Research Article

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Ethics and inscription in social robot design

A visual ethnography

Abstract: In this paper, by turning to examples of visual inscriptions adopted within HRI research, and more specifically social robotic interaction, I wish to explore through visual ethnography some of the challenges faced in designing ethical robots. Firstly, visual ethnography allows for an alternative categorisation of the inscriptions of HRI based on visual characteristics. Secondly, visual inscriptions show multiple and paradoxical meanings when appearing juxtaposed revealing challenges of diminished and asymmetric consideration of human orientated concerns in favour of technical and experimental certainty. Thirdly, by taking a human orientated perspective of experimental arrangements, the understanding of ethics becomes a way of framing and of looking at inscriptions. The paper calls for a better understanding of the role of inscription practices in HRI generally in order to find new approaches useful to bolster a more robust inclusion of ethics within the field.

Keywords: visual studies, visual ethnography, ethics, design inscriptions, visual inscriptions, design representation, design artifacts, HRI, social robotics, visual analysis

1 Introduction

The traditional view is that research within Human Robot Interaction (HRI) is largely non-ethical, involving the development through design and experimentation, of technical artifacts intended to perform unquestionably helpful tasks to improve the future lives of humans. The users of robots may well find themselves with ethical, legal and societal concerns, but these are outside the scope of the computer scientists and engineers developing the technical and computational aspects of these complex machines. My approach here is contrary and is that design is a far richer process than merely determining technical requirements [1]. It involves a process of determining and inscribing, or more precisely 'implicating', values [2] in the material and digital artifacts generated as part of the design process itself. Through the experimental and design processes of robotics, these implicated values will potentially go on to configure the futures of users and societies. Consequently, the design methods through which roboticists work, and more importantly, the inscriptions through which they transform and disseminate their thinking are important vehicles though which ethical values and concerns can, or equally not, become implicated in robots. It follows therefore that in order to develop ethical robots, ethics need to play some part in the inscriptions and inscription practices of the HRI community.

Roboticists engage with a wide range of representational practices. Typically working in multidisciplinary teams a large amount of their design and research activity involves constructing and working with differing types of symbolic representation and comparing those with their experimental arrangements. At first glance the types of visual inscriptions found in HRI include photographic imagery of various sorts, computer generated imagery including CAD and solid modeling media with graphics and diagrams. Alongside these design and engineering inscriptions are computational inscriptions representing mathematical and geometric relationships, as well as flow diagrams and computational architecture and algorithmic code. This diversity of inscription types shows HRI to be a multidisciplinary field in which design and research occur at the intersection of divergent fields of knowledge such as artificial intelligence, language studies, design, robotics and the social sciences. These separate disciplines have different inscription practices and, just as the demands of complex problem solving bring them together, so their inscription practices become combined and juxtaposed with one another. Despite ethical issues and the consideration of implicated human values becoming an increasing part of the interrelated problem solving of HRI, it is largely unresolved as to how these will become embedded within the wider use of inscriptions and design artifacts.

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Unlike the bringing together of text to form a continuous thread of understanding, inscriptions and images provide more fluid forms of knowledge and remain ambiguous (or polysemic) in their communicative function until they become embedded into the conversation. Moreover, they are not bound by the same criteria and characteristic of established discourse genres [3], and may remain available to negotiation and definition through further interactions. Unlike verbal interaction, images and inscriptions do not necessarily follow a linear path when viewed and since they can be rearranged, shown individually, or viewed as a group, the do not directly lend themselves to questioning in the same manner that verbal or written communications do.

The inscriptions considered here are those describing design decision making and research approach as they appear in scientific publications about social robotics. Although presented as part of a coherent textual account to convey the findings of design work, these visual representations and inscriptions reveal as much the knowledges [4, 5] and assumptions involved (or not involved), as they do the organisation and stages through which their work has developed. For that reason, the visual inscriptions found within HRI become a means to study the ethics and values of the field, and may begin to offer a point of departure for understanding the types of representations more appropriate for ethically implicated robots.

