Can Humans Being Clerks make Clerks be Human? – Exploring the Fundamental Difference between UbiqComp and WearComp

Können Menschen, die sich wie Angestellte benehmen, Angestellte zu menschlichem Verhalten bewegen? Zum fundamentalen Unterschied zwischen UbiComp und WearComp

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In this paper it is argued that pervasive ubiquitous computing and surveillance tends to give rise to a dehumanizing society of automatons, whereas wearable devices owned, operated, and controlled by individuals have the potential to counteract this trend.
Within the context of reversing the dehumanizing aspects of ubicomp, through the use of wearable technology, two fundamental axes are defined and described:

- Incidentalism (Nonselectivity), which is the degree to which the wearer's action appears to not be intentionally directed at a specific individual; and
- Freewill (Existentiality), which is the degree to which an action appears to originate from the wearer's own mind, without outside influence or duty.

The primary action explored is that of picture taking in establishments where taking pictures is prohibited. The hypothesis is that an otherwise unacceptable picture taking activity is acceptable in direct proportion to the Incidentalist axis and in inverse proportion to Freewill axis. An extensive lifelong series of experiments conducted in several different countries around the world, in which the author was wearing photographic computers for more than twenty years, is reported.

Der Artikel diskutiert Aspekte des Wearable Computing, also von Rechnern, die am oder sogar im Körper getragen werden. „WearComp" wird kontrastiert mit dem Ubiquitous Computing, bei dem Rechner allgegenwärtig in der Umgebung verborgen sind. Es wird argumentiert, dass Ubiquitous Computing eine Tendenz zu einer institutionalisierten Überwachung in sich trägt, während tragbare Geräte, im Besitz und unter Kontrolle des Individuums, dem entgegen wirken.
In einem technischen Teil wird zunächst die verwendete Apparatur beschrieben, der so genannte Reality Mediator. Der Beitrag geht dann auf die Erfahrungen des Autors beim Tragen des Computers in unterschiedlichen Situationen ein.
Es werden 2 fundamentale Achsen definiert: (1) Nichtselektivität: Dies ist der Grad, zu dem die Handlungen des Benutzers so erscheinen als wären sie nicht auf ein bestimmtes Individuum gerichtet; und (2) Freier Wille: Dies ist der Grad, zu dem eine Handlung der eigenen Intention des Benutzers entspricht.
Es werden Experimente beschrieben, bei denen mit Hilfe eines tragbaren Computers Videoaufnahmen gemacht werden in Umgebungen, in denen dies verboten ist. Die Hypothese ist, dass das normalerweise nicht erlaubte Aufnehmen von Bildern akzeptabler wird, je weniger selektiv dies erfolgt (Nichtselektivitätsachse). Dieses Verhalten wird aber um so weniger akzeptiert, je mehr es eine eigene Entscheidung des Individuums und nicht die einer übergeordneten Behörde oder Institution zu sein scheint. Es wird über eine Serie von Experimenten in unterschiedlichen Ländern berichtet, bei denen der Autor seit mehr als 20 Jahren bildaufnehmende Computer getragen hat.

1 The fundamental difference between WearComp and UbiComp

Recently it has become fashionable to suggest that ubiquitous computing and environmental intelligence can eliminate the need for carrying a portable computer. The reasoning is generally as follows:

If we had projectors and computer screens and sensors (cameras, microphones, etc.) everywhere in the environment, you would not need to carry a computer with you because whenever you needed to do something with a computer, you could just summon the environment to help you.

However, the fundamental issue that separates the underlying philosophy of the author's wearable computing (WearComp) from that of ubiquitous computing (UbiComp) is not really just the fact that WearComp is wearable (the Wearability/Portability axis), but, rather the fundamental difference in the two philosophies is best captured by the Freewill axis [1]. See Fig 1.

It is evident from Fig. 1 that there are a large number of devices along or near the X = Y (Wearability = Existentiality) axis. Examples of outliers away from this axis are shown, but these tend to be less common in our everyday life. Therefore, we tend to think of portable (hand-held) and wearable devices as being liberating, or freedom inducing, whereas environmental technology (such as surveillance cameras) are often installed without knowledge or consent, so we tend to think of them as having less Freewill. Of course we need to understand this relation more fully.

We do not need to dream about the future of someday when computers will be everywhere in the environment, because we already have a parallel ecology we can study as an analogy. We can, for example, right now in today's world ask the same kind of question about cameras: **Why bother carrying a camera since there are so many cameras already in our environment?** For example, when vacationing at Disney, why bother to bring a camera because they already have cameras nearly everywhere there to watch you and "make your life better".

Indeed, we could, as a society, take all the money we spend on our own cameras, and spend this money instead on public cameras owned by the government. If we did this, we could have our dream of cameras and microphones and computers everywhere come true, and we would never need to carry or wear our own, because there would be so many of them in the environment. However, it is the author's opinion that this would not turn out to be the utopian world we would want to live in. Indeed, it has been the author's experience that the more cameras that are installed in the environment, the less likely we are to be permitted to have our own. Corrupt establishments like certain gambling casinos, department stores, and government buildings with surveillance cameras often, through fear of accountability, try to prevent persons from using their own cameras to take their own pictures.

