Article

It's the Camera! A Special One:

The Smartboxing of Image Processing Algorithms and their Uncertainties in Media Representations of Surveillance Technology

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Abstract

This paper presents an analysis of media articles and publicly available documents on one of Austria's first nationwide surveillance systems in operation that makes use of image processing, pattern recognition technology: the "Automatic Toll Sticker Checks" on Austrian motorways. A recurring narrative makes the camera, not the silent image processing algorithms (IPAs), the centre of attention. IPAs and their inevitable uncertainties are completely disregarded and "smartboxed" in favour of the special camera that appears as magic technology. As such, the ready-made smart box is not contested at all. Instead, its economic success and standing as a moral agent is emphasised.

Introduction

Background

In the last two decades we have witnessed the emergence of a "grand narrative" (Law 2008: 629) describing a surveillance society, maybe best demonstrated by the rise of the academic field of surveillance studies (Ball, Haggerty, and Lyon 2012). Surveillance is a multidimensional phenomenon situated between the poles of care and control (Lyon 2001) with far-reaching causes and effects. A publicly, well-known, highly visible and much discussed form of surveillance technology is video surveillance or closed-circuit television (CCTV). CCTV systems are used around the world with the aim of securing critical environments such as airports, train stations, commercial banks and others. While such systems are simultaneously perceived as a threat to privacy and civil rights, the "true panoptic potential" of video surveillance is actually seen in its automatisisation (Norris and Armstrong 1999: 210). At least since the September 11th attacks and their global implications, public discourse on the automatisisation of video surveillance has focused on "Smart CCTV" or "Intelligent video surveillance." Academic discourse has come up with terms such as "second generation CCTV surveillance systems" which are considered to be "smart" and exploit digital technologies for artificial intelligence scene monitoring. In contrast to this, there are "first generation" systems that are "dumb" and based solely on human monitoring (Surette 2005). Other terms used synonymously are "algorithmic surveillance" (Norris and Armstrong 1999;

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Introna and Wood 2004) or “semantic video surveillance” (Musik 2011). Nevertheless, scholars have widely adopted the term “Smart CCTV” for more analytical reasons (Gates 2010; Ferenbok and Clement 2011; Möllers and Hälterlein 2012). According to Möllers and Hälterlein (2012), the term “Smart CCTV” in particular is used “owing to the lack of a better term” because “the new CCTV systems . . . come with a variety of functionalities and applications” (3).

The research presented here suggests that the widespread use of “Smart CCTV” in particular—and the “smart” or “intelligent” modifiers in general—is not due to the lack of a better term. It is rather a matter of how relevant actors, such as system operators, industrial companies, makers of science policy, politicians, journalists, computer scientists, social scientists, or “promissory organizations” (e.g., specialized public relations agencies) (Pollock and Williams 2010), depict it as a *better* term. They do this by promoting the term in media representations, strategically deploying it in descriptions of technically complex phenomena. As such, “Smart CCTV” is a fashionable buzzword that functions as a “linguistic technology” in promoting consensus (Bensaude Vincent 2014). In addition, some of the functionalities and applications surrounding automatised video surveillance are more prominent in public perception than others. Face recognition technologies (FRT) and face detection technologies (FDT) are, for example, usually talked or written about in terms of face recognition or face detection.¹ This especially has been the case since the time when FRT and FDT were popularised in the form of consumer electronics (e.g., digital cameras) or integrated into popular social networking platforms (e.g., Facebook). Many other similar pattern recognition technologies that are also based on image processing algorithms (IPAs) are not treated as such, which means that they are not distinguished in public debate from other technologies. Instead, they act as hidden parts of greater systems or entities such as “Smart CCTV,” “Smart Homes,” “Big Data,” “Ambient Intelligence,” or other very specific industrial applications. Smart systems are, however, the substance of what is perceived and discussed as the great transformation of digitalisation and automatisisation of diverse sociotechnical practices, artefacts, and devices. Furthermore, they are embedded in processes that might provide computers of the future with the, as-of-now, exclusively human ability to see and to recognise. Because all of these attempts at giving computers the ability to see are, in fact, attempts to produce, process, and comprehend images using algorithms, these attempts can be understood as sociomaterial processes in which IPAs are developed, produced, and implemented, on one hand, and promoted, negotiated, used, and modified, on the other. In short, the process involves the material and semiotic negotiation of IPAs in different social situations, contexts, and sites.

