

Introducing the Candidate Board

Robotic Hands

HIGH TECH, HUMAN TOUCH

UNIVERSITEIT TWENTE

Great Science Fiction Movies



Contents

Editorial

The "ATtentie" is the periodical of S.A. Astatine, which is issued four times a year. The ATtentie is distributed among members of Astatine, sponsors of Astatine and employees at the University of Twente connected to Advanced Technology.

Volume 13 / Number 1 / Issue 51 Copies: 750 Date of issue: December 2018

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With thanks

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If you want to contribute to the next ATtentie, you can send in articles via email: attencie@astatine.utwente.nl Authors remain responsible for the contents of their works. The editors preserve the right to modify or minst respond outside

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Dear readers,

There might be some of you that are wondering "What kind of elaborate spam is this in my mailbox?". Well, have no fears, it is no spam for once. You are holding the (sort of) newest version of the Attentie in your hands. Can you imagine? It has been over half a year since the last volume already. And it gets even better, this Attentie was supposed to be published in August. Needless to say, the past six months have been rather turbulent for us. A 100% increase in workforce and some harsh words with our editing software later, we hope to have things sorted out and back on track, and are already working on the next edition. Still, while being in between chairpersons and a 3-man committee, we have worked hard. Hopefully it shows in this (marginally) outdated Attentie.

I hope to see you all in the next one!

Sander de Ridder

(And the other contributing editors in chief, Roos de Vries and Jasper Gerritsen)



Astatine

From the AT staff

Dear AT-students,

We are approaching the end of the academic year, and the modules of the fourth quartile have started. The fourth quartile is always a busy one as we have to make preparations for the next academic year, before we can enjoy our summer holiday. We need to prepare the study programme for the next year, have to draw up a new programme specific part of the OER and have to determine the binding recommendation (BSA). Also, preparations for the modules of the first quartile have to be made. Quite a hectic period!

What makes this fourth quartile even more interesting and at the same time challenging for me, is the fact that I am the module coordinator of module 4 (Dynamics). A lot of preparation was done in setting up the module. We came up with a schedule, an assessment plan and of course had several meetings with the lecturers involved in this module. However, as it is the first time for me being a module coordinator, I am not sure if everything is taken care of in the right way. Let's hope the module will be a success. And if not, I have some points of attention for next year. I think that, as a programme coordinator, it is important to also be a module coordinator and to get familiar with the challenges module coordinators and lecturers face. When things are not clear or are not doable, we as a programme need to take action.

contribution to the ATtentie, we are always open to the feedback from students. By giving your opinion, we know which parts need more attention. Please let us know when something is not clear or not up to standards.

In preparation of next year, we also monitor how many students will be entering the AT programme next year. We expect to welcome about 75 new students next year. This number is similar to the previous years. However, the number of preliminary registrations is always much higher. It's always difficult to guess why not all applicants eventually start with the AT programme. Some register for more than one programme as they are still in doubt and eventually decide to participate in another programme, and some don't pass their high school exams. However, we think there is also a potential group of applicants that we can try to encourage in participating in the AT programme who are not currently applying.

Overall, this is a busy period and there are a lot of things we are working on. There is much more going on than I was able to write down. We try to inform you about changes and exciting projects as much as we can. For now, on behalf of the AT staff, I wish you good luck with the final stretch before the summer holiday.

Eline Marsman Programme coordinator

From the Astatine board

Hi everyone!

First of all, I would like to say hi to all bicycles as well. After you've finally the wonderful people we get to see again this year and of course I would like to welcome all of our new members!

Let me start of by sketching you a situation: you're lying in your nicely warm bed and your alarm goes off, with a groan you hit the off button and get out of bed (or hit the snooze button a couple of times if that's your style) and you start getting ready for your day. Afterwards you step on your bike and start pedaling to make your way to the university, where you will have full day of classes. On your way you get carried along by all the other students that also had to get out of bed early and are also pedaling towards their first class of the day.

Once you've arrived at the university you try to find a place to put your bike, which proves to be quite difficult since

there are so many other students with found a nice spot to park your bike, you hurry inside, trying to find the room you're supposed to be in, and when you walk in, you are met with a lot of faces that are probably still quite unfamiliar to you.

This is the reality of any (new) student of the university and this year, we, the 13th board, will have to face this reality again as well as our classes are also starting up again. We have had an amazing year managing Astatine and organizing various activities, but alas, the time has come for us to return to our studies as well. We are very happy to pass on the baton to the 14th board, who will be leading you this year and we hope to see many great things from them!

Famke Sprakel



As I already mentioned in an earlier

Astatine

Introducing the Candidate Board



Every year Astatine, and with Astatine nearly every other student association, changes its board.

The actual change will not take place until September, at the general assembly. The (current) candidate board has taken the stage though. These six younglings will take over the 13th board from then on. They will be charged with the honourable tasks of keeping Astatine running, giving students the best experience possible and providing **you** with free coffee.

No easy tasks, for sure. But have no fear, they are more than ready for it. The Attencie presents to you the current candidate board, and future 14th board, of Astatine!

Rik Seelen Candidate Chairman

For me, being chairman of an association was never part of my plan when I started with AT. I was really unsure what to do with my life, partly the reason why I chose AT. I thought I would just study and move on. Now, being part of a board, I am still unsure what to do with my life, but at least I know what I will be doing the coming year. This year, I will fulfil the honourable role as Chairman! Being a chairman, I will be present in a lot of boring meetings, be the one who has to tell stupid stories and above all, do not have a very set schedule for most days! This means that I can take on different projects throughout the year. Astatine, for me, is an awesome association that enables everyone to do however they like to do. Throughout the year, I hope to make sure this is will keep being part of Astatine, and I will try to do however I like to do myself as well. Up to a certain point of course.

