

Tactile images Semiotic reflections on tactile images for the blind

by

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Abstract

Since the eighties, the number of pedagogical and artistic images for the blind has significantly increased. The study of these tactile images is now the subject of numerous research projects. In the light of pragmatic and cognitive semiotics and with the help of the concept of ‘theory of mind’, we will analyze a sample of tactile images, highlighting the conflicts resulting from the transposition of visual content into haptic communication. We will focus our analysis on the pragmatic programmes for reading and producing meaning, then we will study the main ambiguities related to the recognition of these images.

Introduction

While tactile images have only gradually been accepted in museums, libraries, specialised institutions and families; making pictures and drawings for the blind is not a recent initiative. According to Eriksson’s historical study (2008), the first tactile images date back to the 19th century. They were then made by teachers of the first specialised institutions. These images were part of the realistic teaching method in vogue at the time. Under this approach, gaining a concrete representation of objects of the world through the still functioning senses overrode theoretical and conceptual education. Natural science education was one of the pioneering areas, and the first images concerned the representation of fauna and flora (Eriksson, 2008: 33). The following image is of a falcon in relief using the technique of embossed paper. The illustration is presented on the upper left hand side of the page containing the description of the bird in Roman characters in relief. This image from 1841 was part of the book *A Peep Into the menagerie of Birds* and was manufactured at the Glasgow Asylum for the Blind. According to Eriksson, it is one of the oldest tactile books. (Ibid.: 128)



A Peep into the menagerie of Birds, 1841¹

A portion of the tactile editorial devices known today were originally developed in handmade books by teachers or parents of blind children. Well received by students or children, they have led to their reproduction and the creation of other books. Gradually, the main communication faults were corrected by the authors who have refined the process of converting visual content into images in relief, but also selected the most suitable materials and the most effective printing techniques for tactile recognition.

In the early 21st century, the field of application of tactile images is much broader. Institutions, museums, specialised libraries or libraries featuring specific sections and of course publishers have engaged in this mode of communication which now benefits from excellent embossing and printing technology. But despite this long history and the successive developments in this area, these images still play a marginal role in all the devices intended to promote accessibility to education and culture for the blind. Indeed, besides the still high cost, the usefulness and effectiveness of such devices are still being questioned by professionals in the field and by blind people themselves.

In the vast majority of cases, these images are made by sighted designers and illustrators trying to put themselves in the place of blind people. To choose their strategies to cope with haptic communication, they must constantly navigate between two cultures and two different semiotic worlds: a *sighted* world which they are ‘spontaneously’ used to and a *blind* world which they try to imagine or experiment with by closing their eyes and exploring through touch.

In the surveys we have undertaken with blind people regarding their understanding of tactile drawings and images, their testimony has often stressed mismatches between the content presented in these representations and the direct experience they have of the world. ‘I

¹ Image from the book by Eriksson, Y. (2008). *Tactile picture: representation for the Blind, 1784-1940*, Göteborg Univ, 1998, *Images Tactiles : Représentations picturales pour les aveugles : 1784-1940*, translation by Ph Claudet, Talant: Les Doigts Qui Rêvent publishers, 2008, page 123.

see the world in three dimensions, so for me it's very difficult to transpose things to understand the drawing'; 'I have already touched many drawings, and there are always things that mean nothing at all for me. Once, for example, someone handed me a drawing and said 'That's a building; it's a view from above and a view from below.' Well, no! Sorry, I don't see that.' (Valente, 2007)

In this paper, we wanted to identify and explore some of the major contextual, perceptual and communicational conflicts that alter the haptic interfaces within tactile books.

Our methodological approach is borrowed from the cognitive and pragmatic semiotics which we apply here to the study of images from four books. For this purpose, we will discuss the 'theory of mind' that develops between the communities of designers and that of users², but also the habits of action and the pragmatic and executive programmes that tentatively develop from interfaces that are also tentative in terms of form and content.

1. STUDY OF THE INTERFACES

a. The Corpus of interfaces

The tactile images of today are still designed to give access to visual content when learning to read, discovering literature, arts and culture, but also biology, history and geography. Even if the goals are varied, all publishing projects pose the same question: how to give access to people who do not see to worlds that have been designed to be seen?

