De Vonk

Periodical of E.T.S.V. Scintilla

Main Article:

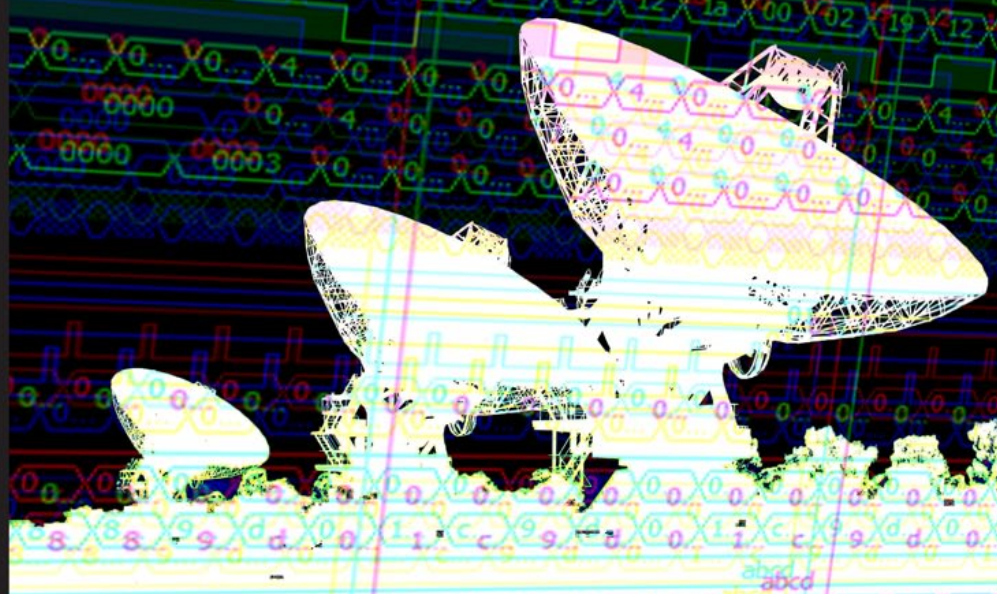
Approximate computing

Junction:

Geert Jan Laanstra

EE-Sports:

Chess Tournament



Year 36 | Edition 1 | January 2018

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Presidential note

While writing this I have come to realize it's that time of the year again. People start complaining about how cold it is, the Starbucks has already changed its cups into festive ones, (and they will probably charge you another euro for just that) and every radio station is getting packed in Michael Bublé wrap. Christmas is right around the corner. And what a wonderful time it is!

When you read this piece you will probably already have enjoyed all the festivities. Did you get a Christmas tree for your house? And if you live on the campus, while transporting your tree, how many times did you dive into a ditch while running from Charlie and realized the ditch wasn't completely dry? Speaking from personal experience here, those stains are not always easy to remove.

But trees are not the only things you see a lot of during this period, there are also lots of festive Scintilla activities! Well... there usually are quite a lot of Scintilla activities regardless of what time of year it is, but those in December always have some special feeling to them! And before the long-awaited Christmas break comes there is of course the Scintilla Christmas dinner. I am sure that you all have survived this wonderful event, but let me give you some tips from my own experiences to make the next one even better:

1. After you drank about a full body of Christ worth of wine, don't end your evening by switching to beer, your stomach will then try its absolute best to show you what a nightmare before Christmas means!
2. Craving for multiple hot dishes at the same time but are you limited to only one pan? Just throw it all together, put your favourite sauce in it as well and make a nice stew! Don't forget to add just a little too much spicing to make you forget what you put in there in the first place.

3. Keep an eye out for your friends. As a good friend you are responsible that they arrive home without too much permanent damage. Indicators that might be making it clear that people drank too much are for example, but not limited to: Hugging pillars, sneaking back inside after clearly being thrown out by the committee, destroying multiple glasses in a matter of minutes or being so confident of yourself even the people at the Stress karaoke drink start to find you annoying.

4. If the current bottle of wine doesn't taste like the divine drink of the gods you think it should taste like, maybe the next one will!

5. If you ever find yourself in the position of not being able to cycle anymore, don't try it! And even if you do, teeth first is not a good diving position when you are diving into concrete.

If you follow these tips, there should be no possible way your next Christmas dinner will turn into a disaster. And if it does, remember that a good story is worth a lot more than a few broken glasses and a few broken teeth!

Dames en heren, Op de koningin, op Scintilla!

Koen Raben, President of the 88th board of E.T.S.V. Scintilla

Eating Contest
Start training as EE-Sports is organising their annual eating contest on the 15th of March. This year we will be eating spicy sandwiches.

LAN-party with S.V. Watt
Would you also like to game all night long, without feeling guilty about missing the 8:45 lecture again? Then come to the LAN-party with Watt!

Masthead

De Vonk

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Editorial team

Mark van Holland, Jippe Rossen, Céline Steenge, Guus Frijters, Maarten Thoonen, Nahuel Manterola, Rik Engel, Wim Hoek, Gino van Spil, Marissa Jonker

Cover Artist

Mathijs Aanen

Board Representative

Friso van der Boom

Print

Gildeprint, Enschede

Editorial office

E.T.S.V. Scintilla, University of Twente, Postbus 217, 7500 AE Enschede,
0031 53 489 2810
vonk@scintilla.utwente.nl

Material

vonkkopij@scintilla.utwente.nl

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09 Main article

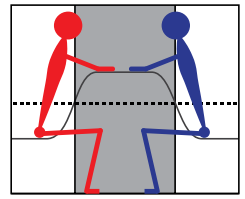
CAES explains about Approximate Computing. If a computation isn't too fault sensitive, the calculation can be a lot more efficient if you allow errors.

18 Activities

The 27th of September, the board organized a pubquiz for first year students. This was a part of their policy plan to increase integration of international students.

Junction 23

Geert-Jan Laanstra tells us about his hobbies and his passion for electrical engineering. He will also shine some light on the path he took and to get to where he is now.



News 06

This year, there have been several advancements in electrical engineering. We've combined some news from local faculties and the rest of the world to give you an update.

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Editorial

A new year has started and with this new year, a new vonk is also available! As you can see in this vonk, we are at year 36, edition 1, which is almost the same as the new year! the first quarter of the 18th year. I see how we got so smart!

But since we all had our little break for Christmas and New Years Eve, we of course do not know a lot of Electrical Engineering anymore. All the social events have made us into social monsters. This edition helps you to get into electrical engineering again, because nobody wants to be seen as social.

We have some articles about aproximate computing, electrical engineering news and of course the datasheet. Since we did not eat enough during the holidays, more recipes are needed.

Another interesting thing in this Vonk is the puzzle. It is lovely this time, Truusje did great! it is not too difficult and it just helps you to destress for all the exams. I will not say anymore things about exams, I had mine this day and am really done with exams.

But luckily, the third module already starts within a few weeks and so minors will be over! This means that I can stop being social met people of IEM and can start to be non-social during lectures with EE friends again.

It's the most wonderful time of the year!