See you all, Op de hoogste!





Dearest Reader,

I am Jons Bolding, a (currently) 19 year old guy who decided 2 years ago to come and study Advanced Technology. Who could have known that this choice would turn out very good. I currently am the Secretary of the Candidate 14th board of S.A. Astatine. While this is an unique function, it does not tell a lot about me. I was interested in this specific function since it offers me the opportunity to work on things that I like. To be able to build on what has already been build, an association with its own traditions and members which are the foundation of Astatine. Everyone always says that as board you are there for the members. This is true, obviously. You work for them, you work with them and you relax with them when it is time to release some stress. At the end of (hopefully) my board year, I can look back with a proud feeling of what we achieved together! Op de hoogste!

Jons Bolding Candidate Secretary

Hello everyone!

After two years of studying, I was eager for a change. Ready to do something else than studying, ready to learn more about what I want, and ready to have a fun and exciting year! Therefore I applied to be in the 14th board of S.A. Astatine, and now I am the candidate external affairs. As extern, I hope to organise interesting and exciting activities and orientate members on what they can do after their studies. Now a bit about myself: My name is Laura Berkhof, I love to travel, and besides this. I like to watch series, read a book, once in a while exercise a bit, and occasionally drink a bit too much.

Op de hoogste!

Laura Berkhof Candidate External Affairs





Laura Rodriguez Comas Candidate Educational Affairs

Hello there!!

Hopefully, upcoming year you will see me around as the Commissioner of Educational Affairs of S.A. Astatine. My name is Laura Rodriguez Comas, or to make it easier just RC. I am 21 years old and originally from Colombia, but you can speak to me in English, Dutch, Spanish or Papiamentu if you desire. First, I like to think that as an international student I did not come all the way to the Netherlands just to study.

Being in a board gives the chance to develop a lot of skills but also to develop yourself as a person. Also, two years ago I was new both to Enschede and to the Netherlands. In a new country and for the first time away from my home, Astatine gave me a place where I could feel home again and it gave me the chance to get to know more persons, develop skills I didn't know I had and become more social (work still in progress). Thanks to that I enjoyed my first year and finished it successfully. Because of all that, on my second year I decided to apply for the 14th board of Astatine.

Besides being board next year I want to work on improving my dancing and trying to get fluent in Dutch. I hope that after a year I can look back and be proud of not only achieving those two goals but also of my work done at Astatine.

Op de hoogste!!



Bram Schotpoort Candidate Treasurer



Greetings from the candidate treasurer of S.A. Astatine! I couldn't be more thrilled to announce that I will be handling all the money business within Astatine next year.

Half a year ago it didn't even cross my mind to sign up for a board year at Astatine. It was way too out of my comfort zone. However, later on, it became clear that it is an incredible opportunity to develop myself as a student as well as a person. So eventually I signed up for a board year and here I am, super pumped to be the board of S.A. Astatine next year with my fellow kandi's.

I must admit that I am curious how I will experience a year (almost) without studying. I have never taken a break like this from studying, so to quit studying for a year will also be a whole new experience. I am determined to keep playing tennis next to my board year. I am a person who loves being active in outdoor sports. That is also part of the reason I have been a member of the SportCo for two years now. All in all, I am going to enjoy every bit of it, and I hope that in one year I can look back at a fantastic experience of a board year that I have been fortunate enough to be part of.

Op de hoogste!



Ralph Brantjes Candidate Internal Affairs

Hi everyone

Most of you already know me, my name is Ralph and I am the Commissioner of internal affairs of the Candidate 14th board of Astatine. The idea to do this came at the start of my second year. I love to participate in activities and organizing them so I signed up for a board year. For me this is the perfect opportunity to be active, to contribute to the association and to fully enjoy the student life. I think that I can speak for all my fellow kandi's and say that we're going to do great together.

RAM - Robotics and Mechatronics Haptic Teleoperation of an Underactuated Robotic Hand

I know the title is a mouthful, but in short it translates to "grabbing stuff from a distance with a robot hand". This does not seem all too impressive at first glance, but one of the key characteristics of this project is to make the system haptic, meaning that you would actually feel like you're grabbing something. If I were to pick up an apple with the robot hand, I should feel it on the user end, and if I try to squish said apple, well, I should feel as though I'm forcing the hand through it. This is part of the research performed at i-Botics, a group that aims to create a teleoperated platform that can give physical feedback to the user based on what it is doing.

In order to make such a system, we have both a Master and a Slave device, both of which can influence the other. The Master device is the controller used by the operator whereas the Slave device is the hand we're trying to operate, both of which can present very different characteristics. The master device is not really a problem. The Omega 7 is a well-documented

piece of equipment that posseses 7 Degrees of Freedom (DoF). The robotic hand, on the other hand, is not as well documented, which led to this assignment.

The hand that I'm working with features three fingers, each outfitted with 9 pressure sensors in order to detect what it is holding. Every finger features two phalanges: the proximal and the distal phalanges. The fingers are contracted by pulling a string going through each phalanx, thus making it impossible to control each phalanx individually. The problem with this, however, is that only the proximal phalanx can be measured, the distal phalanx can only be approximated.

This leads to several design problems due to the uncertainty of certain elements. My goal is to be able to operate the three fingers using a single actuated trigger, thus effectively mapping three DoF to one. Part of my research is also to find an intuitive way to indicate to the user that the hand is grasping something. With the 9 sensors per finger I have an abundance of data just



Figure 1: Simple schematic overview of the various actors/components in the system.

