

## Post Human Design case study: a speculative approach to flourish critical mindsets.

In a context of disruptive innovation Design takes on new roles, which place it in a different position compared to the practices of the last decade. Speculative Design underlines the importance of designing futuristic scenarios, users and artefacts, starting from the phenomena and innovations taking place in the present, with the aim of nurturing critical thinking and shared knowledge about these.

Digital innovations related to augmented, virtual and mixed reality technologies are becoming one of the ideal tool which involves viewers in the process of maturation.

The aim of this paper is to investigate new relationships between innovation, Design and users, through the analysis of a case study.

The aims and objectives of the aforementioned case study fully follow the methodology of speculative Design, addressing the theme of the Post Human, of the possible evolutions of

the human genre, influenced by technologies which are becoming pervasive and efficient, and with mega-trends that are significantly changing lifestyles and the relationships with the rest of living beings and ecosystems.

Through the prototyping and the creation of an app, it was possible to accompany the spectators on a trans-media journey supported by augmented reality technology, used to involve viewers in the designed path and to make different contents of the exhibition usable, turning the users into actors who actively take part in the exhibition.

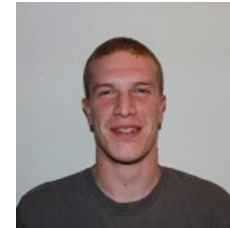
The aim of the paper is to sum up a model useful to address both the practical and the didactic fields of application, through the use of digital and physical tool, following the concepts and the mindsets which lie behind speculative Design approach.



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## INTRODUCTION

Speculative Design deals with the transposition of ideas and themes from the scientific and technological area into artefacts and communication means. It finds its own methodology in the projection of socio-cultural trends over time, studies about the future (Kelliher, 2015) and techno-scientific researches, with the aim of favouring the development of critical thinking in the user, inviting him/her to reconsider the present, deeply understanding how scientific and technological, social, economic and cultural innovations can influence daily life, even if they seem to be far away from personal routine. (M. Malpass, 2017).

Speculative Design works in two ways: on one hand as a practice, looking for progress in the world of innovation and transposing it into domestic life. Through the creation of tangible prototypes it is possible to project scientific and technological developments in futuristic contexts. Secondly, it is a methodology that serves to imagine a new present, proposing a wide range of visions and scenarios that are reflections of the time in which we live (M. Malpass, 2017).

Interviewed during the conference “21st Century: Design after Design” at the XXI Triennale di Milano, Cameron Tonkinwise [1] provides its own interpretation of speculative Design, stating that it is a practice obsessed with ambiguity. He stated four characteristics that a speculative artefact should possess:

1. the excellent realization, finishing and technological implementation must be immediately recognizable, not excessive and not very elegant;
2. it must distinguish itself from mainstream Design production and appear highly functional, but with regard to an aim that seems to be unreachable. In this way the viewer will find himself following this reasoning:
  - a. the designer cannot be serious. The product looks like a joke. No one would want it.
  - b. in any case it is high quality made. The designer did a great job.

- c. there must be something I don't understand. The designer must be very clever. I have to focus on what I don't understand.
3. the main objective of speculative Design is to be provocative. The artefact must therefore be able to be traced back to a near future; if it is too futuristic it will result in a simple speculation, but if too close to the present the spectators will expect scientific evidences about the innovation presented. In the temporal dimension that exists between these two, the artefact will generate questions which the designer has not found an answer to.
4. while aiming to activate a critical thought, the intention of speculative Design is not to participate in the discussions generated by its para-functional provocations. Neither the designer nor the produced artefact should be at the centre of these discussions.

When asked to define the role that speculative Design must assume, Tonkinwise replied that it must act as a translator of strong visions of alternative futures in everyday life. The adjective speculative indicates its contextual and temporal function, which must favour debates around what may be preferable, in addition to what is already considered plausible, if not probable. There are four temporal dimensions within which speculative projects can be grouped: probable futures, preferable futures, possible futures and plausible futures (Dunne & Raby, 2013).

