UNVEILING OF THE IEEE AESS MILESTONE **HUELSMEYER PLAQUE**

on 19 October 2019

PROGRAM

CONTENT

GRUSSWORT
HENRIETTE REKER,
OBERBÜRGERMEISTERIN DER STADT KÖLN

Es war eine Sternstunde der Kölner Technikgeschichte, als Christian Hülsmeyer im Mai 1904 sein „Telemobiloskop“ erstmals von der Hohenzollernbrücke aus der Öffentlichkeit präsentierte: Mit dem Gerät richtete er Hertz‘sche Wellen auf die kreuzenden Rheinschiffe, deren metallische Oberflächen die Wellen reflektierten und vom „Telemobiloskop“ empfangen wurden. Auf diese Weise ließen sich die Schiffe detektieren – das Radar war geboren.

Die damals entwickelte Technologie ist bis heute in verfeinerter Form weltweit im Einsatz und trägt beispielsweise zu unserer Sicherheit sowie zum reibungslosen Ablauf einer komplexen Luft- und Wasserinfrastruktur bei.

Als Oberbürgermeisterin dieser Stadt bin ich stolz, dass diese Innovation ihren weltweiten Siegeszug von Köln aus antrat und sich damit in eine lange Liste von Erfindungen in der 2000-jährigen Geschichte dieser Stadt einreiht. Die Tradition des Kölner Erfindergeists halten wir bis heute lebendig, indem wir beispielsweise unser kreatives Start-Up-Ökosystem intensiv fördern. Das bringt kleine und große Innovationen hervor: Von Smartphone-Apps für Augmented Reality bis hin zu völlig neuen Ideen für Güterlogistik in Großstädten.

Henriette Reker
Oberbürgermeisterin der Stadt Köln

Neben der Wirtschaft sind insbesondere die vielen Institutionen aus Wissenschaft und Forschung die Innovationstreiber der Region:

Köln ist die Heimatstadt der zweitältesten Hochschule Deutschlands, von vier Max-Planck-Instituten, des Deutschen Zentrums für Luft- und Raumfahrt und der größten staatlichen Hochschule für Angewandte Wissenschaften

in Deutschland – um nur einige Einrichtungen zu nennen. Dabei versteht sich Köln als Teil eines der größten und bedeutendsten Wissenschaftslandschaften Europas: dem Rheinland.

Dementsprechend gewichtig ist der Beitrag von Forschung und Wissenschaft am Gründer- und Erfindergeist in der Region. Auf diese Bedeutung aufmerksam zu machen, gelingt uns mit dem Anbringen des Historical Milestone. Ich danke dem Wachtberger Fraunhofer-Institut für Kommunikation, Informationsverarbeitung und Ergonomie FKIE und seinem Schwesterinstitut, dem Fraunhofer-Institut für Hochfrequenzphysik und Radartechnik FHR, die sich zusammen mit dem Institute of Electrical and Electronics Engineers dafür eingesetzt haben, an die bahnbrechende Kölner Erfindung des Radars dauerhaft und öffentlich zu erinnern.

Künftig halten wir genau an dem Ort, an dem die Kölnerinnen und Kölner vor 115 Jahren die Erfindung des Radars bestaunten, das Gedenken an Christian Hülsmeyer und seine geniale Idee wach. Ich wünsche mir, dass die Gedenktafel insbesondere junge Menschen dazu inspiriert, sich selbst mit Technik und Forschung zu befassen. Denn wir brauchen auch weiterhin kluge Köpfe, um unseren Erfinderreichtum in Köln und der gesamten Region zu bewahren.

WELCOME ADDRESS

KONRAD ADENAUER,
GRANDSON OF KONRAD ADENAUER

Reconciliation through RADAR. A Warm Welcome

The invention of RADAR here on the banks of the River Rhine in Cologne, by an inventor from Düsseldorf – yes, we have to admit it! – has many dimensions, indeed. The employees of the Mayor will perhaps be most pleased with the income that RADAR washes through the speeding tickets into the city treasury...

Great RADAR professors from London and Delft will talk about the history of RADAR. And in the evening, when we have inaugurated the plaque for Christian Daniel Hülsmeyer, much will be heard about the present and the future of RADAR.

In fact, many people are even saying that the very first step towards omnipresent sensors and digitalization has actually been taken here in Cologne. This step we are celebrating today as well. For Cologne is not only a world capital of culture and economy, but also of a technology that conquers our world.