That said, the biggest problem does not lie with the hand's design itself, but with the time delays that appear when implementing it over a communication channel. Teleoperation is notorious for inducing (unavoidable) delays in any system and because our system sends signals both ways, this can be quite problematic. For a oneway controller this would not be much of an issue as the receiving device can simply react with a small delay. In a bilateral system, however, the receiver is also a transmitter and with the time delays, it could transmit signals based on outdated data. This, in turn, can cause both the master and the slave side to overreact to a signal, potentially rendering the whole system unstable.

The situation is not hopeless though, this problem has been researched extensively in the field of Robotics and several solutions have been provided so far, all with various degrees of success. M. Franken (2011) goes in depth of the various techniques discovered over the years and then proposes one of his own. This technique is the most supported framework within the RAM group, which makes sense as one of our head honchos, Stefano Stramigioli, happens to be a co-author of said paper. My predecessor has applied it to a KUKA robot arm successfully and thus this is also the approach that I will be taking in my control design. You might be wondering, what is this technique and why is it so much better

than the others? Well, the most defining characteristic of this concept is actually expressed in its name: The Dual Layer Framework.

In order to understand the Dual Layer Framework, you need to understand two key concepts of telerobotics. The first concept is transparency. Transparency is a performance measure of how well the entire system can communicate the robot's interactions with its environment, to the user. This is especially important in bilateral systems as discrepancies can lead to unwanted behavior. The second concept is that of passivity. A system is passive when the integral of the power extracted over time does not exceed the initial energy stored in the system. [Weir and Colgate, 2008] It is essentially an energy limiting approach that will guarantee the stability of a system based on the energy exerted by either system. If either the master or the slave has to exert more energy than its counterpart for a specific action, it means something is wrong. If the energy of the signal receiving end does not exceed the energy expended on the signal emitting end, however, the system is considered passive and inherently stable. The passivity theory is susceptible to time delays though and that is where the Dual Layer Framework comes in.

Haptic Teleoperation of an Underactuated Robotic Hand

The Dual Layer Framework builds upon the concepts of passivity and transparency and assigns both of them their own algorithms, called the Passivity and the Transparency Layer. Unlike the other approaches, the Dual Layer Framework will optimize the transparency of a system regardless of its active or passive state. The passivity controller then converts the first layer's output such that the system remains stable. Although this approach might not always give the optimal solution, it does guarantee the stability of a system and allows for the use of non-passive control techniques, as they will subsequently be made passive in the passivity layer. This is especially useful for my own research, as my robot hand is under actuated. Techniques such as feedforward control and/or signal filtering are now available which can improve my work by quite a margin.

And there you have it, these are the basics of my project. I guess I did end up using quite a bit of robotics jargon at the end there, but it gives some keen insight in what 'Robotics' actually entails. Many people seem to think that robots is just programming robots to do our bidding but there are quite a few other problems that we need to deal with.

Franken, M., S. Stramigioli, S. Misra, C. Secchi and A. MacChelli (2011), Bilateral telemanipulation with time delays: A two-layer approach combining passivity and transparency, IEEE Transactions on Robotics, vol. 27(4), pp. 741–756.

Weir, D. and J. Colgate (2008), Haptic Rendering: Foundations, Algorithms and Applications, A K Peters/CRC Press, chapter 7. Stability of Haptic Displays, pp. 123–156, ISBN 978-1-4398-6514-9.



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Symposium Autonomous Systems

"Since the dawn of mankind, humanity has striven to make the processes that drive our daily lives more efficient. Currently, machines have increasingly taken over functions that were previously performed by humans, and the end is not in sight by far. Computers have outperformed humans at specific tasks for decades. However, they appeared to be fundamentally challenged by some tasks which are considered to be elementary to humans. This, however, is changing at a rapid pace. Machines are more and more becoming independent from human input. What are the developments in the field of these autonomous systems, and is our society ready?"

Could you introduce yourself please?

These were the questions answered on the first organized-by-Astatine-only symposium on the 25th of April 2018. Iust before the summer break of 2017 seven members were selected to organize this educative and exciting day. Directly after the summer, we started brainstorming about subjects that would be most interesting to Astatine members. AT students as well as nano students. We came up with the subject of autonomous systems and started working on getting money, speakers and of course interest for the event by promotion. To be the first after such a long time is hard, but we had a strong team: people from the board (both current and former), SSA and BuCom. The first months we worked in a calm, but steady pace. However, when we did not have a filled program two months

in advance, we kicked in the turbo. We visited the Bedrijven Dagen to get in contact with as many companies as possible. After that, we spammed the companies for cooperation. But since the event was only about one and a half months away, many people were already fully booked. Nevertheless, we found three speakers, from the technical field as well as the ethical field and three workshops to offer to the participants. When the final day was getting closer and closer, plans became more definitive and everything seemed to go perfect. However, on the day before the event, we had to decide that we had to skip the workshop of the Roboteam and that we had to shift the last speaker to the morning, because of the illness of another speaker. This caused some last-minute stress, but eventually we got everything under control.

The day started at 9:30 with a goody bag and some coffee or tea. At 10:00 our moderator Geert Folkertsma warmed the participants with an introduction to the subject and a short announcement about the changes in program. After that, the floor was for Nicolò Botteghi, a PhD from RAM who talked about autonomous robots in pipeline inspection. The audience found out what an engineer needs to take into account to design and construct such a robot.

After a small interactive experiment where three brave men were subjected to an audience that taught them what to do by giving them feedback, similar to self-learning systems, it was At the end of the workshops, all teams time for some more coffee or tea with cake. Then Owen King talked about self-fulfilling prophecies in artificial intelligence. We found out why we all would go to Spain as a result of the algorithms behind advertisements.