If we observe the tactile images available on the market, we find that the approaches adopted by the community of producers are very heterogeneous. The options for conversion and transposition in the tactile world require not only a specific processing of the source content and images but also the choice of an embossing technique then a reproduction technique through printing or collage. The various techniques available include vacuum form, thermography, thermo-inflation, embossing, collage of textures, etc.

As noted by Françoise Martinez-Sarochi (1996: 82), the adaptation of visual content for the blind has two main trends. The first aims at tactile and informative effectiveness while the second favours universal access to cultural, scientific and artistic heritage.

She explains that these two views are opposed to the 'network of rules that bind perceptive coding and the coding of exchange'. While the first trend is seeking dialogue with

² The community of producers is composed of all the players in the books' supply chain. It includes the commissioner, the publisher, the author, the designer, the illustrator, the printer, the distributor, etc. The community of users consists of readers, but also members of the family, friends or school, etc. (see on this topic Darras & Belkhamza, 2009)

the perceptive experience of the blind, the main objective of the second is to promote an exchange between the sighted and the blind through a medium and content commonly accessible. In this case, changes to the original content must be limited by only implementing occasional simplifications of the source content, the result aiming at fostering both visual and tactile reading.

The documents selected for this study³ are either adaptations of existing books from the visual world (Figures 1 and 2), or specific designs for tactile reading (Figures 3 and 4). They all claim to be bimodal, i.e. accessible to the sighted and the blind.

	
<p>Figure 1 – (Children’s story) <i>Rotkäppchen</i> (Grenzenlos, 1990, Germany) - High relief through thermoforming</p>	<p>Figure 2 – (Children’s story) <i>Ernest et Célestine, Le Patchwork</i> (Fellings, 1991, Belgium) - Original image (left) and adapted image through thermography (right)</p>
	
<p>Figure 3 (Documentary image) – <i>Des clés pour Bâtir</i> (Cité des Sciences, 1991, France) - Front (left), side (right) and top view (bottom) of Notre-Dame de Paris - Embossed paper</p>	<p>Figure 4 (Poetic story)- <i>Le Roi de misère</i> (Les Doigts qui Rêvent publishers, 2002, France) - Collage of textures</p>

Figure 1 is taken from a German book ‘*Rotkäppchen*’ (Little Red Riding Hood). It uses the technique of thermoforming, producing a high relief on a transparent plastic material

³ The books presented in this paper belong to the private collection (International Museum of Tactile Illustrated Books = iMoTiB) of the publishing house *Les Doigts Qui Rêvent*, Dijon – France and were photographed by D. Valente. We would like to thank Philippe Claudet, who not only allowed us access to these documents, but has consistently supported and guided us in our ‘discoveries’.

(PVC plastic film), which takes the form of the mould after heating and suction (Strobach, 2009: 129 in: Claudet, org.). The German publisher Grenzenlos uses the same thermoforming technique in most of their books and textbooks.

Figure 2 from the Belgian book *‘Ernest et Célestine, Le patchwork’* uses the technique of thermography (Green machine) to emboss lines. The source image is presented on the left hand page and its thermographic version limited to a simplified outline is presented on the right hand page. During the transposition, the producers have removed some elements of the landscape and limited the content presented to contour lines.

Figure 3 was produced by Hoëlle Corvest-Morel, Christian Bessigneul and the team of the *Cité des Sciences et de l’Industrie*. The technique used in this book is embossed paper. *‘Des Clés pour bâtir’* is a documentary book presenting well-known monuments of Paris. This image shows the Cathedral of Notre Dame from the three traditional angles used in technical drawing and architecture: front, side and top. Most of the books adapted for the *Cité des Sciences* use the same process of orthogonal projection and geometrical presentation of objects.

Figure 4 is taken from the illustrated book of poetic stories, *‘Le Roi de Misère’*, produced by *Les Doigts Qui Rêvent* publishers. The images were created by the editorial team and use simplified shapes that can be perceived by touch through the different textures used. This technique, called *‘texturillustrée’* (texturillustrated) is applied to most books from this publisher. The textures are produced and assembled manually in a workshop.

b. Epistemology, reflexivity and theory of mind

From the outset, the study of these documents poses the question of the position and situation of the analyst and his interpretation process.