While ethics indirectly inform all methodological approaches in research, there are particular aspects of for example, privacy and rights for those, who appear or are depicted. These become particularly important with visual images [6] and can pose challenges for both participants and researchers. My concern here is not however towards privacy issues of the informants of experimental arrangements albeit important, but to understand the wider interconnection between ethics and inscriptions within social robotics and consider its implications for design practice.

Based on a comprehensive literature review, Frennert and Östlund considered the different ethical positions taken towards social robotics pointing towards the ways in which users are "implicated but not present in the development of robots and that their matters of concern are not identified in the design process" [7, p. 299]. In other words, the ways in which users become represented and perceived during the robot design process. Furthermore they call for an understanding of how knowledge is "translated, transformed and modified in the field of social robotics" [7, p. 305]. This leads to a view that ethics and human values aren't static aspects of social robotic design but are rather subject to change, transition and reformation. For ethics to have real implications for end users it

becomes important they remain central and salient to design activity. These two concerns are taken up in this paper by considering:

i) To what extent are ethical aspects of robotic design revealed through visual inscriptions?

ii) What is required to ensure that ethics can be more robustly inscribed with HRI design processes?

2 Study

The data for the study comprises the visual inscriptions appearing in four successive years of published proceedings of the International Conference on Social Robotics (ICSR) [8–11]. This amounted to 277 papers with almost all containing one more examples of inscriptions such as photos, charts, diagrams, mathematical notation, illustrations and flowcharts. Taking a visual perspective to the papers research issues, they typically involve finding ways of representing problems straddling technical and human issues crossing aspects of mechanical and electronic design with aspects of psychology and behaviour. These papers commonly lead to insights regarding experimental setups and suggestions for improved systems and software design.

Seen as the presentation of multiple research objectives, methods and findings, these provide a view of roboticists' visual practices and their associated reasoning. They reveal the ways in which knowledge, and insight into the developmental direction of HRI are stored visually, employed to extend cognitive abilities, used as a medium to communicate with themselves and others, and as triggers to reason about robot design problems [12–15].

The study identifies representations in four main visual classifications often appearing in the same paper, frequently in combination or close proximity that facilitates readings across multiple representations:

1. Photos of experimental arrangements usually showing the position of humans and or the physicality of the robots used or developed (Figures 1 and 2).
2. The representation of a visual 'gaze' being established between humans and robotic artefacts (Figures 3 and 4).
3. Sequential images showing dynamically changing conditions (Figures 5 and 6).
4. Processural, graphic and diagrammatic schema typically showing aspects of computational logic, geometry or the arrangement of software architecture (Figures 7 and 8).

Figure 1: Experimental arrangement from [16].

Figure 2: Experimental arrangement from [17].

Figure 3: Establishment of 'gaze' from [18].

Figure 4: Establishment of 'gaze' from [19].

Figure 5: Image sequence from [21].