At 13:00 it was time to digest all the new insights and to have some lunch. The Roboteam was also there with a demonstration, but due to some technical problems, there was not a lot to see. Sioux and Clear Flight Solutions then challenged the participants in their workshops. Sioux asked participants to come up with a concept design for a robot that can autonomously clean solar panels. Under the guidance of three employees of Sioux, the teams came up with a wide variety of solutions. One team

invented the Flipflop, a robot that could flipflop from one panel to the other. Another team thought of a robot with an extra joint and made smart use of gravity.

For Clear Flight Solutions, the teams had to come up with a conceptual design of a Robird that can autonomously fly at airports with the main focus on bird control. One group thought of a number of small stations spread across the airport, all equipped with solar panels for charging. Another

group had the idea of having a rotating runway so that the bird could always take off and land against the wind.

presented their work and were then led back to Waaier 3 for

some more coffee and a last word from Geert. Then it was time to talk about the day in the TAP. There were free drinks, some chips and delicious snacks (chicken wings!) for the participants. For those who did not feel like going home yet, the drink slowly integrated into the BOSS Symposion drink and our work was done. We, as a committee, look back at a very successful day and hope to have paved the way to more Astatine symposia in the coming years.

Eva van Beurden Secretary of the SympoCie 2018

Phones Transforming Technology

Hi there! Are you reading this article from the comfort of your phone's screen? Chances are, you are, in fact, not. The ATtenTie is still mainly printed and distributed on paper, so it is most probable you are holding the magazine in your hands. If you did somehow get your hands on an electronic version, good for you !

Now, is this going to be another article about how phones are the devil incarnated, how they numb down everyone's wit and how nobody is socially adept anymore without it being on a lit-up screen. No, it will not. Neither will I write about how superior they are, how they brought joy to the world and connected us all. No, this article will be about phones. Phones, phones and perhaps refrigerators.

Sander de Ridder

Most of us would not have been conceived at the time of conception of the first telephone, by Alexander Graham Bell. In fact, even if that did ring true for you (*pun intended*), you are most probably wrong. The actual invention of a telephone-like device can be attributed to Antonio Meucci. Who's that? Well I could tell you, had I done sufficient research. What my digging through Wikipedia brought me were mostly confusion and prejudice for the legal system of the United States. It also taught me how phones worked initially. The basic concept utilizes a

magnet and copper wiring. By talking into the phone, the magnet vibrates and induces an electric current in the wire. The wire transfers this current to other side, and by a reverse process the charge is converted back into a physical vibration- words. And thus, famous words were transferred *Mr*. *Watson — Come here — I want to see you.*

Nowadays, phones are in no way what they used to be. From wired systems came wireless horns, mobile phones charged the market, and currently smart phones are the dominant force. And still, the devices are changing. If your model is over two years old, it probably has one camera, an edge to its screen and buttons on the front. Models with two, even three cameras. have seen the light of day recently. The edge of your phone has either been bent or banned, depending on pronunciation and stuff. Those buttons upfront are as optional as your module 8 lectures. It honestly is somewhat insane. Movies still sometimes depict face scanning technology, or even finger print identification as futuristic systems, whilst a certain fruitbased brand has implemented both in the device in your pocket. Some mobile devices have more RAM than your personal computer had five years ago (albeit they might not use it very efficiently).

The camera(s) take better pictures than cheap cameras did five years ago, as well. All of this innovation makes it a lifestyle for people to keep up. To buy the best of best, whenever it enters the market. Others use it to do business overseas. And, students use to keep their grades at an acceptable 5.5 average.

Because, lets face it, phones have become more of a distraction than a way to keep in contact. Yes, chatting with someone does indeed do both, but you could just as well do that after the lecture. Or during the break. Or when the lecturers tell something uninteresting. Perhaps you have to take care of matters more important, but can now do it from the comfort of your own lecture room. You could download a freemium game to uphold your gambling addiction. Order clothes during a shopping spree. Watch a cat play piano. All the while listening to someone explain quantum mechanics. The possibilities are endless. The cloud is the limit, or perhaps it is not. Innovation seems to be key in the design of phones nowadays.

What I'm trying to say is that phones are a terrific invention. No matter who may be credited for doing so, they truly changed the world, and still are doing so. All the consumers buying their flagship devices are also paying for innovations that can be used later on. I might not have dwelled on the darker parts of smart phones, because they are there for sure. However, sometimes it is better to not look up from your screen, and stay in the happy place that your phone has brought you.

Astatiny

Tiny Astatine News

New Year, New Board!

More than that, even they are already in place for more than a module! Astatine now has an active Snapchat and Instagram! Wild times. Also New Members! Marvel how good swimmers they are!



A Mathematician, an engineer, and a physicist were traveling through Scotland when they saw a black sheep through the window of the train. 'Aha", says the engineer, "I see that Scottish sheep are black." 'Hmm", says the physicist, "You nean that some Scottish sheep are black".

"No", says the mathematician, "All we know is that there is at least one sheep in Scotland and that at least one side of that one sheep is black!"



An admission of guilt

This last year was quite a tumultuous one for the ATtenCie. Lots of Chairmen/women, and lots of disorganisation. Hopefully, this year turns out to be a productive one for us! Here's to us actually getting three periodicals





Q: What is the fastest way to determine the sex of a chromosome?

A: Pull down its genes.

Three statisticians go hunting for deer. They spot one off in the distance. The first one shoots about a meter too high; the second one, about a meter too low; the third one yells, "We got it!"



More than 1000 Bapaos were sold at Astatine, since they were introduced in January! There's an almost up to date graph of Bapaos vs. Time below.



Customer: Do you have any two-watt, 4-volt bulbs? Sales Rep: For what? Customer: No, two. Sales Rep: Two what? Customer: Yes. Sales Rep: No.