Focus and Aim

This paper focuses on the media as a key site of technology negotiation and discussion. It presents an analysis of media coverage and representation of surveillance technology. In this regard, I explore the sociocultural testing and contesting of image processing, pattern recognition technology in media representations and in other publicly available documents. The article concentrates on one of the first nationwide systems operating in Austria uses image processing, pattern recognition technology: the so-called “Automatic Toll Sticker Checks” (“Automatische Vignettenkontrolle”—AVK) on Austrian motorways, which have been in operation since December 2007 and which are complemented by the manual monitoring done by special toll enforcement officers or police officers. Since 1997, vehicles in Austria with a maximum gross weight of up to 3.5 tons are required to display a time-related toll, the so-called Motorway Vignette (toll sticker), purchased by vehicle owners as a condition of driving on Austrian motorways. Toll stickers can be purchased at different points of sale throughout the country, such as at

¹ The use of these terms varies in different languages. For example, in everyday German, the term “Gesichtserkennung” is usually used for both face recognition and face detection. This imprecision in language often leads to misunderstandings, as face detection and face recognition are two very different tasks operating on different levels. Correctly, face detection (to detect if there are human faces in an image) is translated as “Gesichtserkennung,” and face recognition (to recognise specific human faces in an image) as “Gesichtswiedererkennung,” literally, face re-detection.

petrol stations and shops at all Austrian border crossings. They are available as annual or short-term (e.g., two-month and ten-day) stickers. Drivers are charged a penalty toll if they neglect to purchase or display a valid sticker.

This paper analyses the specific socio-technical assemblage of the AVK surveillance system on Austrian motorways through the lens of Austrian media and publicly available documents. The paper explores the assemblage of relevant actors (human and non-human) involved, the mode of operation, capabilities and limitations, and the implications of this particular technological system. In so doing, I advance an empirically grounded analysis of media's role in shaping public understanding of such ready-made technologies along with their inherent uncertainties (Collins and Evans 2008; 2012). The paper shows precisely how the media makes sense of newly implemented surveillance technology.

In what follows, the paper first outlines the conceptual framework of the “media as a laboratory” (Oudshoorn 2003), a concept established in the field of science and technology studies (STS) to apprehend the role of the media in technoscientific development and implementation. Second, it presents the method and focus of the analysis. This is followed by empirical insights, explaining the temporality of media articles and other publicly available documents and their relation to each other, the labelling of the AVK system, its mode of operation, and its performance. Drawing upon these findings, the paper concludes by arguing that media representations contribute to the construction of the smart box as a moral agent.

Conceptual Framework

The Media as a Laboratory

Applying a material-semiotic approach,² the development and implementation of new technology can be understood as “a practice of configuring new alignments between the social and the material that are both localized and able to travel...” (Suchman, Trigg, and Blomberg 2002: 164). That means that technologies take their “shape and meaning not in any single location but through their incorporation across diverse milieu” (164). Thus, in recent years, the analytical focus on technology (invention) in the laboratory and on technoscientific experts (Pinch 1993) has broadened continuously in STS. In her widely known book *The Male Pill*, Oudshoorn (2003) analysed the testing of technology also in the media. In Oudshoorn's understanding, journalistic and scientific texts are equally important in this field (192). With this approach, the media in juxtaposition to the scientific laboratory is also understood to be a laboratory for testing (new) technology. In Oudshoorn's area of interest, male contraceptive technology, “journalists have played an active role in articulating and demarcating the identities of the potential users of this technology-in-the-making” (192). Thus, journalists played an important role in the assessment of this new emerging technology. When tracing the path of a scientific report, to a press release, to media reports, Oudshoorn shows how media accounts differed from original scientific ones. While the scientific report stressed the prototype character of the technology as being far from the finished product, the press bulletin reported on a major breakthrough (205). The British and Dutch media accounts analysed by Oudshoorn, presented the technology in a significantly different way to the scientific report, namely as being painful and problematic for its users. In doing so, the newspapers shaped the scientific claims, contesting them “by providing an alternative testing of the new technology” (206). The media articles did not question the technical, only the cultural feasibility of the technology (207). This was exceptional, as Oudshoorn notes, because it is more often the case that journalists shape scientific claims by uncritically replicating what scientists tell them. This often leads to a “simplified and overly optimistic picture of what has been claimed” (Fox and Swazey 1992 cit. in Oudshoorn 2003: 207).

² Suchman refers to Haraway (1991: 194f.) in order to coin the phrase “material-semiotic.” In Suchman's words, by making use of this phrase Haraway wanted “to indicate the ways in which the natural and the cultural, or the material and the meaningful, are inextricably intertwined” (2007: 261).

As Hargreaves, Lewis and Spears (2003: 52) noted, “the news media clearly play a role in informing the way people understand science” and technology. Their study of the complex relationship between the media coverage of science and the public understanding of it, showed that “most people are aware of the main themes or frameworks of media coverage of science related stories” (52). People are not only aware of, but can also be regarded as active participants in the process of interpreting science-related stories from their own points of view (Irwin and Wynne 1996: 139). What people do with media accounts of science and how they make sense of these accounts is not solely up to media articulation, but rather to their own experiences with science and the media. As a consequence, approaching science (and technology) does not only take place in the media, but also in the engagement of readers (Hilgartner 1990) and manifests in quite different ways. Media reporting and media stories are in most cases the only or the main entry point for citizens in gaining information about and engaging in science and technology (Nelkin 1995). Clearly, in these cases the media significantly shapes the meaning of science and technology and how they are understood and evaluated by the public. As such, it not only influences how people perceive and understand science and technology, but it is also a way to domesticate specific scientific and technological projects (Silverstone and Hirsch 1992). Thus, the media can be understood to be a laboratory. Here, scientific and technological developments are critically tested and contested in alternative ways. Or, conversely, they are not critically tested at all and a “ready-made,” defined status is confirmed. Thus, media articles and other public documents in their reports on technology might pave the way for acceptance or rejection of new or newly aligned technologies by a wider public.

