MAXWELL

New automotion
How we move towards the future

Teleportation
Beam me up, scotty!

Men and machines
Upgrading the human body

Watt the Flux
Report of the EOW

Discover your opportunities

At the ASML Inhouse Day

If you are a technology graduate with high ambition, we would like to introduce ourselves to you. Our special Inhouse Day includes an opening by our CEO Peter Wennink, presentations, campus tour, one-on-one meeting and an information market. We aim to give you a real feel of what it's like to work here. Sound interesting? Sign up fast, there are limited seats available.

Thursday 14 November
15.00h - 20.00h

ASML

For students who think ahead

www.asml.com/inhouseday

ETV Agenda
An impression of the upcoming events

Author: The 142ⁿᵈ Board

Silicon Rally!

The 11th of December a group of ETV-members will hit the road and participate in our annual rally. Via puzzles and several activities the participants will attempt to figure out the route they will have to follow. Achieving challenges along the route will get them extra points, it might even give them the advantage!

P-in-1-uitreiking

It's no secret that Electrical Engineering isn't easy. Combining it with moving to a new city and starting your student life doesn't help either. Passing all of the courses of the first year in the first year is truly an achievement to be proud of. The Freshmen who managed to achieve this will get their certificates on this day!

Ouderdag

Ouderdag

It's always exciting for freshmen to start with their new life as students. New friends, a new city and a new university all account for an exciting start of a new year. After the first quarter the freshmen all feel at home even though their parents are left at home wondering what their child is doing at the moment. In order to give these parents a good impression of the day to day lives of their children the ETV organizes the annual parent day.

Schoentje zetten

Sinterklaas is visiting the Netherlands again with 5 December as the climax of his annual stay. Throughout this time children will wake up every morning wondering if they'll find something in their shoe. As many of our members don't have a chimney available to place their shoes at the ETV gives them the opportunity to do so in our board-room!

Sinterklaaslunch

Before our members have gone home to celebrate Sinterklaas with their families we all come together for our annual sinterklaaslunch. The /Pub will be filled with ETV'ers all having lunch together in honour of this beloved holiday.

Whiskey Experience

Have you always been a fan of good whiskey? Or do you have ambition to become one? Make sure you don't miss our Whiskey Experience! After the success of last year's Whiskey Experience the event will return to the ETV next quarter. Come taste several whiskey's and learn the right techniques for tasting them.
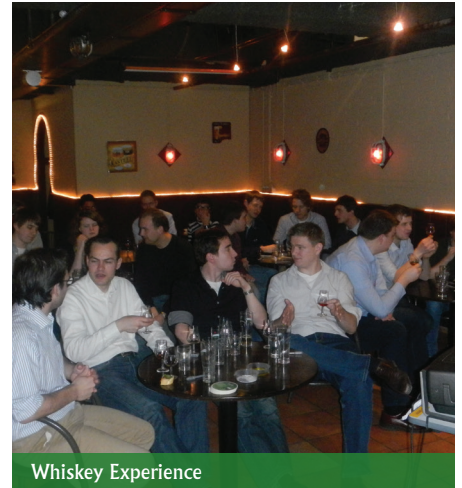
Whiskey Experience

Kerstlunch

Next to the sinterklaaslunch there traditionally is a second time the /Pub is filled with ETV'ers long before beer starts flowing. Christmas time has come and with it the ETV Christmas lunch! Celebrate this holiday with us and come eat with us. There is a rumour going round that Santa himself might even show up and tell one of his beloved Christmas stories.

From the board
An innovative story

author: Ludo van den Buijs

Dear Reader,

Just like every year the first "From the Board" article brings a new writer and with him a new board to introduce to you. This year we will be focusing us completely on accomplishing the goals the ETV has set out for herself. It has been an extremely busy start of the year in which a good night sleep has become a myth we can only dream of to see once again for ourselves. These first weeks have been amazing though. With more stories to tell, more people to meet and more life lessons to learn every day we can't help but look forward to the rest of this year.

Last year my predecessor mentioned in his first "From the Board" article that it would be a major milestone for the ETV when our new members would be just as old or even younger than the Maxwell herself. I am proud to announce that we have reached this milestone and I agree completely with Derk-Jan's conclusion that this is indeed an important milestone. It doesn't mean our new students are becoming younger every year, but it means the Maxwell is doing well and continues to be a success for the 17th year. The only reason that this has been pos-sible is the enthusiasm with which the Maxwell-committee has committed her-self to working hard throughout the year to ensure the arrival of the Maxwell on your doorstep four times a year. I would like to thank and congratulate everyone who has put so much effort in the Max-well for the past 16 years. The Maxwell wouldn't be where she is today without you.

I am glad to say the Maxwell-committee isn't the only successful committee within our study association. Many of our mem-bers are working hard to organise a large variety of events. These committees vary from a group of freshmen who organize several smaller activities in our Activi-ties-committee to a small group of more experienced members taking part in our Travel-committee. As a board member it is great to witness the level of enthusiasm with which all of our committees work. It is a level of enthusiasm which has made the ETV what it is today and it is of the upmost importance that this continues throughout the coming years. Fortunately our new members share this enthusiasm

The 142nd Board at the ORAS Lustrumgala

The 142nd Board of the Electrotechnische Vereeniging

and this hasn't gone unnoticed. The first freshmen have already started participating in committees and more are soon to follow.

As you are reading this the first exams have passed, which in turn means the first quarter of the academic year has already come to an end. It always surprises me how much time has gone past in what feels like a short period of time. This quarter is no exception. Freshmen have made Delft their new home even though the day they first arrived feels like yesterday to us and we have already gone through the first quarter of our year as board members of the ETV. Which brings me to the part of this article in which I introduce our board members to you.

Ludo van den Buijs ⊙ President
Marc Zwalua ⊙ Secretary
Ralph van Schelven ⊙ Treasurer
Kevin van der Mark ⊙ Vice-President &
Commissioner of external affairs
Moritz Fieback ⊙ Commissioner of education

Together we form the 142nd board of the Electrotechnische Vereeniging. All of us are in our third year of Electrical Engineering at this moment and have been active members of the ETV throughout these years. The first time we met each other was at the freshmen welcoming weekend and up to this point in time we have participated in many of the events organised by the ETV together. We have even been part of multiple committees together. We have come to know each other quit well over the years, but this will seem nothing after this year as board. Participating as full-time board members results in us seeing a lot of each other and will bring us closer together as a team.

We've got a very special year ahead of us. It will be a year in which we will attempt

to change the ETV for the better where we see fit. It will be an extremely busy, sleep deprived and stressful year and I'm looking forward to every single day of it.

All that is left for me to say a at this point is that I hope you will enjoy this issue of the Maxwell. It is filled with great stories and articles which are all worth reading. These articles include an article on behalf of Novabike, one of TU Delft's Dream teams and even a report of our freshmen welcoming weekend by a member of the organising committee. Long story short: we wish you a lot of fun reading through the first Maxwell issue of the year!

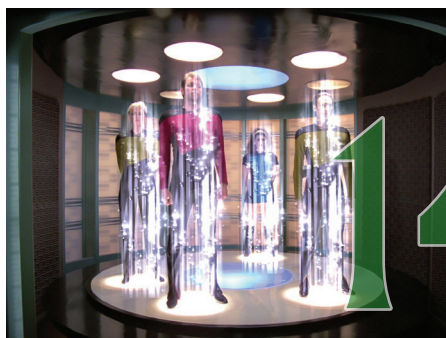On behalf of the innovative board,

Ludo van den Buijs

Theme content

... and more

Editorial

Dear readers,

As always, everyone is studying very hard for their exams, and we are working extra time to get this Maxwell finished between exams.

The first quarter of the year is always the busiest. Or at least it feels that way. You have to get the holiday out of your system and start studying again. It is harder than it sounds.

Not to speak of al the activities taking place to welcome everyone back again, as well as welcoming all the new students. You'll find a report of the EOW in this Maxwell. This weekend is for all the new students Electical Engineering to get to know Delft, the ETV and of course each other.

The Maxwell also has a lot of new blood. As many as four new editors are making their debut this Maxwell, and Ben returns after a break. We have new people, new ideas, and a lot of motivation!

The theme content is all about enabling futuristic technologies this time, and we discuss some subjects which were pure science-fiction merely a few decades ago, but are currently in development. Personally this is one of my favorite themes. Searching for technology that might seem impossible and finding things you never even considered yourself is one of the best parts of being an editor. And this theme supplements that perfectly.

Now it's back time for me to shut down the computer and bury my head in the text books again. I hope you have as much fun reading this edition of the Maxwell as we had making it!