As the grandson of the first German Chancellor, Konrad Adenauer, however, I wish to make a contribution to the political significance of RADAR. Because RADAR became one of the many instruments in my grandfather's hand by which he reconciled Europe after the Second World War. And we still live from his legacy today. For our Europe is now at risk again. That is why I particularly like the fact that an important British radar scientist is speaking after me, from a country that wants to leave Europe again.

Many people say that World War II was actually won by two great inventions, RADAR and the computer. And both were German inventions, the inventions of Christian Daniel Hülsmeyer and Konrad Zuse.

After World War II, the English inventor of RADAR, its re-inventor, was to be knighted. He had defended England against Göring's Luftwaffe by means of an enormous radar chain.

When the nomination package was prepared for Churchill, however, it came out that Robert Watson Watt, the English radar inventor, was not at all the inventor of RADAR. There was already a British Crown Patent for RADAR dated 1905. And on this patent stood the name of a German inventor – the name of Christan Daniel Hülsmeyer, whom we honour today.

My grandfather immediately seized the opportunity to do something for

German-British reconciliation. And the fact that it was an invention that offered him the means to do so was just right for him. Because the first German Chancellor saw himself as an inventor. In the difficult period of his National Socialist persecution, it was his practical inventions that helped him to survive mentally. You can still see them today in the Adenauer-Haus. And in addition, RADAR was an invention from Cologne! My grandfather did like that very much, indeed. After all, he was one of your great predecessors for many years, Mrs Reker.

So what happened? In 1953, soon after the war, a radar reconciliation conference convened. And where? In the Paulskirche in Frankfurt! Which place in the young Federal Republic would have been more suitable for an act of reconciliation? Which place would have been more suitable for our young democracy?

So the great inventors Christian Daniel Hülsmeyer and Robert Watson Watt met in Frankfurt's Paulskirche. A truly Solomon-like compromise was found, quite in spirit of my grandfather: Robert Watson Watt could be called the "father of radar", but Christian Daniel Hülsmeyer was the "grandfather of radar". This is a really good example of reconciliation policy.

Konrad Adenauer
Notary, grandson of Konrad Adenauer

On his 75th birthday, my grandfather awarded the grandfather of RADAR here in Cologne, in his city. And in his humorous speech he spoke to Hülsmeyer as inventor to the inventor.

It is a German-English story of reconciliation that I spoke of. And here in the historic Town Hall of Cologne, English is spoken a lot and German hardly at all. So I can perhaps make a wish in the spirit of my grandfather. May the radar invented here in Cologne by Hülsmeyer from Düsseldorf symbolize the deep and spiritual connection between Germany and Great Britain today and in the future.

WELCOME ADDRESS

THOMAS MÜLLER

CEO, HENSOLDT

HENSOLDT, representing the industry, is proud to host the evening reception of the IEEE AESS Hülsmeyer event here in Cologne, the cradle of this important milestone in the history of international electrical engineering technology. For a company like HENSOLDT whose core competence is in radar technology, this is a very special event and an honour to be part of.

When Christian Daniel Hülsmeyer invented the world's first radar in 1904 with his ground breaking experiments on the banks of the Rhine, he certainly had no idea that the worldwide impact of his invention would continue to radiate to the present day. Today, 115 years later, radars serve to detect and protect in almost every region of the world.

HENSOLDT as the leading sensor solutions provider has been continuing the tradition of the German engineer and entrepreneur Hülsmeyer for over 60 years and translates his technology into products that are in use around the world. In surveillance, reconnaissance, air defence and air traffic control, they reliably provide their services in both military and civil areas.

Thomas Müller
HENSOLDT CEO

Since 1955, HENSOLDT and its predecessor companies have been at the forefront of the development and production of radar systems. Significant R&D resources ensure the continuous development of radar solutions and technologies in the various domains to solve the challenges posed by a modern radar development. These are the

solutions which have enabled HENSOLDT to create many cutting-edge families of radar products since its inception in the 1950s.

HENSOLDT's comprehensive radar portfolio covers different radar applications, ranging from long waves to millimetre waves, from short distance high precision measurement devices to long range air surveillance systems.

One of the company's latest innovations is the TwInvis passive radar. The system does not emit any signals itself, meaning that it remains virtually invisible and opens up an array of new and innovative applications.