Method and Focus of Analysis

In what follows, the specific focus and samples of the media and document analysis is presented. The focus of my research was on a detailed investigation and exploration into all publicly available documents about the AVK. But first, the wider frame of the analysis is explained and how it was part of ethnographic research on computer vision and IPAs. Here, the focus on a “Culture of Secrecy” on the part of the technology operating company significantly influenced this research.

Culture of Secrecy

Sometimes reports in the media can prove to be the only access points available not only for citizens, but also for social scientists to their areas of interest when studying specific technologies. To give an example, Monahan (2010: 103) reported on his arduous efforts to study and gain access to *Intelligent Transportation Systems* (ITS) in the USA. He reported on declined and unanswered phone calls and email by operators. In some cases, initial contact proved impossible to follow up. Monahan explained this behaviour as resulting from insufficient time, as well as from a general “firewall culture” and an avoidance of what was seen as unnecessary scrutiny. As Monahan argues, the main reason for this “Culture of Secrecy” is the fact “that ITS operators knew that their centres had the look of surveillance and that they wanted to distance themselves from that characterisation of their work” (103). In the context of video surveillance, Kammerer considered a lack of knowledge, misinformation and superficial knowledge about its realistic potential as strategically functional, producing consent and public comfort (2008: 83). In the course of these processes, he notes, the information politics of security managers are contradictory: On one hand, extensive media campaigns are aimed at gaining the consent of the public. On the other hand, they are designed as a deterrent to future criminal behaviour. Of course, the principle of “security by obscurity” should not be underestimated as details could fall into the wrong hands (Kammerer 2008: 83). Nevertheless, this constellation makes the social-scientific analysis of technological systems or similar areas highly difficult, if not to say impossible, in some cases.³

³ See, for example, Abolafia (1998), who reported about being rebuffed when trying to gain access to futures trading.

What I experienced in my research on the AVK system in Austria confirms Monahan's concept of this "Culture of Secrecy." During my ethnographic field work on IPAs in and around a computer vision laboratory it was by default, rather than by design, that I came across AVK, one of Austria's first nationwide surveillance systems in operation that makes use of image processing, pattern recognition technology. As my list of questions about AVK grew the more I heard about it, I soon realised that it would become necessary to talk to its operator, ASFINAG, in order to learn more.⁴

To make a long story short: all my attempts to obtain an interview about the AVK or applications for participant observation in the AVK enforcement centre were refused by ASFINAG. The only information they provided was a 270-word press bulletin. A final email request, in which I asked again about the possibility of an interview and to which I also attached my questions about the AVK to be replied to in writing, has remained unanswered to date. In addition, I was not able to include an interview in my analysis with a product manager of EFKON, the supplier of the second batch of AVK devices, because following the interview, the product manager politely asked me not to cite any customer-related information that had not been formerly published elsewhere. The reason was that ASFINAG had heard about the interview as I had mentioned it in an unanswered email request to ASFINAG. They wanted to make sure that no ASFINAG-related information about the AVK would leak to the outside. Obviously, ASFINAG was greatly interested in absolute secrecy regarding details of the AVK.

Media and Document Sample and Analysis

Stemming from ASFINAG's secrecy and restrictive information policy, in framing the following media and document analysis, the focus of my research was on a detailed investigation into all publicly available documents about the AVK, and, in particular, on newspaper reports.

The media articles and documents analysed were researched with the help of the online databank *WISO* search, in which 118 German language newspapers and magazines and a total of 115 million articles are listed (Dec 2012).⁵ Amongst these are the most important Austrian newspapers such as *Kronen Zeitung*, *Kleine Zeitung*, *Kurier*, *Der Standard*, *Oberösterreichische Nachrichten*, *Tiroler Tageszeitung*, *Die Presse*, *Salzburger Nachrichten* and *Wiener Zeitung*. Although the free, daily newspapers *Heute* and *Österreich* are not included in the database, the most important Austrian weekly magazines (e.g., *News*, *Profil*, *Format* or *Falter*) are. Apart from *WISO*, I also made use of *Google* and *APA-OTS*—the original text service of the *Austrian Press Agency*.⁶ This made it possible to add to my sample online articles from the Austrian Broadcasting Corporation (*ORF*), press releases and other publicly available documents, and, in particular, parliamentary question time.

The *WISO* databank, *Google*, and *APA-OTS* were used for searches using the terms "AVK," "Automatische Vignettenkontrolle" and "Automatische Vignettenkontrollen" (only in German, literal translation: Automatic Toll Sticker Checks) in December 2012. The time span within which articles and documents were found, ranged from May 2007 until October 2012. The core sample, including all publicly available documents about AVK, consisted of 13 lead stories; four shorter lead stories; 26 brief

⁴ ASFINAG plans, finances, maintains and levies tolls on the entire Austrian motorway and expressway network covering 2,175 kilometres. ASFINAG, established in 1982, is wholly owned by the Austrian Federal Government. A contract signed in 1997 between the Federal Government and ASFINAG gave the company additional powers and responsibilities. By virtue of this contract, ASFINAG holds usufruct rights related to land and facilities belonging to the primary federal road network and owned by the Federal Government and has the right to collect tolls and/or charges from those who use such land and facilities. As a user-funded company, ASFINAG has committed itself to utmost efficiency in managing its financial resources. ASFINAG does not receive any money from the federal budget (Source: <http://www.asfinag.at/about-us>).