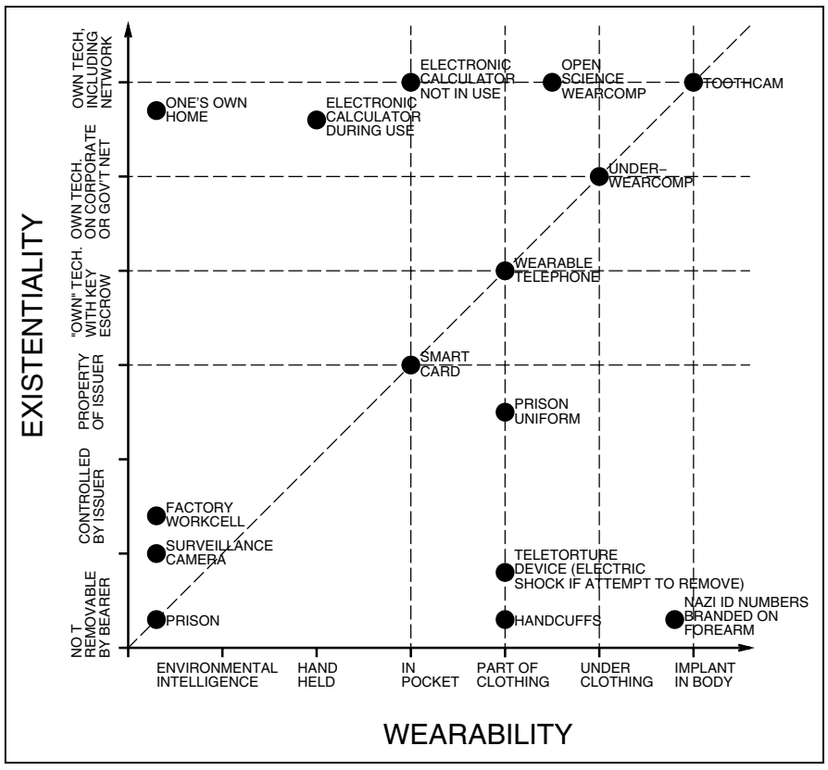

Figure 1: Here are shown some examples of devices that have differing degrees of two parameters: (1) Wearability (Portability) which is the ease with which the devices are attached to or carried by the body, starting with a continuum from environmental intelligence (cameras and microphones and computers installed in the architecture), and then ranging to hand held devices, to wearable computers, and finally to going right inside the body (implantables); (2) Existentiality (Freewill) which is the degree of self determination and mastery over one's own destiny that the devices provide.

The fundamental difference between UbiComp and WearComp, therefore, is in the Freewill (Existentiality) axis, and not so much in the portability (Wearability) axis. By bringing our own camera, we have much greater control of the picture taking process. For example, we can take a picture and own the copyright, whereas if we rely on pictures taken by others, they own the copyright in our image, even though it might be a picture of us. The real issue here is control of information, not the degree to which the apparatus is portable or wearable. However, there is an important relationship between the two axes, because if we wear (or carry) the camera, it is more likely that we control the data from it. If we rely on an organization's cameras, however, we tend to have less control over the data.

Thus the fundamental issue explored in this paper is the Existentiality (Freewill) axis, and its relation to the Wearability (Portability) axis.

2 The Reality Mediator (RM)

Over the past two decades, the author has invented, designed, and built more than a hundred different kinds of wearable computer systems, for the purposes of altering his visual perception of reality, both as a form of visual art and personal exploration, as well as for producing cybernetic photographs (e.g. as appeared in the author's solo exhibit at Night Gallery, 185 Richmond Street, in Toronto, during the summer of 1985).

What was learned from the wide range of experiences attained in inventing, designing, building, and actually wearing these machines, in a wide variety of ordinary day-to-day settings (e.g. not just in a lab), was that there are two fundamental classes of problems, quite apart from the technical feat of getting the machines to actually work. These classes of problems are (1) the effect, often undesirable, the apparatus has on the wearer in long term use, as well as (2) the effects the apparatus has on other people. The first (1) will be called "first-person detriment", whereas the second (2) will be called "second-person detriment", each including:

- first person detriment: the uncomfortable cumbersome burden the wearer must carry, e.g. the weight of the apparatus and the fact that it restricts mobility, and, more importantly, what has come to light only from actually wearing the apparatus for many years, the inducing of visual confusion disorder, flashbacks, etc., when the apparatus does not satisfy the EyeTap criteria; and
- second person detriment: the strange appearance of the apparatus, more pronounced twenty years ago than now, as in Fig. 2, and, more importantly, what has come to light only from actually wearing the apparatus in a wide variety of real life situations for many years, the strong visceral reaction others have against what are known as the personal empowerment (Mann 1998) issues.

The most fundamental second-person issue really centers on the authority of space, and on the ability of an individual to claim or reclaim ownership of that personal space. Furthermore, the most notable di-