We are proud to be able to demonstrate this new milestone in radar development live at the evening reception venue (HYATT, Cologne), to show that Christian Hülsmeyer's legacy was, is and always will be safe in the hands of HENSOLDT, where radar innovation is part of the corporate DNA.

AGENDA

Reception in the Historic Town Hall in Cologne

15:00 **Arrival of the Guests**

15:10 **Welcome Addresses**
Henriette Reker | Mayor of the City of Cologne
Konrad Adenauer | Notary, Grandson of Konrad Adenauer

15:30 **Hülsmeyer and the Early Days of Radar**
Hugh Griffiths | University College London

15:50 **Radar Impromptus on Piano**
Richard Klemm | STAP Radar Pioneer

16:10 **Hülsmeyer's 1904 Experiments in the Netherlands**
Leo Ligthart | Delft University of Technology

16:30 **Get-together and Walk to the Hohenzollern Bridge**

Unveiling of the Christian Hülsmeyer Plaque at the Hohenzollern Bridge

17:30 **Short Addresses**
Steve Welby | Executive Director and COO, IEEE
Joe Fabrizio | IEEE AESS President
Antje Turanli | Granddaughter of Christian Hülsmeyer

17:50 **Unveiling of the Plaque**

“Food for Thought & Body” – Addresses and Flying Buffet @ Hyatt Regency Cologne

19:00 **Champagne Reception**

19:20 **Introduction to the Evening Program & Moderation**
Guy Kouemou | HENSOLDT

19:30 **Welcome to the World of Modern Radar**
Thomas Mueller | HENSOLDT CEO

Hülsmeyer's Heritage – Radar Technology Today
Peter Knott | Fraunhofer FHR

AI in Advanced Sensing – Gateway to Digitalization
Wolfgang Koch | Fraunhofer FKIE

Will they know everything? Reflections and Perspectives
Yvonne Hofstetter | Lawyer and Essayist

Industry and Radar – History, Present and Future Challenges
Ryszard Bil | HENSOLDT CTO

23:30 **End of the Event**

CHRISTIAN HÜLSMEYER: **INVENTION AND DEMONSTRATION OF RADAR, 1904**

Hugh Griffiths, University College London, UK

October 2019 will see the inauguration of an IEEE Historic Milestone recognizing the invention and demonstration of radar by Christian Hülsmeyer, in Germany in 1904. The IEEE History Committee voted to recommend a milestone proposal that was approved by the IEEE Board of Directors during its June 2019 meeting. The ceremonial inauguration of the plaque will take place on 19 October 2019 at the site of the historic event in Köln (Cologne), Germany.

The IEEE Historic Milestone program marks significant developments in the history of electrical, electronic and computer engineering. There are currently some 150 milestones that have been commemorated in this way worldwide. Nominations are evaluated rigorously to ensure their validity and significance, and each is marked by a plaque on public display, with a short citation.

For those of us that work in radar, this event is really rather special. It marks the very first demonstration of radar, and hence the start of a technology that has become truly global in its significance and value to humanity, in so many ways.

On 17 May 1904 Hülsmeyer had arranged a public demonstration at the Dom Hotel in Cologne, and later the same day the apparatus was taken to the banks of the Rhine river, next to the Hohenzollern Bridge, to demonstrate the detection of a barge at a range of several hundred metres.

The demonstrations were reported in the Kölner Tageblatt and Kölnische Zeitung newspapers the next day. Translations of some sentences from these reports read as follows:

After the transmitter had been activated, and the waves returned to the receiver after reflection at the gate door, the receiver switched on a light bulb which also initiated the activation of a small motor-mechanism. This motor mechanism rotated and triggered the explosion of a few cartridges !

The apparatus worked extremely precisely. The inventor explained also that a non-metallic target reflects the electric waves, which could propagate through the wall of the hotel and act in the same and in the same way as before without obstacles. The spectators felt that they were witnesses of the first demonstration of one of the most important inventions of our time.

The British patent was submitted on 10 June 1904 and granted on 22 September 1904. Several aspects are recognizable in modern radar systems. The transmitter used a Righi-type spark gap fed from an induction coil, and it is estimated that the wavelength was around 40 – 50 cm. The receiver used a coherer detector and a separate, directional antenna. The apparatus scanned in azimuth and was mounted on a gimballed platform so it would still point correctly when the vessel on which it was installed rolled or pitched.