Indeed, in terms of method and theory of knowledge, this study, which concerns both sighted and blind communities, deals broadly with the thought, the ‘thought of the other’ in his absence, which forces us to mobilise our capacity for meta representation. Since the work of primatologists David Premack and Guy Woodruff (1978), this capacity has been called ‘theory of mind’. ‘The theory of the ‘Theory of Mind’ is based (...) on the different conceptions of the thought and conscience of the other that have been developed over several centuries by philosophers. But it believes that the ability of the meta representation of one’s and others’ mental state is a basic mental and social reality available to humans and some

animals. It develops from childhood – some experiments show that it is activated in the child of fifteen months – then gradually grows more and more efficient. The discovery of mirror neurons has provided the ‘Theory of mind’ with a physiological grounding. (Darras and Belkhamza, 2009: 178)

Any person speaking of another person based on perception or experience is indeed engaged in a meta representation that is a ‘Theory of mind’ of the other. In our case, our analyses and interpretations are in fact the ‘Theory of mind’ that we attribute to designers or illustrators, firstly, and secondly, to users, a young blind reader for example.

As sighted researchers, this study puts forward the ‘theories of mind’ that we attribute to the members of the community of sighted producers of whom we ‘deduce’ the intentions of communication from the books of our corpus. More importantly, we develop the theories of mind of blind users whose experience is perceptively, pragmatically, phenomenologically and semiotically different from ours and that of the designers.

But is this study therefore discredited? We think not and for these three reasons.

The first is that as researchers we are working in an ‘intercultural’ way between the sighted world to which we belong and the blind world which we study for our research. As such, we stand on the edge of these two worlds.

The second reason concerns the purpose of this study which aims at drawing attention to the tactile communication of information whose origin is visual, and to recommendations that can be addressed to the publishers and designers of tactile books.

Thirdly, we will try to show that by constructing an informed theory of mind of both worlds, sighted and blind, it is possible to be vigilant about the differences of culture, and it is possible to avoid certain errors made by the sighted and due to oculo-centrism, a term invented by Martin Jay (1993).

However, we know that this study should be supplemented by surveys with blind people reading these types of books, on the one hand, and with the community of producers of these books, on the other, which we are actually doing.

c. Pragmatic semiotics and situated agents

The fact of considering the differences and equivalences in the interpretation of an image / sign by readers situated in different cognitive and socio-cultural contexts requires an

appropriate methodological approach. Thus we have adopted the pragmatic semiotics of C. S. Peirce and its most recent applications in cognitive semiotics⁴.

Unlike the structuralist school of semiotics⁵, which focuses on the internal organization of the system of signs, disregarding the conditions of interpretation or considering that they can be generalized from the experience of the analyst, Peirce's pragmatic semiotics is interested in the construction of signs by users in the context of their experience and according to the circumstances of production of meaning by the user. This approach, however, is only partly 'subjectivist' because it shows that the construction of meaning is undertaken within interpretative communities that regulate common sense and diverse experiences. The different results of these constructed meanings are more or less stabilized within the various internal and external memories available to individuals. Internally, the perceptive and semantic memories are globally consensual and socially shared, episodic and procedural memories are more personal. Externally, organized objects and spaces are also stabilized memories. This is the case of the books we will study here. (On the topic of the communication of the object, see Darras & Belkhamza, 2009).

2. APPLICATIONS

Strategies of embossing and transposing of images.

a. Disregarding the world of experience and 'seeing with your fingers'

In the two works presented here: *Rotkäppchen* (Fig. 1) and *Ernest et Célestine, le Patchwork* (Fig. 2), the designers limited themselves to emboss the images. They adopted embossing techniques that are relatively well optimized for tactile reading, but these images were transposed into high relief in the first book and into embossed contour lines in the second. In both cases, the transposition ignores the difference between the worlds of experience. For the designers and production community⁶, it is as if these operations were

⁴ 'Each semiotic experience of everyday or scientific life takes place in a specific environment of interpretation that guides the interpretative processes. This environment is called *context* and the players of the experience are called *situated agents*. All the signs are in an environment of signs that interact more or less strongly with each other and influence the interpretation process. There is therefore no neutral or independent analysis of the context, the subject or community of subjects that is undertaking the interpretation.' (Darras, 2006: 67)

⁵ Semiology was introduced by the Swiss Ferdinand de Saussure in the early 20th century, while Charles S. Peirce had been laying the foundations of his semiotic theory in the U.S. since the late 19th century. But the two researchers were not aware of each other's work.