Kisses,
Céline

News for the Electrical Engineer

Author: Richard Nötzel, BIOS

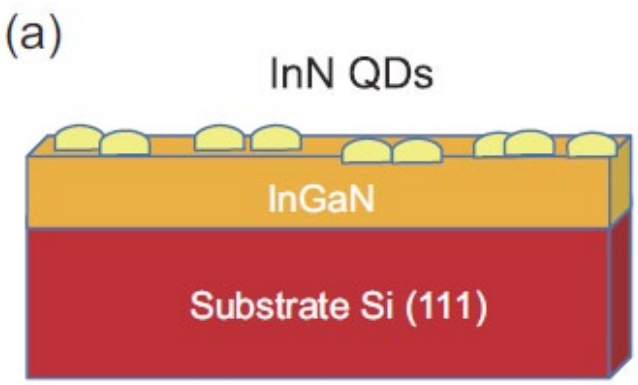


Figure 1. Scheme of the InN/InGaN QD structure [1].

Defying nature at BIOS, the Lab-on-a-Chip group

Recently, BIOS started co-operation with Prof. Richard Nötzel, South China Normal University. He works with InN/InGaN quantum dots.

These epitaxial heterostructure nanomaterials (fig. 1) can be used for fabricating potentiometric sensors. Potentiometric sensors generate a voltage that is a function of some specific ion concentration in an aqueous solution, e.g., applicable for medical purposes. All textbooks refer to the Nernst Law for describing the sensitivity of these kind of sensors; you can't do any better than this Law. Or can you...? In a paper by Nötzel [1], he describes a quantum dot based sensor showing a sensitivity that is almost twice the theoretical one and he even explains this extraordinary behavior. We have got some samples from him. BIOS PhD student Esther Tanumihardja did some initial measurements confirming this exciting sensor response. Obviously, we want to do more experiments! Interested? Contact me for an exciting and explorative bachelor or master assignment in our BIOS group.

Wouter Olthuis, Bios the Lab-on-a-Chip group, w.olthuis@utwente.nl

1. Nötzel, R., InN/InGaN quantum dot electrochemical devices: New solutions for energy and health, (2017) National Science Review, 4 (2), art. no. nww101, pp. 184-195.

Low-cost battery from waste graphite

Lithium ion batteries are flammable and the price of raw material is rising. It is therefore important to look at alternatives. Empa and ETH Zürich have found a way to make batteries out of waste graphite and scrap metal. A challenge with this kind of battery is that you need a liquid electrolyte at room temperature. Metal ions move through this electrolyte coated in a thick mantle of chloride ions. An alternative is large but light weight organic anions. A problem is that these "thick" ions need a place to go when the battery is charged. This means a suitable material has to be found.

To solve this, the research group turned the principle of a Li-ion battery upside down: instead of the anode, the cathode is made of graphite. You need a special kind of graphite for this, however. Luckily, waste graphite from steel production or "kish graphite" is suitable for this, as it has very coarse edges, because it is build up from multiple layers. Normally, these layers are ground too finely or folded up. Natural graphite works as well, as long as it has the same characteristics. Currently, the density is at 60Wh per kg, but the group believes with lighter materials and increased voltages they can get to 150Wh per kg.

https://www.empa.ch/web/s604/waste-graphite-batteries

In Other News

Transparent solar technology represents 'wave of the future'

Engineers at Michigan State University believe that by using transparent solar panels on windows they can greatly decrease the use of fossil fuels. They could harvest as much power as bigger and bulkier rooftop units. By only using invisible light, the panels can harvest a lot of energy while still being transparent, which is great for buildings, automobiles and mobile electronics. The thin, plastic-like material can be used on any clear surface. With 5 billion to 7 billion square meters of glass surface just in the U.S., they believe they can satisfy 40% of the U.S. energy demand. Together with rooftop units and better storage technology, this might rise to 100%. At the moment, efficiency is at just 5% compared to 15% to 18% in conventional solar panels, but transparent technology has been developed for only about five years, compared to five decades for conventional cells.

http://www.innovations-report.com/html/reports/energy-engineering/transparent-solar-technology-represents-wave-of-the-future.html

The world's most intense laser is doubling in power

Thanks to a $2 million donation from the National Science Foundation, the world's most powerful laser, at the University of Michigan, will double its intensity. With this, researchers can make better tabletop devices that produce particle and X-ray beams for medical and national security applications and do research in astrophysics and in the quantum realm.

The laser, called HERCULES, is powered by five embedded pump lasers that amplify ultrashort pulses of light. The final three of these pump lasers will be replaced, boosting the power from 300 trillion watts to 500 or 1000 trillion watts. When the laser was first build, they had to make custom pumps, as commercial pump lasers weren't powerful enough. Now that technology has caught up, the laser can be upgraded.

https://www.eeweb.com/profile/nicole-digiose/articles/the-worlds-most-intense-laser-is-doubling-in-power

De Vonk

Approximate Computing

Author: - Ghayoor Gillani, Mark Krone, André Kokkeler, Computer Architecture for Embedded Systems (CAES)

One of the most dominant driving forces in Integrated Circuit (IC) technology advancement is the well-known Moore's Law. According to this law, transistor density increases with a factor two every 1.5 to 2 years. The smaller transistor dimension has two main consequences (see e.g. [1]).

First, because of the smaller dimensions, the delay reduces with 30 % which leads to an increase of the maximum clockfrequency of 1.4 (performance increase of 40 %). Second, according to Dennard's Scaling Law (see [2]) the supply voltage should be proportional to the linear dimensions of a transistor to keep the electric field constant. The power consumption is reduced with 50% when the transistor size decreases with 30% based on the active power equation:

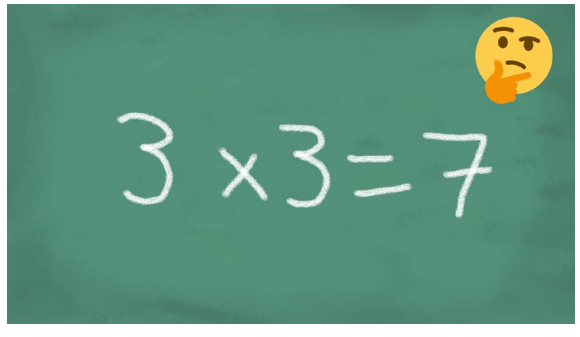
$$(P = f \times C_{eff} \times V_{dd}^2)$$

where f and C_{eff} are frequency of operation and effective capacitance respectively, while V_{dd} is the supply voltage. So, overall, the effect is that every 1.5 to 2 years,

for a specific area on an IC, the number of transistors doubles, the clockfrequency is a factor 1.4 higher and both come with a fixed power budget. Although the pace at which transistors become smaller has slowed down, Moore's law is (more or less) still valid. But, it is becoming increasingly difficult to adhere to Dennard's Law. Dennard's Scaling Law is ignoring the effects of leakage current and threshold voltage. When lowering the supply voltage, the threshold voltage cannot be lowered to keep the leakage current under control which results in limited energy reduction. So, as process technology advancements result in smaller transistors while at the same time performance and power efficiency are not increasing, new paradigms have to be explored. One of the paradigm shifts is to move from conventional 'always correct' processing to processing where small errors are allowed. In this article, computing techniques that are based on the latter paradigm are called 'Approximate Computing Techniques' or in short 'Approximate Computing'.

What is Approximate Computing

Approximate Computing realizes the fact that computing systems in general are overdoing with respect to the accuracy of calculations, at least for several applications. It provides aggressive optimization to reduce computational costs like area, power and latency, and introduces an additional trade-off parameter: quality. The design target in approximate computing is to achieve the best quality-cost trade-off, i.e., highest quality output for a given cost constraint, or lowest cost for a given quality constraint.