⁵ <http://www.wiso-net.de>

⁶ <http://www.ots.at>

notes, or side notes within other stories; two press releases and two parliamentary questions and their answers in Austrian Parliament (Interpellation). The ASFINAG website, ASFINAG Business Reports and Toll Regulation documents were used as background material.⁷

Following the collection of data, it was qualitatively scrutinised using open coding (Gobo 2008: 227) in the tradition of grounded theory (Strauss and Corbin 1998) in order to examine the media articles and other publicly available documents for themed and temporal phase clusters. The open coding procedure produced ten different themed-temporal phases, starting with a pre-implementation period of the system and ending with AVK performance reports (see Table 1).

Table 1. Ten Themed-temporal phases of AVK implementation

Ten Themed-temporal phases of AVK implementation	Date or Timespan
Pre-implementation period	2006-12/2007
Initial start-up of the first AVK device	12/2007
Confusion with a design change of the toll sticker due to AVK	12/2007
Reports about AVK use in the Bundesländer	12/2007 – 01/2008
AVK reports in Germany	02/2008
First expansion: Implementation of a second AVK device	08/2008
Parliamentary questions and answers (right of interpellation) about AVK in the Austrian Parliament	First: 11/2008 - 01/2009 Second: 07/2010 - 09/2010
Performance Reports I: Economic Success, Failure and Irritations	11/2009-03/2011
A new start? Or: Second expansion?	Spring 2011
Performance reports II: Success and “Schönheitsfehler”	11/2011-03/2012

In a next step, I developed a framework for analysing the media articles using the same open coding. That means that the framework categories resulted from the open coding of the selected material. This framework consisted of seven levels, with the focus here being on the four I considered the most in terms of my research interest: the temporality of media articles and documents, the labelling of the system, its mode of operation, and its performance.⁸ In the final stage of selective coding (Strauss and Corbin 1998) my empirically grounded results were brought together to describe and to tell the larger story of the smartboxing of IPAs and their uncertainties in a “thick” way (Geertz 1973).

Empirical Results

Temporality of Media Articles and Documents

The first time that the Austrian public was confronted with AVK was about seven months before the first AVK device was introduced. The first AVK device was put into effect in Austria on December 12th, 2007. On this occasion there was wide media coverage in the Austrian news. Eight different media organisations (four main articles, two shorter main articles, and three short notes) reported on the implementation of AVK. Only one week after the initial start-up, four Austrian newspapers printed short stories about confusion concerning the design of the new annual toll sticker for 2008. This confusion was also due to

⁷ <http://www.asfinag.at>

⁸ The other three levels are: relevant social groups, problem definition and the wider frame.

the newly introduced AVK system. In December 2007 and January 2008 three regional newspapers reported on the use of AVK in their areas. In February 2009, three German newspapers mentioned the introduction of AVK in Austria.

Regional newspapers articles (01/2008) were the last of their kind reporting on AVK in my sample from the Austrian press, until November 2009. This is particularly interesting because in August 2008, a second AVK device was installed on Austrian motorways. Even more striking is the fact that in the period in which my sample of Austrian newspaper articles did not show any substantial reports on AVK,—that is over one year and ten months between January 2008 and November 2009⁹—there was a parliamentary question time (“right of interpellation”¹⁰) on AVK (11/2008) with corresponding answers (01/2009) in the Austrian National Parliament. To come straight to the crucial point: there has not been a single account in Austrian newspapers about this interpellation process or any of the comprehensive information provided about AVK in answer to these parliamentary questions. Another parliamentary question time on AVK in July 2010 and the answer to it (09/2010) also went unnoticed by the Austrian news press.

Almost two years after the initial start-up of the first AVK device on Austrian motorways (12/2007), and 15 months after the implementation of the second AVK device (08/2008), a first account of the performance of AVK was published in the nationwide newspaper *Oberösterreichische Nachrichten* on November 25th 2009. In the timespan until March 2011 several other articles reported on the performance of the first two AVK devices.

In 2011, two articles reported on the planned expansion of the existing two AVK devices to altogether five devices. One article referred to a press release provided by *EFKON*, the supplier of the new or additional AVK devices. It is interesting to note that the press release implied that the new *EFKON* devices were neither a replacement nor an expansion of the two existing ones, but were something completely new. Following this new start or second expansion of AVK in spring 2011, several articles reported on the performance of AVK between November 2011 and March 2012.