A further demonstration was arranged just a few weeks later on 9 June 1904, in Rotterdam in the Netherlands, in particular to representatives of various commercial shipping companies and navies.

Perhaps surprisingly, little commercial interest was shown in the invention. This lack of interest may partly be due to the recent advances in radiotelegraphy by Marconi (the first transatlantic radio communication had been demonstrated in December 1901), and partly due to a recession in the shipping industry. So interest in radar waned, till it was rekindled in several countries in the 1920s and 1930s.

Some sources – particularly the British scientist Sir Robert Watson-Watt who developed the Chain Home radar system in the UK in the late 1930s – maintain that Hülsmeyer's invention could not properly be called a radar because it did not measure range (the term 'radar', standing for radio detection and ranging, had first been introduced in the USA on 19 November 1940). This is not strictly true, since a development of Hülsmeyer's invention, detailed in a subsequent patent granted on 2 April 1906, did indeed measure target range. But as well as that, we have no difficulty today in speaking of police Doppler radars – which measure target velocity but not range. There is a certain irony that Watson-Watt's celebrated Daventry Experiment in 1935 did not measure target range either.

Although there are plenty of others who made significant contributions, it was Hülsmeyer who designed, built, demonstrated and patented the first system of this kind, so it is right that he receives the credit for the invention of radar.

HÜLSMEYER'S LIFE AND CONTRIBUTION

Hugh Griffiths, University College London, UK

Christian Hülsmeyer was born in Eydelstedt on 25 December 1881, the youngest of five children. His mother was Elisabeth Wilhelmine (née Brenning); his father, Johan Heinrich Ernst Hülsmeyer, was a farmer.

At school he showed himself to be very able, especially in practical science and mathematics, and he passed the examinations to allow him to study at the Teacher Training College in Bremen. He then worked for the Siemens and Schuckert company in Bremen, but left this employment in April 1902 and moved to Düsseldorf where he continued his experimental scientific work.

He conceived the idea of a device that could detect the presence of a distant obstacle, even in conditions of poor visibility. He filed a patent on 21 November 1903 for what he called a *Telemobiloskop*, but it was rejected. On 17 May 1904 – he was just 22 years old – he was able to demonstrate the detection of a barge at a range of several hundred metres at the banks of the Rhine river, next to the Hohenzollern Bridge. The British patent was submitted on 10 June 1904 and granted on 22 September 1904.

Subsequently, Hülsmeyer established a successful engineering company. He was called for military service in World War I, but did not actually serve due to medical problems. When the Nazis came to power, he was imprisoned for some time in 1934, and his passport was confiscated.

Hülsmeyer died on 31 January 1957, at the age of 75, and was buried in the North Cemetery at Düsseldorf.

HÜLSMEYER'S RADAR
A GATEWAY TO MODERN DIGITALIZATION

Wolfgang Koch, Fraunhofer FKIE
Peter Knott, Fraunhofer FHR

Leading radar scientists pay tribute to the historical significance of Hülsmeyer's RADAR and trace the development that began with it. But what is it that makes the connection to our present and future and far beyond?

THE NEXT STEP – PASSIVE RADAR

Hülsmeyer's invention already undergoes a significant expansion in World War II. What was his original idea? Send out a wave and listen to its echo. It carries news about the world from which it returns. What would be a very natural extension? Someone else sends out waves that I am passively receiving without sending waves myself.

Hülsmeyer's successors in the 1940s applied this idea to hostile radar systems. The British radar network Chain Home sent out waves that illuminated the airspace over the North Sea, including their own bombers en route to Germany. Without emitting radar waves and thereby betraying themselves, German stations on the European coast line passively received the waves of the Chain Home system and their echoes from British aircraft that could be located. This was not yet reliable. But the principle of "Passive Radar" was sound and worked. What was still missing? Powerful computers, intelligent algorithms!

ELECTRIC SMOG FOR ILLUMINATION

Today, we live in a world full of electric smog. Some don't like it, radar people do... Each mobile communications station, for example, continuously transmits certain radio signals which are reflected by objects. By boats or drones, for example. And there are many mobile phone stations. Passive radars receive both the direct signal and its echo. Clever algorithms filter them out. The computer answers further questions: What is the delay before the various echoes arrive? From which direction do they arrive? Which frequency shift occur due to the Doppler effect? In order to determine all this in real time, sophisticated mathematics is required.