Tobias Roest
Editor

Cloud: Onder- én overschat
Feiten en fabels

Auteur: Simon van den Doel

'De cloud? Dat is toch gewoon hetzelfde als internet?' Tegelijk met de enthousiaste geluiden neemt ook het cynisme ten aanzien van de cloud toe. Opmerkelijk is echter dat de échte uitdagingen (inclusief de soms eenvoudige antwoorden) vaak onbesproken blijven. Hoog tijd dus dat feit en fabel gescheiden worden. Cloudspecialist Simon van den Doel van KPN Consulting vertelt.

Het is nog maar een paar jaar geleden dat de cloud zijn intrede deed. De verwachtingen waren hoog, soms zelfs torenhoog. Wat niet zo vreemd is, wanneer je in acht neemt dat de voordelen van een clouddienst als SaaS (Software as a Service) als muziek in de oren klinken van de gemiddelde ondernemer of manager. Bijvoorbeeld doordat er geen investeringen meer in hard- en software nodig zijn, alleen nog betaald wordt voor daadwerkelijk gebruik, altijd automatisch de laatste versie van software wordt ingezet. Of doordat er ruimte- en tijdwinst in de eigen (ICT-) organisatie ontstaat. Bovendien geeft het ICT de kans om een strategischer positie in de organisatie te verwerven. In plaats van het bijhouden van de laatste softwareversies kunnen ICT-medewerkers hun blik namelijk verleggen naar de lange termijn en zo de eigen organisatie helpen voorop te lopen. Dat zou toch voldoende reden voor een organisatie moeten zijn om de overstap te maken?

Nu, enkele jaren later, groeit de inzet van clouddiensten echter niet zo hard als mijn collega's en ik indertijd verwachtten. Tijdens diverse projecten bij klanten zagen we dat ICT-managers en DMU's in organisaties tegen een aantal steeds terugkerende vraagstukken aanliepen. Vaak waren dit vraagstukken die we eenvoudig konden oplossen. In de loop van vorig jaar besloten we daarom een kwalitatief onderzoek te houden en goed in kaart te brengen wat de knelpunten nu precies zijn. Verschillende relaties nodigden we uit voor een gesprek. Deze relaties vormden een dwarsdoorsnede van betrokkenen bij ICT-processen – beslissers en operationele ICT'ers, uit kleine en grote organisaties, in diverse sectoren, overheid en bedrijfsleven.

Behoefte aan beleid

Uit het onderzoek blijkt dat één knelpunt door bijna alle deelnemers als doorslaggevend wordt ervaren: het ontbreken van beleid. Beleid van de eigen organisatie en beleid van buitenaf zowel van de eigen overheid als van Europa. Met ontbreken van beleid vanuit de eigen organisatie bedoelt men meestal heldere kaders op het gebied van privacyregelgeving of security. Van de overheid en van de EU wordt verwacht dat er een duidelijke richtlijn komt over de inzet van de cloud: wat kan wel, wat mag niet. Zolang deze onzekerheid blijft bestaan, zullen organisaties zich belemmerd voelen bij de inzet van de cloud.

Voldoen aan veiligheids- en compliance-vereisten is een voorwaarde voor verdere acceptatie van de cloud, zowel vanuit de eigen organisatie als daarbuiten. Daarop inspelen klinkt wellicht complexer dan het is. Het management – zowel vanuit ICT als bijvoorbeeld vanuit Legal en Compliance – kan al een grote slag maken door risico's te inventariseren en daar beleid rond te formuleren. De overheid en toezichthouders staan ondertussen ook niet stil. Begin dit jaar keurde De Nederlandsche Bank (DNB) gebruik van clouddiensten van Microsoft door financiële instellingen goed.

Simon van den Doel

'Introductie van de cloud is een ICT-aangelegenheid'
Fabel

Wanneer het management besluit infrastructuur, systemen en (of) software vanuit de cloud af te nemen, gaat dat veel verder dan ICT. Het is een cultuurverandering die op de hele organisatie impact heeft, klein of groot. Denk aan een hele nieuwe manier van contracting en bekostiging van ICT-systemen – daar zal ook Procurement rekening mee moeten houden. Door op tijd alle relevante stakeholders, van HR tot Finance, te betrekken, komt succesvolle toepassing van de cloud snel dichterbij.

'Het maken van een goede business case is onmogelijk'
Fabel

Een correcte berekening van kosten en baten is zeer goed mogelijk. Het is echter wel de kunst terdege te definiëren wat de reikwijdte van het werken in de cloud is, zowel qua kosten als baten. En dat gaat doorgaans óver de grenzen van de ICT-afdeling (zie ook de andere fabel). Van benodigde opleidingen tot goed nadenken over bekostigingssystemen: de impact kan groot zijn. Maak de business case dus organisatiebreed en betrek de juiste stakeholders.

'Bestaande systemen zijn goed te integreren met clouddiensten'
Feit

Natuurlijk zijn er altijd haken en ogen, maar in principe zijn de meeste bestaande (legacy)systemen te integreren met clouddiensten. Dat betekent niet dat iedereen in een organisatie lukraak en op eigen initiatief clouddiensten kan gaan afnemen: over de integratie en migratie moet wel goed nagedacht worden. Hierin kan ICT een belangrijke strategische rol vervullen. Zij hebben het overzicht en het inzicht. En zij zien wat de impact van een nieuwe clouddienst is op de lange termijn – op de relaties met andere leveranciers of clouddiensten.

> *"Het is een cultuurverandering die op de hele organisatie impact heeft, klein of groot."*

'Er zijn zoveel clouddiensten dat er altijd wel één past'
Feit

'De cloud' bestaat niet. Clouddiensten verschillen enorm qua functionaliteit, voorwaarden, technische architectuur en kostenstructuur. Het loont om te onderzoeken wat in de eigen organisatie gewenst is. Of wat gevreesd wordt. Om een voorbeeld te noemen: niet alle data staan standaard op een server waar de Amerikanen met de Patriot Act in de hand zo bij kunnen. Datacenters van sommige Nederlandse cloudleveranciers volgen namelijk de relatief strenge Nederlandse regelgeving, waardoor zij organisaties in staat stellen direct al te voldoen aan veel compliancevereisten.

Cloud is meer dan alleen internet

Overigens is 'de cloud' niet alleen een ander woord voor internet. Hebben wij het over de cloud, dan bedoelen we een vorm van dienstverlening. Of beter nog: talloze vormen van dienstverlening, die als gemene deler hebben dat ze altijd beschikbare en makkelijke netwerktoegang bieden tot een gedeelde externe ICT-omgeving. Deze netwerktoegang kan met minimale beheerinspanning snel geleverd of juist opgezegd worden. En dat kan organisaties veel winst opleveren. Of zoals ik al eerder zei: de cloud zou toch als muziek in de oren van vrijwel élke manager moeten klinken!

Simon van den Doel werkt voor KPN Consulting, het ICT-adviesbedrijf van KPN. Samen met collega's schreef hij een whitepaper over het onderzoek.

Food for Thought
Fly me to the Future...

Author: Ben Allen

When I was growing up I was fascinated with the Apollo space program. And no surprise, what geeky kid doesn't love the idea of men climbing into the most expensive and dangerous vehicle ever constructed to fly through space and visit the moon. These were tales of courageous, modern heroes in real-life science fiction!

The cynic in me wants to tell you that the only real reason mankind undertook this epic adventure was the cold war. But even as a child, it was obvious to me why people were prepared to take almost idiotic risks; apart from wanting to beat the Soviet Union to it there is a much more elementary reason NASA sent men to the moon: We fancied having a look.

That's it. A bunch of guys got together in a pub after work, like countless others before them, and had said "wouldn't it be awesome if we could walk around on that thing?" The difference was that at this point the technological barrier had recently been removed, and drumming up a space program was less of a PR risk than dropping hydrogen bombs on Saint Petersburg.

So when these chaps said "Well this time maybe we should actually do it then", the result changed the world overnight.

Figure 1: The Apollo 17 Command Module in orbit over the moon. (NASA)

Of course, while Neil Armstrong's setting foot on the moon was a monumentous occasion in history and lots of very cool science experiments became possible, an often overlooked aspect of the story is what this did back on Earth. Dr. Neil deGrasse Tyson made this very same point when he was interviewed by the US Congress about the NASA budget: the space race inspired not just engineers, but the entire nation became excited. NASA unified the country and set people's sights towards the future, and that's where the beauty of all this lies. Instead of focusing solely on what was, people started imagining all that could be. Star Trek is a fantastic example of this, with food replicators being the best example of day-to-day technology. The 1960's (kickass) TV show *Thunderbirds* featured one episode where a character pressed a button, and a cigarette holder slides up out of the desk. Not only this, but it automatically lights the cigarette you pull out of it. Now first off, smoking isn't cool anymore. But secondly and sadly, sleek and elegant integration of technology like this still remains absent from our daily lives.