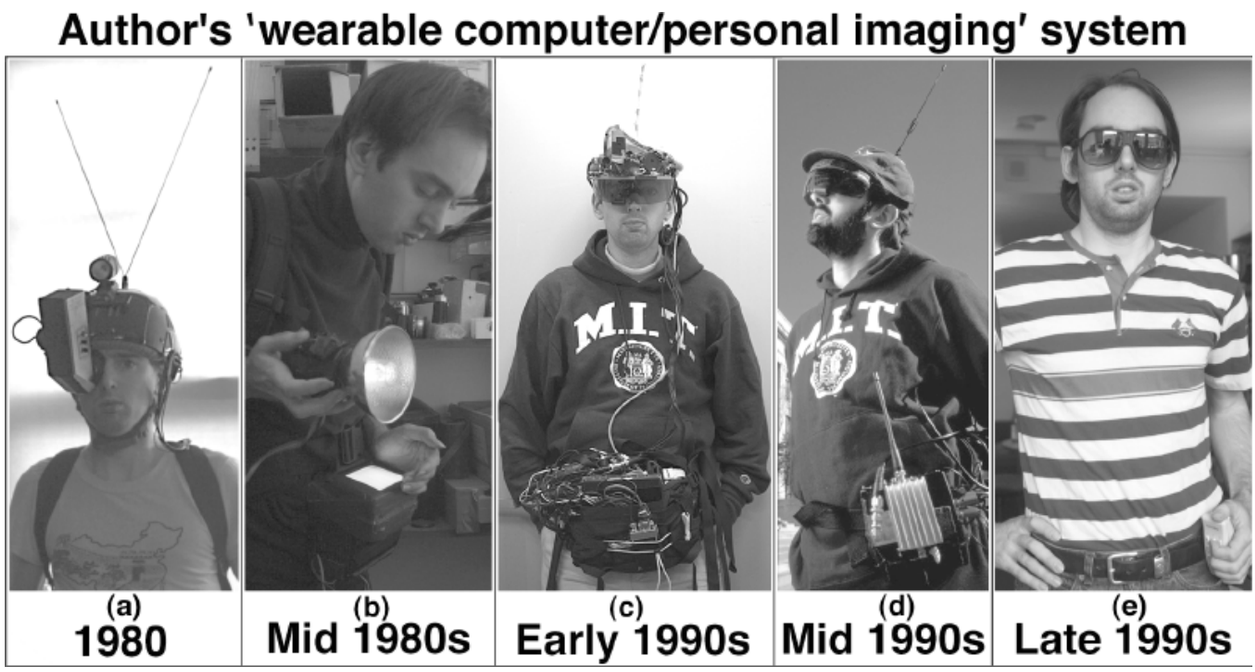

Figure 2: Evolution of the author's WearComp invention.

mension of this second-person issue is the photographic or visual dimension. Although many aspects of assertion of personal space are involved, in the author's opinion, the most powerful assertion of personal space is that of visual image capture. In particular, just as space-protection is often facilitated through video surveillance, in establishments, a personal image capture is a very strong assertion of personal space (e.g. any kind of apparatus that assists with visual memory). While it has been argued that audio capture may be a greater violation of privacy than video capture, the author's own experience is that there is a much stronger and more visceral reaction to the visual aspects. These social interactions have been explored in the author's documentary "shootingback" [2], and, indeed, even the metaphor, to "shoot a movie", or to "go out on a shoot", suggests something stronger than one can obtain with audio or other nonvisual informatic capture means.

Accordingly, the author identifies the two fundamental axes of the Reality Mediator (RM) in day-to-day life:

first person axes:

- immediacy: swiftness of response, minimization of time lag in processing visual material and redisplaying the processed version of visual reality;
- collinearity: geometric correctness, e.g. each ray of incoming light from subject matter in view of a wearer of the apparatus, can, in at least one mode of operation of the apparatus, give rise to a collinear ray of synthetic light (e.g. laser-generated light);
- comparametric isometry: the apparatus has at least one mode of operation in which each outgoing ray of synthetic light has the same attributes as a corresponding ray of incoming light from the subject matter in view of a wearer of the apparatus.

second person axes:

- covertness (nonovertness): The apparatus cannot be detected by anyone other than the wearer. The improvement along this axis over the past twenty years has meant that first-time encounters with department store clerks, airline baggage claims agents, bankers, gas station attendants, and the like have gone much more smoothly than before. Although persons knowing the author well, have learned of the author's lifestyle, there has been an appropriate chance for these persons to come to learn about, know, and accept this lifestyle.
- generality (nonselectivity): The device is always operational and continually captures images, such that there is not a feeling, among subjects, that they are being singled out.
- absolvability (nonautonomy, or non free-agency): There exists an articulable basis upon which to discount the frailties of personal choice of lifestyle and the possibly offending action embodied therein.

These more fundamental philosophical aspects are the far more important ones, especially in view of the fact that the author has already invented, designed, and built systems that are completely covert and relatively comfortable to wear, and that these systems are clearly easy to manufacture. Therefore, the cumbersome and burdensome aspects of the apparatus, as well as the social stigma associated with looking strange, are moot points, once we can mass produce comfortable and covert embodiments.

It is the author's view that a Reality Mediator is of most benefit when it is worn over a long period of time, so that, as a computational framework, it leads to a constancy of user-interface. In order for there to be widespread acceptance of this apparatus, it may well need to have the appearance of ordinary eyewear (e.g. be covert).

2.1 More than just an information display

It is important to emphasize that the RM is more than just an information display, like the many eyeglass-like or goggle-like headworn displays that are commercially available. It is far more than just a TV set or word processor built into eyeglasses, although it certainly can be used to watch television and send email messages while walking around in ordinary day-to-day life.

2.2 Headworn camera with TV versus a true Eye Tap Reality Mediator

A traditional camcorder with viewfinder, held up to the eye, provides a form of personal imaging experience, whether intended or not. Visual perception of reality is altered (mediated) by the device. This alteration of reality arises from optical distortion in the viewfinder, some amount of offset between the camera's center of projection and the actual center of projection of the eye (to the extent that one cannot readily remove one's eye and locate the camera in the eye socket, exactly where the eye's normal center of projection resides), as well as other attributes of the system. Cameras with electronic viewfinders alter our perception of reality when we look through them, such as by removing or altering color, or inserting overlays of text such as the letters "REC", or graphics. However, what is desired is a more natural apparatus, in which the visual perception of reality is computationally altered in a controlled way. This requires a much more refined personal imaging system, such as an Eye Tap device.