What is needed are intelligent mathematical algorithms that are able to turn very large amounts of data into information. By this processing we know in the end where and at what speed targets are moving, what those targets are, and perhaps also what they are planning.

RADAR APPLICATIONS FOR SECURITY

Fraunhofer researchers show that their technology works. On the Baltic coast, for example, they used their passive radar to record all shipping traffic

between the island of Fehmarn and Denmark. Or to monitor ports and to protect infrastructures against drones. The comparison with regular GPS position reports from the ships shows very good agreement. The use of passive radar on complex coast lines with many bays and fjords, such as the Norwegian coast, would be particularly interesting. Monitoring with active radar is hardly possible there because it is simply too expensive. But the mobile phone providers are already illuminating most of these coasts. Therefore, this very communication infrastructure can now easily be used for monitoring.

When drones will soon be doing their job everywhere, ensuring safety, bringing and fetching goods, monitoring infrastructure for leaks, helping with disasters and much more – How can we integrate them into the airspace? How to identify and eliminate drones that are harmful? Here, too, passive radar offers good answers. The communications infrastructure, which is available almost everywhere, is far too precious just to be used for phoning or surfing – surveillance is the cooler use of it.

ALGORITHMS – SOUL OF SENSORS

Even before any scientific reflection or technical realization, 'intelligence' and 'autonomy' are omnipresent: Each living creature fuses different sensory impressions with learned knowledge and messages from other living creatures. This creates a picture of its environment, the prerequisite for targeted action in the biosphere according to the situation.

Hülsmeyer's radar was the very first example of an artificial sense organ, of a sensor. Today, the algorithms of artificial intelligence attempt to technically reproduce the collection of data by sensors. Therefore, Hülsmeyer's modern successors try to scientifically understand the optimal combination, the fusion of sensor data, and to automate what creatures and we ourselves are naturally doing while perceiving. In certain aspects they increase it far beyond the natural capacity of perception. Technical autonomy deals with the automation of chains of action, the control of sensors and the platforms they carry.

It's a kind of "power steering for the brain", i.e. cognitive tools enhance natural abilities to perceive as well as mechanical tools are enhancing physical strength. They are necessary as soon as data is received in such abundance that it can no longer be processed, fused or evaluated in any other way. This is the only way to ensure responsible action in the increasingly complex technosphere.

This support of perception takes place on a deeper level than through glasses or hearing aids, telescopes or microscopes.

HÜLSMEYER REVISITED TODAY

Hülsmeyer's "Telemobiloskop" wanted to warn of dangers on the River Rhine and to protect people from accidents.

Today, his successors are developing networked sensors and AI-assisted knowledge to identify a wide range of threats and identify options for action, be it in road traffic or in combat. Such systems help to master complex missions more appropriately, to balance human subjectivisms and to improve the protection of one's own forces and those of others not involved.

Three areas have to be distinguished: Increase of perception through sensory assistance, of situational awareness through cognitive assistance, of action through physical assistance. The physical presence of humans therefore becomes more and more dispensable in dangerous situations.

The focus is on cognitive assistance to 1) evaluate massive input of sensor data, 2) fuse complex context knowledge with current data, 3) fuse complementary and different sensors, 4) assess the plausibility of the information obtained, 5) offer target-oriented impact options, possibly based on mobile and interacting platforms, and 6) respect the ethical framework of action. Finally, AI-based technical autonomy should adapt to individual tasks and capabilities of its users.

UNBURDENING HUMAN BEINGS

Everything that has emerged from Hülsmeyer's idea in the end should thus unburden human beings so that they can do what only human beings can do, namely work intelligently and in responsible autonomy. An important demand is the comprehensibility of the artificial offers.

In view of artificial intelligence and technical autonomy, is humanity facing fundamentally new challenges? No. Throughout history, new technologies have repeatedly led to increased possibilities of perception and an expanded sphere of influence. The difference to earlier technological revolutions is therefore more quantitative than qualitative. Therefore, even today, a timeless question arises: How do we work ethically well? Any answer to this question requires from information and engineering science answers to two different questions: 1) How do cognitive

machines remain controllable by humans? 2) How can their responsible use be made technically possible?

