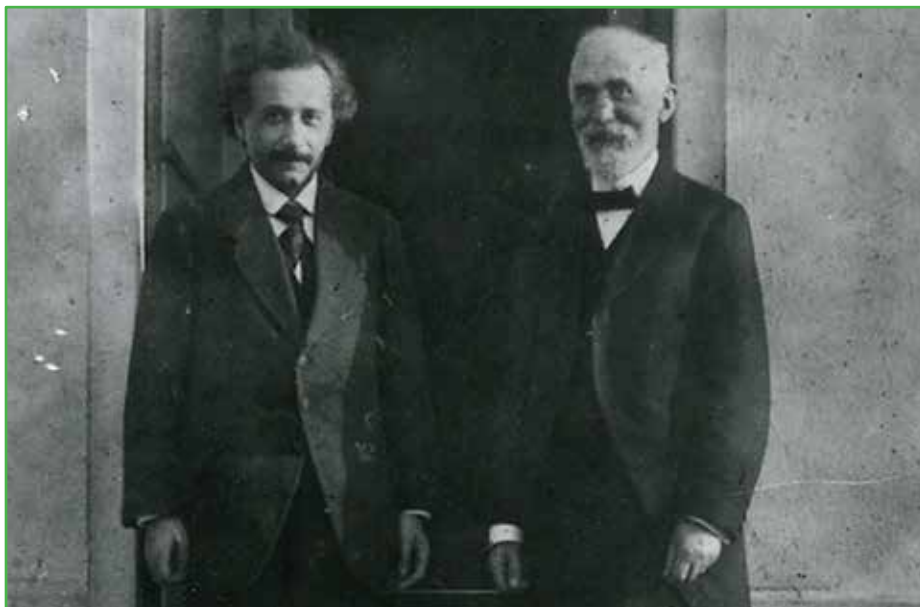
got a position in a newly created chair for theoretical physics, which resulted in Lorentz becoming one of the first to receive the title of professor in theoretical physics in Europe. He stayed at this same university for the rest of his career, while always focussing on electromagnetism, light and eventually special relativity. Next to being a professor at the university of Leiden, he was one of the founders of the first public library in the city in 1910. At the end of his life, after his career as professor, Hendrik was chairman of the educational board that advised the government on the subject of science and education.

Lorentz is most widely known from the electromagnetic force that is called after him, but most people do not know that this theory was actually a result to his findings in electromagnetism in the optical domain. The basic principles behind Maxwell's equations are not able to explain the difference between the optical behaviour of different substances. By connecting the Maxwell's equations to the molecular theories of Boltzmann, Lorentz was able to fill this gap in knowledge and created what is called the electron theory. The addition of the electrons to properties of atoms could make the use of Maxwell's equations for light possible. However, this could only

be possible if the ether and electrons interacted with each other by an electromagnetic force.

Next to creating the electron theory, Hendrik had a lot of influence in other discoveries. For example, the Zeeman phenomenon, which was discovered by Pieter Zeeman, was based on the prediction of Hendrik that a magnetic field would split the spectral lines of atoms. This eventually led to Hendrik receiving a Nobel Prize for Physics. Another field in which Hendrik was of great importance, is special relativity. Einstein had a lot of respect for Lorentz, and saw him as a father figure for theoretical physics. He even used the electron theory and Lorentz transformation to confirm his ground-breaking theory, which was initially called the Lorentz-Einstein theory.

Overall, Hendrik had a very big influence on the science we know of today. Without a doubt he is in the list of most influential scientists in Dutch history, and he even achieved a Nobel Prize for his outstanding work. He was the corner stone of what might be one of the most ground-breaking physics theories of the last century, and therefore helped the field of electrical engineering a step forward. ■
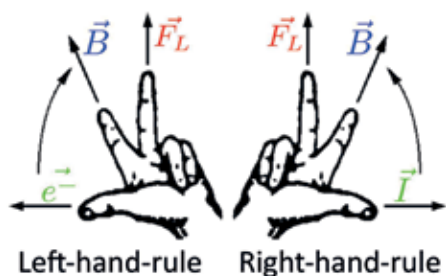
Lebanon: Never stable, always safe

By: Sander Verdiesen

Last December, my girlfriend and I were in a bar in Tripoli, Lebanon, celebrating my birthday. At some point a girl next to us strikes up a conversation. She had just returned from a protest against the government and their allies. As we start to understand her situation more and more, she advises us to watch a documentary on Netflix. The documentary is about people protesting in Ukraine, and their struggle against the government in 2014. Some of the stories told in the documentary were very similar to that of the girl in the bar, but we were not in Ukraine, we were in Lebanon.