3 Experimental methodology

It is important to distinguish between internal validity and external validity in the proposed experiments. While it has become fashionable to constrain experi-

ments to a lab like setting, especially in the behaviourist tradition of psychology, the author believes that this trend takes away much of the human element, and that experiments done in this way often lack applicability to the natural world as a whole. Therefore the experiments presented in this paper were done in the ecological framework of ordinary day-to-day life over the past twenty or thirty years.

There are two classes of experimental subjects, the long term subject (the author), and external subjects, primarily officials, authority figures, and the like. The long term subject (the author) represents, admittedly, a small sample size of one person, but given the length of the experiment (more than twenty years), new and insightful results were obtained. It would be unreasonable, at this point, to have a large sample population wear these devices for a twenty or thirty year time period. Thus results based on the long term subject (the author), fall under an experimental paradigm related to that of George Sratton's experiments published in 1896 and 1897 in Psychology Review, in which the experimental subject was himself.

4 Experimental apparatus: Eye Tap devices for mediating reality

Eye Tap devices have three main parts:

- a measurement system typically consisting of a camera system, or sensor array with appropriate optics;
- a diverter system, for diverting eyeward bound light into the measurement system and therefore causing the eye of the user of the device to behave, in effect, as if it were a camera;
- an aremac for reconstructing at least some of the diverted rays of eyeward bound light. Thus the aremac does the opposite of what the camera does, and is, in many ways, a camera in reverse. The etymology of the word "aremac" arises from spelling the word "camera" backwards (e.g. see [3]).

There are two embodiments of the aremac:

1. one in which a focuser (such as an electronically focusable lens) tracks the focus of the camera, to reconstruct rays of diverted light in the same depth plane as imaged by the camera; and
2. another in which the aremac has extended or infinite depth of focus so that the eye itself can focus on different objects in a scene viewed through the apparatus.

5 Focus tracking Eye Tap systems

This paper describes only the focus tracking embodiment of the Eye Tap system. The aremac has focus linked to the measurement system (e.g. "camera") focus, so that objects seen depicted on the aremac of the device appear to be at the same distance from the user of the device as the real objects so depicted. In manual focus systems the user of the device is given a focus control that simultaneously adjusts both the aremac focus and the "camera" focus. In automatic focus embodiments, the camera focus also controls the aremac focus. Such a linked focus gives rise to a more natural viewfinder experience, as well as reduced eyestrain. Reduced eyestrain is important because the device is intended to be worn continually.

The operation of the depth tracking aremac is shown in Fig. 3.

Because the eye's own lens L3 experiences what it would have experienced in the absence of the apparatus, the apparatus, in effect, taps into and out of the eye, causing the eye to become both the camera and the viewfinder (display). Therefore the device is called an Eye Tap device.

In stereo versions of the invention, there are two cameras or measurement systems and two aremacs that each regenerate the respective outputs of the camera or measurement systems.

The apparatus is usually concealed in dark sunglasses that obstruct vision except for what the apparatus allows to pass through. Because the experimental apparatus is built to be used in ordinary day-to-day life, and not the lab, it must have an appearance of ordinary eyewear and ordinary clothing, so that the test subjects do not seem to regard it as an unusual apparatus. The experimental apparatus is shown in the picture of the author within the biographical statement at the end of this article. The author's wearable computer system consists of a small computer that fits in a shirt pocket, and apparatus concealed under ordinary clothing. The eyeglasses, which provide an infinite depth of focus image, have a normal (e.g. not unusual) appearance.

6 Experiments in first person detriment

In addition to providing reduced eyestrain, the author has found that the Eye Tap system allows the user to capture dynamic events, such as a volleyball game, from the perspective of a participant. In order to confirm the benefits of the new device, the author has done extensive performance evaluation and testing of the Eye Tap device as compared to wearable camera systems. An example of one of the performance test results appears in Fig. 4.

7 Can humans being clerks make clerks be human?

The author has designed, built, and tested various wearable computer systems that are completely covert (e.g. do not have an unusual appearance), such