In 2008 the “Design and elastic mind” [2] exhibition contributed to change the concept of making Design: it was shown how the ability of Design to see beyond things could be the starting point of scientific research, influencing and being influenced, generating a fertile fusion of these disciplines (Johnson, 2011; Wilson, 2010). This ambivalent relationship can be demonstrated in the use of speculative Design as a communication tool for Science, as a tool for spreading scientific knowledge -fundamental action, which must be democratic- in a safe, protected and proactive manner towards those who do not belong to this area of knowledge. On the other hand, Science can be-

come a source of knowledge, of themes and topics able to support critical Design work: speculative Design must become a regular source of visions focused not only on Science Fiction, but, expanding the perspective, on Environmental and Social Science Fiction, conceiving and trying to provide images on the repercussions that certain innovations can have in the daily life not only of human beings, but of all living beings (Ashley, 2011).

## METHODOLOGY

The practice of speculative Design is part of the methodology of critical Design (Dunne & Raby, 2013) and therefore presents itself as a form of problem setting methodology rather than problem solving. As Galloway (2007) states, highlighting that Design has the role to give life to debates, and noting that the best chance for a critical intervention lies in taking an active part in dealing with shared issues, even if this may mean to not solve the problems.

Like any Design practice, even speculative Design has useful tool for the development of the different phases of the process [3]. They can be divided into various categories, depending on the purpose they assume in the Design process: there are research and analysis tools, such as online platforms that collect and describe global trends in the present and projected consistently in the future [4], used for the construction of scenarios; other research tools can be platforms for sharing scientific knowledge, such as Google Scholar [5], which makes information about research, in progress or completed, available to the public, useful in providing truth to what designers want to design, and finally interviews and focus groups with participants belonging to the areas of knowledge involved in the project.

Meta-design tool, used for the construction of scenarios (Schultz et alii, 2012), contexts, users, needs and future problems, such as polar graphs and 4 or 6 axis matrices, able to define and deepen all the elements necessary to generate a plausible contextualization.