In some sense, approximate computing has always been there since the start of computing. Cyberphysical systems deal with real-life measurements (inputs) that are analog in nature. These measurements are sampled, quantized and encoded for digital signal processing. Sampling and quantization introduce inaccuracies that are traded against feasibility of computation. The same is the case with finite precision representation, e.g., floating point or fixed point computing.

Where is Approximate Computing Applicable

There is a multitude of applications where approximate computing techniques can be used. In general, applications where information is presented to a human being by means of sound or images are relatively error-tolerant because of perceptual limitations of humans. For example, a few pixels having the wrong color when watching a video or some additional noise in an audio stream are hardly noticed. Furthermore, several digital signal processing applications can tolerate controlled inaccuracies in computations, such as multimedia, search engines, motion sensing, computer vision and machine learning, and are therefore called Error Resilient Applications (ERA). ERAs have one or more of the following attributes: redundant or noisy input data, healing computational patterns like iterative methods, and a range of acceptable output quality. ERAs relax the quality design parameter, that can be traded for reducing computational costs (area/latency/energy) of a computing system.

How to Approximate the Computing

Approximate computing has shown computational cost benefits for error-resilient applications across the system stack [6]. Here we discuss some of the prominentsoftware and hardware layer techniques, and the adaptive accuracy architectures.

Software Level Techniques

At software level, several techniques have been investigated such as reducing the number of iterations for an iterative process and skipping some parts of a loop to reduce the computational costs. Moreover, programming language support and resilience analysis tools have also been explored to identify the parts of an application that can be processed using approximate techniques.

Hardware Level Techniques

At hardware level, approximate computing mainly proposes circuit pruning and voltage overscaling strategies. Circuit pruning simplifies the logic and reduces the number of transistors to implement functional blocks like adders and multipliers. Consider an example of an application in which a comparison is done. Suppose we need to compare C and D. C=axb, D=exf. a,b,e and f are 2-bit numbers. If we use a 2x2 multiplier (MUL) with an accurate circuit (Fig. 1) in order to compute C and D, we always get the correct comparison result. Interestingly, if we use an approximate 2x2 multiplier (AxMUL, see Fig. 2) we again get the correct comparison result. AxMUL provides one error out of 16 possible input combinations, i.e., 3x3=7 (Table 1) and saves computational costs [5]. The aforesaid example looks very simple, but these type of comparisons form a significant part of search engines.

	00	**01**	**10**	**11**
00	0000	0000	0000	0000
01	0000	0001	0010	0011
10	0000	0010	0100	0110
11	0000	0011	0110	0111

Table 1:Truth Table for Approximate 2x2 Multiplier (AxMUL)

Approximate adders can be designed by simplifying the carry chain to reduce the latency. This simplification also helps to reduce area and power at the cost of quality degradation. The quality loss can be improved by simplifying only those parts of the circuit that have less probability of usage based on the input distributions of an application.

Voltage overscaling on the other hand, exploits the quadratic relation of power consumption to that of supply voltage:

$$(P = f \times C_{eff} \times V_{dd}^2)$$

The voltage overscaling technique reduces Vdd of a circuit below the required

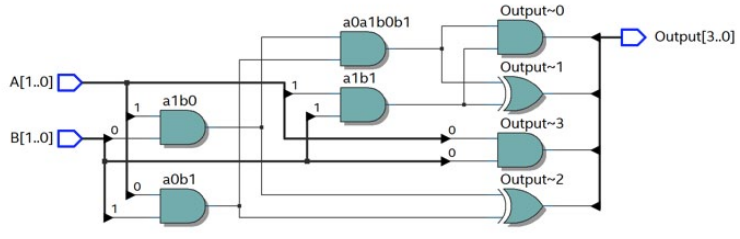
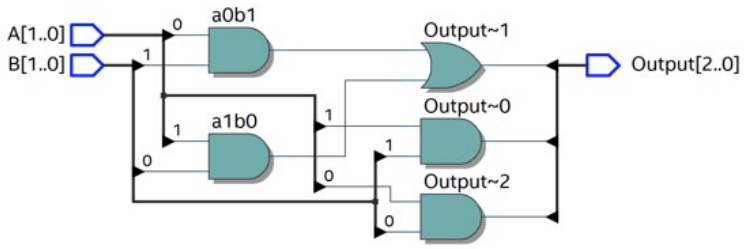


Figure 1: Accurate 2x2 Multiplier



Fugre 2: Approximate 2x2 Multiplier

threshold to improve power efficiency. However, this slows down the circuit and introduces timing errors, which in turn compromises the quality of output.

Approximate Memories

Approximate memories also offer a useful trade-off, especially for data intensive applications. Dynamic Random Access Memory (DRAM) can be approximated to improve power and performance efficiency by reducing the refresh rate. However, for Static Random Access Memory (SRAM), the approximation knob is mainly the voltage overscaling.

Adaptive Accuracy Architectures

Heterogeneous architectures (processing platforms containing different types of processors, each tailored towards a specific set of tasks) have the ability to handle various workloads efficiently while using different power and performance trade-off computing nodes, e.g. ARM's big. LITTLE architecture [4]. However, in the approximate computing domain, the definition of a heterogeneous architecture extends further to combine exact and inexact computing units, where control instructions and sensitive computational parts run at precise cores while the error resilient parts run at the error-prone cores to increase the overall efficiency. Moreover, with the advent of accuracy-configurable architectures like adaptive voltage over-scaling and accuracy-configurable adder/multiplier designs, where the quality-cost trade-off can be controlled at run time, it is also possible to deploy approximate computing for applications that are not fully error resilient but can tolerate inaccuracies in partial computations.

Error Analysis – A Challenge

Some interesting approximate computing techniques have been discussed but a major challenge in deploying them is to quantify the error resilience of an application, i.e., how much error is tolerable and what types of errors are tolerable. For example, some applications may tolerate higher error magnitudes but with a low error rate or vice versa. Therefore, a comprehensive analysis is required to identify the error-resilient parts of an application and to infer the viable approximation techniques in order to achieve an efficient quality-cost trade-off.

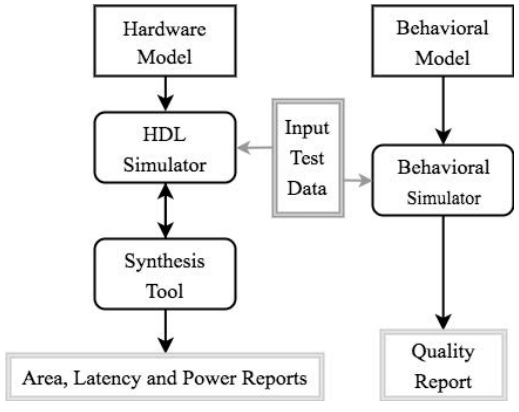


Figure 3: Experimental Setup for Approximate Computing

Experimental Setup

Fig. 3 shows the design flow for designing and comparing approximate modules. Behavioral models of approximate designs are created in high level languages

like C and Matlab, which are then simulated with the test input cases to assess and compare the quality of various approximate designs. For computational cost assessment, hardware models are created using Hardware Description Languages (HDL) like VHDL and Verilog. These models are simulated in an HDL simulator such as Modelsim for functional verifica- tion. Then the HDL models are synthesized using ASIC/FPGA synthesis tools like Synopsis and Quartus. The synthesis tools generate the net-list, and also the chip-area and latency reports. Post-synthesis simu- lations are done again in the HDL simulator to verify the functionality of a synthesized design and to generate the switching activity. This switching activity is utilized by the synthesis tool to estimate power consumption.