⁶ We believe that publishers, authors, designers, illustrators, etc. constitute a community of production. On this topic and on the modelisation of the interactions between communities of production and reception and the 'theories of mind', we recommend you to read our work published in: Belkhamza, S. & Darras, B. (2009) and Darras, B. & Belkhamza, S. (2009).

sufficient to make the visual content of the image available through touch. Under this approach, the fingers are considered as the eyes of the blind... but, only if one continues to consider them as the eyes of sighted people. From this perspective, it is as if the only problem for the blind was related to the medium but it is indeed the access to the information of the world in general that is determined by the specific experience of active senses.

b. Superimposition of figures

In *Rotkäppchen* as well as in *Ernest et Célestine*, the first illustrators have repeatedly chosen positions of the body that require the masking of certain areas or limbs. In their direct and mobile experience of the world, the sighted are used to these discontinuities and understand them without major problems within fixed images⁷. If the arm of the Little Red Riding Hood or the leg of Ernest is 'hidden' in the image, it does not pose them any problem of interpretation.

The blind have a different experience of the world. The process of superimposing objects of the world are also known and experienced, but they are not constructed by a point of view but from the experience of the relationship between objects and bodies in the space of action. The fusion of the different levels of information required by the superimposition within the two dimensional and fixed space is a major problem. How do you untangle all this overlapping information that is interwoven under your fingers? How do you make sense of this jumble of lines whose sole purpose is to replicate the depth of a visible reality which is precisely inaccessible to the blind?

c. Learning orthogonal projection

Figure 3 differs from the other images presented in this paper as its purpose is to be a source of cultural documentation, architectural here, and not to illustrate a story. Like the majority of tactile images presented by the publishers of the *Cité des Sciences*, this illustration favours the visual mode to contribute to a cognitive and cultural growth of the blind through the discovery of visual culture. The designers used the technique of orthogonal projection and geometrization often used in tactile books on themes relating to architecture, but also the human body, astronomy, history and geography.

As they use geometrization and orthogonal projection, the tactile pictures offered by the *Cité des Sciences* require a specific learning and remain complex for blind people,

⁷ On the other hand, when they are children, they must learn, progressively and with difficulty, how to draw these images. (Darras, 1996)

especially if it is their first contact with these transposition processes. We had the opportunity to take part in a training session in reading these images at the *Cité des Sciences* and we observed the difficulties faced by blind people with this learning. Some participants even expressed their frustration at having to discover these images with the continued assistance of a sighted person.

d. The Choice of pertinence

The book *Le Roi de Misère* that we have selected to continue our analysis has solved some of the issues we have just mentioned. It was produced by *Les Doigts Qui Rêvent* publishing house (LDQR)⁸ which strives to only present elements ‘supposed to be relevant’ for the identification of objects. The designers took the advice of the *Guide Typhlo & Tactus de l’Album Tactile Illustré* (Claudet, dir., 2009) which brings together the experiences of the producers of tactile images of different countries.

This tactile book illustrates a poetic story by Mickael Ziolo which tells the story of a village whose quiet life is disrupted by the departure of its king to war. The inhabitants must leave their home and follow the path to exile. In turn, they talk to a camel, a giraffe, a crow, a turtle, a cow, a crocodile, a bird and a donkey.

This study will help show how a community of experienced producers is constantly faced with the difficulty of creating a system of tactile representation far from the world of visual representation and the beliefs associated with it. Priority is being given to creating a system of coloured textures visually recognizable and easily distinguishable by touch.

Occurrence, consistency and learning

When exploring this book from the perspective of our dual commitment to explain the theories of mind of both designers and users, we immediately had the impression that the designers have sought to facilitate tactile reading. Thus they have clearly separated the different figures in the space by avoiding superimposition and using the thickness of textures to create both relief from the page and different tactile sensations.