Speculative Design, because of the themes it deals

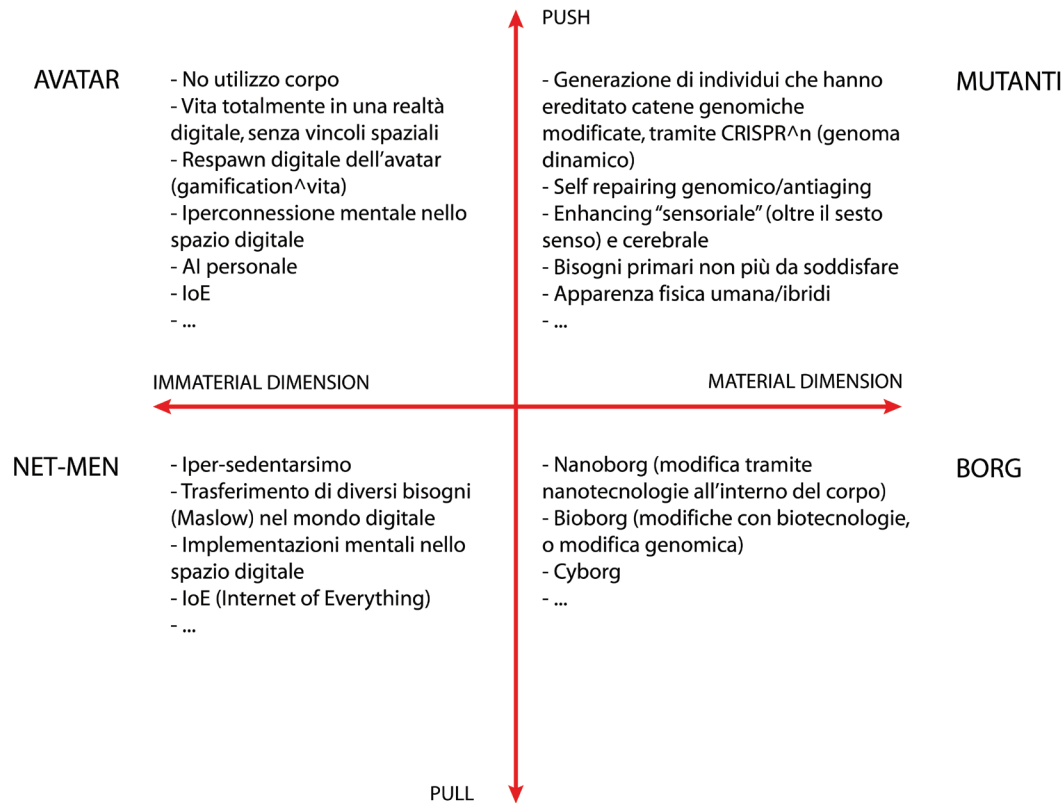


Fig. 1 - Profilation's matrix

with, finds mainly application in the circuits of exhibitions, as well as being discussed in conferences and conventions. For this reason, storytelling and Design fiction [6] (Bleecker, 2012) are the tool mostly used to make the designed content available to the public. Among the techniques used to support the narration, as anticipated in the previous paragraphs, there is the creation of physical artefacts through rapid prototyping [7] and communicative artefacts that can range from simple images to videos, more or less complex and articulated, and infographics [Davies & Sarpong, 2013].

### CASE STUDY

Following, a case study will be presented to show the application of what has been explained in the previous paragraphs and to try to identify ideas for implementing the typical tool and methods of speculative Design and to be able to expand its possible fields of use. "Post Human Design" exhibition, designed and created by The Bench Collective [8] for the Milan FuoriSalone [9] of 2019, and implemented re-proposed during the Porto Design

Biennale [10] of the same year, deals with issues related to possible evolutions of mankind in relationship with the development of certain technologies and scientific knowledges, and mega-trends that are significantly changing the life of human beings on the Planet.

Starting from scientific and technological innovations such as CRISPR-cas9 [11], biotechnologies [12] and nano-technologies [13] and digital technologies [14], and projecting them in 2100, two possible evolutions of the human being, defined as material or immaterial, depending on the technological driver followed, and two further sub-categories have been conceptualized, using a four-axis matrix where the polarities were physical-digital and driving-driven (fig.1).

In the material side the two sub-groups have been defined as Borg and Mutants: the Borg are those who modify their bodies using less innovative nano-technologies and biotechnologies; while the Mutants are those who modify their bodies through genomic editing technologies, transmitting the change to their descendants as genome heritage.

In the immaterial side we find instead the Net-Man and the Avatars: the firsts live in an advanced digital network, maintaining however the use of the body, even if it is limited; while the latter live their existence in a completely digital and virtual reality, continuing to exist in the physical world with a totally helpless body and without being aware of this condition. The moment of the exhibition was preceded by a first part of the project, which had the purpose of introducing the actual exhibition and starting to accompany the possible spectators towards the correct mindsets to take advantage of the actual event.

On the Instagram platform a main profile and two additional profiles connected to it through the tag system inside the platform were created. On the main profile three different images were weekly uploaded, creating a single larger image, which dealt with the evolution of the human being related to a technological-scientific innovation, while the other two profiles were respectively dedicated to explaining the expected and unexpected results



Fig. 2 - illustration made by one of the designers of the collective, representing virtual reality



Fig. 3 - Illustration made by one of the designers of the collective, representing genome editing

and the consequences of these innovations. The last two themes addressed in this phase -virtual reality (fig.2) and genome editing (fig.3)- have been useful to introduce part of the arguments discussed during the exhibition.

The exhibition held during the FuoriSalone 2019 took place at the Liprando Tower [15] in Milan (fig.4). The place, representing a third landscape [16] and not having electricity available, has defined a double design constraint: first, the physical layout of the space had to remain consistent with it, without going to modify it significantly; secondly, since electricity was not available, it was not possible to take advantage of audio and video supports, absolutely necessary for the exhibition. Driven by this need, the designers decided to develop an augmented reality app [17] to support storytelling, which would act as an element of interaction with visitors and which allowed to make certain video content available.

The web-app was built through several experimental web libraries and frameworks (Majchrzak et alii, 2018). The foundation for in-browser AR content was AR.js, an open-source augmented reality library AR.js [18]. To handle 3D models and animated content, three.js [19], a 3D JavaScript library, along with several community-developed add-ons, was also employed. Finally, for one of the scenarios, jeelizFaceFilter, an open-source face filter JavaScript library, was implemented.

For a marker to be understandable by the library, it needs to meet certain criteria. The marker must be square, it must have discernible boundaries from its environment and needs to be rotationally asymmetrical. The web-app handles 68 distinct markers, where each needs to be different enough to one another in order to not gather false readings. The AR.js and three.js libraries were used on top of A-Frame [20].

WebVR is an open specification for the web that aims at bringing device-independent virtual reality content in any mobile browser.

A-Frame is usually employed for in-browser virtual reality applications such as web game development, and is in general meant to be used with a virtual reality headset.