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The Gala

Ralph Brantjes

I personally liked the Astatine/Proto/ Atlantis gala this year, it was at the marvelous Jaargetijden, the biggest and fanciest 'zuipschuur' in Enschede. Not that this was really a problem. Everyone came there in a fancy suit not really planning to dance - but to get wasted. For me this was very successful. This was also reflected in the beautiful opening of the dance where our then 'VOzitter Roelof-Jan and our then secretary Niels gracefully danced like two bisons preparing to ram each other, and mostly, everyone around them. Luckily, no one was hurt. Except for some toe stepping here and there. This year, the gala was at the back of the Jaargetijden. It looked very fancy. It had a nice balcony and there were big chandeliers hanging from the ceiling. But that did not fool me: we were now in the backroom, which was obviously made for the groups that were determined to drink their 30 euros worth. And so I gracefully accepted this challenge. Sadly, after the dating and dancing night I was not successful in procuring myself any female company (probably because some had seen me dance). I did find a last minute date. Namely Cham. We downed the entrance drink and stepped into the venue together like two astronauts on a mission towards Mars. We immediately parted ways and I do not remember seeing him since. But at least I had a date. For the whole evening a nice band played music. It was the same one as last year and I remember them being (very) underwhelm-

ing to say the least. But this year I really enjoyed them. Maybe because I was more drunk than last time... but I honestly think they had improved a lot. Or maybe it was just because I like Shrek and over the course of the evening they managed to play about every song in all of the Shrek movies. This time I also remember dancing (jumping hopelessly around) to the Foo Fighters which is great. After an uncertain number of drinks my memories turned a bit foggy, but that just confirms that I was well on my way to complete this mighty quest in which all my brethren were drinking with me. I half remember taking some photos with various committees because the organization had even put in the effort to hire a professional photographer. I ended up quite well in one and really bad in the other due to there being a saxophone in the way of my face. Not that I really mind, it is probably for the best that my face was not visible. I do also remember seeing Jorg and another girl standing atop the balcony furiously making out. Not that one could have missed this, I think the whole room was staring and the band might even have missed some notes. One of the staff member quickly and not so kindly removed them from the balcony and everyone was able to continue with their evening. I think that somewhere between 12:00 and 1:00 my quest was about finished so I set off to drink a broad variety of other alcohol containing liquids.

From your well-known Internal Affairs

This is why there are only two things I remember after that. The first one is that our Intern Lennart decided that it was time to order a vast amount of tequila and before I knew it, 20 people were walking around with shots of tequila. However, one could hardly call these shots anymore, as this particular bartender used shots of around 8cl or so. I do not like tequila so I was walking around with baco but fortunately I have very generous friends that gracefully offered part of their tequila to me by mixing it into my glass. The second thing I remember is Piano Man being played and people walking around all confused. That's when everything became a blur, but the headache next morning felt like the rest of the evening was great, too.



On Diversity and Dynamics

In super-curricular student teams such as the RoboTeam, all sorts of interesting blends of people form . Competing in the small sized league of the Robocup is no mean feat, and as such, quite a sizeable team is needed to make this happen. On both an academic and a cultural front, diversity within a team can lead to lots of interesting ideas and ways of working , on one end, as well as miscommunications and misunderstandings on the other. With that in mind, we're going to spend the next few hundred words looking into what sort of consequences one could envisage this to have on our dynamic as a team .

Let's first take a look at the electronics team. Academically speaking, they're not a very diverse bunch, as they all come from electrical engineering backgrounds. This has the advantage of clear communication lines, because they are used to the same way of tackling problems. That saves on an initial "getting used to one another" phase that a lot of new teams have to go through. In terms of nationality, however, matters are different. Electronics only boasts one fully Dutch student, with others from Argentina, Croatia, France, and China. While I don't see this directly affecting the team dynamic, you never know what might happen. Having different points of view on the world around us (even if it isn't electronics related) is never a bad thing where working as a team is concerned, in my opinion.

The software team is quite the opposite . In terms of cultural background,

Christophe van der Walt

we're very boring. All of us have Dutch passports, and the only person who isn't fully Dutch is me, but if I trace my South African lineage back far enough, I'll probably find I come from the Netherlands as well. One advantage this gives us is that we have the potential to be versatile in the language we use to talk about things. If we can't find a word in English, the Dutch word does fine, too.. Our diversity is in our various educational backgrounds. Technical Computer Science is obviously well represented, but we have members from AT and BMT as well. This makes for a varied and elaborate set of approaches to problems, seeing as we've all been taught differently. As far as I'm concerned, viewing issues from multiple angles always makes for a better finished product.

Finally, we have the mechanics "team", composed of one Dutch mechanical engineer. Working alone does circumvent the problem of internal communication altogether, but also puts all the responsibility on one person. There isn't much else to say on the diversity front, where mechanics is concerned, unless the person in question turns out to have a split personality disorder. This was all just to point out that ours is quite an interesting group in terms of diversity. Obviously, the main driver of our team dynamic is going to be the complementarity of our respective personalities, but it's interesting to speculate as to what kind of an effect such diversity could have. These dynamics are helping us work together since 9 months and going. Diversity seems to be the thing for group dynamics.

<u>23</u>

On useless Maths

In search of the least applicable concept

"Mathematicians have had an exceedingly difficult time finding truly useless mathematics. And they've been trying for thousands of years."

- A Physics Teacher

This is the quote from which I embarked on my journey to find the least applicable mathematical concept. Let's find something to define the basis of all usefulness. Never again will we say: This is the most useless thing I've ever learned." At least not in engineering.