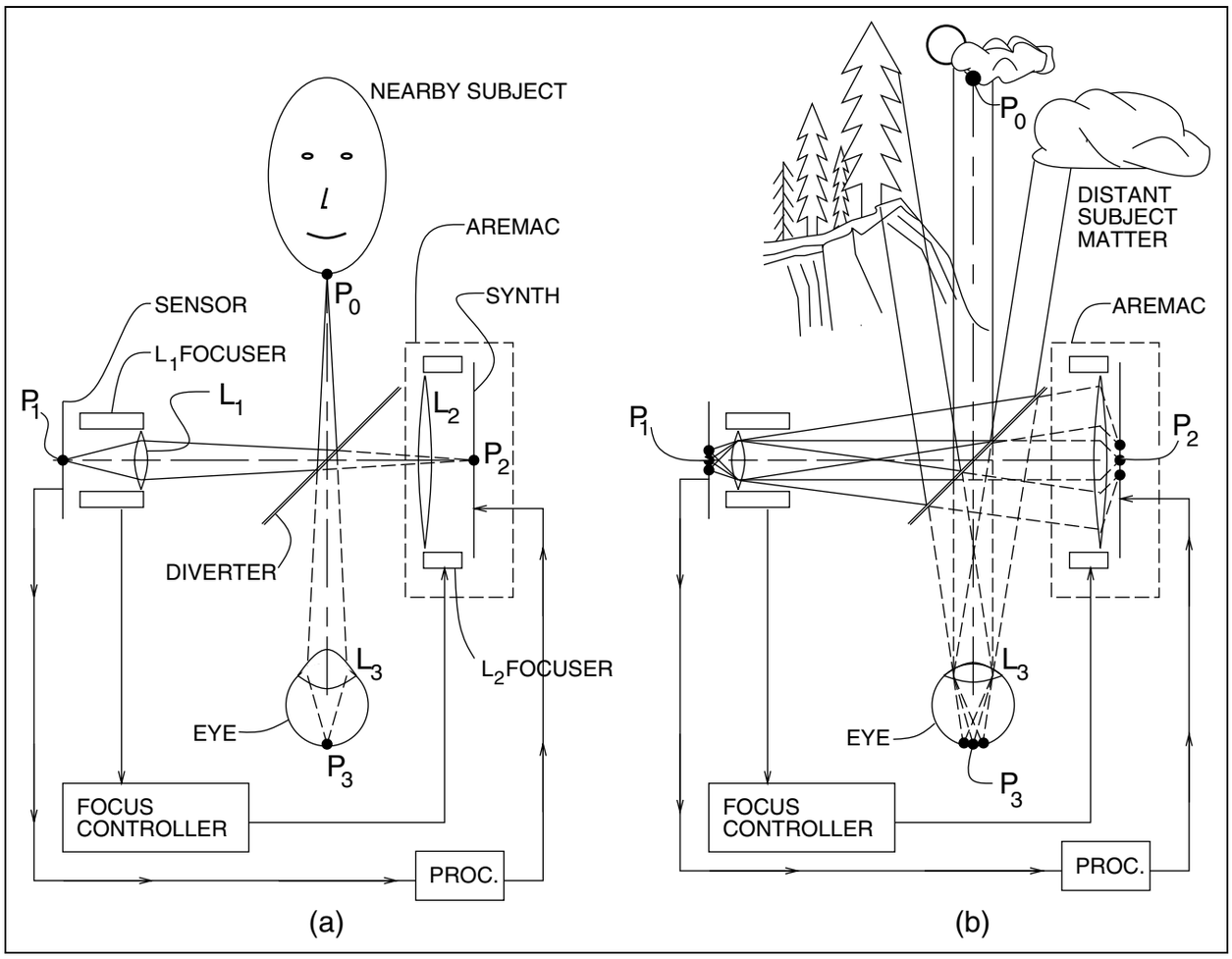

Figure 3: The Eye Tap principle with focus tracking aremac: (a) with a NEARBY SUBJECT, a point P0 that would otherwise be imaged at P3 in the EYE of a user of the device is instead imaged to point P1 on the image SENSOR, because the DIVERTER diverts EYEward bound light to lens L1. When subject matter is nearby, the L1 FOCUSER moves objective lens L1 out away from the SENSOR automatically, as an automatic focus camera would. A signal from the L1 FOCUSER directs the L2 FOCUSER, by way of the FOCUS CONTROLLER, to move lens L2 outward away from the light SYNTHesizer. At the same time, an image from the SENSOR is directed through an image PROCessor, into the light SYNTHesizer. Point P2 of the display element is responsive to point P1 of the SENSOR. Likewise other points on the light SYNTHesizer are each responsive to corresponding points on the SENSOR, so that the SYNTHesizer produces a complete image for viewing through lens L2 by the EYE, after reflection off of the back side of the DIVERTER. The position of L2 is such that the EYE's own lens L3 will focus to the same distance as it would have focused in the absence of the entire device. (b) With DISTANT SUBJECT MATTER, rays of parallel light are diverted toward the SENSOR where lens L1 automatically retracts to focus these rays at point P1. When lens L1 retracts, so does lens L2, and the light SYNTHesizer ends up generating parallel rays of light that bounce off the backside of the DIVERTER. These parallel rays of light enter the EYE and cause its own lens L3 to relax to infinity, as it would have in the absence of the entire device.

that image capture and documentation are possible, so in many ways, the second person detriment problem is a solved problem.

However, another aspect of the experiment is to explore, in an experimental fashion, the second person detriment.

In order to do this, the author built a variety of systems in which the overtness (degree of obviousness that a camera was present) could be varied.

The goal of this work was to set forth an hypothesis that the overtness is actually a function of the other variables, and to understand the relationships between the variables.

The test subjects were chosen from among those who appeared to show the greatest anger toward the author from earlier years of wearing the less covert (more cumbersome) variations of the apparatus. It was found previously that those persons who are part of an organization extensively using video surveillance were more likely to complain when the author had a personal safety device. Most notably, it was the representatives of surveillance regimes who most notably complained about being held accountable. Thus the experimental subjects were drawn from:

- gambling casino owners,
- security guards at gambling casinos,

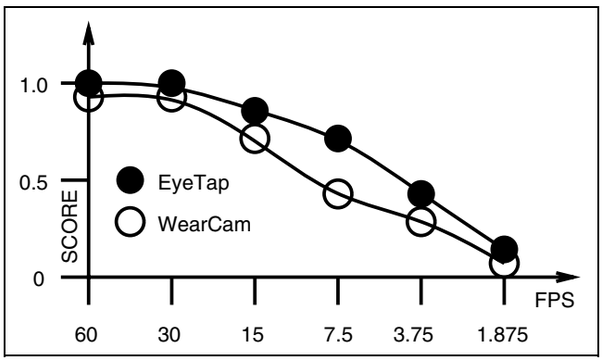

Figure 4: There exists a sharp knee in the curve of frame rate versus ability to do many tasks. Many tasks required a certain minimum frame rate below which performance drops off rapidly. Eye Tap systems work better than wearable camera systems at a given frame rate. Moreover, EyeTap systems can be used at lower frame rates to obtain the same degree of performance as can be obtained with a wearable camera system operating at a higher frame rate.