In order to display augmented content, AR.js binds it to a single marker. In room-scale applications, such markers have some limitations: for larger augmented content [21], normal hand shaking and camera resolution limit the distance at which the content can be confidently displayed. For this reason, a multi-marker approach was necessary. With multi-markers, arrays of four markers placed in a square matrix act as one single marker; even if some of the four markers are out of the camera's sight, the augmented scenario can still be tracked and displayed; this proved apt to an application where the user needs to move freely in the room, without having to focus on each single marker at all times.



Fig. 4 - Liprando Tower. Photo taken by one of the designers of the collective



For instance, if three separate scenarios are present, twelve previously created different markers are stored and loaded. Since changes in environmental features such as lighting and weather conditions would affect the marker recognizability confidence, an area learning script was implemented in the web-app back-end. The script allows the developer to scan the room for markers through the device camera. If at least four markers are found, they're compared with the stored versions and checked if they belong to one of the stored arrays. If both conditions are satisfied, the script determines the pose of each marker in relation to one another and stores it in a file. Once learned, the developer can then proceed to scan and store additional scenes.

These pose files are then loaded as parameters of the web-app for the user devices to correctly place and dimension each scenario in the space.

The user is taken through a brief initial tutorial first, in which he/she will get confident with the user interface and interaction possibilities. At the end of the tutorial, the device's camera and sensors are accessed and the experience starts.

To contextualize, define and make "visible" the macro-scenario in which the narrative was set, a time-line was created to accompany the spectators, decade by decade, from 2020 to 2100. For each decade it was written and made accessible through the augmented reality app, a newspaper article that dealt with an environmental, social, technological, economic or geopolitical trend, underway in the present, considered futuristic and projected over time.

Following the model and the tool of the practice of speculative Design, the articles have been realized by interpreting phenomena of which we have evidence and hypothesizing a plausible development based on the year in which the designers wanted to project the spectators (fig.5).

During the exhibition in Porto the articles were made available in a traditional way, while through the web-app, animations that summarized the content of the article were accessible in augmented reality.

The first nine augmentations in the timeline are

<http://disegnarecon.univaq.it>



Fig. 5 - Timeline experience.

Photo taken by one of the designers of the collective

attached to news articles through the aforementioned marker matrices; each augmented article contains an animation relevant to the article itself that is triggered once the markers are in sight. Once each animation is completed, the user is presented with a question and two different choices about his/her personal stance about the news article. The answers to the questions are collected through the experience; once all nine questions have been answered, the user is then profiled into either the material dimension or im-

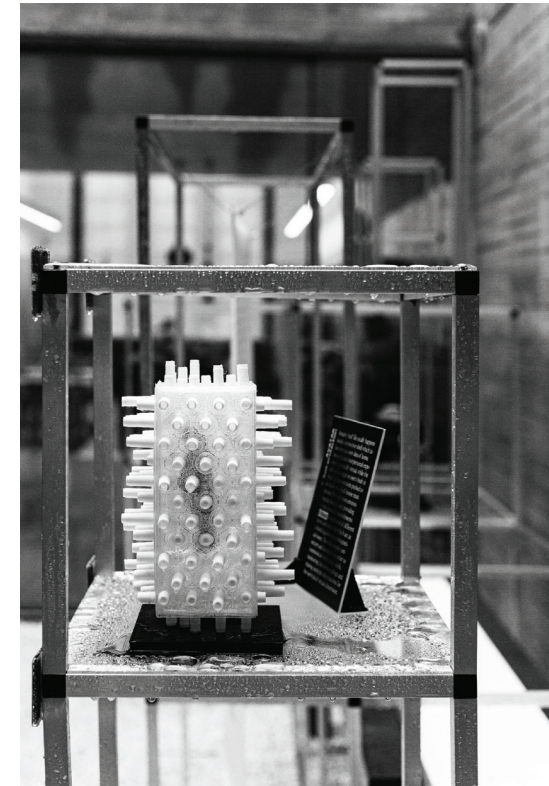


Fig. 6 - One of the 3D printed objects.

Photo taken by one of the designers of the collective

material one, and presented with his/her result. The second part of the exhibition showed, through artefacts produced with 3D printing technologies and the implementation of videos using the augmented reality app, how the different conceptualized human beings will adapt to an environment that will be increasingly electromagnetically polluted, and how they will carry on the heritage, finding the ideal partner and reproducing themselves (fig.6).