Last December my girlfriend surprised me with a trip to Lebanon for my birthday. Since the end of the civil war in 1990, Lebanon has been safe, and especially in recent years it had become more of a tourist destination. Unfortunately, about a week before we went, protest broke out due to the population's discontent over the government's handling of the economic crisis. Usually I try not to visit countries where protests are ongoing and the situation remains volatile, especially when several armed militias are present, such as Hezbollah. However, as the protests carried on, they remained peaceful. After careful consideration we decided to go and were very happy that we did.

We started our trip in Beirut. A city where the remnants of the fifteen-year civil war are still visible. Even in the city center, there is still a 26-story building riddled with bullet holes hidden among the modern skyscrapers. Unfortunately, there was also some damage visible from the more recent protests. We managed to avoid the protests, but we saw various roadblocks and graffiti on the walls. We did not yet fully understand the details of the conflict, but it was clear that many people did not approve of how the political elite is handling the economy.

Lebanon has a population of around 6.5 million, but in 2011 war broke out in neighboring Syria. Many countries shut their border, but Lebanon let in refugees, as they remember the horrors of war all too well. As the conflict continued, around 1.5 million Syrian refugees fled to Lebanon. They were welcomed by many, but nonetheless it put a huge strain on the country's economy. Desperate for an influx of cash, the government tried to impose a tax on the use of WhatsApp in late 2019. This was the final straw, as hundreds of thousands of people took to the streets.
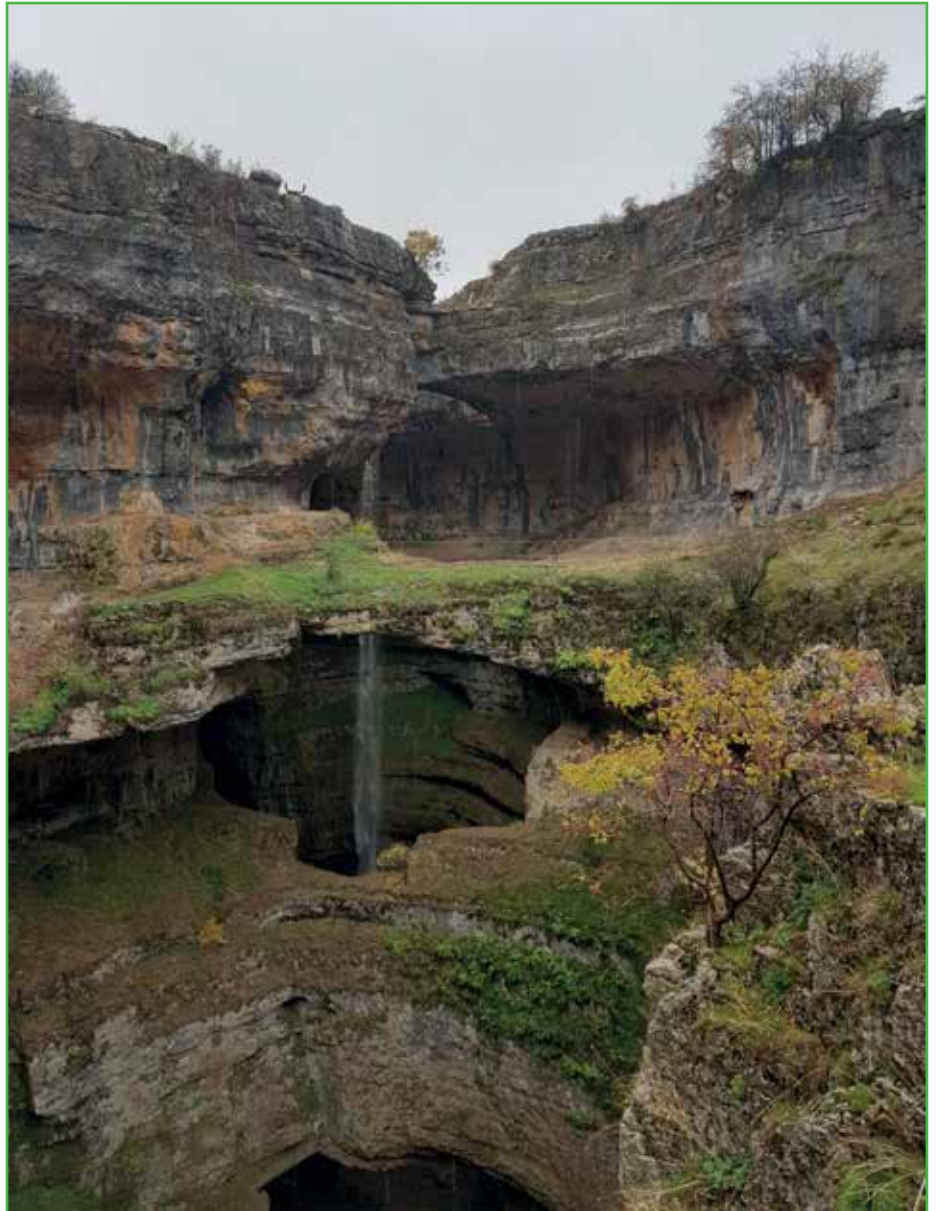
The Baatara gorge waterfall