Labelling

In spite of being officially labelled **AVK** (short for German “Automatische Vignettenkontrolle”—literally translated as “Automatic Toll Sticker Checks”), media reports, press releases, and the parliamentary questions and answers use a wide array of terms and words to name it. It is referred to within different articles as an “intelligent system,” “mobile and automatic toll sticker checking system,” “surveillance system,” “mobile system,” “innovative system,” “electronic eye,” “all-automatic toll sticker checking facility,” “electronic assistant” or “toll sticker blitz.” The first of two parliamentary questions raised by Member of Parliament (MP) Harald Vilimsky and other colleagues from the *Austrian Freedom Party FPÖ* and directed at the Federal Minister for Transport, Innovation and Technology, Werner Faymann (*Social Democratic Party of Austria SPÖ*) on November 27th 2008, used the label “fully automated toll sticker checks” (“vollautomatische Vignettenkontrolle”).

Most frequently, labelling terms are used that make use of the word “camera,” such as “automatic camera,” “modern camera,” “high-tech camera,” “high resolution camera,” “surveillance cameras,”

⁹ There was one mention within this period in 05/2009, but AVK was only mentioned as a very brief side note in a short *Tiroler Tageszeitung* article.

¹⁰ “Under Art. 52 B-VG [n.b. B-VG is the Federal Constitutional Law] the National and Federal Councils may examine the activities of the Federal Government and interrogate its members on all matters of execution (right of interpellation) and demand all requisite information. This also applies to all enterprises in which the Federal Government holds a majority interest. In principle, the persons interrogated are under the obligation to answer truthfully. If the desired information cannot be given the reasons must be stated.” Source: <http://www.parlament.gv.at/ENGL/PERK/KONTR/POL/1INTERPELLATIONSRECHT/index.shtml> [21/04/2016]

“camera system” or just “special camera.” When describing how AVK works, most of the articles referred to a camera that recognised or read the toll sticker. Therefore, the camera was positioned as the main actor in the AVK system (and not an assemblage including a camera, computer hardware, and image processing algorithms) that is able to recognise and to read what is on the toll sticker. For example, the head executive of ASFINAG, Klaus Schierhackl, was cited in an ORF Vienna online article (December 12th 2007) explaining the mode of operation as follows: “The modern cameras detect when a car is without a toll sticker or if the validity of the affixed toll sticker has expired. These cases are passed on, double-checked and the culprits fined.”¹¹ In this article, it was further stated that the cameras take pictures of all cars. These pictures capture the windscreen and number plate.

Only indirectly, when the Senior Vice President of *EFKON* thanked his development team at the end of a 2011 press release for having “done an outstanding job” and having “successfully incorporated [...] many years of experience with various toll systems, camera technologies and image processing,”¹² does the reader get to know a little more about the technology behind or in the camera: that is, image processing. It is the only moment in which the term “image processing” came into play in any of the publicly available accounts on AVK in my sample, but there was no notion of this in the press.

Mode of Operation

The AVK mode of operation was described on three different occasions: (1) in several media reports in the pre-implementation and initial start-up period in 2007, (2) in the answers to the first of two parliamentary questions in January 2009, and (3) in the *EFKON* press release in June 2011. Media reports in the first phase showed different understandings of the mode of operation. On one hand there were reports describing it as an “all-automatic,” autonomous system, positioning the camera as the only key actor. On the other hand, in at least three reports there were more detailed descriptions of a division of responsibility between the two cameras integrated in an AVK device and of human operators double-checking the data produced and analysed by the camera (in particular two images: one overview image including the car number plate and one of the windscreen) during post-processing (see the ORF Vienna online article example above). In two articles the mode of operation of AVK was said to be similar to that of speed cameras (“Radarkasten”), the main difference being that the AVK device was installed on overhead gantries (“Überkopfbügel”) above the motorway. Nevertheless, in these more detailed descriptions, no precise observations about the mode of operation could be found, which kind of technology (e.g., image processing, pattern recognition, etc.) was used, or where the technology came from (e.g., which distributor), not to mention capacities and limitations, (e.g., possible error rates or restrictions). All in all, AVK was portrayed as a ready-made and unproblematic system that was able to increase toll sticker checks, boost toll sticker compliance and generate additional revenue.¹³

Many more details on the AVK mode of operation were provided by Doris Bures (*SPÖ*), the then new Minister for Transport, Innovation and Technology, in answering the parliamentary questions raised by *FPÖ* MPs in November 2008. Besides also mentioning the division of responsibility between the surveillance system and human operators double-checking the data, some of AVK’s capacities and limitations were described. For example, it was explained that AVK is able to record images on one traffic lane in good visibility conditions (e.g., in daylight). During summertime that is 16 hours; during

¹¹ (German original/translation by author): “Die modernen Kameras erkennen, wenn ein Auto keine Vignette hat bzw. die geklebte Vignette nicht mehr gültig ist. Diese Fälle werden dann weitergeleitet, gegengeprüft und zu einer entsprechenden Anzeige gebracht.”

¹² (German original/translation by author): “Unser Entwicklungsteam hat hier hervorragende Leistungen erbracht und unsere langjährigen Erfahrungen mit unterschiedlichen Mautsystemen, Kameratechnik und Bildverarbeitung einbringen können.”