The additional eight augmented scenarios were



each composed of complex and/or animated 3D models, thus being rather resource demanding, especially on mid to low-end performance devices. Additionally, to increase the visual engagement of the content and simulate complex behaviours like waves, beams and sparks, particle animations (A-Frame includes an embedded particle system) were developed and integrated. To limit the amount of data that the user's phone had to process and render in real time, and since several behaviours (like the particle animations motion and appearance) all textures, shaders and

particle animations were previously baked (simulated and calculated beforehand, then saved as static files to be loaded accordingly) in the augmented scenes. Once at the avatar scenario, the user could take a selfie and see the augmented filter superimposed in the scenario itself. As stated in a previous paragraph, a possible story was narrated following the storytelling technique, and it was made visible through the exposition of physical artefacts and communicative objects, such as graphic and copywriting parts, and through the augmented reality app.

The purpose of this exhibition, like any other speculative project, was to foster the development of critical thinking about the themes addressed, which could make the viewers more aware of what is happening in the present, trying to remain neutral in the narration of these issues. For this reason, during the exhibition at the FuoriSalone, a third stage was designed, exploiting the architecture of the bell tower, which served as a moment of time for personal reflection and which preceded the conclusions of the exhibition, written from the point of view of the Collective. In these it was stat-

Fig. 7 - Last day. Photo taken by one of the designers of the collective



Fig. 8 - Last day. Photo taken by one of the designers of the collective



Fig. 9 - Last day. Photo taken by one of the designers of the collective





ed, among other sentences, that the point of view of Design and, more generally of the activities of our species, should move from Human Centred to Environment Centred [22] with the community of living beings as a driver [23].

Keeping these conclusions in mind, on the last day of FuoriSalone exhibition a collective meditation session was organized, led by an expert, with the aim of emphasizing how different practices, lifestyles and mindsets could be models that can be pursued with positivity (fig.7; fig.8; fig.9; fig.10).

## CONCLUSIONS

Despite being linked to a case study, these summarized conclusions introduce an interesting topic to try to implement the typical tools and methods of speculative Design and to be able to expand its possible fields of use.

Taking into consideration this case study and the methodology, the tools and the characteristics of speculative Design highlighted in the previous paragraphs, it is interesting to try to define a model that can implement the aforementioned way of doing Design, overcoming its main critical points. As previously stated, speculative Design finds mainly application in the circuits of exhibitions, lending itself to the criticism that is moved to any branch of critical Design, of not being able to generate outputs usable in different contexts than the aforementioned.

The defined role of speculative Design is to act as an activator of the process of critical thinking in the viewer, which, stimulated by the contents and the way in which they are communicated, begins to reflect on the issues addressed. In this sense we can say that, given the nature of the issues typically analysed and described by speculative projects, this way of doing Design is very close to the political one, in the more general meaning of the term (Candy, 2010). Politics deals with themes that are also important for speculative design (Ericson & Mazé, 2011). In this logic, aware of the fact that the “political” activity should be conducted by each person, made part of its dynamics, even the speculative Design

should open its practices and methodology to a wider public, referring to typical tools and methods of participatory Design (Sanders, 2002), such as joint activity sessions and focus groups, games, role plays, activities with cards [24], thus including the possible end users of its outputs in the generation of scenarios and in the planning activities. In this way the users can be more activated in the critical thinking processes, entering even more deeply into contact with the issues addressed. With a greater number of users involved, for example by promoting workshops open to the public, or by practising the methodology in the university environments, the possibility of generating projects that could find applications outside the exhi-

bition contexts will be increased.

In this regard the case study “Post Human Design” becomes important, thanks to the decisions of designers of relying on digital tools such as social networks and the web-app for augmented reality, to create the format.

This, although in support of a work of curation, allows to develop the following question: if the speculative Design is supported, among the various methodological tools, by interfaces and digital tools would be possible to create “products” saleable even in areas other than the exhibition?

Products that therefore diverge from a certain type of format, which become accessible to a much wider public, perhaps because they are

Fig. 10 - Meditation experience. Photo taken by one of the designers of the collective



more involved and participatory and therefore more aware?