The IMPEDRA Project

At the Computer Architecture for Embedded Systems (CAES) group, we are investigating approximate computing to achieve power efficient digital processing in Radio Astronomy (RA). RA studies celestial objects at radio frequencies. The sky spatial intensity distributions are estimated over the field of view in a radio telescope to generate the sky images. The signal processing pipeline in radio astronomy is expected to be error tolerant because it contains the attributes of the inherent resilience, namely: real-life/redundant data input, and approximate/statistical/self-healing computation patterns. Therefore, we are analyzing RA applications for error tolerance [3]. During calibration, complex sensor gains are estimated to compensate for environmental conditions. An Approximate Computing version of the calibration stage was realized by randomly skipping computations. In spite of skipping computations, the calibration process was still converging and the accuracy of the calculated complex sensor gains still met the requirements. In Fig. 4, 124 sensors are considered and their exact and approximate complex- valued gains are plotted. We are also investigating the best approximation schemes for the dominant kernels like Multiply-Accumulate (MAC) processors. A large part of the research is done in BSc. and MSc. projects.

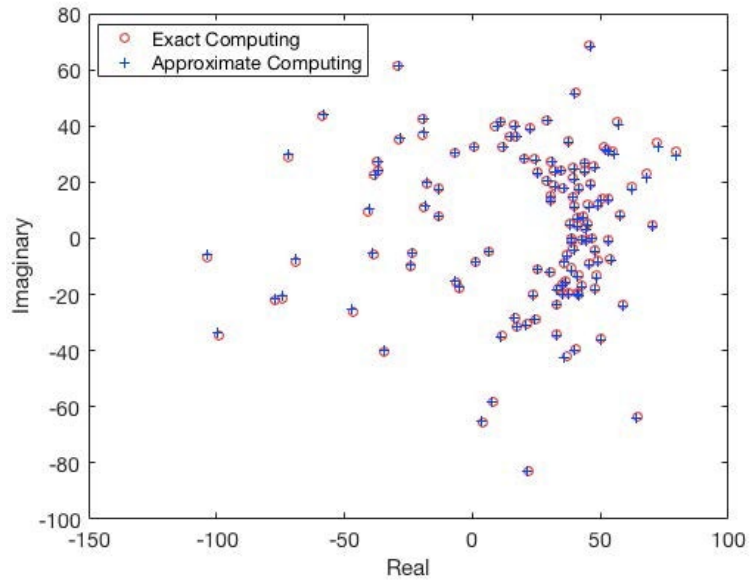


Figure 4: Complex Gains for 124 Sensors in a Radio Telescope [3]

Related Techniques

It is also worth mentioning that approximate computing provides deterministic transfer functions. This means that for a specific input there will be always a specific output. However, there are other forms of in-exact computing in practice: probabilistic and stochastic computing. These techniques provide a non-deterministic output behavior, i.e., for a specific input the output may vary within some known statistical distribution.

Conclusion

We have discussed approximate computing with some interesting state-of-the-art techniques to reduce computational costs such as chip-area, power consumption and latency. The principles of approximate computing can be deployed from software level to circuit level for processing error-resilient applications. It is really important to consider the fact that various applications respond differently for a given approximate technique. Therefore, it is essential to perform a comprehensive design space exploration to find the best approximation for a given application in order to achieve an efficient quality-cost trade-off.

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advertorial

Advertorial: Witteveen + Bos

SYSTEM AND SOFTWARE ARCHITECTURE WITHIN INFRASTRUCTURAL PROJECTS

Author: ing. J. Kornet

The level of automation within infrastructural and waterstructural objects (movables bridges, locks, tunnels, water treatment plants, etc) is increasing rapidly. In combination with the continuously growth of restrictions by legislation, the complexity of software and hardware systems are increasing linearly. Nowadays, in a tunnel with a length of more than 500 m and 60 subsystems there are about 5 million rules of programmable code involved. For comparison, the control system of a Boeing 747 contains about 6 million rules of code. The number and type of hardware and software systems are therefore comprehensive, for which a well-thought system and software architecture is essential.

3B architecture

A commonly used architecture in infrastructural projects is the so-called 3B architecture. 3B is a Dutch abbreviation for Operation, Monitoring and Control. This type of architecture is a functional architecture, which means that the architecture yields a framework rather than an implementation of a functional design. The latter has to be realised for each project specifically. In figure 1 the 3B architecture is schematically visualised.

The 3B architecture consists basically out of three layers: man-machine interface (MMI), 3B and LFV's. The functionality contained within the 3B architecture are based upon the business processes of the related object. For example, business processes describe what kind of actions need to be taken in case of an collision by a ship in a lock or a when a car accident happens inside a tunnel. These processes are focused on users, like operators and emergency services, and are developed to handle processes in a uniform way, in order to minimize errors and to improve the speed of handling.

From these business processes requirements are derived for the interface (MMI) of the control system. The MMI contains mainly both hardware and software functionality. The MMI layer contains little to no intelligence, and provides the status of an object by visualisations on one or more displays. Based on this information, an operator is able to operate the object. The functionality for coordination (i.e. intelligence) is contained by the 3B layer, in order to control the so-called LFVs. LFV is a Dutch abbreviation for Logical Function Filler. LFVs are subsystems of an object, like a traffic installation, height detection and ventilation.

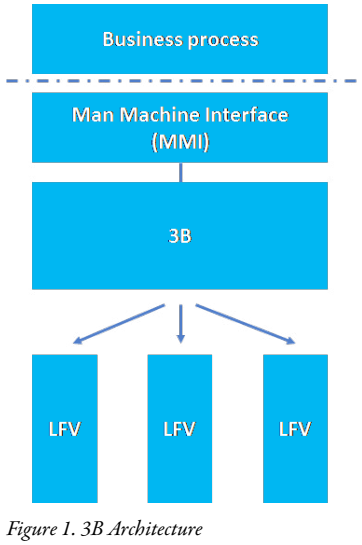


Figure 1. 3B Architecture

An LFV is designed to function as autonomous as possible, and is controlled by the above 3B layer. An example of a controlling 3B function is the function 'measurement and control of a tunnel ventilator unit'. In this case, the LFV "Sight measurement (smoke detection)" measures a too high value, from which the 3B layer decides to activate the LFV "Tunnel ventilation". The purpose of the 3B architecture is that LFV's have no knowledge about each other and cannot exchange signals, data and information; exchange is only possible via the 3B layer. Consequently, so-called spaghetti-code is prevented and the demands for object-oriented data (encapsulation) are met.

> "Consequently, so-called spaghetti-code is prevented"

J-STD-016

Infrastructural systems are mostly complex systems, that contain between 20 to 60 subsystems (LFV's), like energy supply, low voltage installation, lighting installation, escape route installation, rainwater drainage system and traffic installation. To anchor the demands of these subsystems in a clear and uniform way, often the standard of J-STD-016 is applied. This standard is a documentation standard, which has been developed by the US Army on purpose for the design and realisation of complex systems. Using this standard it is possible to work on different subsystems simultaneously, meanwhile integrity is preserved. The standard of J-STD-016 is very suitable for application on the 3B-architecture, since system, software and interfaces can be described clearly. In total, the J-STD-016 standard contains 22 documents, among which the IRS and SDD. The interfaces between the various subsystems are described within the IRS (interface requirements specification). In the SDD (software design documentation) the functional behaviour of the system is described. The methodology of J-STD-016 is also used widely in aviation and by NASA.