As researchers learn to make and understand these kinds of inscriptions in their particular and evolving problem spaces, they do so on a number of dimensions such as the cognitive, the social and the material [24]. On the cognitive level they need to be able to perceive in the inscriptions, meanings and associations related to their situated problems. Ethical concerns therefore, need to be in some manner discernible from a reading of the inscriptions they generate. Additionally they must develop the skills needed to combine and extend inscriptions in new ways as design work unfolds and alternative ways of perceiving situations are called for. Robot ethics is not a fixed or added-on aspect to research, but rather something intertwined and varying as opportunities and findings present themselves. Verschaffel and co-authors [25] point to the way inquires relying upon creative thinking need flexibility able to represent issues in multiple ways and provide scope for seeing connections amongst diverse ways of inscribing.
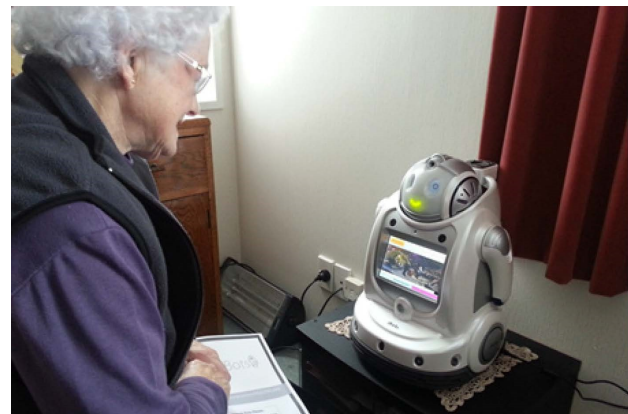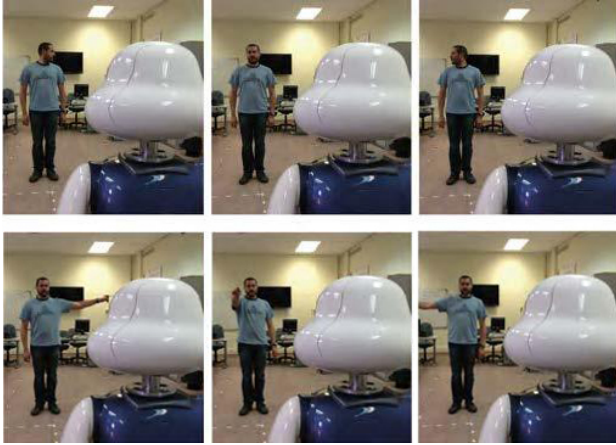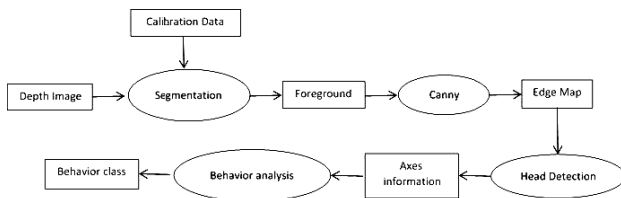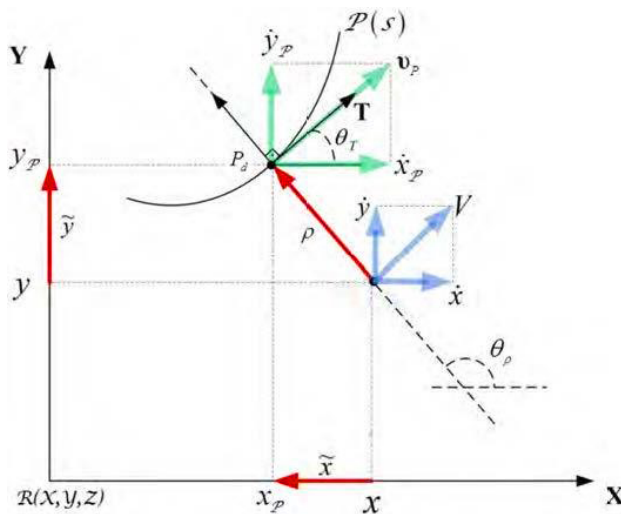
3 Methodology

In broad terms, visual ethnography is a methodology based on the consideration of the production, content and consumption of visual media rather than for example the direct observation or interviewing of participants. The

Figure 6: Image sequence from [20].

Figure 7: Diagrammatic schema from [22].

Figure 8: Diagrammatic schema from [23].

the visual in processes of research and representation [26] and new configurations of relationships between images and words, as well as a range of new media. By adopting visual ethnography the aim here is to show how ethics are directly addressed through the meanings produced by the inscriptions made and employed in social robotics, and can therefore inform design practice.

The interest here in inscription is aligned with others who have turned attention to particular groups for which inscriptions play an integral part of their practice. These include such things as the blueprints and diagrams of engineers [27–29], the network diagrams of software engineers [30], computer screens of telecommunications controllers [31], artefacts of industrial designers [32], and inscriptions in architectural practice [33]. These studies go beyond simple descriptive accounts of visual materials to provide a deeper understanding of the social practices, relationships and knowledge [34] that inform the occupational cultures. For Kathryn Henderson, for example:

> "Examination of the construction and use of visual representations employed in many other kinds of work can reveal how access to information is controlled in ways that discriminate against some and empower others, how group cognitive work and its outcome is organized, and where centers of calculation and hence power are located in an organization or community," [28, p. 135].