But why? Looking first towards myself, I know I have the skills (or otherwise can find those who do) to make this technology. Given the materials and the time, I could probably work out how to make a TV slide up out of the floor. I could make
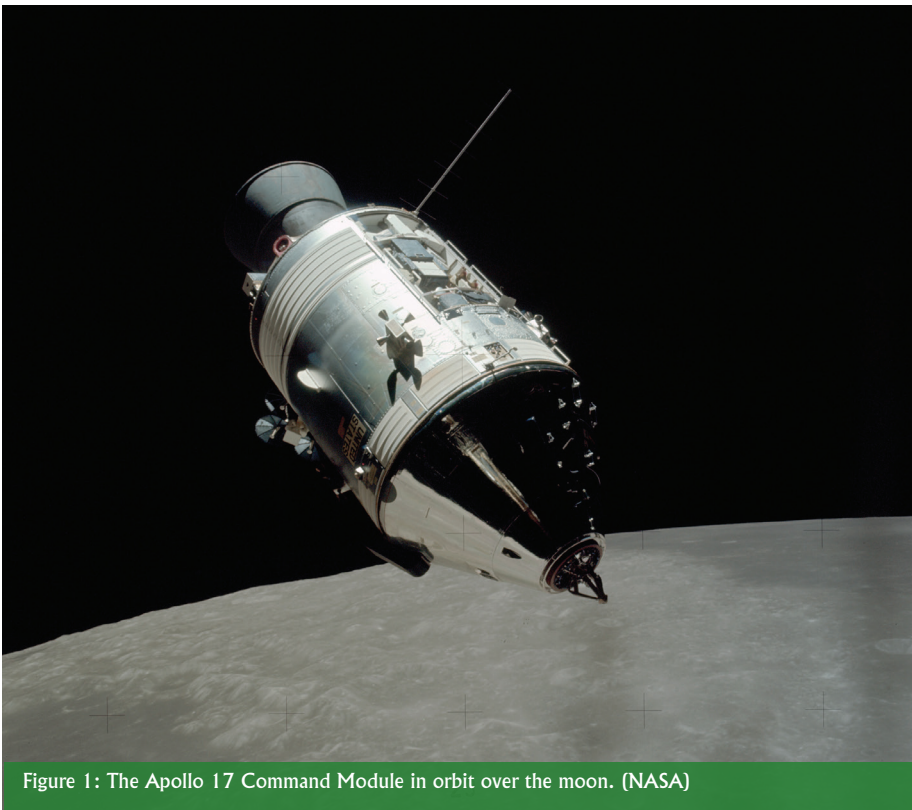
the lights automatically switch on around me and even have my daily schedule beamed onto the kitchen wall. I could verbally tell my computer to play the latest episode of the Daily Show while I eat my cornflakes in the morning. All the components for this technological nerd-porn fest already exist, so why does the description I just wrote sound like bad futurist mumbo-jumbo straight from the History Channel? Why is it that so far nobody - Bill Gates and a few somwhat less high-profile others aside - has put these components together in this way? Even worse, why is it that apart from a few creative and possibly weird people, nobody even wants to?

It's because nobody is *inspired* by technology anymore. The iPhone caused a massive shift in what we consider a telephone, but when tablets were introduced, we weren't as shocked. You can buy a full HD 42″ flatscreen even on a student budget, and my microwave has a better oven function than my actual oven. Not only that, but as clichèd as it is I can't for the life of me figure out how to set the clock on that thing. Technology is mundane, boring, and taken for granted. You've heard the "can't set the clock" joke before. It, too, is boring. In fact, the guy who made the control system for the microwave was probably bored while he designed it.

Most people in the real world - who are feelers rather than thinkers - don't care about the beauty of a system or how elegantly something is implemented because it doesn't affect them - all they want is a device that works every time they want to use it. And for most, the idea of customising hardware to suit their needs is alien and uncomfortable. It's unthinkable, in their minds nobody should even attempt it because the odds of success are, for those not educated in engineering disciplines, relatively low. And since there are no ready-to-go swag-up-your-pad kits on the market, we don't see awesome things like home automation. It's not even about cost - if we can make a huge TV for under 400 euros I'm sure we can work something out to keep things affordable on the home improvement front. But this isn't the problem at all - we are dealing not with a problem of technology but rather one of *zeitgeist*, the way society views matters in a specific period in time.

So how do you change the world? I think it's by changing the way people view technology. Right now, consumers just consume and aren't playing a part in how technology is developed, and this is a crying shame. Everybody should be able to chip (oh wow) in on development of products they want to see. Engineers hold a powerful tool to create - a tool which many don't understand the attraction of - and this can change. When people are asked what kind of technology they'd like to see, or how they'd like to have technology support their lives, they might start to dream a bit more. And when people start to dream, they start to try things out, and this in turn results in a happier, more creative society. It's not even a guess; we know this is true because we saw it in action during the Space Race.

Figure 2: 1960s concept art for a large scale self-sustaining space station.

And, of course, our homes would be filled with amazing gadgets - which is really what I wanted all along.

Let's tell people why we love the things we love. Next time you think *I want a coffee table that also keeps beer cold*, build a mini fridge into a coffee table. Add flashy lights and a remote interface so you can check the status of your fridge over the Internet. Then post pictures online, call your family and tell your friends. Explain to anyone who will listen why this is a Good Idea™. Invite people over to view your wondrous creation. Try it out, even if it is just to see if it'll work at all. You might just inspire someone else! Slowly but surely, we can infect people with our enthusiasm, and share with everybody a kind of creativity most people never knew existed.

Figure 3: I believe the sign says it all.

Dream team
Novabike

Author: David Meijer

All over the world people are looking for an alternative to fossil fuels. The DREAM-teams have a long history of developing exceptional vehicles with a sustainable power source. NovaBike wants to reshape the image of bio-ethanol by proving its potential for high performance. Four years ago, NovaBike Racing Team Delft was founded to show the power of bio-ethanol by designing and building a motorcycle that competes in a professional racing class.

NovaBike competes in the European SuperMono Championship. In this class you're allowed to have a one-cylinder engine with a maximum of 800CC. This championship was chosen because of the high levels of technical freedom, meaning we can build a custom-made motorcycle. Almost everything can be manufactured and designed yourself, so the only limit of our designs is the imagination of our team members. Therefor we can use the full potential of our team members' engineering knowledge. By combining the skills of students from different faculties we're able to create and design a bike that's tailored specifically to our needs. Almost all faculties are represented in the team, including students from electrical engineering of course!

The NovaBike
- Custom build by students
- 800 CC
- 125 kg - race ready
- Max. speed 240 kmph
- Bio-Ethanol fueled

The team
- 2 full time students
- 11 parttime students
- Minor places available!

Our competitors are professional racing teams that all use regular gasoline. If we're able to beat these teams we can show that bio-ethanol is a reliable, powerful, sustainable fuel and that it can replace conventional fossil fuels. We believe that the best way to do this is to beat them at their own game and defeat them in a race to the finish line. At the moment we finish around the fifth place in the European Supermono Championship, a very good achievement in a field with 40 riders.

Although the goals of NovaBike are all race and bio-ethanol related, we have one even more important goal: the education of our team members. The students are given an opportunity to work together with other students from other disciplines. They gain experience in designing, building, planning and much more. By applying their ideas in the real world they also get a chance see how the theory works in practice. All in all, invaluable experience for the engineer of the future.

The team is divided into five departments: Hardware, Engine, Electronics, Bodywork and the Management. Students from Electrical Engineering are usually part of the Electronics department. This de-
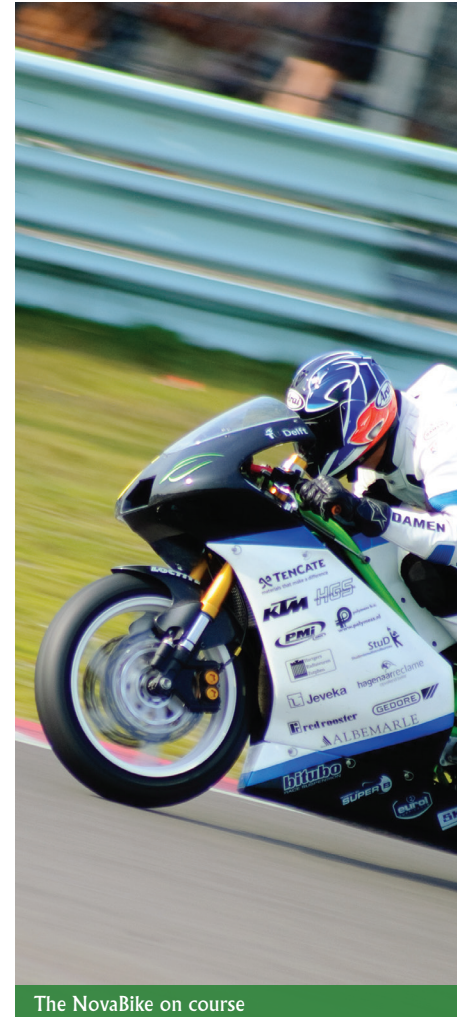
The NovaBike on course

partment is responsible for all electronic systems on the motorbike. One project the team has been working on in the last year are the data-logging systems. Using a wide array of sensors all kinds of data is being logged during the races. Using the information of for example tire speed, throttle positions or suspension response we're able to perfect the set-up of our suspension or engine.