V-model

In order to properly test the 3B architecture (software, hardware and integration) the so-called V-model is used.

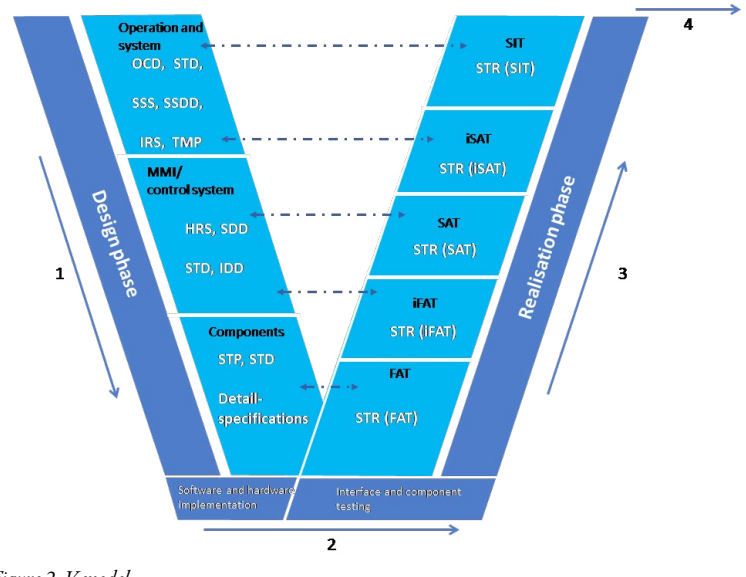


Figure 2. V-model

The V-model, shown in figure 2, is a part of the methodology of systems engineering (SE). In a project, the V-model starts in the upper left corner (1) and ends in the upper right corner (4). At the left hand side of the V-model, the design documents are made (e.g. SDD, OCD, IRS, according to J-STD-016). The programming of software and the assembling of hardware has to be carried out by (2). At the right hand side of the V-model the systems are realised and tested. By means of the dashed lines, validation takes place towards the client.

Software and hardware are tested in a modular way, like LEGO® bricks. First, the LFVs are tested separately by means of a FAT (factory acceptance test). Next, one or more subsystems are tested in an integral by performing an iFAT (integrated factory acceptance test). If these tests are also completed successfully, testing of the subsystems takes place at the object location by a SAT (site acceptance test). Only if all tests are passed successfully, the project continues towards the phase of exploitation and usage (4).

Conclusion

The 3B architecture for software and systems is an exciting and complex methodology within infrastructural objects. Both the management and execution in projects takes place by the system designer, together with the project manager, system engineers, lead engineers and the technical manager(s). Basically, the system and software architecture is the backbone of the IT, electrotechnical and mechanical installations. Due to the emerging possibilities by robotisation, Blockchain, machine learning and Internet of Things (IoT), the contribution and role of system designers will get even more important.

The City of the Future

Author: Jermain Horsman

Scintilla organized a Symposium on the 4th of October 2017, a day consisting of several presentations from different companies, a company fair, the opportunity to visit one or two cases and drinks and dinner to conclude the day.

It was quite a busy day, and the symposium committee had been working on it for about a year prior. First a theme had to be decided upon. The chosen theme was "City of the Future". This theme was chosen not just because buzzwords like Smart Cities are popular these days, but more so because it would be a broad theme which would allow a lot of different companies to present new and ingenious product, as well as give them the opportunity to discuss problems that may arise in the future. With a theme set, the organization could move on to the next step: representation towards companies. For this the logo and website were made, as well as a company brochure to present the different possibilities for the companies to participate in our symposium. Next came the hard work: trying to find the companies who would provide a speaker and make a program which could fill the entire day. Also a location and the additional services like coffee, tea, lunch and dinner had to be arranged.

Furthermore we needed a chairman which would lead the symposium, for this we found Richard van Heijningen. We thought he was a good fit since he is involved with special projects for early development and new technologies, a member of IEEE and KIVI and he shared our opinion that technology and innovation will play a key role in improving our way of living, while at the same time minimizing the environmental consequences.

> "We were fully prepared, ready to go and most of all quite excited to see how our hard work would pay off."

Finally, after a year of preparations, the date of the symposium had come and we were fully prepared, ready to go and most of all quite excited to see how our hard work would pay off. After we had handed each participant their name tags it was time to start the day. After the introductions of the committee itself and the chairman of the day it was Benchmark that kicked off the day with the first presentation. The subject of their presentation was the energy grid and ways to measure it.

After Benchmark it was Nedap who gave their presentation. They presented the way in which we would be shopping in the future by utilising phones and social media.

The program was resumed after a little coffee break with a presentation from Innovatie Cluster Drachten. Their subject: laboratory automation and the challenges involved with networking in such a solution.

After the first three presentation were finished it was time for the lunchbreak and cases. There were two cases, of which only one could be attended by a participant. These cases were presented by Innovatie Cluster Drachten and NDIX. For the first case the focus was on ways to obtain data while on the other hand examining the impact of the amount of produced data by the proposed method. The second case focused on a discussion about ways to implement a platform to use acquired data in a network, and the privacy issues that would arise.

> "The second case focused on a discussion about ways to implement a platform to use acquired data in a network, and the privacy issues that would arise."

During the lunch there was a company fair in which the participants had the opportunity to have a personal conversation with the attending companies.
After the break, ASML resumed the presentations with a very interactive presentation about knowledge transfer, where different statements were discussed with the audience.

Next was Alliander, which delved in to the changing requirement of energy distribution, due to the fact that more and more datacentres are being build, and the impact of charging electric cars.
After the final coffee break it was time for AnSem to show some examples of their work and the application for society, like an RFID powered MEMS contact lens for medical diagnosis.

And finally the last presentation was from Dialog, where they focused on wearables, smart home solutions and the products they make to provide these.
With the last presentation finished, the day ended with a conclusion from the chairman of the day and a discussion with all the participants.

Afterwards there was a drink where everybody could share their opinions, insights and impressions of the day. And finally the day was concluded with dinner in the Faculty Club. After the dinner was finished we as the symposium committee could look back at a day without any setbacks, but with a wide variety of subjects and satisfied participants. And with all that being written, the symposium committee is almost done with the organisation of the symposium. While the finances are being finalized the last things to do to conclude it, is to finish this Vonk article with this sentence.

(No)tifications

Author: Jippe Rossen

On some dark day in January, I once wondered what I had actually done the day before. I knew still that I was quite busy, but I honestly could not remember anymore with what. So I made up my mind and decided that it was time for stuff to change and to start planning my day better. To achieve that, a drastic change was required: no more notifications.

But let us go back a bit first. On that same day I made a list of all the things I had done and included an estimation of the time it should have taken. After some hard thinking I concluded that I was missing roughly two and a half hours of my day. The next day I carried a notebook around with me to keep track of what things I was doing throughout the day. I compared the lists and found that you do loads of things without even realizing it, or you were just doing them very inefficiently.

> "As long as you keep working on something, you actually do not feel like you are missing out on anything!"

The most striking thing however, was that most of the time was lost because of things that came up while you were doing something else. Most of these were initiated by a notification on my phone or in my mailbox. It also occurred to me that it takes quite some time to switch tasks. So it was not that I was wasting time, I was just constantly shifting my attention from one task to another. I thus decided to start with an experiment of living without any notifications.

> "I guess your body needs some breaks throughout the day."