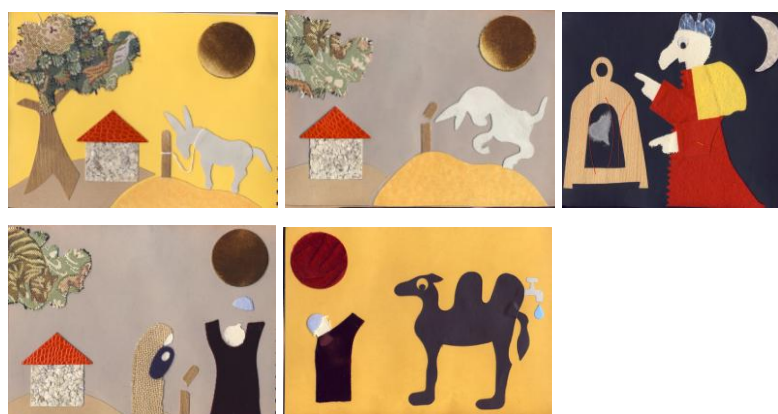
Similarly, the designers seem to have distributed more or less systematically the recurring elements in the space of the page. The representation of the house, for example, appears on

⁸ Books such as ‘Au Pays d’Amandine...dine dine’ (Ph. Claudet, Les Doigts qui Rêvent publishers, 2005) and ‘Le petit Chaperon Rouge’ (Les Doigts qui Rêvent publishers, 2005) are successful examples of the application of this illustrative system.

the first page with a rough texture for the wall and a smoother texture for the roof⁹. This pattern is repeated identically in each occurrence in the following illustrations. Thanks to this effect of repetition and retention of textures, the blind reader can locally construct their learning of the sign ‘house’ by gradually developing a programme of tactile reading. As they advance in their reading, the initial trial and error process tends to stabilize in habits of action that produce an executive and semiotic programme both safer and faster. (See on this topic, Belkhamza & Darras, 2009). The system of components of the image: its recurrent shapes and textures, thus allows the blind reader to construct a system of habits composed of stable information from which is developed a system of anticipation which constitutes its predisposition to act.

Regarding this, the case of the sun and the moon is interesting to study.

Here are the five first illustrated pages of this book:



Figures 1, 2, 3 and 4 and 5 (pages 1, 3, 5, 7, 9 of the book *Le Roi de Misère, Les Doigts Qui Rêvent*)

In our first approach to the illustrations of this book, we have instantly interpreted the image and identified a daytime scene with sunshine. This interpretation was so powerful that the contradiction provided by the text did not bother us ‘*Tout est pourtant si calme, on dort dans la maison*’ (*Everything is so calm; however, everyone is asleep in the house*). The next page confirmed our hypothesis of daytime, and the third page, with a night sky and a crescent moon, confirmed our reading system.

However, a blind reader who begins their exploration with textual information indicating night time certainly interprets the shape as being the moon. And this meaning is confirmed on the next page. When the moon suddenly appears in the form of a crescent on the

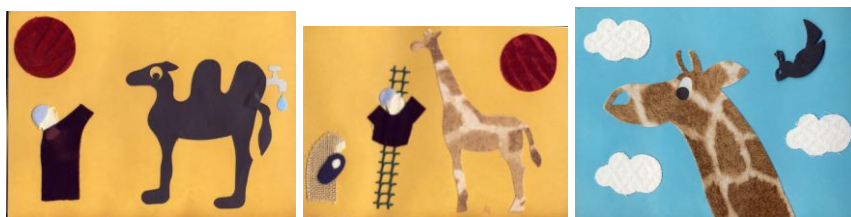
⁹ To respect the conventions of visual reading, the colours of the textures are in general rather similar to those used in the sighted world. This is true with the ‘red’ roof of the house.

third page, the reader probably does not know what to make of this sudden change. Does this change in shape mean a change of phase of the moon, therefore of time? It then becomes even more complicated. How can the reader interpret the return of the circular shaped moon on page 7, then its change of position on page 9?

The instability of the shapes that represent the moon and the sun and the inconsistency of their position on the page probably pose more problems of understanding to the blind child than to a sighted reader who is not troubled by this diversity. At least that is what we assume, considering that the disability causes difficulties in situating and identifying, and imagining that these difficulties could be offset by more ‘predictability’ and formal and topological regularity.