RADAR RESEARCH IN WACHTBERG

In the “Forschungsinstitut für Funk und Mathematik” (FFM) and “Forschungsinstitut für Hochfrequenzphysik” (FHP), predecessors of the Fraunhofer institutes in Wachtberg that today consider themselves as Hülsmeyer’s legitimate heirs, aspects of air traffic control have been the driving factors for applied research in modern radar since the early 1960s. Radar technology intimately combined with advanced mathematics – this has been the truly explosive mixture that has blown away rocks and opened up a gateway into the world of modern digitalization.

Radar digitization, distributed radar systems, fusion with background information such as flight plans or advanced target tracking have been keywords describing the challenges at this time. This work has comprised distributed and extended multiple target-tracking and data fusion in multiple radar networks for the German Agency of Air Traffic Security (DFS). At the end of the 1960s, the "Tracking and Imaging Radar" (TIRA) was set up and the first experiments and the first experiments could be carried out. Today it is still a powerful and much sought-after instrument for the observation of satellites and other objects in Earth orbits. It is both a prominent landmark of the institutes’ site and the region. Radar images were an important topic from the very beginning and the first ISAR images of satellites in space were taken as early as 1975. Over many years, active sensor management, SAR processing, adaptive tracking, and data fusion for the phased-array radar system ELRA (Elektronisches Radar, a dominating project over a long time) was an important focal point. The FFM was among the first institutes that proposed and realized a sequential track initiation scheme based on an optimal criterion related to state estimates. Important milestones have been multiple emitter tracking within networks of electromagnetic and acoustic sensors under the effect of hostile measures in challenging Cold-War reconnaissance scenarios.

Important until today are research activities that cover a wide range of topics in the area of sensor data fusion related to localization and navigation, wide-area surveillance, resource management, self protection, and threat recognition for countless applications.

WILL THEY KNOW EVERYTHING?
REFLECTIONS AND PERSPECTIVES

Yvonne Hofstetter, Lawyer and Essayist

INTRODUCTION

In addition to all the wonderful contributions on technology, of course especially on radar technology and – notably – Artificial Intelligence, it is my turn tonight to point out the societal impact of technology.

It is autumn 2019, and Germany celebrates the anniversary of a political miracle: Exactly thirty years ago, the Berlin Wall collapsed. The citizens of the GDR, who tore down that cynical border, were longing for an everyday life in a free, in a liberal country. In a wondrous exchange they traded totalitarian control against sovereignty of man, centralist planning against social market economy, and public property against private property.

Today, thirty years later, much has changed in both Germany and the whole world. Enthusiastically, people all over the globe have dedicated their lives to the chic means of total surveillance. Those are legion, their names are: social media, data cloud, smart assistants, smart cars, smart homes, in short: **Ambient Intelligence**. Tiny sensors and effectors, a growing communication network and the proliferation of analytic algorithms are integral to our entire existence today. It builds a surveillance infrastructure that is almost impossible to escape.

HISTORY

Concepts of surveillance reached the mainstream, but they are not new. For decades, military reconnaissance and situation analysis collected and evaluated raw data. A famous example is the AWACS (last modernization was in 1997). With its radar, the "flying eye" monitors the airspace and collects data. To classify an aircraft as friend or foe, the system fuses all raw data captured: airspeed, radar cross section, civil flight schedules. (There was already much talk of data fusion today.) Even the question of whether one can leave a hostile fighter jet unmolested or if one has to push it aside can be answered with the help of a smart assistant – today exist powerful algorithmic control strategies that could make that decision automatically and optimally under uncertainty. Cognitive machines with their triad of "monitoring – analysing – controlling" are therefore not only useful for the military domain, but serve as base technology for technical autonomy as such, from Industry 4.0 to autonomous driving. Networked industrial plants can be monitored and controlled to only produce what is necessary to meet actual demand, which makes manufacturing environmentally friendlier. The health condition of steel railway turnouts, their potential malfunctions and their material failures due to heavy

mechanical stress can be measured, and their required maintenance can be predicted and more optimally scheduled.

APPLIED TO THE HUMAN BEING

We can state: Digital surveillance can certainly have beneficial effects for security and for the economy. But: The providers of Ambient Intelligence – initially the pioneers from Silicon Valley, today the companies seated in China (the "mercenaries of the Chinese government") – make no secret of their ambition to fully monitor, analyse and control not only the *Internet of Things*, but in particular persons (it's even easier). In the eyes of digital entrepreneurs, humans are programmable. The slogan of the American artificial intelligence company "x.ai" takes this idea to the extreme: 'Using AI to program humans to behave better.'[1] **This idea supports autocratic, even totalitarian leadership** – it supports American Big Tech and the Communist Party of the People's Republic of China equally, who monitor, program, and control people.