The general approach to the content analysis of HRI images offered above presents one way of categorising visual inscriptions but by no means the only way. The difficulty to organise inscriptions into coherent categories [35] reflects the diversity resulting from a specificity of inscriptions and their relevance to researchers working in unique problem areas. From a social perspective, researchers need to establish agreement to the relationships the inscriptions have with the phenomena they are describing. This happens through interactions on a local scale, talking and negotiating [36] as well as through the publications of the field.

Although founded in the use of film for data collection, ethnographic analysis has extended across visual studies to include a view of scientific production [37] and the digital realm [38]. Visual ethnography has become a methodological approach in a range of disciplines spanning cultural studies, psychology, design and art research [39]. HRI publications such as the conference proceedings considered here present design work and robotic development within the paradigm of scientific experimentation. Through these conventions, inscriptions become a part of the scientific method such as the description of experimental arrangements and the presentation of data and

roots of visual ethnography lie in the use of film and photographic documentation for the identification and interpretation of cultural ideas and the provision of descriptive accounts. Adopted across a number of disciplines such as visual studies, semiotics, media and cultural studies, visual communication studies, visual ethnography and anthropology, as well as social semiotics and new literacies studies, it has led to a wide diversity in both application and focus. More recent approaches emphasis the role of

findings. HRI researchers need therefore, to mobilise their inscriptions as part of the scientific method within the heterogeneous communities of HRI. They become a part of different intersecting discourses joining multiple perspectives and diverse ways of creating and interpreting. Greeno and Hall [40] have shown the ways that inscriptions are used for constructing understanding on the one side and communicating and sharing it on the other. The particular challenge to the consideration of ethics as an aspect of HRI design, rather than as something that occurs separately, is finding ways it can become an active part of this meshing of multiple approaches and their interpretation and discovery.

The communicating and sharing within a community as large and global as HRI places challenges upon the shared interpretation of inscriptions and the ways conventions can become established. The structuring of proceedings through the conventions of scientific method may be questionable with an endeavour aimed at perfecting the making of material artefacts like robots, but it provides an established convention through which to share developmental insights. Engineering and design practices conducted outside of academic frameworks rarely adopt a science method approach in favour of organisational and procedural conventions mediating efficiencies of development and the satisfying of specification.

Figure 9: Example of layered modality from [41].
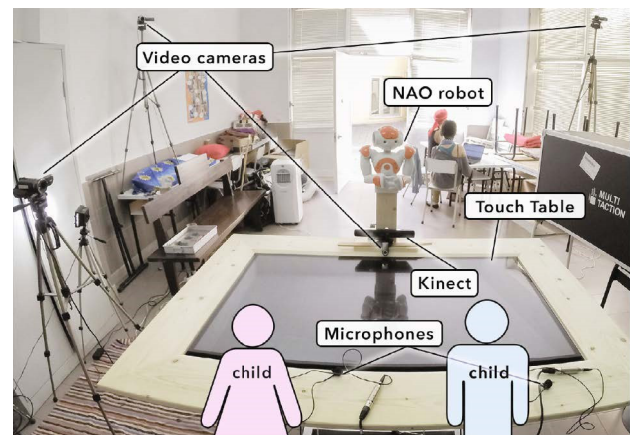
Figure 10: Example of layered modality from [42].

4 Findings

The four generalised classifications of visual inscriptions in social robotics offered above, although providing a visual perspective fail to show the complexities found within such a broad conceptual and experimental space. Rather than readily adhering to categorisation, inscriptions become hybridised formats or mixed modalities in which for example photographic, 3D modelling, schematic and computational elements become layered over one another.