So where do we start? The first step is easiest. We will probably find the most useless thing in pure mathematics, not the applied branch. "A mathematician's apology", written in 1940, is the brave attempt of Godfrey Harold Hardy to talk about the creativity and beauty intrinsic to mathematics, in particular/exclusively pure mathematics. We are going to ignore his point of view to be awe stricken by the inapplicability of some paintings of the mathematical mind.

Now, we don't just want a useless concept. No, that would not be enough. We want a stupidly difficult concept, too. Inter-universal Teichmüller theory provides just this. First enjoy the name for a bit. Inter-universal Teichmüller theory. Especially the German bit (^^).

This theory is supposed to prove the abc-conjecture, a conjecture that captures a mesmerizing observation

about three *relative primes* (integers that have 1 as the biggest common divisor, e.g. 21 and 25 are *relative* primes) a, b and c that satisfy a + b = c. According to it, these <u>usually</u> have a product of their *prime factors*, that is <u>not much smaller</u> than c (Imagine constructing a number by multiplying primes, e.g. 34866 = 2 * 3^2 * 13 * 149 , then 34866 has prime factors 2, 3, 13 and 149). You might think that this is pretty abstract. But it's not nearly as abstract as our Teichmüller-Theory, which proves this.

Inter-universal Teichmüller-Theory (from now on IUT) was made by Shinichi Mochiuzuki, and the first papers on it were published in 2012. Don't get me wrong, it's not useless in pure mathematics: It has a bunch of applications such as solving conjectures about curves, and it has major consequences in number theory. But maybe you remember my words: The theory is *supposed* to prove the abc-conjecture. It hasn't, then? Actually, it did. According to those that understand the entire proof... That's where the problem pops up: The proof given with IUT is too complex to be reduced to a few lines accessible to mathematicians from other fields, so it's not generally accepted.

A quick glance at the length of an abstract of *one of four* papers explaining it, may show why I won't explain what it actually does (See below). Maybe I can explain the title though: What is a Hodge theater? A quick google shows a Quora answer saying that this is not an answerable question, not even for most math Ph.D.'s. The second result is "A quick preview of Hodge Theaters", which takes 19 minutes.

Glorious were the times, when in the first light of dawn this ship started its odyssey of knowledge of an incomprehensible concept. Naïve was I, to think that it would not be shattered on the way.

> INTER-UNIVERSAL TEICHMÜLLER THEORY I: CONSTRUCTION OF HODGE THEATERS

Maybe you, brave sailor, can continue

this journey while procrastinating on

some important task. Have some links

[1] http://www.kurims.kyoto-u.

Teichmuller%20Theory%20I.pdf

[2] http://www.kurims.kyoto-u.

Mathematician%27s_Apology

[4] https://www.youtube.com/

watch?v=CVZ3bgDnpuQ

ac.jp/~motizuki/Inter-universal%20

ac.jp/~motizuki/papers-english.html

[3] https://en.wikipedia.org/wiki/A_

to set wind to your sails.

Shinichi Mochizuki

December 2017

ABSTRACT The present paper is the first in a series of four papers, the goal of which is to establish an arithmetic version of Teichmüller theory for number fields equipped with an elliptic curve - which we refer to as "inter-universal Teichmüller theory" — by applying the theory of semi-graphs of anabelioids, Frobenioids, the étale theta function, and log-shells developed in earlier papers by the author. We begin by fixing what we call "initial Θ -data", which consists of an elliptic curve E_F over a number field F, and a prime number $l \ge 5$, as well as some other technical data satisfying certain technical properties. This data determines various hyperbolic orbicurves that are related via finite étale coverings to the once-punctured elliptic curve X_F determined by E_F . These finite étale coverings admit various $symmetry \ properties$ arising from the additive and multiplicative structures on the ring $\mathbb{F}_l = \mathbb{Z}/l\mathbb{Z}$ acting on the *l*-torsion points of the elliptic curve. We then construct " $\Theta^{\pm \text{ell}}NF$ -Hodge theaters" associated to the given Θ -data. These $\Theta^{\pm ell}$ NF-Hodge theaters may be thought of as miniature models of conventional scheme theory in which the two underlying combinatorial dimensions of a number field — which may be thought of as corresponding to the additive and multiplicative structures of a ring or, alternatively, to the group of units and value group of a local field associated to the number field are, in some sense. "dismantled" or "disentangled" from one another. All $\Theta^{\pm ell}$ NF-Hodge theaters are isomorphic to one another, but may also be related to one another by means of a " Θ -link", which relates certain Frobenioid-theoretic portions of one $\Theta^{\pm \text{ell}}$ NF-Hodge theater to another in a fashion that is not compatible with the respective conventional ring/scheme theory structures. In particular, it is a highly nontrivial problem to relate the ring structures on either side of the Θ -link to one another. This will be achieved, up to certain "relatively mild indeterminacies", in future papers in the series by applying the absolute anabelian geometry developed in earlier papers by the author. The resulting description of an "alien ring structure" [associated, say, to the domain of the Θ -link] in terms of a given ring structure [associated, say, to the *codomain* of the Θ -link] will be applied in the final paper of the series to obtain results in *diophantine geometry*. Finally, we discuss certain technical results concerning profinite conjugates of decomposition and inertia groups in the tempered fundamental group of a p-adic hyperbolic curve that will be of use in the development of the theory of the present series of papers, but are also of independent interest





Electric Superbikes

THIRE SHITES INFINT

Electric Superbike Twente is the youngest student team at the University of Twente. This year, the team is designing an all-electric motorcycle to compete in the Moto-E competition. A lot of student teams in Twente are currently focusing on sustainable energy and ways to increase the power efficiency of such techniques. This raises the question: what's left to explore? How do you convince and inspire people to change to these new techniques? You show them how cool it is! Most of us have been fascinated by cars and bikes from our childhood. Speed and thrilling action bring up emotion, and motorsports are the perfect embodiment.