After the first day it amazed me how easy the transition has been. Most of the time notifications interrupt you while you are doing something else. So as long as you keep working on something, you actually do not feel like you are missing out on anything. I also concluded that what I planned on doing that day, I did more efficiently and more focused.

There were also some unexpected side effects. During the first few days I regularly completely lost track of time. I guess when you force yourself to actually focus on one thing only, you do not even bother to look at the clock. It was not that I missed appointments or anything, but it was quite an unusual experience to just not know the time.

Another interesting side effect was, that I was way more tired at the end of each day. I guess your body needs some breaks throughout the day to replenish some energy. Without those I was likely wearing myself out too much.

I also noticed that there were some things that I actually needed to schedule which previously happened automatically. At day three I realized I had not checked one of my email accounts in three days. Also my girlfriend started to feel slightly neglected at times, simply because I did not bother to check my messages at certain times.

Nowadays I reactivated my notifications for emails. All other notifications, such as social media are still off. After a while it became a habit to once again open the same applications I did before. But now I do so only on moments it suited me and they no longer interrupt other things. I still ocassionally read some messages way too late, but if it is truly important, people will surely call.

Chess Tournement

Author: Jeroen Klein Essink

Thirteen hopefuls entered Scintilla's inaugural chess tournament. By December 19th only two were left. I was one of them.

I faced two tough matched (the first one ended in a draw) against former Proto board member Xadya van Bruxvoort, but in the end I managed to defend Scintilla's honour. Other than that, I had a relatively easy path to the finals, where I would again have to defend Scintilla's honour. This time against Inter Actief's Reinier Stribos. At 16:30, with one hour on the clock for both players, and about 30 spectators via livestream, the match was set to go.

(The moves in underlined are those that were played and the other moves are there for illustrative purposes. An "x" means a piece was captured and an "+" indicates check. Knight moves are indicated with an "N", as King also starts with a "K".

Jeroen Klein Essink - Reinier Stribos

1. e4, e5 2. f4, exf4 This opening is known as the King's gambit. Black will likely have to give back the f4 pawn, or spend a lot of energy defending it while White is improving its position. White hopes to have a strong f file and put pressure on the f7 pawn.

3. Nf3, Nc6 4. d4, d5 5. exd5, Qxd5 6. Bxf4, Bd6 Note that 6. ... , Qe4+ does not win the bishop on f4, because after 7. Qe2 the Queen is pinned.

7. Bxd6, Qxd6 8. Bc4 This is probably a mistake, because Black can now play 8. ..., Qd4+ 9. Nbd2, Qxb2 which wins a pawn. However, White has some compensation because after 10. Rb1, Qa3 he has a strong rook.

8. ..., Bg4 9. 0-0 (castling, the king moves to g1 and the rook from h1 to f1), Nge7 After 9. ..., Bxf3 10. Rxf3 the pawn at d4 would be attacked twice and defended once, but the pawn at f7 is also attacked twice.

10. Bxf7+ This is a strong move. 10. ..., Kxf7 11. Be5+ (check by both the Knight and Rook), Kg8 12. Qxg4 and white has its bishop back. 12. ...,Qxd4+ will take back White's pawn advantage, but he will still have a strong position.

10. ..., Kd7 10. ..., Kxf7 would have been better, as the played move allows White to keep the pawn advantage

11. c3, Raf8 12. Qa4 This move would allow Ne5+ to be played in the future, because the Knight on c6 is now pinned. If that move were played, it would not only check the king, but also attack the undefended bishop on g4. It is also the reason why black can't play 12. ..., Rxf7, because after 12. Ne5+ the rook on f7 is attacked twice and can only be defended once.

12. ..., Kc8 13. Be5, a6 Black doesn't do anything about the bishop on g4. I searched for some kind of trap but couldn't find any.

14. Nxg4 That sense of relief when your opponent doesn't immediately makes his move, which would be a clear sign that you stepped in a trap, is one of the best there is in chess.

14. ..., f6 15 .Qb3, h5 16. Qe6+ A good rule of thumb is that when you are ahead, you want to trade pieces. The reason for this, is that with a lot of pieces on the board, a lot can still happen, even if you are ahead. But if you go into the endgame with an advantage of a bishop or knight, victory is almost certain. This move causes a cascade of forced trades.

16. ..., Qxe6 17. Bxe6, Kb8 18. Rxf8+, Rxf8 19. Ne3 At this point the game is basically over. After White activates the Knight and Rook that are still at their starting position, Black is done for. Black played some more moves before resigning, which I will include for completeness sake.

19. ..., Rf6 20. Bb3, g5 21. Nd2, h4 22. Rf1,Rg6 23. Nb5, Rg7 24. Nxe7, Nxe7 25. Ne4, c6 26. Rf7, Rxf7 27. Bxf7, g4 28. Be6, 1-0 Black realized the hopelessness of his situation and resigned.

With that I became Scintilla's first chess champion. If you think you can do better, I hope to see you in a future tournament.

Position after 10. Bxf7+

Symposium

Olympiae Scintillae

Bachelor Graduates

EEF

Cantus

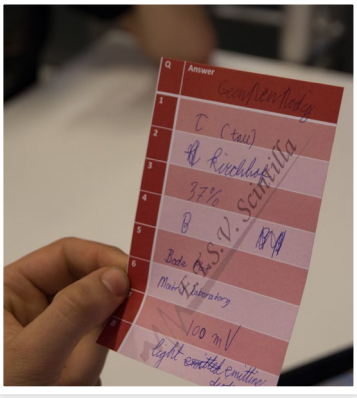
Lunch Lecture

Pubquiz

Author: Olaf van der Meer

On the 27th of September, the first edition of the Pubquiz for first year students was held. A new concept to introduce our first year students to the great activities Scintilla has to offer. Over the last years, different formulas were tried to provide the first years with a good first experience regarding Scintilla's activities. This year, the Pubquiz was chosen as the best option, since it combines the affinity with electrical engineering, a few cold beverages, contact with other students and relevance to the curriculum all in one activity!

This activity was actually also part of module 1's course on 'Intercultural Sensitivity', which raises awareness on cultural differences to benefit the cooperation between people with different backgrounds. Due to the large diversity in questions, the students could work together in groups to answer the questions, benefiting from the mixed backgrounds present in the teams. Having a fun afternoon, answering questions and having a few drinks and snacks; isn't that simply the best way to earn your study points?



The pubquiz was also part of the policy plan of the 88th board of Scintilla. To be more specific, it was an attempt to increase integration of international students in the association. The current board believes that internationalization should not be promoted through preferential treatment or through activities that only target a subgroup of Scintilla. Instead, the board has tried an approach which was aimed at emphasizing the common ground between subgroups such as an above-average knowledge of scientific subjects and of course the shared fun of enjoying food and drinks. The pubquiz was the ideal activity to execute this strategy and regardless of the benefits for internationalization, it was very enjoyable to say the least.

In the coming years, the activity will hopefully be repeated many times. The sheer enthousiasm from everyone to participate this year was confirmation for the organization that they got roughly the right formula to set up a great activity for first year students, older students and teachers alike. The coming years will show how much bigger this event can grow.

Datasheet

Author: Céline Steenge

Already the fourth datasheet! Time is flying and therefore we do not have time to cook a proper meal. Therefore, this time 1 quick & easy dish. But since cooking is also stress relieving, I added an easy desert and a more advanced dish. Hope you like them! If you still have a great recipe at home, do not hesitate to mail it to vonk@scintilla.utwente.nl!