This layering of graphical and visual formats occurs at the nexus of complex problem solving and the opportunities provided to researchers with digital tools and a widening awareness of visual media. Reliance upon representational diversity coincides with the developing focus in the 'multimodality' of literacy and communication, in response to changing social and material practices of communication, and with the overlapping of disciplinary boundaries. The use of digital video technology for example, provides duel and related opportunities with HRI. It offers input data for the development of robotic vision and image recognition through techniques and technologies

such as sparsity recognition and modelling [43]. The visual inscriptions produced though these approached become opportunities for researchers to disseminate their findings, and explore new visual means of communicating and further developing their ideas.

Together with inscriptions made up of layered or hybridised formats, a common occurrence is the use of inscriptions placed in close proximity to one another. Whether this is intended or not by the authors, it results in intermingled relations established between them. Juxtaposition further contextualises representations by provoking the occurrence of differences and similarities between images [37]. Therefore, although the meaning of visual inscriptions are clearly constituted, at least in part, through the contextual elements they show, meaning and consequently values and assumptions are also informed by their particular juxtaposition, combination and sequencing. In other words, we consider their meanings as through produced across inscriptions [45]. Roland Barthes considered this by adopting the phrase "the third meaning" [46] and related it to the effects of film editing. The consequence of this 'third meaning' or juxtaposition upon the train of assumptions or rather epistemological leanings that result is

considered in the following example from from D. Cazzato et al. [22]. The authors are developing a means to identify the occurrence of 'joint attention' established through the gesture and gaze of two people, a therapist and a child.

Figure 11: Juxtaposed inscriptions from [22].

On the left hand side of the inscription, a photograph taken with bird's eye perspective shows two people in front of a table with a robot on it. The person nearer the table is facing the robot and the other person on the left is facing him. From this perspective we are unaware of human aspects such facial expressions or direction of any human gaze adopted by the participants. We can infer their bodily stance and through their precise spatial organisation, as viewed from above, the scene appears a deliberate experimental arrangement and the result of careful positioning. The addition of dashed graphical arrows layered onto the photograph enhance the geometry of the scene and implies a specific direction of gaze by the two people. One established from the person to the robot and the other from the second person to the first. The direction of arrowheads suggesting, at least between the humans, that attention is focused in one direction only and consequently that human awareness of presence is not possible in the opposing direction, or in any wider spatial sense. Juxtaposed with this image is a graphical representation of the arrangement with an oval shape depicting each of the actors containing the designations of NAO (robot), Educator and Autistic child. Arrows are positioned between these shapes in the same configuration as the assumed gaze shown in the adjacent photograph. The angle established between these two arrows is denoted using the Greek letter beta. If considered in terms of a third meaning then the inscriptions are neither photographic nor geometric but present an epistemological operation with meaning transposed from one modality to another. The juxtaposition effectively visually authenticating the movement and reduction from human perception to a single geometric relation. The uncertainties of why and how two humans are positioned in space and relating to one another in the presence

of a robot have become demobilised in the presence of algebraic certainty.

The emergence of this third visual space allows complex human situations to be simply understood and designed by means of crossing different modalities of visual communication. The movement from inscriptions able to reveal social and human orientations and ambiguities towards those suggesting mathematical and computational certainties becomes problematic when considering human values and ethics. It introduces an epistemological divide between what becomes 'seen' and 'unseen'. The 'seen' establishes the experimental argumentation and converges towards an unquestioning confirmation of computational and analytical order. Geometric certainty and algebraic operations become the 'context of experience' [47] within HRI, what Johanna Drucker calls a 'poetics of relations' [45]. On one level however, this can seem entirely reasonable given that the domain of computer science aims at producing working algorithms from concrete data. The 'unseen' however is qualitative human understanding and humanistic oriented inferences and interpretations that are ignored in favour of numerical and graphical ones. The overall visual aspect in scientific terms becomes assuredness and certainty. Visual ethnography provides an alternative view of complexity, ambiguity and vitality through revealing the presence of complex social and cultural values amid technological design and experimentation.