Our Mission: We want to show that electric driving is not only efficient, but also very cool!

The first time I heard about the electric superbike team and their goal I was immediately convinced to join them. The main reason for this was that I was looking for a practical challenge, and on top of that it also fit perfectly with my interest in motorcycles. A big project like this opens up opportunities to learn in a different way than you do when just going to lectures. And with a team of 15 students, of which 11 are full-timers, a lot can be achieved within a year. In the team I work with, there are people from all kinds of studies like industrial design, industrial engineering and management, business administration, mechanical engineering, electrical engineering and applied physics.

As someone who studies Advanced Technology it is great to see how I am able to work together with almost anyone from any discipline. The reason I say this is because most of the team is divided up into a mechanical and an electrical section: from the mechanical engineer's point of view it's hard to understand what the electrical engineers are doing - and the other way around. However, as an AT'er you can have a proper overview of the entire system and how everything works together.

For the same reason, I am working on the batteries. Designing the battery pack for the motor is a nice challenge that combines both the mechanical and the electrical part.

These batteries must deliver the 150 kW's that the electromotor needs to accelerate the motor to a top speed of 250 km/h. Almost all the parts of the motor will also be designed by the team.

This will of course be done with the help of all our sponsors.

At the end of this year we will be competing in the MotoE competition. A Delft and other universities from for example England will also join the competition and it promises to be a spectacular season.

Astatine

The Astatine Ski Trip

Alright boys and girls, here it is! More than six months after the actual occurrence, what follows are the few scraps I remember of what exactly went down on the astatine ski-trip. It's been long enough that not even Ralph of the Commiski exactly remembers what happened, but I'll try my best to recount the facts. Just don't murder *me in my sleep if I misremember.*

The trip itself began mid-afternoon on Saturday 24th of February (lol, it's been that long since the last ATten-Cie came out). Into the bus we piled, on came the Escalatie Mixen, and off we went. I'm afraid I can't recount too much more of this bus ride, as, despite my famous love of Escalatie mixen and drinking flugel, I found myself forced to put on a pair of noise cancelling headphones and play Super Mario Galaxy 3 on Carl Beekhuizen's Switch.

Anyway, fast-forward 14-15 hours, and a 32-strong party of tired (and for some, hungover) AT-ers spilled off the bus and into a room we could dump our bags and get changed, right before we grabbed our gear and skipasses and headed up the first ski lift into the Valfréjus slopes. For me, the next step was to actually learn how to snowboard, so Jelle Slief gave me a few pointers and so began the knee-

bashing, bruise-filled day that was my Sunday. The most important thing I learned that day was that while green slopes are great for beginner skiers, they're a beginner snowboarder's worst nightmare. If you take it too

slow, you get stuck on these horrible

flat sections, so you need to unstrap a foot and start pushing. Ralph Brantjes ended up towing me in at the end of my first day.

The next day saw me avoiding green slopes like the plague. Unfortunately, blue slopes make you accelerate somewhat faster than on green slopes, so it's safe to say I was permanently eating snow. Over the course of that day, I perfected the snowboard version of the snow-plough, which essentially entails keeping your board quasi-perpendicular to the slope for quite a bit of the time. It's a good way of keeping yourself vertical, but it's also a great way to see lots of local's middle fingers from when you hold up everyone behind you. Lesson learned.

We got a bit of a change in scenery on Tuesday. We went to the neighbouring slopes of Aussois. This was really great for yours truly, because there was a blue slope you could take from the top of the station, all the way down to the bottom. This was quite a great day for most people I spoke to except for Daniel Doller, who had a little moment of idiocy going ~80 km/h and broke his leg. He managed to ski down, but that was the end of his skiing for the near future.

As for the following day, I can't speak for what the slopes were like. Apparently, we went to Val Cenis and it was great, but I spent the day babysitting the aforementioned idiot (jk Daniel I love you), who couldn't speak French and needed to be able to communicate with a local doctor. It was fun though. We played cards and listened to music. La Norma, which we visited on Thursday, was, in my opinion, the prettiest of the places we went to. The air was clearer, and everything was more heavily forested. Thus ensued a rather relaxing day, if you discount a big wipe-out I had on a red slope. I slid for something like 25 meters, and when I looked up, all my friends were laughing at me from the ski lift under which I happened to be. I guess it's a rite of passage.

The last day was back at Valfréjus. By this time, Jelle was sick of watching me T-boning the blue slopes and finally taught me how to snowboard properly. Finally, on the last day, I was able not to look like a complete idiot on the slopes. The rest of that day was probably the most fun I'd had on the slopes all week. Pity we had to be off the slopes early so we could have dinner and get on the busses. Whatever, at least I got there, I guess.

Anyway, that's how the ski-trip ended. After another gruelling, although somewhat less noisy (I wonder why) 14-15-hour bus ride back to Enschede, we all went home to catch some actual, proper, horizontal sleep.

Great Sci-Fi

Through Time



In the previous edition of the Attentie, one of our esteemed writer/editors, Christophe van der Walt, ranted about the portrayal of scientists in pop culture. He addressed some very valid discrepancies between the popular view of scientists, and actual scientists. It was a satisfying read. Anyways, I would like to expand on what Christophe was saying, in the following way: Pop culture does not just dramatize scientists. As with the frazzlehaired, lensed scientists, their subject (science) is also dramatized.