We therefore assume that upon discovery of the first two illustrations, the child is activating, through induction, a rule which takes the form of a pragmatic programme, i.e. ‘the moon is round and located in the ‘sky’ in the top right hand corner of the page’. Once this pragmatic programme is developed, it constitutes a predisposition to act which should gradually result in an executive programme that would allow the young reader to seek this information from page to page. Unfortunately, the designer does not always respect this method, as the moon suddenly changes shape. This graphic change in the phases of the moon nevertheless does not show days passing. From our point of view, this is only a gratuitous stylistic and misleading game with the pictograms of the moon.

In the fifth illustration, we see the sun appear, represented as exactly the same size as the moon, but with a change in texture, colour and positioning. These changes are generally insignificant for the sighted reader, but are they for the blind reader searching for tactile and topological clues to convey meaning? Can they remember an unstable rule such as ‘the moon is either round or a crescent! It is usually located in the ‘sky’ in the top right hand corner of the page. The sun only differs from the full moon by its texture and its location on the right or on the left... or even its absence’. How can they then interpret the return of a crescent shape taking the place of the moon, but which is in fact the (illegible) figure of the crow described in the story?



Figures 5, 6 and 7 (pages 9, 11 and 13 of the book *Le Roi de Misère*, Les Doigts Qui Rêvent)

All these changes of signs have little effect on comprehension for a sighted person who can manage them using their system of graphic and stylistic habits, but they certainly do not help a blind child to develop a system of stable and intelligible signs.

This instability causes conflicts in the early stages of reading and hinders the formation of pragmatic reading programmes that tentatively develop page after page. In all cases, it prevents the development of standardized executive programmes, which are indeed the only guarantee of the autonomy of the reading process.

A study of segmentation through framing

To conduct the following study, we used the figure of the crocodile that appears on page 19. Before meeting the crocodile, the child has already met various species of animals: a donkey, a camel, a giraffe, a turtle and a cow. With the exception of the cow which is surprisingly shown from behind, these animals have been schematically represented in profile. In most cases, their bodies are fully represented in the image, and the giraffe is even represented entirely then with a 'close up' of its head and neck. The crocodile also appears in close up, but as it only appears once in the book, we assume that its identification may be problematic to the blind reader.

A person living in the visual culture of our time recognizes the crocodile without hesitation. Sighted people are regularly exposed to the representation of this animal which is also the emblem of a famous brand. They have probably seen many pictures and drawings of crocodiles in the illustrations of books, comics, cartoons, in biology class, etc. And they have also probably tried to draw this animal too.

They therefore possess not only the required interpreting tools to differentiate it from other visual phenomena but also to link this occurrence to their perceptive, semantic and episodic memories, in which is stored information about the crocodile. These are signs-habits, i.e. the predispositions to recognize and act that constitute the different beliefs and knowledge of the world from which they develop meanings.

Depending on the circumstances and purpose of the action, it is possible to name the crocodile, to classify it in the animal kingdom, to be amused or thrilled by it, to be amazed by its schematic shape, and to identify it here as a protagonist of the story that we have been following for a few pages and that the text describes.

*Le crocodile est plus aimable.
il se propose pour les aider.
L'oiseau siffle : « N'écoutez pas !*

*The crocodile is friendlier.
he offers to help them.
The bird whistles: 'Do not listen!*

But how does it work for blind or visually impaired people who are the main target audience for this book? What do they know about this animal? What construction have they developed? What have they constructed during verbal interactions? But especially, and that is the question that concerns us most here, is their knowledge of the animal compatible with the partial representation provided by the designer?

This illustration is the tenth in the book; the young reader has therefore acquired certain reading skills through trial and error based on the medium that they are touching. Each new page is both an update of the rules constructed from previous experiences and a discovery.

In addition to the taste for variety and novelty that drives every designer (a trend that we consider here as harmful to readability), we assume he or she wished to draw the attention of the child to the ambiguity of the crocodile by focusing the information on the open jaws and large teeth of the animal.

Is the shock of the close-up image compatible with the experience of the blind child? Informed or not by the text, what can they understand of the partial information provided to them? Can they transfer on their own their experience of the close up gained through the exploration of the giraffe's head to the crocodile's head?