From Beirut, we made our way to the ancient Roman city of Baalbek. The ruins of the city are amazing and, in my opinion, rival those in Rome. On our way out we were offered Hezbollah T-shirts, another eerie reminder that conflict is still present in people's minds. Another highlight during our trip was the Baatara gorge waterfall. This stunning gorge has a waterfall inside, which makes for some amazing views. As not many tourists visited Lebanon due to the protests, we had the entire place to ourselves.

By far the biggest surprise of our trip was the city of Tripoli. This northern city is considered unsafe by some governments due to its close proximity to Syria, but we experienced nothing but kindness and hospitality.

At the time of writing this, the protests in Lebanon are still going on. A new government has been formed, but it has not yet had any success in battling the economic crisis. This crisis is worsened yet again due to the emergence of the corona virus. Lebanon is one of the few countries that welcomed refugees of war while many others stood by and watched. Now they are paying an unfairly high price for their hospitality and humanity.

Ending on a positive note, I want to add that Lebanon is totally built for tourism. So, once the corona virus lockdown is over, I can strongly recommend you to go to Lebanon and experience this warmhearted and beautiful country like we did. ◾

A building painted by protesters at a square in Tripoli. The text in the middle means: 'Tripoli is the paradise of Lebanon'

Ruins of the ancient city of Baalbek in Eastern Lebanon

Puzzle

We develop and maintain energy grids. Through these cables and pipes, over 3 million Dutch households and companies receive electricity, gas and heat. The world around us is changing rapidly, because the energy transition moves at full speed. Windmills, solar panels, charging poles, heat pumps; they all affect our power and gas grids. We play a crucial role in the transition to a durable energy supply.

Now, it is up to you to prepare our energy grid for this new world! The solution to the puzzle to the right is a connected energy grid without any crossings or breakups. Can you manage to create this?

Rules

- Each number shows the amount of lines that should be surrounding it

- There should be no lines surrounding the zeros

- Empty squares can be surrounded by a random amount of lines

More information

Did you manage to solve the puzzle? Send a picture of your solution to starter@alliander.com and maybe you will win a great prize!