Why can Spiderman swing from a web? "He was bitten by a spider and because Science." Why did Lucy become able to read mids and meld into the walls? "She overdosed and because Science." The tedious hours of processing, the error margins, and the papers that real scientists concern themselves with are all ignored in favor of sensational explosions and technicolor test tubes. One could even go so far as to say that "science" is just a plot device which can be used to add weight to a semiridiculous premise.

Luckily, if you focus on the creative value, or decide to approach fake science with humor, it's pretty fun stuff. And, for the social scientists out there:

the portraval of science can even tell you a lot about pop culture and society through time.

So, without further ado: Here is a short list of some ridiculous and notable Sci-Fi films. Some I have seen, some I really want to see. Some have political and social implications, some are just ridiculous. All are recommendable. Next time you feel like seeing some fake science, these movies are the go-to:

The Devil Bat (1940)

This science fiction horror film was apparently one of the "scariest features on the market" after its rerelease in 1945. But the plot is super random: a spiteful scientist decides to breed giant bats and train them to attack anyone wearing an aftershave he concocts. How can anyone take this seriously enough to be scared-especially in a post-war setting? It must be pretty good.

Invasion of the Body Snatchers (1956)

This Cold War-era movie has stayed with me since I watched it years ago. In it, emotionally-void copies of characters slowly take over a small town. The film uses fake science to elegantly illustrate themes such as the loss of individualism, and totalitarianism,

which were very important at the time. An awesome, significant movie.

The Fantastic Voyage (1966)

I added this movie because according to Wikipedia, the plot is imaginative, and the special effects were ground breaking (at the time). The film also has Cold War elements, and, naturally, sixties glamour. Seems like a pretty wild ride!

Solaris (1972)

Not to be confused with the 2002 version, this Russian film based on a Stanislaw Lem book features a group of scientists dealing with the mysterious effects of a sentient ocean. A very influential film which added new weight to the Sci-Fi genre, and not western. Cool!

Back to the Future (1985)

Most of you have probably seen this movie; it's definitely a cult classic. In it, a high school boy from 2015 goes into the past to improve his current life, riding a hovercraft and driving an iconic DeLorean DMC-12. This movie comes from an error of massive economic growth and hope, which is reflected in the mood. Everyone needs to have seen this-if only to get the references.

Apollo 13 (1995)

This movie is almost more of a historical science film than a science fiction film. As you might guess, it depicts the events of the Apollo 13 space mission.

This movie was meant to be extremely accurate; the dialogue is based mostly on quotes from the actual astronauts. and the film even has scenes filmed in free fall.

Wall-E (2008)

How strange to think that this Disney-Pixar animation has been around for 10 years! For those who have not seen it: two robots fall in love while on a quest to restore a badly-polluted Earth to a livable state for some rather spoiled humans. The deeper message is: take care of the Earth, and don't let technology make you lazy! It's cute, emotional, and poignant.

Ex-Machina (2014)

end.

This movie features a robot who outsmarts the humans by playing psychological games. It's scary because it doesn't seem unrealistic. I think it really speaks to modern society's fear of accepting AI into our daily lives. Watch it. Think about it. Talk to your friends about it.

So yeah. There's my movie list. Looking at it now, it seems to get less and less ridiculous as time goes on, as if the Sci-Fi Genre began to be taken more seriously in its ability to portray societal themes. I legitimately didn't intend for this trend to exist-I just chose some fun movies. There may be a point to be made here about people's ability to distinguish what is real from what is not. But, I won't make it. The



Puzzle

out?

Cheerful chef

Summer Rice with Fish, Greens and Dip

This recipe can be easily prepared for vegetables and rice. a large group of people, it's hard to mess up, and is absolutely delicious!

- 450 g frozen fish (I recommend cod-

1. Defrost the fish ahead of time.

from the base of each. Rinse.

parsley leaves off the stalks.

salt and pepper to taste.

container of a hand-held mixer. Add

Ingredients for four:

- a head of celery

- 450 g of frozen peas

- 2 tbsp of fish spices

fish or pangasius) - 200 g cottage cheese

- 30 g parsley

instructions.

ter 5 minutes.

cooked.

Recipe:

- a lime

- 300 g of long-grain rice - a head of Bok Choy

9. Serve hot or cold with a slice of lime, some parsley, and dip!

Expert Tip: This dish can be easily adapted. Replace the fish with meat or tofu - or add whatever vegetables you have lying around!



The problem is this. Each board member is the contact person for a committee, listens to a particular genre of music, identifies with a certain Friends character, and has a personality related to a certain colour. However, the evil chairman of Alembic, *Olaf van Ginkel, has placed a curse on the* to R&B board using some weird occult chemistry

This is what the board remembers:

• Roelof-Jan is the contact person for the ATtencie

magic. They now have memory problems.

A more pressing problem is that Niels re-

ally needs to know which Friends character

he is to impress a girl. Can you help him

- The contact person for the ATtencie has a Pumpkin personality
- The contact person for the ComCon does not listen to Grunge
- The prettiest of the friends (Rachel) loves Smooth Jazz
- Elise has a Turquoise personality
- Lennart does not have an Icterine personalitv
- The person who likes Smooth Jazz has a Maroon personality
- Monica is very Mauve
- Phoebe is not Icterine
- The contact person for the ATAC is Joey
- Monica is not the contact person for the KitKat
- The contact person for the FlitCie listens to Smooth Jazz
- Famke is not Chandler
- The person who listens to Reggae has a Pumpkin personality
- Joey likes to listen to Happy Hardcore

- Ross has a Pumpkin personality • Niels does not listen to Happy Hardcore
- Daniel is a very Maroon person
- The contact person for the ComCon has a Turquoise personality
- The contact person for the KitKat listens
- Famke is not Joey

Which of the friends is Niels?

thalescareers.nl

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