Ultimately, and in conjunction with what has been written previously, speculative Design could deepen its relationship with the world of scientific disciplines, transforming them from a simple basin in which to seize themes and design cues, to a germinating bi-directionality: for Science Design could become a tool of projected communication of innovations, discoveries and advances and therefore a tool to interface with a public less aware than the sector's employees. It would become, in the same way that technology is and was, alongside with the environment and sociality, one of the three cornerstones of this branch of the discipline.



## NOTE

[1] Cameron Tonkinwise is a professor at the University of technology in Sydney. He is the director of the Design innovation research centre in the same university. He does research among the themes of Design studies, service Design, sustainable Design, Design for social innovation and philosophy of technology.

[2] The exhibition was curated by Paola Antonelli and Patricia Vecchierini. For further information cfr website <https://www.moma.org/interactives/exhibitions/2008/elasticmind/> [accessed 1/11/2019]

[3] For further information cfr website <https://speculativeedu.eu/>, a platform that shares tools and knowledge around the practice of speculative Design. [accessed 1/11/2019]

[4] For further information cfr website <https://www.quantum-run.com/> [accessed 1/11/2019]

[5] For further information cfr website <https://scholar.google.com/> [accessed 1/11/2019]

[6] Design fiction is a Design practice aiming at exploring and criticising possible futures by creating provocative scenarios, narrated through Design tools. It is a way to facilitate and foster debates.

[7] Rapid prototyping is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three dimension modeling softwares. Construction is usually done 3D printing or additive manufacturing technologies.

[8] The Bench Collective is a group of young designers born in Milano during the 2019. All of them have graduated from Politecnico di Milano in product

Design, interior Design or communication Design. As a group they work in the field of critical and speculative Design and they are moved by the belief that speculation around possible, plausible and probable futures is a fundamental means to use to fuel a critical vision of the present and raise the degree of awareness about critical subjects. One of the author is the co-founder of the group.

For further information cfr website <https://sitontheben.ch/> [accessed 1/11/2019]

[9] FuoriSalone is a brand that works as a container and communicator for exhibitions and events during the Milano Design Week. The last edition took place from 8th and 13th of April. There are usually five districts where it can be possible to find exhibitions and events that correspond to as many areas of the city, which are Brera, Isola, Ventura, Tortona and Sant' Ambrogio.

For further information cfr website <https://fuorisalone.it/welcome/> [accessed 1/11/2019]

[10] The first Porto Design Biennale held during 2019 deals with the themes of new millennium Design, democracy, futures and post millennium tension. For further information cfr website <https://portodesignbiennale.pt/pt> [accessed 1/11/2019]

[11] CRISPR gene editing is a method by which the genomes of living organisms may be edited. By delivering the Cas9 nuclease complexed with a synthetic guide RNA into a cell, the cell's genome can be cut at a desired location, allowing existing genes to be removed and new ones added.

[12] By the term biotechnology it is addressed any technological application that uses bio-

logical systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

[13] Nanotechnology is the manipulation of matter with at least one dimension sized from 1 to 100 nanometers.

[14] Virtual reality is a simulated experience that can be similar to or completely different from the real world. Applications can include entertainment and educational purposes.

[15] The Liprando Tower is the bell tower and the only remaining of an ancient church located in the Sarpi neighbourhood in Milano. It is property of Bordiga Group.

[16] Gilles Clément in his Manifesto of the Third Landscape (2005) describes it as the sum of the space left over by man to landscape evolution, to nature alone. It should be considered as the genetic reservoir of the Planet, the space of the future.

[17] Augmented reality is an interactive experience of a real world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities. It can be defined as a system that fulfills three basic features: a combination of real and virtual worlds, real-time interactions and accurate 3D registration of virtual and real objects.

[18] AR.js is a lightweight library for augmented reality on the web, coming with features like marker based and location based AR.

[19] Library of contents for JavaScript.

[20] A-frame is a web framework for building virtual reality experience.

[21] The smallest augmentation in the web-app is 33 cm wide.

[22] Human centred Design is an approach to problem solving that develops solution by involving the human perspective in all steps of the problem solving process. Here the hope of the designers is to be able to see the switch from this perspective to a one based on the Environment as the sum of all living beings.

[23] In the second performance at Porto Design Biennale, again for this reason, the conclusions were omitted.

[24] For further information cfr website <http://dirtoolkit.com/participatory-design/>. [accessed 1/11/2019]

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