Did this catch your interest and do you want to work at Alliander? Discover your challenge at werkenbij.alliander.com ■
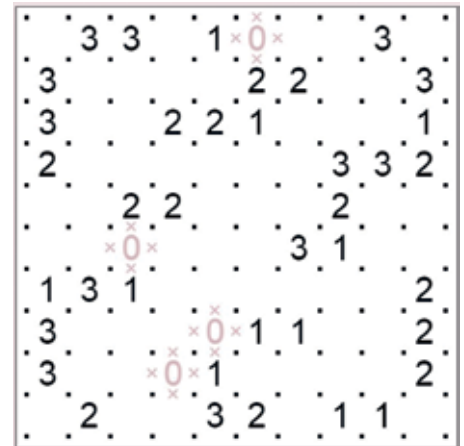
Recipe: Blackberry Lemon Mocktail

This lemon blackberry mocktail is a refreshing and tangy drink for when you want a non-alcoholic option that tastes just as good!

Ingredients

- 1/2 cup fresh blackberries

- 1/4 cup sugar

- 1 cup water

- 1/2 cup pre-made lemonade

- juice of 1 lemon

- lemon slices

- seltzer/club soda

- mint

Instructions

1. Add the blackberries to a small sauce pan and mash them with a fork or potato masher until broken down into small bits.

2. Add the sugar, water and lemonade and bring to a simmer.

3. Simmer over low-medium heat for about 10 minutes.

4. Strain the mixture to remove the bits of blackberry, add the juice from the lemon and refrigerate the liquid until cooled.

5. Once cooled, pour the liquid evenly among 4 glasses filled with ice cubes.

6. Add seltzer until glass is full.

7. Garnish with lemon slices, mint and extra blackberries.

Enjoy! ■

text and image source: runningtothekitchen.com

We demand answers

By: Tom van Nunen

In crazy times like these, people seem to have more time to 'analyze' the situation. The whole situation affects the lives of many, so it is understandable that people want to know the why and the how. Furthermore, they have plenty of spare time. It looks like some people spend every free minute they have imagining the craziest explanations for what is happening.

The more I read how people respond to the situation, the more I realize the importance of communication. Especially the messages from scientists and other experts must be constructed carefully. I have since then also realized that some people know how to do this better than others.

Let me take you back to right around the time when the first COVID-19 case in the Netherlands was detected. Press conferences and talk shows were hosted to give much desired clarity to the Dutch citizens. Already then, many stories were going around. One of them stated that some scientists found that the virus could survive for 24 hours on stainless steel, for four hours on copper, three days on plastic, and a dozen or so other materials were investigated.

That night in a talk show, the public could submit questions, and one was related to this piece of research, which had just been released. How long can the virus survive outside of the human body? For example, on a shopping cart. The answer from the expert was somewhat like: that depends, for example when the virus is covered in some snot, it might survive longer.

The answer is probably not wrong, and I am quite sure that the complete answer is still not known for sure. However, I can imagine that this might not yet be completely comforting to the general public. The truth is that this simple question is very hard to answer, since it depends on a lot of external parameters.

I have the impression that the answer is at least not completely satisfying. When a question is answered in such a simplified fashion, people might get the impression that it is indeed a simple case. This might lead them to think that, for example, we don't need the expert, or that surfaces only carry an infection risk when there is snot present. I think we all know that neither is the case.

The truth is way more complicated. The ambient temperature and humidity play a role. Does the surface contain moisture or fat (or snot)? Is there maybe some chemical residue left from a recent cleaning job? And of course the material of which the surface is made. I wouldn't be surprised if the virus could survive on one surface for a few minutes, and for several weeks on another, depending on the conditions.

I encountered a similar situation a few days ago. Dutch researchers had finally proved for the first time that the virus could indeed be spread through air. Someone said she stopped believing the media because many stories contradict previous stories. I explained that this is an interesting phenomenon of, for example, a pandemic; at first, we know very little about the disease, and the more time passes, the more research is done, so the more knowledge we build. In that sense, it is not strange that new stories contradict older ones.

I believe that, if experts take some extra time in explaining why some things are not as easy as they seem, and why new research contradicts old conclusions – and the media covers this well – the general public can benefit more from their advice. This extends further than the current COVID-19 pandemic; it applies to almost anything. Or maybe I am wrong, and I am terrible in imagining how other people judge situations and new pieces of information. ■

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