The truncated effect that strikes the sighted reader requires the blind reader to imagine such a framing before attempting to recognize an animal in this partial shape. This is a normal process in the visual context, but in our view, it is far from easy for a person who does not have this experience. It is in any case the theory of mind that we project from our knowledge and our simulations of the experience of blindness.

By studying these examples, we have observed the difficulties producers are facing in the creation of their haptic interfaces, notably to detach themselves from their visual graphic habits. They must at all times try to imagine the world differently and to simulate it mentally then graphically. Although LDQR publishers make a constant effort to take into consideration

the perceptive context of the blind, the analysis of a few pages of one of their books shows the extent of the problems to address in order to create a graphical interface between the blind and the sighted world.

3. METHOD

The ideal procedure to analyze the production of meaning of the documents received would obviously be the direct observation of users reading the book. It would be important to know what kind of blindness the reading child has and the degree of development of their visual experience. Children blind from birth have no perceptive visual memory while those who became blind later retain information from their visual culture; this also applies to more or less visually impaired children.

It is also important to know the user's level of habit, discovery or learning with picture books, and their level of practice in reading tactile images and producing drawings. In research conducted with Sarah Belkhamza (Darras & Belkhamza, 2009) on the semio-pragmatic communication of an object and its interaction with the user, we have shown that levels of habit and learning of the users with objects play a crucial role in the construction of the meaning produced, and that this has an impact on the discourse that the user produces to describe their actions. 'During the observation on the usage of an object, expert users can be mixed with irregular users and 'primary users'. In the first case, the respondents acted without hesitation but spoke with difficulty about their actions and the meaning they attributed to them; in the second case, they were hesitant, and in the third case, they had no trouble verbalizing their actions in the learning phase'. (Darras and Belkhamza, 2009, pp. 148-149).

Similarly, one must consider that a child who discovers a tactile book is rarely alone, but usually accompanied by a sighted mediator – members of their family, or teachers – who more or less guide their reading and provide them with elements of meaning originating from the sighted interpretative community. This community sometimes agrees or is sometimes in conflict with the meaning produced individually by the child.

Discerning the role and influences of the mediators in the process of reading tactile books by blind children is therefore an issue of great importance to understand the

interpretative system of the child facing this interface. Specific studies are also conducted on this subject in the area of science of education¹⁰.

Finally, we must not forget that all images studied here are actually fragments of figurative stories in which the meaning is constituted during the course of reading.

Regarding production, we would need to study the upstream design process and the different intentions and constraints that are involved and confront them with the various 'theories of mind' generated during this process.

4. CONCLUSION

Most publishers and producers of tactile interfaces have common concerns regarding the embossing of information and the adaptation of the visual content originally designed for an interpretative sighted community.

The designers responsible for this transposition should be able to put themselves in the position of the blind to increase the usability of the interfaces they produce while encouraging the development of pragmatic and executive programmes by the reader. To do this, they must constantly project a theory of mind of the user, and distrust their own beliefs constructed in the context of visual perception. Beyond these projective approaches, investigations on usages and with users should then be incorporated into the design process as it is the case in all areas of design.

To analyze how the blind interpret figurative signs, we should also carry out an upstream analysis of their modes of interaction with objects and attempt to identify the differences and similarities of their experiences with those of the sighted.

We are currently conducting experimental research and surveys to try and answer these questions.

We are therefore testing the 'Tactilonary'¹¹, a board game that we designed, using drawings and embossed images of communication in a situation of interaction very similar to the everyday life activities of blind adolescents.

¹⁰Team coordinated by Gérard Sensery, CREAD, University of Rennes 2, member of the research project 'Des images au bout des doigts : l'enfant aveugle, la famille, l'école, et les livres tactiles illustrés' (IMADOI-ANR), where Les Doigts Qui Rêvent is partner.

¹¹ A prototype of the Tactilonary designed by Dannyelle Valente has been made by Les Doigts Qui Rêvent.

Finally, we would like to stress the importance of the dialogue established between the empirical knowledge of producers in this field and scientific research projects studying the understanding of tactile pictures by blind people. In this area, several collaborative projects are underway with LDQR publishers and IMADOI, the multidisciplinary research group coordinated by Annie Vinter. This group, in which we also participate, focuses on developmental psychology, science of education and pragmatic semiotics.

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