Whether from the professional or academic fields of robot development, the consideration of ethics as a part of inscriptional practice calls for shared explicit and implicit ways for sorting out human robotic issues and dilemmas through common vocabularies and codification systems. Building upon Goodwin's [48] insights about 'professional vision', Markauskaite & Goodyear [24] stress how learning to distinguish what relevant things need to be coded and inscribed involves developing a skilled set of methods and practices able to reveal certain features and aspects of a phenomenon as salient and distinguishable. What they term highlighting. For Latour [49] this means finding ways for 'knowledge discovery' to be possible through manipulation of the inscriptions themselves. This might be the equivalent of being able to contend with ethics simply through the consideration and writing of computer code. The complexities of designing for future states of human interaction require contending with multiple contingencies and situated understand that are not reducible to any single form of codified knowledge or representational modality. As pointed out by Latour and Woolgar [50], understanding phenomena in scientific work also depends upon material things, instruments and practices that are

'constituted by the material setting of the laboratory' (p. 64). As such, the inscriptions used to depict the arrangements of experimentation typically showing the robot in question in proximity with experimental subjects, become inscriptions of complex ethical meaning.

One of the difficulties encountered within the field of robot ethics is any agreement of what may in fact constitute ethical issues beyond for example well considered extreme cases centred on human safety and physical harm. A notable exception to this is the study of ethical issues in robot care for the elderly by Sharkey and Sharkey [51]. In their paper, the authors explore the issue of robot ethics from the perspective of how robots may alter human rights and shared human values. This draws upon aspects such as the physical and psychological welfare and the consideration of probable risks of reducing the social life and human contact of elderly people. They concluded with a range of 6 ethical concerns about the use of robots: (i) the potential reduction in the amount of human contact; (ii) an increase in the feelings of objectification and loss of control; (iii) a loss of privacy; (iv) a loss of personal liberty; (v) deception and infantilisation; (vi) the circumstances in which elderly people should be allowed to control robots. With these kinds of concerns in mind, it becomes interesting to apply visual ethnography to a photograph from a study by J. Welge and Hassenzahl [52] investigating aspects of companionship for elderly persons coping with loneliness.

Figure 12: Experimental set up from [52].

The photograph presents us with an experimental set up, a scenario of a future case of robotic interaction between a human and a robot. The experimental space is an enclosed one with three visible sides. Two of the walls seem makeshift being constructed from stretched white sheets. The window on the right hand side appears to be the kind found in a public building, and the presence of a bed and two single articles of furniture strongly suggests

a hospital room or some kind of care institution. Our view of this clinical space is from an elevated position looking down as if from a surveillance camera or maybe looking over the top of the unseen wall. The human, robot, bed and two pieces of furniture, a chest of drawers and chair, are all occupying the middle half of the image frame. The action of the scene occurs in an isolated part of the space and positions the viewer as an unseen onlooker. Perhaps not surprisingly if we see it as an objectively detached experiment! The wall and window on each side appear curved from the distortion of a wide-angle lens further accentuating a feeling of surveillance. This is a scene of the future in which robots are given to alienated subjects carefully observed by experimentalists.

The robot is directly in front of the person who is sitting on the bed. It is roughly constructed from paper and cloth with some kind of inner support that we are not able to see, and with a lower part resembling a bedside table with a magazine on it. The upright part is at a level higher than the seated person is, and has two images mounted on two adjacent sides. One of these is a simple smiley face drawn with two dots and a curved line. The second image consists of a blue rectangle, which could represent a small screen and a circle, which seems to suggest a hole with an arrow pointing into it. The hole is facing the human and the smiley is pointing towards the corner of the room. This is a prototype hastily constructed and therefore easily changed, but with clear design attributes and intentions. The person seated on the bed with knees together is facing the robot. The female figure is presented to us in the figure caption as a 'senior'. She is holding both arms in the air with the forward arm blocking most of her face. If we imagine the pose as being in-motion then it could appear as if she was exercising perhaps by following instructions given by the robot. If we see this as a more static pose, then the raised hands resemble someone who is being arrested and told to 'keep their hands up".