¹³ By toll sticker morals (“Vignettenmoral”) ASFINAG and other actors refer to both the general willingness and percentage of car drivers to purchase a valid toll sticker.

wintertime it is 8 hours a day. All vehicles on the respective lane were captured. Further, error rates were requested at parliamentary question time. While the answer (“Altogether there were 159 cases, in which the absence of a valid toll sticker was not clear. In such cases the decision was in favour of the client.”¹⁴) referred to a concrete number of false positive cases detected in a specific period of time (but not to a specified false positive rate as it is common to refer to in technical reports), there were no numbers provided about false negative cases and additionally there was no reason given why this information was not shared.

Regarding the mode of operation, the description in the *EFKON* press release (06/2011) did not differ significantly from the media article descriptions of the “old” AVK devices in 2007. The press release explained that “the system recognises the toll sticker and automatically checks its validity.”¹⁵ Interestingly, a mention of the human operator double-checking the results was completely missing in the press release. This was underlined when the capability of the system to independently (“selbständig”) determine and monitor the existence and validity of the toll sticker was described. Similar to the press accounts in 2007, it was the camera—in this case a special high-resolution, light-sensitive camera—that was positioned as the central actor in the AVK system and was presented as being able to recognise and to read whether a toll sticker existed or not and whether it was valid.

Performance

Despite the fact that the answers to the first parliamentary questions in January 2009 as well as the answers to the second parliamentary questions in September 2010 both offered details (e.g., detection numbers, false positive cases, objections against detected offences, multiple penalisation) about the technical performance of the first two AVK devices, most media accounts reported on its economic success when referring to the performance of AVK. This occurred within two periods of time already mentioned in the temporality section.

In the first period of performance reports, three nationwide newspapers agreed that AVK had been a success. An article in the *Oberösterreichische Nachrichten* (11/2009) noted that as a consequence of AVK implementation, 12,200 more toll sticker offenders were caught in the first two quarters of 2009 than had been in the same period in 2008. A *Kurier* article (01/2010) agreed that AVK had been a success, stating that the number of toll sticker offenders was diminishing. An ASFINAG spokeswoman cited in the article argued that the reason for this trend was seen as an increase in car drivers’ awareness, due to permanent checking. It was further argued that AVK also contributed to this trend. A *Wiener Zeitung* article (07/2010) continued the individual accounts of AVK success when writing, “A new Record in the Hunt for Toll Sticker Offenders”¹⁶ as its headline. By providing monthly detection rates and by calculating the annual revenue of the system, the AVK was therefore presented as “kind of a magic weapon”¹⁷ in the war on toll sticker offenders. This article, however, also explained that the development of the system had taken a long time and had even been in danger of failing due to technical problems. It also reported that the system had been continuously refined, which ultimately led to a higher success rate. In October 2010, an article in the newspaper *Kurier* announced in a short note that ASFINAG was currently testing a new toll sticker surveillance device because the existing device that had been in operation for years “had never

¹⁴ (German original/translation by author): “Es gab insgesamt 159 Fälle, in denen das Fehlen einer gültigen Vignette nicht ganz eindeutig nachgewiesen werden konnte. In diesen Fällen wurde zugunsten des Kunden entschieden.”

¹⁵ (German original/translation by author): “Das System erkennt die Vignette und prüft automatisiert deren Gültigkeit.”

¹⁶ (German original/translation by author): “Neuer Rekord bei Jagd auf Vignetten-Sünder.”

¹⁷ (German original/translation by author): “eine Art Wunderwaffe.”

really functioned perfectly.”¹⁸ As such, the note in the article contradicted the view of AVK success as reported in the previous articles and instead presented the existing two devices as failures.

Following the new start or second expansion of AVK in spring 2011, there were two articles in particular that reported on AVK performance in terms of economic success and minor flaws. The first article in the *Oberösterreichische Nachrichten* (11/2011) reported on the performance of AVK in exactly the same way as it had done two years previously (09/2009) when the same newspaper (and same journalist) had reported that as a consequence of AVK implementation, more toll sticker offenders had been caught by September 2010 in comparison to the same period of time in 2009. This was explained in the article, referencing an ASFINAG press spokeswoman who stated that prior to this there had only been two AVK devices in operation. By the end of March 2011 there were five working devices. As the article published in November 2011 seemed to be a copy of the one published in November 2009, just with different numbers, it was interesting to note that a similar one had been missing in November 2010. The reason might be that as numbers published in other media reports imply, there had been no increase in the number of detected toll sticker offenders, and therefore there had been no success worthy of reporting in 2010.

The success story of AVK in Austrian newspapers did, however, continue. A main article in the *Wiener Zeitung* (03/2012) reported on a “new record in toll sticker offenders.”¹⁹ In reference to ASFINAG annual statistics—not publicly available, but passed on exclusively to the journalist—a leap of toll sticker offenders was revealed. The increase in AVK devices was named as having substantially contributed to the increase in their detection. The article went on to again make use of the term “magic weapon” (“Wunderwaffe”) in the fight against toll dodgers. The first part of the article presented AVK as a success story, the second contextualised the success with a mention of so-called “Schönheitsfehler”—minor flaws. In spite of the leap in the numbers of detected toll sticker offenders (+26.9%), the overall ASFINAG revenue from fines remained at nearly the same level as in the year before (+1.19%). For ASFINAG, the article states, the reason for this discrepancy was difficult to explain, because the overall revenue from fines consisted of fines from both cars and lorries. The journalist considered the reason for this discrepancy to be the absence of private law agreements with other nations making fines resulting from AVK detection not enforceable outside Austria.