Also we're using the KMS motor management system. This system is fully customizable and is programmed to control our engine. This is a chance for Electrical Engineers to work together with student

from other disciplines. Cooperation with Mechanical Engineers that have a lot of knowledge about the engine is needed to be able to use the motor management systems. By working with other students you'll gain experience and learn to look further than the Electric systems themselves.

These are just two examples of projects of our electronics department. However, there is much more we could be doing in the electronics field. Newer, faster and more accurate sensors could be used to open up a whole new world of possibilities. Also by using a drive-by-wire system you can create all sorts of new systems to control the motorcycle, from launch control to linear throttle response. There's only one thing to remember at NovaBike and all the DREAM-teams in general: if you can dream it, you can build it!

Our racing season starts in May and is the reward of all the hard work that has been put into the motorcycle. Seeing your own creation racing on the track is one of the best feelings you'll ever have. With this experience you perfect your own part of the motorcycle and improve the bike

during the season. Racing with a sustainable, innovative and competitive motorcycle is a great experience!

Are you interested to join the NovaBike team? Do you have new ideas for electrical systems that could give our motorcycle the push we need to become European Champions? We're always looking for new members (part-time, minors or full-time) that can make a contribution to our team.

Look at our site www.novabike.nl or pay us a visit at our workshop in the DREAM-hall if you want more information about how to join our team!

The team cheering for their driver

Teleportation
'Beam me up, Scotty!'

Author: Yvo Mulder & Isabelle Vlasman

When thinking about teleportation, Star Trek-alike scenes first come to mind to most people. But the idea of teleportation is almost a century older than the popular sci-fi series. One of the first books which mentions teleportation in some extend was 'The Man Without a Body'. In this horror story, written in 1877, a man transmits matter through a telephone line using a device called a 'telepomp'[1]. But it was Charles Fort who gave birth to the word *teleportation* in his book 'Lo!' in 1931[2]. Teleportation, as made famous by Star Trek, is being investigated by scientists all over the world, but still, we can't 'beam up' people like Scotty did in Star Trek... yet.

Present Teleportation

Although it's not common knowledge, there have been scientists who succeeded in teleportation. In 1993, the first paper was published about the idea of quantum teleportation. Five years later, the Furusawa group at the University of Tokyo succeeded in a complete quantum teleportation[3]. At the moment, the record distance bridged for quantum teleportation is 143 km. This took place in 2012 between the Canary Islands Tenerife and La Palma[4], see figure 1.

This kind of teleportation differs a lot from the teleportation of objects or humans. Star Trek, for example, got their idea of teleportation in the early 1960's from the National Aeronautics and Space Administration (NASA). Also, special effects where way too expensive in those days and it was cheaper to 'teleport' the characters than to create a filmset for every landing and takeoff of a spaceship.

A very hot topic at the moment is quantum teleportation, which teleports the physical properties of atoms, instead of real objects or matter and also is very important in the development of quantum computers. Quantum teleportation of atoms means 'scanning' these physical properties from the original atom, transporting the data containing the properties and recreating a new atom with these properties somewhere else. Basically, the original atom will be destroyed.

The question rises that, if we can teleport atoms, could we also teleport whole groups of atoms, or maybe even objects or people? Maybe the teleportation of objects isn't even that impossible in a near future. Currently, the university of MIT can already teleport ensembles of atoms over a distance of 150 meters[5]. The step to teleporting objects seems to become smaller and smaller...

Human teleportation

The step to teleporting human beings is a big one though. The first problem that arises is scalability. Calculations show that sending data of cells would not be the problem, because the DNA is the same in all cells and this contains all data of the human being. This means that all that has to be sent is the DNA and not much more. The bottleneck of human being teleportation is the brain. Every memory, peace of information or knowledge that you have is saved somewhere in there. Copying this, will take a whopping number of 2.6×10^{42} data bits! If we, for example, transport all of this data with a bandwidth of 30 Ghz. It would take around 4.85×10^{15} years, which is 350,000 times longer than the age of the universe, to complete teleportation[6]. Needless to say,

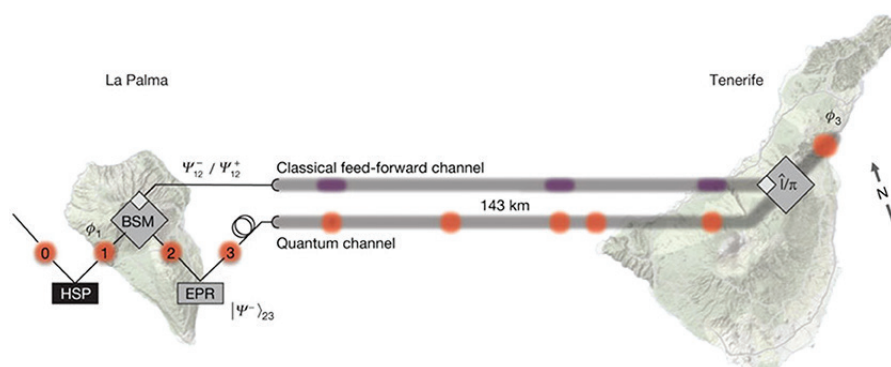

Figure 1: Quantum teleportation between Tenerife and La Palma[4].

this makes teleportation a lot less attractive to people. So, unless there is a way to transfer this information a lot faster, there is no way (yet) to really achieve human teleportation.

Ethical questions

If mankind every succeeds in teleportation, some ethical question arise. First of all, the original version of 'you' is destroyed and a new one is created somewhere else. Even though you don't seize to live when you are teleported, you're made of a new material and your old body is destroyed. The question is: is this some kind of murder of the original you? Because your old body is in fact destroyed, but still, you're there and you're the same as you were before.

Secondly, there's also the problem with teleportation going wrong. If a success rate of 100% is not achievable, should it be allowed? Horrible thoughts come to mind when thinking about mistakes in teleportation. If limbs are left behind or part of the brain, someone's life would be ruined. People could get killed by it. When will the success rate be high enough to allow people to use teleportation and if something goes wrong, who is responsible?

All in all, a world with teleportation available for everybody would differ from now like night and day. And maybe, one day, it will really happen. The first events for teleportation have already been set in motion. Not only with quantum teleportation, but also with the 3D printer.

Is 3D printing the future?

Since the rise and evolution of the 3D printer, mankind is one step closer to teleportation of human beings. But how can that be? What do 3D printers and teleportation have in common? A 3D printer alone will not teleport anything. However, when combined with a very thorough

scanner, teleportation isn't that far away anymore.

In theory, we could do a very thorough scan of a human being. That being an analysis of his or hers DNA, cell structure, nerve system, brain, et cetera. If the results of the scan are sent to an advanced 3D printer, we could print the human being and if the printer is at a totally different location, we have succeeded in the 'teleportation' of a human being.

All in all, it looks like teleportation is still pretty far away. Even though it probably is the dream of many people, there are so many drawbacks that we might wonder: is this what we want to accomplish?

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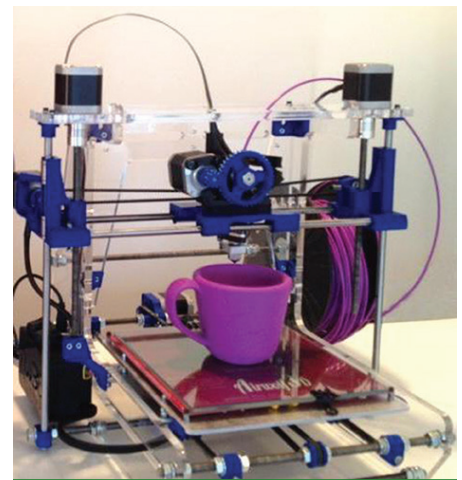
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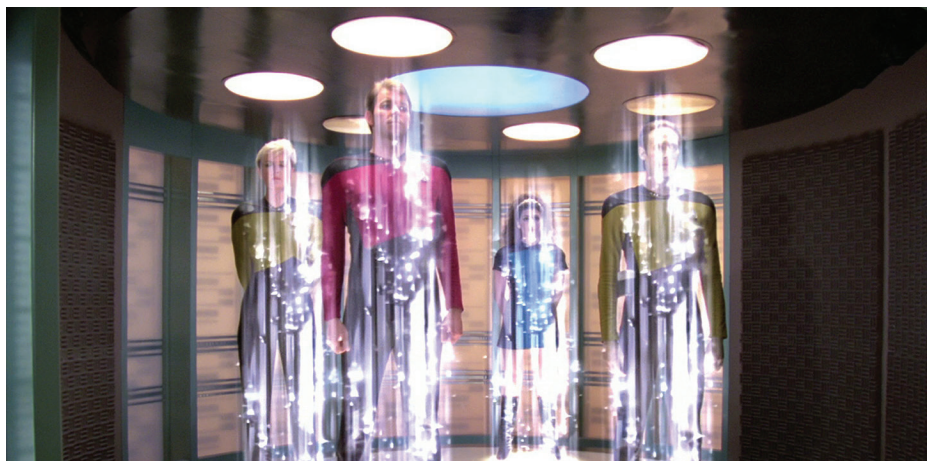Figure 2: A household 3D printer[7].