- security guards in department stores where video surveillance was being used extensively,
- customs officials,
- other officials involved in placing our society under surveillance but being fearful of being placed under surveillance themselves.

7.1 Ranking methodology

Rather than using questionnaires, or asking subjects how they felt about the experiment, results were instead based on the immediate reactions of the subjects within the context of their natural environments. The reactions of subjects being photographed or videotaped without their permission was surprisingly diverse, especially given their expectations of being able to videotape or photograph the author without his permission. In all cases, to be fair, the experiments were conducted in situations and settings where the author was being videotaped or photographed by the subject, or the subject's organization. Thus the reflectionist approach (e.g. "shooting back" at persons already shooting) was used to ensure fair play, from an ethical standard (see [4]).

A ranking scale, based on the immediate reaction of the subject to being photographed, or overtly imaged with video apparatus, was used as follows:

- –5 violent action, e.g. punches author in face, knocking camera or picture taking surveillance apparatus to ground
- –4 threat of physical violence, or detained with threat of violence
- –3 demand that author leave premises, threatens to call police
- –2 nicely asks author to leave premises
- –1 frown, or similar facial expression, gesture of disapproval
- 0 neutral (no apparent action)
- +1 smile
- +2 approval
- +3 praise
- +4 expresses interest in purchasing a system or funding the author's research project
- +5 actually funds the author's research project or bestows similar benefit upon the author's research efforts.

Obviously, when the camera was completely hidden, it did not produce any reaction, so the axis of interest is overtness.

It is hypothesized that the overtess axis may be considered to be an independent variable, in the context of the ranking scale listed above. In particular, to reduce the dimensionality of the problem, isoscore lines (lines of constant score) passing through a multidimensional space, provide overtness as a function of other independent variables.

In this way, overtness was varied as an independent variable, while noting the effect of other concomitant variables, while noting what level of overtness as a function of one point would provide the same score as another level of overtness for another point, and so on.

This approach answered the fundamental question as to which of the following functions of overtness and score were most important, and how they were related:

– PERCEIVED VALIDITY, e.g. need, and benefit to society or the subject: For example, if the camera was a visual prosthetic to help the wearer see better, so that the wearer could earn more money and therefore pay more taxes to improve the roads and public schools that the subject used (e.g. if the apparatus benefitted the subject directly), then the subject was found to be more favorable to the same level of overtness. Similarly, as a visual prosthetic so the the wearer can see better and not bump into the subject, or not bump into shelves in a department store, the apparatus benefits the shopkeeper. Another example of perceived validity is when the device was used or appeared to be used to summon remote purchase advice. For example, while shopping at a department store where videotaping and photography were strictly prohibited, it was found that clerks were very tolerant and in fact welcomed the author to have a video camera in the store to remotely videoconference with his wife on getting advice to make a purchase. Thus when the camera was associated with helping to make a purchase, it was OK to break the rules. In this way the camera was present so that the author could serve the subject better, and benefit the subject with a commission on completing a sale.
– EXISTENTIALITY: the degree to which the author was photographing the subject as an act of

free will, versus simply an agent of an external force. For example, when the author photographed subjects as a requirement of a higher authority, the degree of acceptability was much higher than when the author appeared to be operating on free will. For example, when the author appeared to be an employee of an organization that required him to wear a camera, officials were much less angry when photographed. Thus if wearing a uniform, in which the camera appeared to be part of the uniform, the author could increase the overtness (make the camera much more obvious) without triggering an angry or violent reaction from clerks and other officials.

– SELECTIVITY: the degree to which the author selectively photographed the subject, versus simply photographing everything and anyone, such as by wearing a camera that is always recording everything, versus carrying a handheld camera that is directed at photographing only the subject and nothing or noone else. The selectivity axis is closely related to the wearability axis of the Existentiality versus Wearability/Portability plot. The author found that shooting with a handheld camera would often trigger violent attacks, whereas a wearable camera seldom did. This difference in reaction was found to be attributable to a selectivity axis, wherein selection of an official or other clerk singling the person out with a handheld camera caused negative reaction much stronger than when wearing a device that photographed everyone and everything. In order to factor out misunderstanding (e.g. those who might not recognize the wearable apparatus as a camera), the author mounted a big old style camera to a helmet, with a big electronic flashgun, and wore this into various establishments, while the flashgun was flashing once every second, or once every two seconds. Thus the device was obviously a camera, having been made very overtly. In some embodiments, the author additionally wore a chest mounted Web browser TV screen to make it even more obvious that the system was a real camera and not just an electronic flash costume. This apparatus was actually more acceptable (in terms of the above scoring methodology) than a handheld camera, despite its ridiculous appearance.

8 The EXISTENTIALITY axis

The most difficult to understand, but nevertheless, perhaps the most interesting of these axes is the existentiality axis. The existentiality axis is better understood with reference to figures depicting an individual interacting with a clerk.

Figure 5 illustrates an individual interacting with a clerk who either is, or pretends to be, under the control of a manager who either is, or pretends to be under the control of a chief technology officer, who either is, or pretends to be, under the control of a board of directors, etc.:

A typical example of such a situation is when a person tries to negotiate with a used car salesman, and the used car salesman might say something like "I'd love to give you the car for one thousand dollars; let me check with my manager". The used car salesman then disappears into a back room, has a coffee, and reads a newspaper for a few minutes, and then comes out and says "I'd love to give you the car for one thousand dollars by my manager won't let me.". Although the salesman never talked to a manager, the salesman has some degree of power over the customer by virtue of being able to credibly pretend that he is bound by a higher authority. A credible, articulable, higher and unquestionable authority allows representatives of organizations to obtain external blame and excuses for their otherwise irrational or disagreeable actions.