Conclusions

The Smartboxing of Image Processing Algorithms and their Uncertainties

The first central insight after analysing media articles on AVK is that the camera is positioned as the central and most powerful actor. It is the camera that detects and recognises the presence and validity of toll stickers, whereas IPAs are fully neglected in favour of the “automatic” and “innovative” camera. It was remarkable that the media did not report on what is actually inside this special camera, deeming it self-evident. This means that it was no matter of concern what actually makes the camera so special and how the material object of the camera is part of a greater sociomaterial assemblage. It was therefore being presented as a black-boxed “camera” and, over and above that, a smart-boxed “special camera” actor in the system. It was presented as a matter of no concern that IPAs in particular make the camera a “smart camera.” By not mentioning them at all, IPAs were smartboxed. That is, they were made part of the opaque inside, and thus, were completely invisible to the smart outside.

As much as IPAs were relegated to the opaque inside, their uncertainties, ambiguities and restrictions were also left completely invisible in media reports. Some of these uncertainties were mentioned during parliamentary questions and answers. As an example, it was stated in 2009 that the system could only work properly in good visibility conditions, for instance daylight. False positive cases were also presented.

¹⁸ (German original/translation by author): “nie wirklich perfekt funktioniert.”

¹⁹ (German original/translation by author): “Neuer Rekord an Vignetten-Sündern.”

Instead of making capacities, limits, and uncertainties of IPAs a matter of communication, most of the media articles presented AVK as a stable, fully developed, ready-made, and almost autonomous camera by referring to it as an “intelligent system,” “electronic eye,” or “modern camera” that is unproblematically able to automatically detect and recognise the presence and validity of toll stickers. That AVK and its main actor, the special camera, are able to do so was shown by presenting as evidence their economic success. A recurring theme in the media articles was that detection numbers and sales figures that had been exclusively provided to a journalist were presented to the public. In this regard, it is interesting to note that most articles were published in the business section of the newspapers.²⁰ There was not one single article published in the science & technology section of a newspaper, implying that AVK is not about science and technology, but instead is, very notably, a business issue.

On a more general level, smartboxing as both a continuation and co-process of blackboxing (Latour 1999: 304), which is an influential concept in STS, can be considered to be the way sociomaterial assemblages and the scientific, technical, and operational practices that go along with them are simultaneously made invisible as well as being labelled and treated as ready-made smart or intelligent materialized entities. In this process of smartboxing, the focus is exclusively on the outside (especially on a successful output which is duly accentuated) while never referring to what makes a specific entity smart or special and in which way.

In the AVK case, the focus on the smartboxed camera refers to a well-known technological artefact, the camera, which makes it easier for people to understand what it is all about. What is communicated is that the innovation is not something radically new and, therefore, might not be something problematic, but just a continuation of other similar technologies, such as speed cameras. It presents AVK as a speed camera not for checking speed, but for checking the right to be permitted to drive on a motorway by ownership of a valid toll sticker. This method of framing AVK conceptualises something as new and unknown as AVK as being something very familiar. At the same time this well-known something comes with a look of innovation about it, by labelling it using terms such as “automatic,” “special” or “high-tech” that describe the camera as being “smart.”

The Non(Con)Testing of the Smart Box AVK as a Moral Agent

Expanding on the first central insight, the second insight is that AVK was neither tested nor contested in the media articles at all. It was framed as a ready-made, familiar, and hence, unproblematic camera technology that makes sense, especially in economic terms, by facilitating the collection of more toll fines. Moreover, it was framed as a moral agent that led to more justice and lawfulness on Austrian motorways. People were taught the positive economic and fairness effects (“boosting the toll sticker morals of car drivers”) of AVK in order to accept it as a useful and plausible technology that comes with an innovative smart touch. ASFINAG, the operator of AVK furthered this narrative in particular. ASFINAG was in a position to decide which information on AVK was communicated or conveniently left out. Thus, they can be regarded as an “Obligatory Point of Passage” (Callon 1986) through which information and communication must always pass. ASFINAG provided the media and the author of this paper with exclusive and filtered information about the economic success and the moral aspirations of AVK, while not providing information about the uncertainties, potential errors, and the organisation that comes with it. While, on one hand, public attention was selectively focused on the former. On the other hand, public attention was actively diverted from learning about the latter. Following Rappert (2015), it can be noted that certain presences and absences of knowledge and information were produced in the course of AVK implementation. The information about uncertainties was partially present in the publicly documented two parliamentary question and answer sessions. However, astonishingly, no single media article reported on the interpellation process or on the information provided in the answers.

²⁰ Apart from the business section, AVK articles were also found in the transport & automobile sections, in the local or domestic sections, and in the news sections of newspapers.