Figure 3: Star Trek Teleportation[8].

Fotopagina
Arcologies, the ideal cities.

Ever since humankind has started planning on building cities - rather than just expanding existing villages - there have been many extraordinary designs, including airbourn and submerged cities. Most of which were completely impossible to realise with the technology of that time.

Yet, with climate change threatening our current metropole, we have started taking some of these projects a lot more seriously. Once again, we began the search for a safe haven that could provide us with everything. The self-sufficiant cities have been named arcologies - Architecture meets ecology.
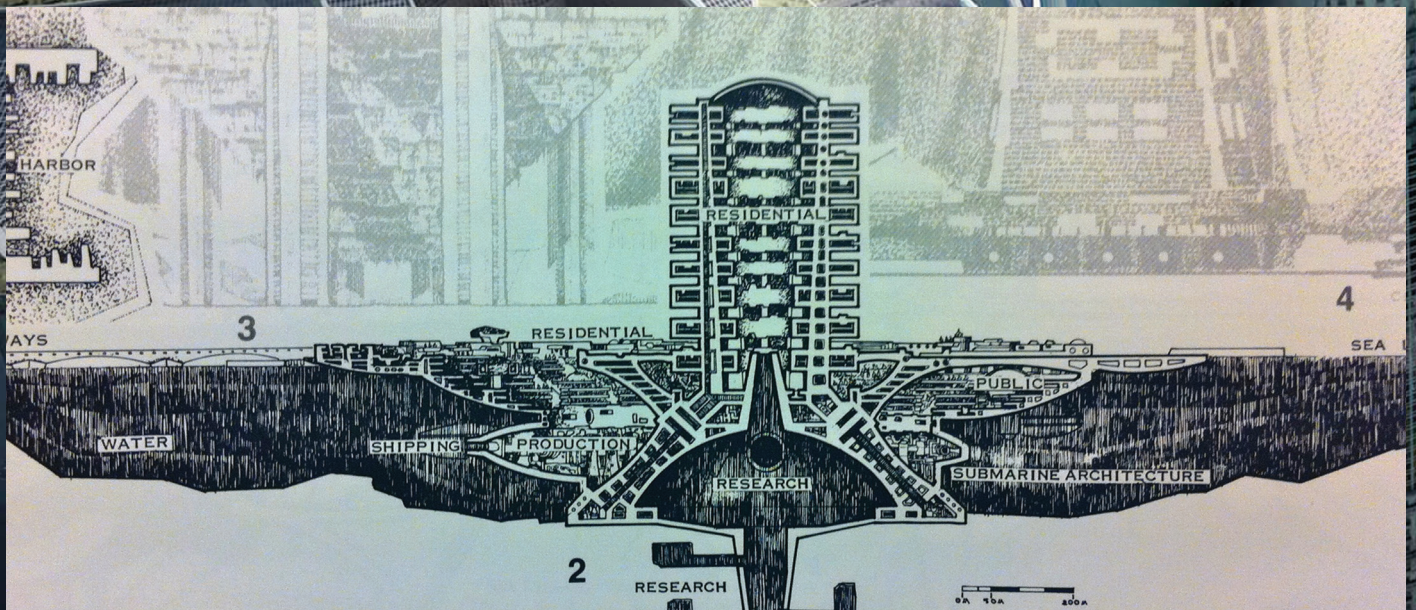
The italian architect Paolo Soleri popularized the idea of the arcology by his designs - one of which is shown here - that we published in "The Last Whole Earth Catalog" and his work on the experimental town of Arcosanti, Arizona, USA. Starting in 1970, it was his personal attempt at an arcology.

A more modern attempt at an Acology is the developement of Masdar City in the United Arab Emirats. This city - planned to be finished around 2025 - will rely purely on solar energy and is said to produce a zero-waste ecology.

New automotion
How we move towards the future

author: Derk-Jan Hulsinga

While many of us still ride conventional bikes and trains, we would be surprised how many alternative forms of transport that are already out there, are still considered futuristic. There are obvious reasons why some of them aren't common property - imagine the chaos a thousand flying cars would bring - but that does not change the fact that once you see such form of transport, you actually really want to ride it.

The new definition of 'off-road'

Let's start off with everything everyone loves, but which isn't seen out on the streets all that often. Since steering a hovercraft is still considered difficult, turning your land vehicle into a boat has been made much simpler by companies like Gibbs Technologies and WaterCar, who already have quite the experience in combining a car with a functionality much a jetski or a speedboat. Though these amphibious vehicles are nothing new, none of the old designs are used often since they are more focussed on a fifty-fifty use – even when biased, this mainly leans towards the water front. – but this is quickly changing. As the sailing installation, allowing the car into the water, becomes less prominent and less costly, it is already a lot easier to combine it with your daily car.

Diving deeper into the topic, we find that the Rinspeed company has taken this whole aquatic car a bit futher. Their sQuba is the world's first car that can be completely submerged and "fly underwater." This car is – next to a beauty in design – also a zero-emission vehicle, powered by rechargeable Lithium-ion batteries and includes diving regulators for its occupants since it has an open cockpit. You still need to put on a bathing suit, though.

Thankfully, the future harbours even greater vehicles for us. PAL-V One is a car-gyroplane hybrid for two which, though it is a prototype, is a working example of hardly seen on the road, simply because with a 10 minute transformation it is ready to take off to the skies. Four rotors are normally bound to the vehicle itself but by pushing a few buttons you

The PAL-V One. Both trycile and helicopter.

are both capable and allowed to fly up to 1200m and as the Dutch company which designed it, PAL-V Europe, states: "Open up new dimensions on your personal freedom."

Taking it a step further, brings in the TF-Xtm from the terrafugia company. Though this flying car, just like the PAL-V, has the impractical problem of having to stop before taking off, this design is somewhat more green as the flight motors are electrical and allows place for four instead of the mere two. With an astonishing 1200 km travel reach, this vehicle – designed to fit in any domestic garage – seems to be more of a candidate for common use. *See its working on http://tinyurl.com/bt8ka4d*

The sQuba - Worlds first completely submergable car

Everything without a driver

While many challenging autonomous driving projects like SARTRE and DARPA – which will be discussed further on in this article – are hot topics, let us take a look at the milestones that we have already reached in this field. Many of the underground public transportation systems – technically referred to as rapid transit – in the biggest cities in the world are already fully automated and only a few men control most of their movements – if not left to computers completely already. The London Underground 'Victoria Line' was the first in its line of completely driverless trains, the real challenge was won by the completion of the first APM – the automated people mover. Currently, the Vancourver SkyTrain is the largest fully automated system with a span of 60 km. This is roughly the distance from Delft to Amsterdam. All completely autonomous.

Now, eyes back on the road. What is bringing us the future? Since 2004, the Defense Advanced Research Projects Agency has set up the so called DARPA Grand Challenge. A project which draws the topic of fully autonomous ground vehicles onto the open road. Fifteen cars were planned to take place in a 240 km race through the Mojave Desert but none of them finished. This shows how difficult this challenge actually is. In 2005, five cars finished the 212 km track of the second race which took place in Nevada USA. The DARPA Grand Challenges were seen as one of the more prestige challenges, combining image interpretation, trajectory modelling and interpretation algorithms. Although all the challenges would be easily com-

Lexus Autonomous Vehicle Cameras

pleted by a human driver, the races have seen many failures – Some even before the start of the event. The research on autonomous driving has taken great steps forwards thanks to this government funded challenge.

The most recent DARPA challenge which focussed on autonomous cars has been the 2007 Urban Challenge. Here, the teams were challenged with driving through the setting of a small town, obeying the basic traffic rules and coordinating traffic flow (They were only allowed to pause for 10 seconds). The top five teams received up to 1 million US dollars as a support on their research on autonomous driving. With many teams completing the challenge successfully, it seems that the challenges had a tremendous effect on the interest in autonomous driving.