If we refer back to the ethical issues revealed by Sharkey and Sharkey [51] above, they are understandable though our ability to perceive how the presence of robots are able to influence human feelings. In consideration of this inscription, we can question whether it is able to invoke feelings through our analysis of the evident actions. Does for example the internal narrative of the image raise issues of human social relations. As a familiar image within HRI research, the answer may be no, although seen from a broader perspective with an external narrative of a future isolated from human contact, the answer may be yes. The researchers responsible for this inscription were only presenting it for their peers whereas its use in the context of this article involving visual ethnography and ethics

means it is presented in another way and for a different audience. As stated by Marcus Banks "the multivocality of visual images means they can address different audiences in quite different ways, creating a problem of audiences" [53, p. 140]. In other words, the audience has a way of looking at inscriptions and if ethical concerns do not interest them then they will not be looking in that way. The particular compositional interpretation I provided here described something of the content and a spatial organisation of the image while also noting its expressive content through ideas of isolation and surveillance. I have not taken an intertextual [54] stance towards the image, considering it with reference to the author's text, but have instead chosen to follow my own interpretations. Doing this in light of Sharkey and Sharkey's ethical orientation means that my framing suggests, at least in part, visual equivalents for the findings of their study with robot having authority over the human in this otherwise dehumanised space.

5 Discussion

In an attempt to summarise the findings from the analysis above then these can be considered with reference to the proposed aims of the paper. Firstly related to i) to what extent are ethical aspects of robotic design revealed through visual inscriptions:

- Human values are diversely inscribed in social robotic design through an evolving visual culture rooted in forms of computational, design and technical representation produced through evolving media practices, technologies and techniques.
- Human values are embedded amid experimental and design concerns in multiple ways allowing scope for fluidity and the possibility of ambiguous and conflicting interpretation.
- Not confined to the content of individual inscriptions, human values are also embedded across different, and juxtaposed, visual modalities and forms of representation.

Secondly related to ii) what is required to ensure that ethics can be more robustly inscribed with HRI design processes:

- The inscription of ethics needs to acknowledge the complex and changing ways human values are interpreted. Concern and attention is called for to avoid technological deterministic readings of human situations and the tendency for computational certainty to discriminate over humanistic uncertainty.

- Understanding how multiple and layered images can shift the focus of values in ways that challenge what becomes seen and what remains hidden from view.
- A more robust inscription of human values in social robots necessitates a form of professional vision able to discover hidden complexities amongst the possible consequences of robots to all manner of human response, perception and sensibility.

Ethnography as the study and description of cultural groups can be applied as much to those within the field of HRI as to cultures intended to inform the progress of their research and development. The ethnographic study 'on' rather than 'in' HRI is able to shed light upon how they solve the complex problems of the field. HRI has a distinct visual culture, as do all scientific disciplines [55]. This visual culture is diverse integrating complex sets of information to illustrate phenomena that would be difficult or indeed impossible to describe in words [36]. As a sub field of computer science HRI is further imbued with computational signs, architectures and algorithms rarely considered in isolation but rather appearing in relation to other inscriptions providing a view of the social and epistemological phenomena of the field. HRI has therefore a particular way of seeing the world [28] linked to their material practices in achieving the goals of human machine interaction.

Visual inscriptions need to be accessible by researchers in ways that are appropriate to them in order to easily extract and manipulate information for their own needs. Visual inscriptions have the duel goal [55] of conveying information objectively about real world features such as how a robot is constructed, and secondly, doing this in a subjective form convenient for its transformation. For Larkin and Simon, the pioneers of AI, the advantage of visual over written communications was not a question of qualitative understanding but merely quantitative, allowing for an ease of informational retrieval at a glance. They conveyed this by referring to a reputed Chinese proverb that "a diagram is (sometimes) worth a Thousand words" [56, p. 34]. An ethnographic study of visual inscriptions within HRI draws upon the broad field of visual anthropology typically concerned with non-textual communication and the products of visual cultures [57].