Instead, the media—with the exception of one article questioning the proper functioning of the first AVK devices but not taking this any further—just uncritically replicated what ASFINAG had claimed and did not show any interest in other aspects that were not mentioned or provided by the operator. Thus, the media articles gave the impression that AVK was infallible and the ultimate means of combating toll sticker offenders. This was maybe best expressed by one headline that associated AVK with toll sticker offenders now having a “zero chance” of success. This implied that AVK was a perfect moral agent ensuring that nobody would ever drive without a toll sticker on Austrian motorways again. The simultaneity of the omnipresence of economic success and the absence of information about uncertainties put AVK in a position in which its viability was neither tested nor contested by the media, and, as a consequence, by the wider public. Its viability was just taken for granted. The impenetrable and powerful smartboxing of AVK in media descriptions aligns it with Latour’s (2000) “Berlin Key” or with the “Sleeping Policeman” (Latour 1999: 186). The same way that speed bumps, known as a sleeping policeman in British English, force people to reduce their driving speed in order to avert damaging their own car, so too does AVK force people to put a valid toll sticker on their windcreens while driving on Austrian motorways, because the all-seeing and infallible AVK camera could be anywhere, anytime. This panoptic message was then delivered to car drivers mainly via the smartboxed newspaper articles and not merely because of its material presence on Austrian motorways. On one hand, the way in which AVK was presented by the media, with the special camera as its central actor, made it appear like “magic technology” because the inner (and outer) workings were never made clear. On the other hand, the mere presence of one of the most powerful symbols of objectivity—the camera (Daston and Gallison 2007)—might be sufficient explanation for the viability and *raison d'être* of this “magic technology.”

Smartboxing, Public Understanding of Technology, and Public Engagement

A closer look into the magic smart box and the sociomaterial assemblage of which it is part could definitely endanger the magic and power of this moral agent, at least seen from the point of view of the operator. From a democratic point of view, a closer look into the magic smart box and its place within a larger sociomaterial assemblage would put those affected into a more powerful position from which to participate in discussing, assessing, contesting, and shaping not only the specific surveillance technology of AVK but also (future) “intelligent” or “smart” technologies, such as autonomous machines, self-driving cars, smart homes, and sociotechnical development in general. Knowing what kind of technology is used, in what ways, how and by whom it was created, and how it works (including capacities and limits) could be the basis for critical questioning, participation, and dialogue in (highly technological) democratic societies. This does not entail demonising or rejecting “smart” technologies like AVK as these might have several benefits (e.g., road safety). Instead, critical questioning is a chance, and a necessity, for shaping technology sustainably in a “socially robust” way (Nowotny, Gibbons, and Scott 2001). However, this fundamentally requires a culture that accepts viewing technology as a social process that never is free from uncertainties and limitations. This is the opposite of the media representations of AVK researched in this paper. In this regard, the representations of smartboxed technology in print media are close to what has been called “CSI-science” (Cole 2015: 140). In CSI, the popular American crime drama television series, forensic technologies are portrayed as revealing absolute truth and certainty, delivering evidence that speaks for itself (Kruse 2010: 80f.). This representation obscures the actual need for forensic technologies, such as DNA matches, to be interpreted and intervened on by humans—as is the case for a wide array of other similar pattern recognition applications including AVK. Pattern recognition applications are embedded in a complex chain of inference (Collins and Evans 2012: 906). In real-life DNA matching practice, absolute certainty is unattainable and probabilities must always be specified by scientists. This means that both the “smart box” and the “CSI-science” views support an *asocial* representation of science and technology to the public (Collins and Evans 2012: 906).

As a consequence, communicating and representing technology in this way might lead to public indifference, as it is experienced as an unapproachable activity that is elitist and sophisticated. It also

might cause overestimation and unrealistic expectations, especially with non-experts, of what technology is able to do. In the context of *Hawk-Eye* and similar visual decision aid technologies that are increasingly part of popular televised sports coverage, such as tennis, Collins and Evans called for making “their capacities and technological limits more clearly visible” in order to “promote a more nuanced and widespread understanding of the statistics of uncertainty” to the wider public (2008: 284). This call could be smoothly applied to the AVK case by addressing the media in particular but also the operator ASFINAG, state agencies, and social scientists, as this science-related topic has bearing on a large group of potentially affected motorists. Further, the results of a recent study on communicating scientific uncertainty in the field of nanotechnology suggests “that science communicators should not be afraid of engaging with the scientific uncertainty associated with modern technologies” as people’s interest in science and new technologies was affected slightly positive when scientific uncertainty was communicated to them (Retzbach and Maier 2015: 449). Consequently, public engagement on this subject matter aims to promote a specific form of science and technology communication and education: in particular, “the opportunity to experience science as a social practice rather than a set of facts to be learnt” (Collins and Evans 2012: 905). Further, the understanding of technology as a social practice might reduce the perception of it as a highly sophisticated, isolated activity performed by a handful of people in powerful positions, or by smart, expert machines. Thus, it might encourage more participation in science and technology, making these disciplines more open and democratic.

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