With the technological limitations fading, it seems that a whole new problem arises: The legal cause. As expected, this topic has mainly risen questions in America. Since this is the only country in which some state authorities have made autonomous cars street legal and not at all because we expect this country to be known for its arbitrary lawsuits and unpredictable outcomes. Since this is not a law magazine, I will end this discussion with the following question, set up by Bryant Walker Smith – a researcher on this topic:

"One night, a driver is brought home by his autonomous car. He is tired and falls asleep during the journey. His car tries to wake him up with noise and flashing lights – as he is still expected to pay attention – but it is a lost cause. For the drivers safety, the car directly pulls over and parks on the side of the bridge they were driving on. Here he is tailgated by another driver. Both are badly hurt, but alive.

A software update would have decided to drive past the bridge, park where there would be less chance of an incident and brace the drivers seatbelt for any impact. Yet the management had decided to not make these updates mandatory and our driver had not yet done so himself.

The question arises: Who is to blame for this incident?"

While DARPA is now focussing its challenges on other subjects, the SATRE project is still focussing on the road. This project from the Princeton University is focussed on creating 'road trains'. Because we have long reached our limit in simply up scaling vehicles for transport the "SAfe Road TRains for the Environment" idea is based on multiple vehicles autonomously following a single lead driver. With less distance between the different vehicles and a single command, this project expects to reduce fuel consumption up to 20% and anticipates a 10% reduction of driver caused traffic accidents.

The true paradigm switch will take place when we are completely free of our current traffic issues. Alternative transport, personalised routing and a growing infrastructure will revolutionize door-to-door travel in large economic areas. When and how the above stated topic will be combined, we are unable to say. So while douglas' view of the intergalactic highway is still improbable – you might just live long enough be able to call your personal, automated, flying transport pod for a ride anywhere.

Head-up Display
Augmented Reality

Author: Jurr Andriessen

While the idea was brought up more than a century ago by the fantasy writer Frank Baum (Well known for "The wonderful wizard of Oz"), it has only been recently that the augmented reality (AR) has been taken to the streets. Even though the head mounted display made its appearance for the first time in 1966 as a window to a virtual world, the real revolutionary aspect of a virtual assistant in permanent eyesight has started with the 2000 ARQuake game designed by Bruce Thomas.

As simple as it sounds, the AR version of the popular Quake – a first person shooter from 1996 - allowed the players to run around a physical environment while influencing a virtual overlay of it, enabling to shoot enemies with a custom designed gun controller. Sadly enough it was never released to the public. Good thing there weren't that many game-violence discussions back then.

Nowadays the virtual overlay of our real world is expanding as more and more companies are interested in its uses. And there is no need for wearing special helmets anymore. Virtually every handheld and phone is equipped with one or two camera's enabling us to play various games just like Quake on our phones, shooting zombies in the metro we sit in ourselves. But there is more than just games.

It is no longer required, for example, to visit furniture shops and do measurements in your living room since we can now see what a sofa looks like and if it fits using a simple Ikea-app that allows us to put down virtual pieces of furniture from the catalogue in 3D in our own room. In a similar way we can for instance view shoes in 3D, directly from a picture in some magazine.

There are numerous applications. You can view what houses are for sale in the street you walk, where nearby shops are, the ratings of the restaurant you're standing in front of or automatically find information on the historical object you are looking at. It's even possible to read the ingredients of your noodles written in some foreign language as your phone can translate them immediately and make them appear to you in your preferred language. Never getting lost in Chinatown again.

Just now companies are taking the next step by creating products that are made especially for augmented reality. The best known example of this, are obviously the Google glasses but many other – also some non-head mounted – so called "Heads-Up Displays" are being marketed. Implementing the desired information in your vision as you go, showing you the way like a normal navigation system would, as well as translating foreign languages with live subtitles, you won't even have to get your phone from your pocket anymore.

These Heads-Up Displays (HUDs, The origin of the name stems from a pilot being able to view information with the head positioned "up" and looking forward, instead of angled down looking at lower instruments.) seem like a neat sci-

Augmented reality in IKEA webshop
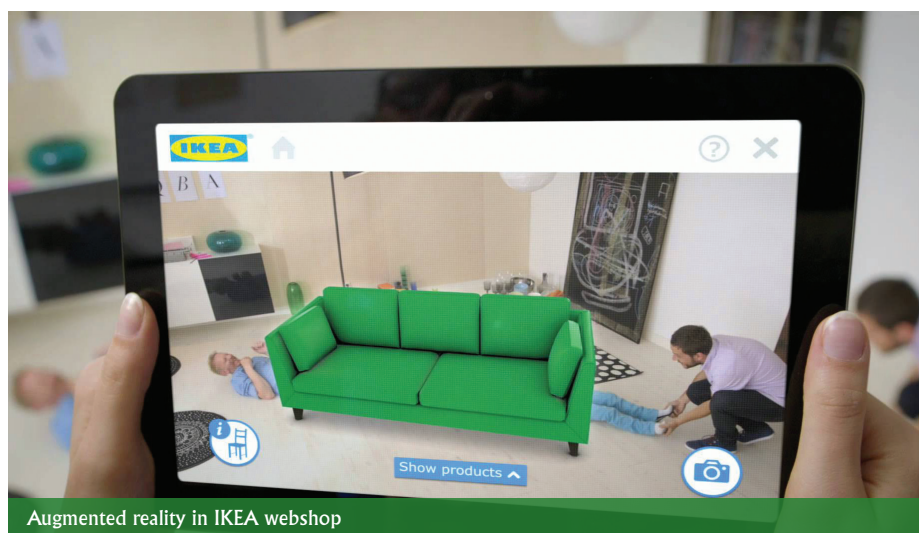
Head-Up Display in a car

ence fiction tool only Iron Man gets to have in his suit, but have actually been incorporated in US military aircraft since late 50s. The key idea is to display important data without requiring users to look away from their usual viewpoints, by presenting it on a transparent display. This way the user can stay focused on what he needs to see, although application as in the Google glasses might be more a form of distraction.

As we speak the R&D departments of today's leading companies in technology are working on the integration of HUDs in our daily life as well as in more professional fields like the military. It will not be long before most cars have a HUD similar to those of jet fighters (some BMW series already have one) and it might be pretty useful too. Imagine the windshield of your car not just showing your speed and

directions, but maybe even highlighting rapidly braking cars in front of you or suddenly crossing pedestrians. It's only waiting for our own minimap showing nearby police vehicles.

The army has been using HUD-techniques as well, not merely as a support for soldiers – warning them of possible dangers and pointing out barely visible enemies, but also as a two way communications device, transferring the cadet's vision back to the headquarters in a live stream. Hopefully Google won't be doing the same to your glasses. Although it would be nice if Google's glasses also warned you for dangers and pointed out people you know using some face recognition technologies, who knows? Give it a few years and wearing glasses containing a HUD might very well be just as common as wearing a watch.

Finally, anyone had Geordi La Forge as his childhood hero? The latest developments in AR technology have been suggesting on-eye displays and full optical implants. Though these technologies have risen from the gaming, medical and military sectors they are reaching the general public as we speak.

Master thesis experiences
Tips & tricks for your master thesis project

Author: Nils van der Blij MSc.

Every Electrical Engineering student finishes his or her studies with a Master Thesis project. This project spans at least 8 months and is concluded by presentation. Students usually have the option of doing a project in collaboration with a company.

My project subject was "Feasibility Study of a Superconducting Linear Actuator" and was done in collaboration with Philips. My final presentation and hearing was on the 29th of May (2013) where my Master Thesis project was awarded a 9.5. This article will discuss the experiences of a research project at a company and tips and tricks to achieve a high grade on your Master Thesis project.

Master thesis at a company

My master thesis internship was at the PInS (Philips Innovation Services) mechatronics department. This department mainly focusses on the design and optimization of (linear) actuators. I had about 30 colleagues of which 10 were electrical engineers.

As PInS is located in Eindhoven I moved to a room there. For my entire life I have always lived in the Randstad so the change was quite big for me. However Eindhoven was very welcoming to a young engineer.

Essentially this project was a solo endeavor. All the research was conducted and all calculations and models were made by me. However I have never felt alone.

The entrance to the PInS

I had three direct supervisors at Philips with which I had a progress meeting every other week. During these meetings the progress on the superconducting linear actuator was discussed and my planning for further research was adjusted.

Throughout my 8 month project twice there was a meeting with all 10 electrical engineers to discuss the progress and brainstorm about the final design. Such a large meeting was very useful to ensure all options for the design were considered.

During my studies I have never realized how much you actually learn at university. Over the course of my research project I developed myself as somewhat an expert on the area of superconductivity and linear actuators. At Philips I was respected as an engineer and not just a "measly" student.

But even if you just consider the way of thinking you, as an aspiring engineer, can contribute considerably to a company or society. Some colleagues discussed their (electromechanical) problems with me and sometimes I was able to help them out considerably. Realizing the depth of your knowledge and skill is an important experience from doing a Master Thesis project.

But also not work related my colleagues were always there to have a chat. At lunchtime me and about 10 colleagues moved to the canteen and sat and ate together. During lunch a nice variety of conversations emerged.