Unfortunately the individual person does not ordinarily enjoy the same luxury as the clerk, and must therefore behave more rationally, or risk seeming irrational, rude, or otherwise inappropriate. For example, if an individual carried a handheld video camera around videotaping clerks, casino operators, police officers, customs officials, and the like, the individual might be regarded as strange, rude, or otherwise acting in an inappropriate manner.

The individual could rely on religion, as a manager, by, for example, wearing a camera contraption as part of a religious order. Just as religion allows individuals to wrap their heads in various materials that would otherwise be regarded as inappropriate, a new religion such as the "personal safety religion" could be invented, that required its members to wear cameras.

Thus religion could form a similar purpose to the manager for the individual, but there is the danger that others (including clerks) may dismiss the individual as a religious freak. Therefore, what is needed is a similar way for the individual to have excuses for and an ability to externalize blame for otherwise irrational or disagreeable actions.

An important aspect of the invention is for the individual to be able to nonconfrontationally inflict fear of accountability, uncertainty, or doubt on persons exerting physical or other coercive force, or the threat or possibility thereof, upon the user of the invention. This can be done by way of an incidentalist imaging possibility.

Incidentalist imaging refers to imaging which can be made to seem as if it occurs merely by chance or without intention or calculation. An incidentalist imaging system may in fact blatantly capture images (as by an articulable requirement from a higher author-

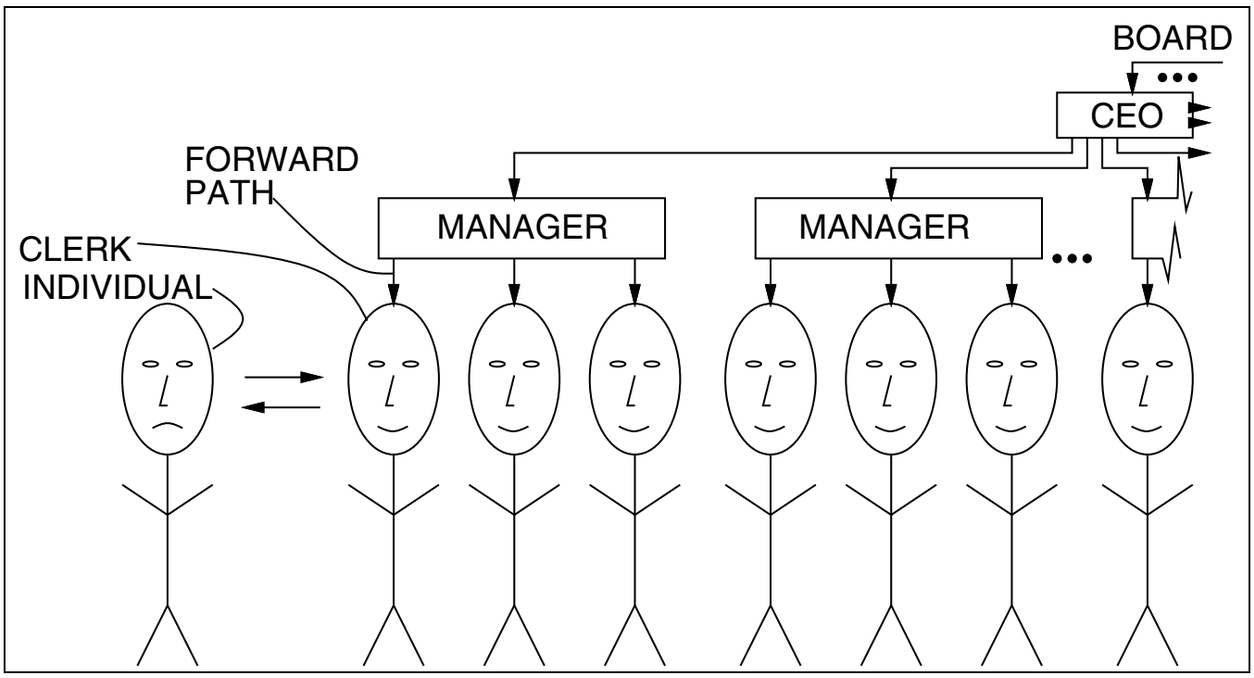

Figure 5: This figure is a diagram depicting an INDIVIDUAL versus a CLERK. The CLERK is bound by, or pretends to be bound by, conditions from a MANAGER. For example, the CLERK may be protected by a surveillance camera, or may be protected by a conspicuously covert container for a surveillance camera (such as a large plexiglass hemispherical dome of wine dark opacity). Alternatively, the CLERK may be protected by a blatentized covert surveillance potential, such as a blatently displayed television connected to a hidden camera. If the INDIVIDUAL complains about the surveillance, or about the potential for surveillance (e.g. by asking about plexiglass hemispherical domes of wine dark opacity within the establishment), the CLERK can either claim to not know what's in the domes, or can absolve himself or herself from responsibility for the situation by making reference to the MANAGER. The CLERK can either claim that the MANAGER installed the surveillance cameras, or authorized or required the installation of the cameras, or that the MANAGER decides whether or not images are captured from these domes. Alternatively the CLERK can completely deny knowing whether or not the domes actually contain cameras. Similarly, the MANAGER is bound by, or can pretend to be bound by conditions from a chief technology officer (CEO). The CEO is bound by, or pretends to be bound by what the insurance company requires, or by a board of directors, denoted BOARD.

ity to do so), or it may present itself as a device that could capture images in a way in which it is difficult to discern the intentionality of the use of the invention.