Nano particles (Chili con carne)

Need to cook for a lot of people and you do not have enough time, take this dish. Chili con carne is one of the most easy dishes since you just put everything together in one big pan.

Ingredients (10 persons):
1 kg Minced meat
3 Paprikas
500 g Carrots
1 Leek
1 big Onion
800 g (2 cans) Kidney beans
800 g (2 cans) Chili beans
600 g (2 cans) Corn
400 g (1 can) Tomato pieces
Some spices like: paprika powder, chili flakes, Cajun, parsley, coriander

What to do:
1. Cut the vegetables.
2. Bake the minced meat.
3. dd the vegetables but not the tomatoes!! (Are they vegetables? Are they fruits? I do not care, just do not add them yet).
4. Leak the beans and corn.
5. Add the tomato pieces and the tomato puree.
6. Add the beans and corn.
7. Add the spices.
8. Wait a couple of minutes.
9. Perfect dish is ready!

Variation tips: change some vegetables or change the spiciness. Also the side dish can change from rice, Turkish bread, tortillas or even tortilla chips.

FFC (Forest fruits crumble)

This may not look like the most sturdy recipe, but is easy, healthy and delicious!

Ingredients:
400 g deep-frozen forest fruits / strawberries (Fresh probably less grams)
15 g cornstarch
2 bags of vanilla sugar

For the dough:
100 g sugar
195 g flour
120 g butter
65 g oatmeal or flakes
½ tl baking powder
¼ tl salt
1 egg-white

What to do:
1. Defrost the fruits in time.
2. Preheat the oven to 180 ° C.
3. Get a square baking dish and grease it.
4.Cut the butter into cubes and mix all the ingredients for the dough with a mixer. Pulse until coarse crumbs have developed.
5. Keep ¼ of the mixture separately for the topping. Divide the rest over the bottom of the baking sheet and press firmly. Make sure that a uniform layer is created.
6. Cut the big fruits like strawberries into pieces
7. Mix the fruit with the vanilla sugar and cornstarch.
8. Divide it over the dough.
9. Take the remaining crumbs and sprinkle them over the fruit.
10. Put the dish in the oven till it is well and brown (in 50-55 minutes).
11. Cool for a couple of minutes, get it out the dish and cut into cubes.
12. Possibly, add a little powdered sugar on the top to make it look fancy.

Variation tip: really nice with some ice cream or vanilla custard.

Integrated circuit (Cannelloni spinach ricotta minced meat)

This dish is a bit more advanced and can take up some time. It seems a bit like lasagne, but this is in a fancy shape. So whenever you want to impress someone, think of this.

Ingredients (2 persons)
150 g spinach
½ onion
1 clove garlic
150 g minced meat
10 cannelloni
400 ml tomato sauce
hand grated cheese
4-5 tbsp. ricotta

What to do:
1. Preheat your oven to 220 degrees.
2. Cut the spinach, onions and garlic.
3. Bake the minced meat.
4. Add the onions and garlic.
5. Add the spinach as soon as the meat is cooked. Bake the spinach for about 2-3 minutes and turn off the fire.
6. Add the ricotta and mix well with each other.
7. Divide half of the tomato sauce over the bottom of the oven dish.
8. Fill the cannelloni (with a small spoon or anything that could fit but not break the cannelloni) with the filling and place them in the oven dish. Continue until the oven dish is filled or you are out of ingredients.
9. Divide the rest of the tomato sauce over the cannelloni.
10. Finish with a little grated cheese and possibly some ricotta
11. Put the cannelloni in the oven for about 30 minutes.

Variation tip: the filling can differ any time just like normal lasagne.

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Turning ideas into solutions

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maxon motor

Author: Maxon motor

Starting something new is always difficult. This is particularly true for engineers who are trying to get a project off the ground. Often they have creative ideas, but not the necessary equipment or funding. This is why maxon motor has launched its Young Engineers Program (YEP), which supports innovative projects that use electric drive systems.

Young Engineers Program

The maxon Young Engineers Program (YEP) supports innovative projects that use electric drive systems. By supporting enthusiastic engineers, maxon motor is not only helping realizing dreams, but also able to stay at the frontiers of technological developments and also stays inspired by a new generation of tech leaders.

Support

Supporting engineers in their quest to solve technical issues and challenges is one of the most inspiring aspects of YEP. Through this program we're able to get to know the brightest, most energetic and entrepreneurial engineers around the world. Young engineers shift paradigms, see opportunities where others might see hurdles.

The support provided by maxon motor varies from giving a (substantial) discount, to technical advise and access to our global network.

Not only engineers and technicians can take part in the YEP. Event organizers can also apply to maxon using the online form. Those who are accepted into the program will also benefit from their event being promoted on the maxon communication channels.

The Scewo team with its stair-climbing wheelchair is supported by maxon motor. ©scewo

drive.tech
by maxon motor
YEP

Share

Sharing stories, experience and knowledge will inspire others, which is really important. Innovating isn't a solitary venture. Asking for help and helping others is the key factor to success in a fast moving and rapidly changing world. We stimulate and support sharing your experience with fellow engineers to bring the best ideas to life.

Start today!

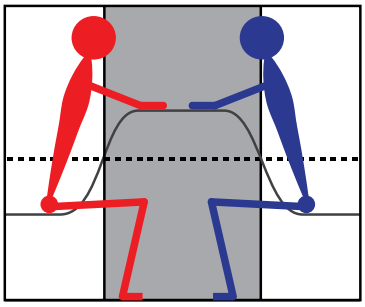
You can enter your application for YEP at www.drive.tech, our blog about drive technology developments. A group of experts from maxon motor will evaluate all the project details provided and decide whether the project will receive support and in what form. On drive.tech, engineers can also find out about other YEP projects. The website includes case studies that describe different applications for maxon products and blogs written by maxon experts about drive technology and the latest trends in the field.

Junction

Geert Jan Laanstra

Author: Marissa Jonker
Rik Engel

I'm a hobbyist, a technician in heart and soul. I'm married and have three beautiful daughters who've grown up quite a bit. I grew up with four sisters. The technician in me kind of inherited from my father and grandfather, of whom I'm quite proud. After my studies I started here at the university as a temporary employee and I've never left. I've been working here for about 27 years now and I really enjoy working here at the UT, especially with all the students around me. The fact that you can transfer the passion of the profession to the newer generations, I just love that.



What did you study?

I've had a very long trajectory: MAVO, MTS, HTS. It took me 5 years to complete the MAVO, 3 years for MTS, and HTS took me 5.5 years. During the MTS I chose not to do an internship, so

> "My dream job became something in engineering pretty quickly..."

I could do something at the university of applied sciences , which saved me a year. After the MTS I went to the HTS (nowadays university of applied sciences Saxion). There, I studied technical computer science, which I was really interested in, as back then it was on the rise. And well, I'm still working in the same field, so that worked out quite well. I considered to continue my studies, but when I loo at how much effort I have to put into it, before I get something back, I thought it was fine the way it was. But hey, I'm still learning new things everyday.

> "My experience was: working like this is so much fun, when the people around you are nice."

What kind of internship did you do?

I did two internships, both applied university. One of them was at My Computer Industry, which was a company across the road from the university. It worked on information systems for financial applications. Think of bookkeeping and things like that. And those systems were repaired at that company. That internship was a real computer science internship.