Overall the experience of doing my Master Thesis internship at Eindhoven was very educational. For the first time I had no

one telling me what to do and the freedom to research all the topics I wanted to research. Additionally I got a taste of the working life as I worked from 9 to 5 in the office. I would recommend anyone to do a project at a company.

Tips & tricks to achieving a high grade

Announce to your supervisors from the beginning to the end that you want to achieve a good grade.

Although this might seem unimportant this is crucial. Your supervisor cannot smell that you have ambition. Tell your supervisors at the company and university that you are aiming for a high grade (do not forget reminding them from time to time) and they will give you feedback appropriate for these ambitions.

Schedule regular meetings with your supervisors.

Not only appropriate feedback is important but the more regular the better. I would advise meetings with supervisors at the company every other week and at least every month at university. In preparation of these meetings prepare a simple presentation or make a list with what you have done and what you are going to (this list of course expands over time).

Start writing your thesis from the first day.

Do not wait until the end of the project to start writing down what you have done. Believe me you will thank yourself later if you write regularly. Writing around a 100 pages thesis is tedious and will not benefit the quality of the thesis. Additionally hand in the chapters you have written at your supervisors. Supervisors generally do not have time to read 20+ pages in one go. Handing in your thesis for feedback in chunks will increase the quantity and quality of the feedback. I would advise writing about a chapter each month (10-20 pages).

Answer all questions that come to mind.

The Master Thesis project is the time to expand your mind and knowledge. If a question comes to mind about your subject take the time to answer it even though you might not use the information in your thesis. Your insight in the subject will greatly increase and questions the exam committee will ask will likely be similar. Do not leave any loose ends.

Discipline and relaxation.

I have seen many graduates spend a lot of time on Facebook or other "extracurricular" activities. Do yourself a favor and refrain from this. You are making the transition to the working life, get used to working 8 hours a day. You will be amazed what you can do in 8 hours a day 5 days a week.

However your brain needs rest as well. Do not stress over problems you cannot solve immediately. A stressed brain underperforms. Clear your mind, do something else for half an hour (write a part of your thesis, run a simulation, read a paper or grab lunch).

Quick tips on writing a thesis:
- *Structure is key.*
- *Be consistent.*
- *Be coherent.*
- *Be unique.*
- *Quality not quantity.*

Career Column
A life after Electrical Engineering

Author: Frank Teunisse

During their time as Electrical Engineering students the ETV plays an active part in the student life's of many of our members. After finishing their bachelor or master they leave the ranks of active ETV-members and begin their journey towards finding their first job. In the career column a former ETV-member gets to tell their experiences on the job market. This edition it is Frank Teunisse who shares his experience.

Already during the first year of my Master in Embedded Systems, I was orienting on the labor market. I was doubting whether to start working in the field of my study, or to use the managing and business skills I gained during my "career" as a committee and board member at the ETV. The final company of choice was Accenture, where I could start right between both worlds as a "Business and IT consultant". I started in January 2013, within the Health & Public Service department.

Even before I got my first paycheck, I felt the benefits of being a laborer; my company immediately provided me with a new car, phone and notebook. The most important differences between the life as a student and as a laborer are indeed financial; the lack of money has changed for the lack of free time. Not being a student anymore, furthermore, meant I had to move out of my student apartment. Although I still visit my flat mates quite often, the quietness of living just with my girlfriend, is very welcome after a long day at the office.

My first client is an organization within the Ministry of Social Affairs. After being a 6th year student, all the way up the ladder, it felt a bit weird to start as a rookie, all the way down the ladder. My first role was to run the helpdesk, at the first line support. But already within a few months I worked my way up. Currently I'm managing my own projects and project members.

During my daily job, I get plenty of clues for answering the question in the first line. Solving the underlying problem, however, may be more than a lifetime challenge.

Frank Teunisse

Watt the Flux
Report of the EOW

Author: Jonas Carpay

Almost 200 students start Electrical Engineering every year. For many of those that means starting a new life in a new city. In order to help these students with this transition, the ETV organises the EOW ('Elektro Ontvangst Weekend', which roughly translates to 'Electrical Engineering Introductory Weekend').

For the past 31 years, the EOW has been held at the end of the summer, a week before the start of the academic year. The goals of the EOW are to introduce the new Electrical Engineering students to the EEMCS faculty and the ETV, but first and foremost to let them get to know each other. Some of the best friendships between Electrical Engineering students are forged right at the start of their academic career, during the EOW.

What sets the EOW apart from other introductory weekends is that it is organised almost entirely by a small group of first-year students. This is a very deliberate choice on the ETV boards' part. Freshmen have had their own EOW most recently and can therefore judge better than anyone what parts of the EOW work and what parts need to be changed. Consequently, no two EOW's are alike. While freshmen might not have a lot of experience organising events this size, they are presented with an invaluable learning experience.

One of the first things the newly formed EOW committee has to do is decide on a theme for the weekend. Out of a 107 candidates we finally settled on 'Watt the Flux'. This years' EOW was unique in that it was four days long, instead of the usual three days. It started on Thursday, August 15th and ended on Sunday, August 18th. The staff during the weekend consists

New students at the Highvoltage Lab

of several parties. Many freshmen outside of the committee are asked to help during the weekend as student mentors. They are in charge of smaller groups of new students and form the backbone of the organisation. Aside from the mentors, there's the committee, the current board, next year's board and many older students, all of whom help during the weekend. This makes it so that while the preparations are in the hands of the EOW committee, the weekend itself is very much a group effort.

Students were welcomed at noon on Thursday at the EEMCS faculty. As soon as they came in they were given their boiler suits and glass steins. These two items

New students socialising together

have long been a tradition for the EOW; the boiler suits are the students' uniforms for the duration of the weekend and the stein serves as their mug, regardless of beverage.

The first day of the EOW was all about the university campus. After the students had time to arrive, talk amongst themselves and customise their steins, the first item on the program was the introduction in the university auditorium. This university-wide introduction is where the dean welcomes the new students to the TU Delft. Afterwards, it was back to EEMCS for more talks and introductions: first by the faculty dean, then by the ETV president and finally by the EOW committee president. After all this talking it was finally time for action. The students were given a tour of the faculty, led around in small groups by the mentors. There are many locations in the faculty worthy of a visit. There's the roof, which is the highest point of Delft and offers an incredible view. Then there's the 'studiebewaring', a sort of museum beneath the faculty featuring some incredible electronics-related equipment. There are the high-voltage laboratories, the DIMES lithographical laboratories; the list goes on and on. The

Breakfast on sunday morning

evening consisted of a host of activities ending with a drop in the area around Delft. Upon their return the students were welcomed in the faculty bar, after which it was time for bed.

Friday started with pictures of the whole group from the roof of the faculty, after which it was time to leave the university campus to go to the campsite. The main event on Friday was a game that hadn't been played at the EOW for some time: the 'beursspel', or auction game. The goal is to gather all the necessary components

for one of several possible circuits. In order to do so, the students need to earn play money, trade components and build their circuit. What makes the auction game so successful is that students earn money by learning things about the ETV, the faculty and electrical engineering in general, and the trading components invites them to talk to one another. Even if a team does not manage to finish its circuit, the students will still have learnt a lot maybe even made some new friends.

Saturday's main event was the trading game and the subsequent visit to the beach. In the trading game, students are given a resistor that they are supposed to trade for something more valuable, which they then in turn trade for something even more valuable, and so on. By the time the game was over and the students arrived at the beach with their haul, they had couches, toasters, paintings and all sorts of electrical equipment. On the beach they were asked to rebuild the EEMCS faculty with the things they brought with them. The final winner was decided upon by some very special guests: the very first EOW committee, who organised the weekend 31 years ago. While everyone was at the beach the barbecue was being prepared on the campsite. The

Drinking champagne at the beach

The tradional peanut butter jar race

EOW barbecue, on the Saturday of every EOW, is open to all faculty staff and ETV members. It is a great opportunity for the students to meet students from other years and see what the ETV is like.

The final day of the EOW was the most laid back. There were some games and around noon there was a large inflatable gauntlet. Most importantly, however, the students got to form the groups in which they were going to do the OWee (the OWee is the introductory week in Delft where new students get to know the city and student societies). Afterwards, it was back to the faculty for a final closing ceremony, and the students were off to the OWee.

All in all, this year's EOW was very successful. The weather was generally good, and everyone seemed to have a great time. Next year the EOW will be in the hands of new people, and I can't wait to see what they come up with.

The new students, the new board, the old board and the studentguides

Lunch lectures
Lely and Technolution

Lely

De lunchlezing van Lely was bijzonder duk. Welgeteld 106 man waren aanwezig in collegezaal PI om te horen welke verschillende disciplines van elektrotechniek komen kijken bij het maken van een melkrobot.