This idea attacks the image of sovereign man as propagated by the (historic) Western world. Liberal democracies are based on a certain image of a human – a person who is sovereign, who thinks by herself, who is granted individual fundamental rights and who can execute powers, either by voting or after being elected.

SUBJECT AND OBJECT

However, digital technologies that indiscriminately monitor **people like things** blur the line between human and machine, between object and subject. In legal terms, a person is a subject, a bearer of rights and legal obligations. We couch the monitoring of people in the euphemistic language of **profiles, social credits and scores**. But the analyzed raw data of our lives produces a different image of a person, one that is an algorithmically furnished digital twin. The data economy reduces humans to mere data. What remains is merely the measurable and visible.

Digital technologies objectify humans and treat them like any other observable object. But a human is more than abunch of analyzed data and observable information.

1 https://www.linkedin.com/pulse/using-ai-program-humans-behave-better-dennis-r-mortensen/?trk=eml-email_feed_ecosystem_digest_01hero-0-null&midToken=AQE2Xrxn6jNXEw&fromEmail=fromEmail&ut=3xzMM1-m4Hl8g1

Therefore, when challenging the image of a sovereign human being, **this idea fundamentally contradicts the basis for democratic government**. A determinate, unfree, possibly digitally manipulated human cannot be sovereign.

SOCIOLOGICAL ACKNOWLEDGEMENT

We have all helped develope this new image of ourselves. We have accepted and socially legitimized the digital transformation of our lives that has been driven by technology companies rather than by governments. In other words, we have colluded in a radical social redesign driven by market participants rather than by representatives of the people. This has severe and underappreciated consequences – not just for democracy, but for the idea of what it means to be a citizen on which governing systems are based.

So, anyone being concerned about the humanization and democratization of digital technologies and businesses, can no longer discuss only single aspects, such as ethical standards for Artifi- cial Intelligence, or about breaking up Big Tech monopolies. Humanization and democratization is all about that – but yet it goes beyond. Ultimately, it is about the question of how we want to live in the digital age: Self-determined? Sovereign? Or as objects of a smart dictatorship – may those be global businesses or nation states? When the digital age relativizes our fundamental and human rights, how do we want to strengthen them on the contrary, so that technological progress becomes progress for humanity?

In September 2015, on a cool, grey Sunday morning, 27 women and men, including myself, met in Berlin to make an ambitious, bold attempt. Following the invitation of the ZEIT Foundation, one of Germany's largest non-profit foundations, civil rights activists, writers, lawyers, net activists, academics, journalists, entrepreneurs and politicians, young and older participants, liberals, conservatives and the Greens, started a debate on the issue of whether some fundamental freedom rights should be reinforced in the digital age. They discussed a Magna Charta for the 21st century, a Bill of Rights for our digital age. For fourteen months, the 27 talked over how to protect the sovereignty of the individual in the digital age – with German history in mind, against total surveillance by the state, but also against infringements of powerful corporations. Finally, on 30th day of November 2016, the Group published the “Charter of Digital Fundamental Rights of the European Union” and presented the draft on the 5th day of December 2016 in a public

hearing at the European Parliament in Brussels.

Three ideas, which are deeply rooted in European tradition, in the history of Enlightenment and Democracy, make the central claims of the Charter.