My second internship was at HSC in Apeldoorn, which was an automation system for the off-shore industry. It was a more software related internship, the work atmosphere was better than at my first internship. My experience was: working like this is so much fun, when the people around you are nice. As long as the atmosphere is nice, which is the most important thing.

What used to be your dream job?

My dream job was pilot, of course, but also truck driver. I wanted to have all kinds of jobs, even a nurse at the hospital, so I've been switching quite a lot. However, my dream job became something in engineering pretty quickly, so after the MAVO I knew that I wanted to be an engineer. The fact that I ended up at the university was a surprise, even for myself. I'm not in the business life, I've never wanted to be. I feel right at

my place here, with the freedom I have and the people around me.

What kind of student were you?

A nerd, a big nerd. Let me phrase it like this: I was not a party animal, but most of the time I was hobbying, almost 24/7, but I did need some sleep every now and then.

> "I wouldn't change a thing."

Looking back, what would you have done differently as a student?

I would try to work harder on the years I missed out on because of missed lessons. I kind of used to be a messy person and sometimes I had other priorities, but other than that I wouldn't change a thing.

> "Through all those years you experience so many reorganisations, splits, and additions.."

What did you do after your studies?

You know, I'm still at the university. I started at the group operating systems and computer science, which was under management of Otto Herman, a German professor. Luckily, I managed to get everything done so I could do what I wanted to the surprise of many. After that, Kees Slump took over. He's in the RAM group nowadays. Then, the group merged with the department signals and systems, which was a collection of many branches in the field of signals and systems: acoustics, biomedical, telecommunication, biometrics. Quite a range of things we've done. Because of reorganisation, the group has been split up, and the branch of biometrics moved to another department, the department I'm in now: SCS (Services, Cyber Security & Safety). In the near future something else is coming, because from the 1st of January the group is going to be separated again. I will join the new group that will be a combination of Biometrics, Database and Computational Statistics.

Geert Jan Laanstra

Age	51
Favorite food	Indonesian (spicy food)
Favorite Drink	Whiskey (Dalwhinnie)

Through all those years you experience so many reorganisations, splits, and additions, so for that matter I went through a lot, but it's always challenging.

What are you working on at the moment?

At the moment I'm guiding the preproject of module 2. I'm preparing some things for the end-project, so we can offer measuring systems to the students, with which they can all perform measurements at the same time. Concerning the measuring setup for the solar panel, I'm making a new box for that, so every group can get one of those boxes of their own. There's a solar panel emulator in it, which can be used as if it were a real solar panel. There's also an artificial load in it, with which the solar panel can be loaded and measured. On top of that, there is the power feed with power measurement. In the end a real solar panel will be used, but this way every group can simultaneously test and measure their own project.

> "I want to put in more effort all the time."

Apart from that, I'm currently working with the GPU cluster. For half a year now. With CTIT funding a small computer cluster was set up with a few machines also containing several GPU cards, mainly for deep learning, but also other purposes. I do a bit of support for them, and the standard assistance in the group of course. It is a bit of everything. It is assisting research, assisting and guiding practical courses, guiding bachelor and master students. And that is about all the work I do.

What are your hobbies?

Since a year, I've gained a new hobby: I'm working on cars. At home, I was working with electronics so much, I sometimes get the comment: "what are you doing, are you working on your job or on your hobby?". At a certain moment something snaps and then you need to work on something else, put your mind on something else.

> "I'm working on restoring a so-called kit kar."

I then started cautiously, but at one moment I needed to do more: unfortunately, the motor of my car gave out, so I had to replace that myself. I then took my first steps into tinkering with cars. At the moment, I'm working on restoring a so-called kit car, which is a lotus 7 clone type of car. Getting my hands dirty, welding, polishing, and looking for parts. That's a process which will cost a lot of time and will take quite a while, but there's no hurry.

> "...stay curious and eager to learn"

Also a hobby is my family life. My daughters are 23, 21, and 17. So you can imagine I've experienced the joys of life with them and my lovely wife.

What do you like most about your job here?

The most exciting thing I do here is giving practical courses, which I really like. I like working on projects, to figure things out, to support researchers, to develop things myself. It's a very broad spectrum of software, hardware, a combination of both. I can't get complex enough.

What keeps you up at night?

Sometimes, the worries you have about your family; the stress at work; what goes on with others around you; sometimes less nice stuff happens. Apart from that I sleep pretty well.

Is there something you would still like to do or achieve?

I'm working on so many fun things and I want to put in more effort all the time. I just really like working here, so staying here would be my answer.

Do you have a piece of advice for students?

Be curious, don't give up too soon and be patient with some things. Some things just take time, but stay curious and eager to learn.

Olympiae Scintillae

Author: Sjoerd van den Belt

On the 2nd of October EE Sports organized the annual Olympiae Scintillae. During this event, electrical engineering students gather to show off their skills on various disciplines. Students formed teams that battled each other to win eternal glory and for their team name to be featured on the Olympiae Scintillae cup.

The program was kicked off with an ultimate frisbee contest. All teams had to play ultimate frisbee against each other, this event required lots of stamina and it quickly became clear that team "88' Vo" was aiming for victory, as almost nobody was able to defeat them.

During the ultimate frisbee tournament, teams were picked out to participate in another activity. In this activity, all members of the team had to assist in carrying one bucket of water to the other side of an obstacle course. It became clear that this task was not as easy as it seemed as the water made the course more and more slippery, making it difficult for the members of the team to climb over the obstacles. The score in this activity was based on the speed of the teams, as well as the amount of water left in the bucket once it reached the other side of the course.

Besides athletic skills, EE Sports also tested the teams on their electrical engineering skills by challenging the teams to a soldering estafette. The teams received a bag of components, and a schematic for an LED die. The teams were not only judged on the time in which they finished the die, but also on how elegant the soldering of each team was. With all teams longing for their promised beers once they had completed the task, they tried to solder the boards as quickly as they could, however the task turned out to be more difficult as it seemed. I don't think any of the teams managed to get their board to completely work as intended. The judgement was fortunately not solely based on functionality, but also on elegance, and, according to one of the juries, how nice the board cracks when you stand on it.

> "With all teams longing for their promised beers..."

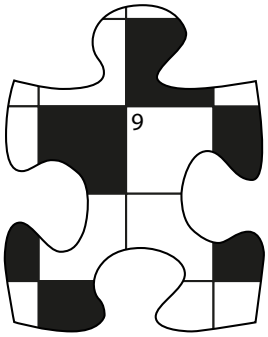
After the soldering estafette all the participants were dying for a well-deserved beer, and, fortunately, the time had come for the last part of the Olympiae Scintillae. For the last part, various games were played at Abscint where the participants could participate in the game using their own smartphone. The games involved things like coming up with the funniest answers to questions, where other teams could vote on which answer was the best one.

After this final activity, and many beers later, the winners of the Olympiae were announced. The team "Help ik zit bij twee Sjoerden", through their limitless skill and effort, won the first prize and their names will be featured on the unique Olympiae Scintillae cup. Luckily the evening did not end there as all teams, winners or not, continued to enjoy a great night rounding of a successful Olympiae Scintillae.

Puuzle

Author: Truusje

The winner of last Puuzle, randomly chosen from the correct submissions, is Willem Mulder! Because of the dissapointing results for last Puuzle, I decided to make this version a lot easier. Connect the dots in the order of the numbers, and give the shape some colour. I will choose the nicest painting that is submitted before the first of April as the winner!
Cheers,
Truusje



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