Figure 6 illustrates the situation of a wearable computer user who is able to either be, or pretend to be, under the control of a Safety Management Organization (SMO).

This figure shows an embodiment of the WearComp invention in which the INDIVIDUAL has a credible mechanism to externalize at least a portion of his or her image capture actions to a Safety Management Organization (SMO). The SMO provides an articulable basis upon which to deny free will or self determination. The SMO creates a management system, either real or perceived by others, that forces the CLERK out of the normal role, making necessary a true back channel (REVERSE PATH) from the CLERK to the MANAGER, which will often also require a true back channel to the CEO, etc.

Ordinarily there would be no such back channel, or the back channel would be reduced. For example, if an INDIVIDUAL complains about video surveillance systems in use by a CLERK, then the CLERK will simply refer the INDIVIDUAL to management, and management will be likely only available on certain limited hours, and after waiting extensively and being held up and delayed in line extensively. Then management will likely say the directive for use of surveillance comes from head office, and refer the INDIVIDUAL to a head office, where the INDIVIDUAL will spend several hours waiting on hold and calling various telephone numbers, etc.. The head office will then often say that the surveillance is used because the insurance company requires it.

However, if the INDIVIDUAL takes out his or her own personal handheld camera and photographs the CLERK, indicating that the SMO requires it, a very fast back channel (REVERSE PATH) will arise. Quite often the MANAGER will immediately become available, and the INDIVIDUAL will no longer have to wait in line or come back on a certain special day to talk to the manager. The matter will rapidly escalate to the highest available level of authority.

This system has a symmetrizing effect in which the individual and manager either snap out of their respective roles, or a back channel is forced, disrupting the normally one-way nature of the control flow

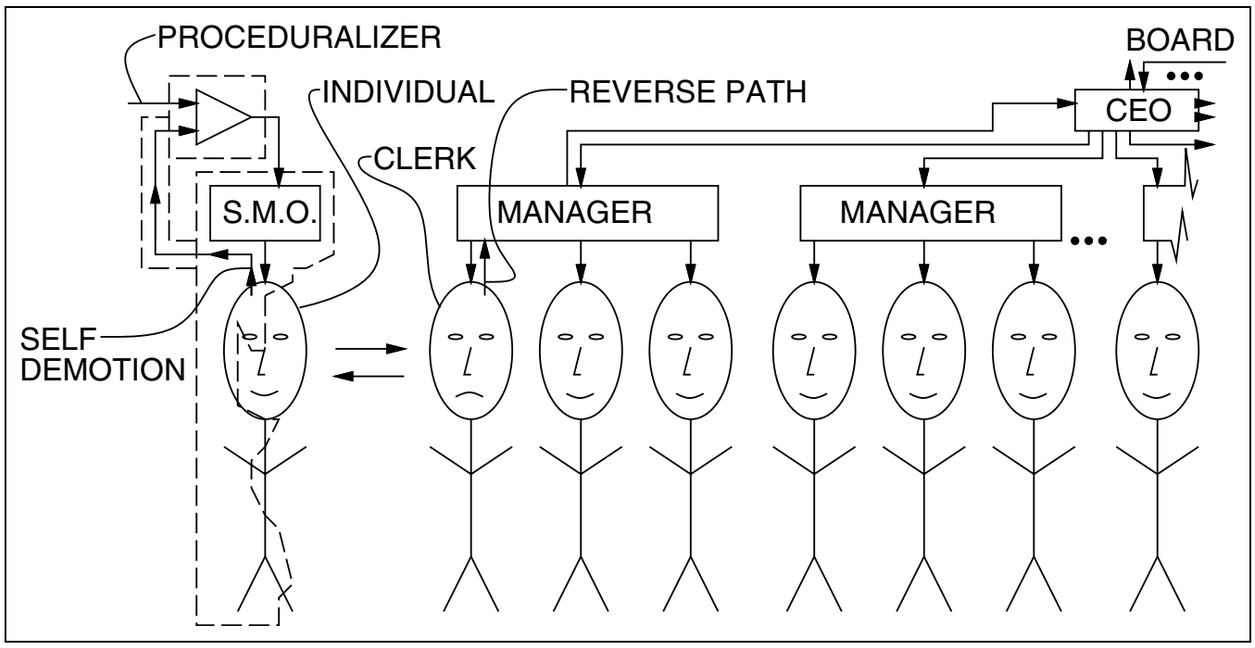

Figure 6: WearComp versus UbiComp. WearComp enables the individual to be empowered by self-demotion, in the same way that clerks and UbiComp facilitate empowerment of large organizations. The self-demotion provides a deliberate self-inflicted dehumanization of the individual that forces the clerk to become human. In summary, humans being clerks can make clerks be human.

from the top-down nature of management to the CLERK. Thus the individual human becoming a clerk forces the clerk to become an individual human and make responsible decisions outside the scope of just being a clerk.

Preferably, in the experimental apparatus, a PROCEDURALIZER is used to allow the individual to follow, or to appear to follow, a prescribed procedure without appearing to be thinking for himself or herself. The lack of apparent individual thought or intentionality, allows the individual to become or seem to become a clerk, which is what forces the CLERK to be human in being forced to think and make decisions for himself or herself.

Moreover, a secret input (SELF DEMOTION) to the amplifier may actually originate by the INDIVIDUAL. In this sense, the INDIVIDUAL is actually bound by his own wishes. Thus the SMO may actually be directed by the INDIVIDUAL to bind the INDIVIDUAL to certain terms and conditions.

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