De spreker ging van start met een introductiefilmpje van Lely. De diversiteit van Lely als automatiseerder van de agriculturele sector werd erg duidelijk. Vervolgens werd er verder ingegaan op de ontwikkelingen van Lely in Nederland. De R&D in Nederland richt zich voornamelijk op de melkrobot. Deze machine laat een koe in een kooi lopen zodra de koe zelf vindt dat zij gemolken moet worden. Zodra de koe binnen is, detecteert de machine haar en sluit hij het hek. Door middel van een uitgebreid netwerk van sensoren vind de robot de uiers, reinigt ze en sluit voorzichtig de melkkoppen aan. Eenmaal gemolken, worden de uiers nogmaals gereinigd en controleert de robot de melk op ziektes en bacteriën. Mocht een koe meer krachtvoer nodig hebben omdat ze minder melk geeft, dan past de robot dat automatisch aan in het voerschema. Ook de voederrobots in de schuur en de autonome mestruimers komen van Lely.

Samen met deze robots werkt Lely aan een geautomatiseerde boerderij. De boer hoeft veel minder personeel aan te nemen, niet meer vroeg op de staan en het is beter voor de koe. Wat wil een boer nu nog meer!

Students during the Technolution lecture

Technolution

On 19th of September we had the honor to get a guest lecture by Technolution. Technolution is a firm that is specialized in innovative and technological projects. In this lecture they presented a project they are working on now. The client of this project is Eneco. Eneco is looking for a way consumers can collect data from their electricity meter. This information can be used to read the current meter statistics, but also monitor energy consumption.

The idea is simple, but there are a lot of problems that come up with a device which can receive and send the data which is collected. The main problems are compatibility with known software and devices, but also ease of use and costs. After months of designing and building they have come up with a product consisting of two parts. A main part which can be used to extract the data from the meter and connect it to your home network using your router. If no router is available near this part you can use a wireless extender. This simple pair of devices can be used to view data from your meter in any browser, similar as a router configuration page. The system is secure and can only be accessed from your local network and is easy to use. It is a great project which not only improves the way we consume energy, but also make people aware on how this energy is consumed and may even save energy which is better for the economy and environment.

Men and machines
Upgrading the human body

Author: Tobias Roest

As the 1974 TV-series "The Six Million Dollar Man" already depicted, one dream of mankind has been to fuse our technology with the human body to make it faster, stronger, more agile and resilient beyond imagination. "Cyborgs" have been around in books and stories for over a century. These cybernetic organisms are the perfect example of how we see ourselves being enhanced with technology. Since the beginning of humanity people have made utensils to aid us in our endeavours, but taking the next step and actually implementing mechanical and/or electrical devices in our own bodies is a subject of the last decades.

In 1879, sir Edward Page Mitchell wrote a short story about a man with a mechanical brain.
This brain, incapable of making mistakes would get him from the mental asylum to world leadership. This plan was thwarted by Dr. Fisher, who cleverly removes the brain from his head and throws it into the ocean.

Using the same numbers, in 1987 the film RoboCop was released, which was a huge success. In this film, a man's dead body is used to turn him into a cyborg which is used for law enforcement. The film was cited one of the best films of 1987 and next year a remake is going to be released.

Some people might say that cyborgs are already among us.
A heart pacemaker, an insulin pump and cochlear implants are examples of technology people hook up to their body to keep it functioning. An example of a big piece of technology that improves body movement is the HAL.

The HAL – an abbreviation of hybrid assistive limbs – is a robotic suit designed by Cyberdyne, meant to allow crippled individuals to walk again. Apparently it takes some training, but the technology is already there. The system is based on bio-electric sensors which read the nerve signals when they arrive in the muscles, reproducing the expected movement in the robotic limbs. It also supports the user in standing up and when the nerve signals are to dim to read, the suit can feel the desired movement of the user by pressure sensors and lend a helping hand in completing those. Currently it is being used in rehabilitation, as well in the support of daily life over a longer time. Now let's hope the battery life is acceptable. – Read more on their website: "www.cyberdyne.jp", obviously available in English.

Then again, merely supporting the human body in fulfilling its normal tasks is not enough for many people.
Raytheon company in the USA developed an exoskeleton under the name XOS, followed by an upgrade called XOS 2. This device has been developed for the US army, and gives the wearer superhuman strength. One operator in a suit could do the work that would normally take three
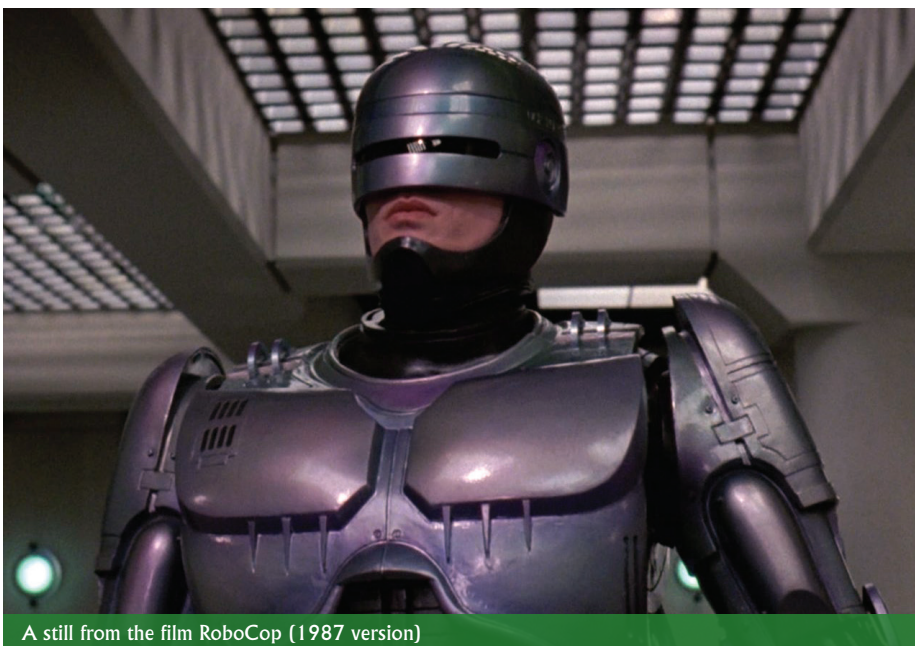
A still from the film RoboCop (1987 version)

soldiers. It enables the wearer to lift 200 pounds (90,7 kg) a couple of hundred times without tiring! As if that is not impressive enough, you can punch through 3 inches (7,6 cm) of wood repeatedly if you're wearing one.

These exoskeletons are examples of upgrading the body from the outside. Kevin Warwick, professor of cybernetics at the University of Reading, England, has been experimenting with implants for years.

In his project Cyborg 1.0 a silicon chip transponder was placed in his forearm. This chip allowed a computer to monitor Warwick while he was moving through halls and offices of the Department of Cybernetics at the University of Reading. This made it possible for Warwick to operate lights, doors heaters and even other computer without any physical effort.

The XOS 2 Exoskeleton suit by Raytheon

Four years later Kevin Warwick underwent surgery again. A microelectrode array consisting of 100 individual electrodes was inserted in the median nerve of his left arm. Quite notably it enabled Warwick to control several things such as an electric wheelchair and an intelligent artificial hand. The array could also stimulate the nerves in his arm, creating an artificial sensation.

It probably won't be long before real cyborgs walk among us.

This might creep you out. But then again, you could very well be one of these cyborgs. We could all be cyborgs. To me, upgrading the human body to do superhuman things is one of the most awesome things science can bring us. However, there is quite an ethical discussion attached to this subject. I'll leave that for another time. For now, just form your own opinion, and think of what awesome power you want to have in a few decades.
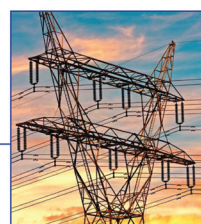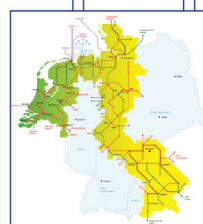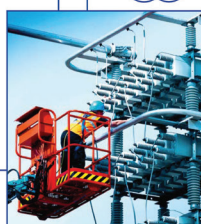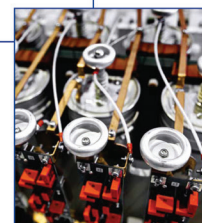
EESTEC Upcoming Events

Altijd al voor een week naar het buitenland willen gaan om met internationale studenten aan een project te werken of gewoon voor de gezelligheid?

EESTEC, een europese organisatie voor studenten elektrotechniek en informatica, organiseert door het jaar heen in veel landen workshops en events. Hiervoor hoef je alleen je eigen reis kosten te betalen en uiteraard je consumpties op locatie. Verder betaald de locale organisatie je verblijf.

Hou dus regelmatig een oogje op deze poster, misschien zit er wel iets voor jouw tussen!

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