The inclusion of the social sciences within HRI and the need to understand the ethics of human interaction with technology brings qualitative and contextual issues to the foreground. Whereas AI may have been largely a concern for quantifiable aspects, the recognition of societal and humanistic implications such as ethical and emo-

tional responses to robotics points to the question of how such values can be included, objectified and manipulated. Warr et. al. [39] reveal the potential of ethical dilemmas and challenges associated with the descriptive and explicating character of images. Visual research methods may draw attention to private expressions of individuals that extend far beyond the intentions of the original media and necessitate ways to diminish any anxiety that this may cause. In this way, visual ethnography is in no way different from any other form of ethnography in being a qualitative means of investigation and analysis. Although the researcher is drawing upon different perceptual sensibilities, forms of knowledge and inscription, they are equally considering "the routine ways that people make sense of their world in everyday life" [58]. Ethnographic methodology refers to systematic ways that ethnographers apply social science techniques to their "looking, analysing, and reporting" [59]. The inscriptions presented by the field shed light upon the ways researchers make sense of, and find ways to achieve these goals. Concerned with the generation of a future state of human society their inscriptions provide a way to analyse their future imaginary and interpretations of what it is to improve life, and consequently what is involved with the quality of human life itself. This interplay of social and material innovation [60] requires ways to achieve just that, the interplay of technological and social understanding in actionable ways. Bringing social thickness and complexity back into the appreciation of technological systems has been a central aim of the field of science and technology studies (STS). It is from this field that the theme of inscriptions as a central element of knowledge practice emerged [24]. Focus turned to the ways scientific work and scientific knowledge become inseparable from the creation and sharing of inscriptions through documents such as research papers, protocols and presentations [50, 61, 62]. Inscriptions provide a way of making knowledge visible and integrating practices of collaboration and transformation [32]. Despite the focus upon the importance of inscription work within scientific and technological domains, the connections between knowledge work, inscription and visual literary remains poorly understood.

6 Conclusion

The focus of this study is the visual inscriptions within the field of social robotic interaction. This field is devoted to "improve quality of human life through assistance, enabling, for instance, independent living or providing sup-

port in work-intensive, difficult, and possibly complex situations....that enable social robots to have an impact on the degree of personalized companionship with humans" [11, p. v]. Despite these worthy aspirations a growing awareness for the need for ethics to play a more active role in the future development of robots raises questions as to how this can be achieved. The use of visual ethnography points to different approaches towards the analysis of inscriptions in this field, and challenges in determining and inscribing ethically oriented understanding.

In general terms, the study shows how the considerations of HRI designers are oriented towards their technical and computational needs and in so doing lead to an impoverished representation of human values and the ethical complexities of human interactions. It questions how knowledge and the visual realm are related within HRI in the ways pointed out by Johanna Drucker:

"Visual knowledge is as dependent on lived, embodied, specific knowledge as any other field of human endeavour, and integrates other sense data as part of cognition. Not only do we process complex representations, but we are imbued with cultural training that allows us to understand them as knowledge" [45, p. 51].

Although acknowledging that all designers work occurs within certain domains of knowledge, the intention of the current paper is to draw attention to the ways in which this disparity or asymmetry of humanistic knowledge within the field of HRI occurs through the types and ways in which visual inscriptions are employed. Although HRI research strives to solve the technical barriers in pursuit of a better future assisted by socially engaged robots, there are dangers of successively diminishing the very representation of humanity and sociality it aims to support. If ethical, legal and societal issues are to be taken seriously by the HRI community then it would seem important to explore ways in which these can be implicated through practices of inscription and therefore actively conscripted [28] into design and experimentation. It would also seem that the field of visual studies and the approach of visual ethnography could prove to be beneficial in unearthing some of the complex assumptions involved within the shaping of technologies. In this way, fundamental ethical aspects of our human future can be tackled up front rather than being referred to as the 'unintended consequences' of unsuspecting engineers and computer scientists.

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