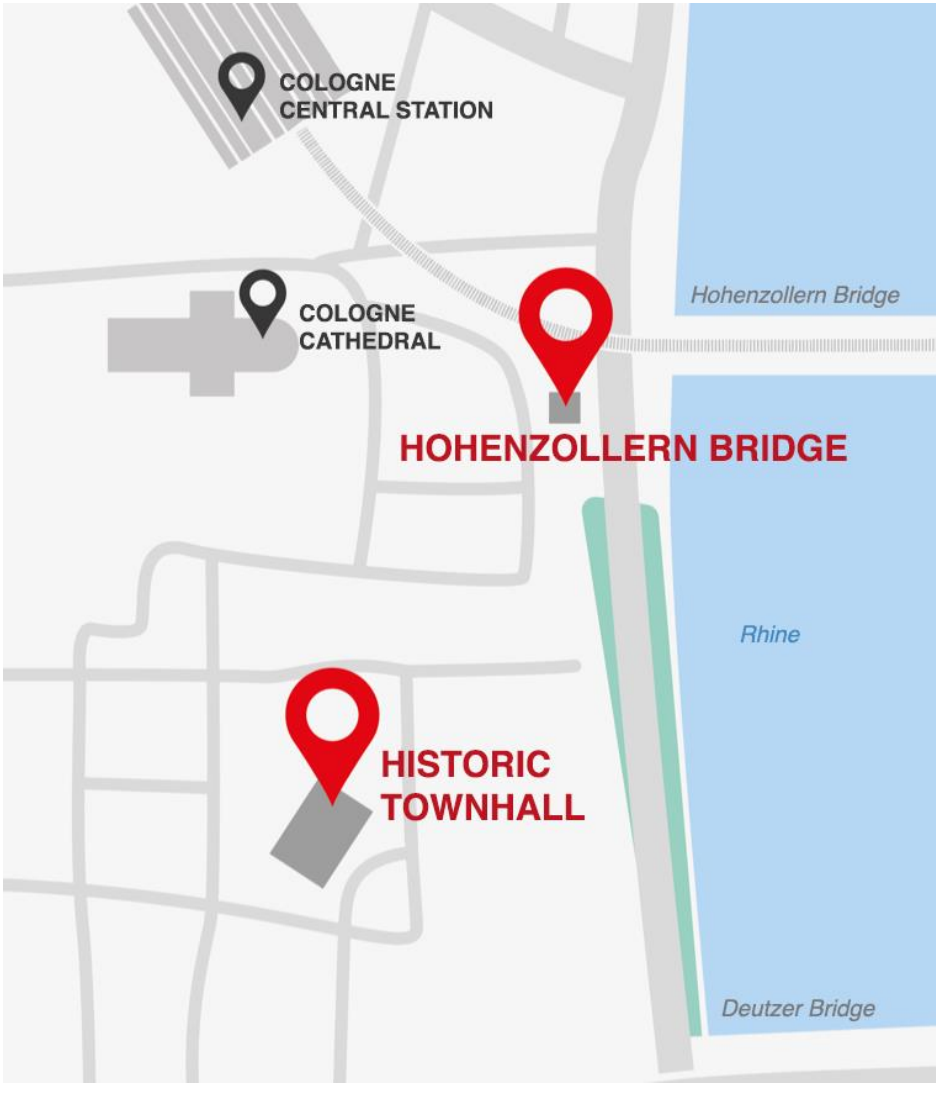
The first and foremost claim is that also in the digital age dignity of man is inviolable. No human being must be made a digital object – neither by the state nor by private persons. Article 1 of the Charter, based on the German constitution of 1949, states: "Human dignity is inviolable, also in the digital age. It has to be respected and protected. No technical development may affect it." Protecting the dignity of man means: A human being must not be reduced to a bunch of data. It must not be considered as biologistic algorithm. It must not be commanded by a computer or by digital entrepreneurs. Man must not be remotely controlled, and: Without any exception, human beings shall be held responsible for the actions of machines – "meaningful human control".

The second idea of the Charter is that the rules of the digital society should not be written in the research laboratories of the universities or the R&D departments of the digital corporations or in Working Groups for Digital Ethics, but in public, in our parliaments. Not: code is law. But: law rules code. The rule of law is key.

And, third, the Charter should not only be binding to the state, but also to large companies. "Our fundamental freedom rights must be enforced equally against both governments and private corporations, because in the digital age, Big Tech has a state-like impact on our lives and, above all, on the exercise of our freedom."

The Charter is supported, among others, by the former President of the European Parliament, Martin Schulz, the German philosopher Jürgen Habermas, the computer scientist Jaron Lanier, Stanford Professor Fred Turner and the head of the Munich Security Conference, Wolfgang Ischinger. **No country alone**, not even a union of states like the EU, can create rules for the global regulation of the digital age. But the EU, with its 500 million citizens, is an important market – and a role model for the world. Even the EU's GDPR has created binding standards that are being observed outside Europe. This encourages Europe to follow a third way between USA and China and to keep up democracy, rule of law and fundamental rights in a world that has become a challenge and a threat to what is the vital heart of our European idea and peace project.

MAP
OF COLOGNE

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