Socio-enactive Systems: The Hospital Scenario

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Abstract. This technical report presents the preliminary results from the work group "GT Hospital", a subgroup from the Socio-enactive Systems research group. GT Hospital will explore the "socio-enactive" concept within the context of a hospital for craniofacial rehabilitation. In this first year of project, this group has explored the scenario with the lens of Organizational Semiotics via DSC (Socially Aware Design) system; developed preliminary products for proof of concept and a communication protocol. This research is supported by FAPESP, process #2015/165280.

Keywords: Socio-enactive systems, enactive systems,

1. Introduction

In earlier days, computer use was limited to performing tasks that were well defined and most often spatially confined to individual offices. Today, digital technologies are present in many areas of our lives and are used for a variety of purposes at all times, everywhere, and by many people interacting together. The current ubiquitous and immersive scenario demands new forms of interaction, making those earlier definitions of HCI (Human-Computer Interaction), that put the computer and the human being as separate systems, obsolete. More in line with contemporary needs is the concept of "enactive systems". According to Kaipainen et al. (2011), an enactive system does not assume traditional interfaces (i.e., one that uses graphical interface manipulated by traditional input devices such as mouse, keyboard and touchscreen), nor does it follow patterns of goal-oriented interaction models and conscious human actions. The premise is that interactions occur in an "embodied" way, that is, guided by the body's involvement and the human agent's spatial presence. Moreover, in these interactions, a conscious control of the system is not assumed to exist (Kaipainen et al., 2011). In an enactive system, the system can pick up information (e.g., collect user data) during interaction and respond accordingly. The user's (body) reactions to the system's response, generate new inputs to the system. This cycle goes on in a dynamic and nondeterministic way.

Usually, enactive systems relies on techniques and findings coming from Artificial Intelligence and Affective Computing. In Affective Computing (Picard, 1997), users' emotional responses are recognized in an automated way by computer systems and used to promote interaction improvements. This type of approach, based on objective and static information, can be considered as an "informational" approach (Boehner et al., 2007) to the treatment of affection in systems interaction.

In contrast to informational approaches are "interactional" approaches (Boehner et al., 2007). Such approaches seek to preserve the subjective nature of emotions. Boehner et al. (2007) argue that affective interactions are dynamic, culturally mediated and socially constructed experiences. That is, affection is a product of a living society. The values and culture of society are important in building meaning for affective states, affective behaviors, and words that denote such states and behaviors.

On the one hand, purely informational approaches lose the richness of meanings and accuracy of actual emotions. On the other hand, purely interactional approaches can produce results that are considered too subjective or too specific for a certain group. One of the objectives of our research is to act in a way that respects users values, cultures and the dynamic and rich essences of varied possibilities of interpretation of emotions. At the same time, we seek for flexible interactions, based on informations from sensors, statistics, providing relatively predefined responses. One of the goals of this research is to combine both informational and interactional approaches in systems to be co-created with(in) a community of users in a hospital setting. Our research scenario is embedded in Project "Socio-Enactive systems: Investigating New Dimensions in the Design of Interaction Mediated by Information and Communication Technologies", a FAPESP Tematic Project (#2015/165280). Project Socio-enactive Systems is based in three scenarios, one of them being the Hospital one. The Project Socio-enactive Systems was proposed based on the premise that social relationships that exist in the world are strong and they must be explored and made sense in mediating systems that are situated. This means that the design of systems should extend and perpetuate existing relations and interactions that take place in a physical space (Baranauskas, 2015). This approach demands a socio-technical perspective for investigation.

In a social responsible perspective, Baranauskas (2009, 2014) articulates ideas inspired by Organizational Semiotics (Liu, 2000) and Participatory Design (Schuler and Namioka, 1993) to propose a framework that considers a dialogue with design materials and mainly among individuals in their different roles (e.g., designer, developer, user, other stakeholders) to conduct participatory work in interactive system design. For this author, the technical aspects of system design depend on and impact the formal and informal aspects of organizations and society. A technically centered perspective prevents those involved in a design context from a wider sense-making of the problem being handled and the solution being proposed. Instead, Baranauskas argues that any design process must be understood as a movement from the outside to the inside of the Semiotic Onion: a social process that starts in society, crossing the informal and formal layers of signs towards the construction of the technical system, returning from the technical layer and impacting the formal and informal layers, and society. When moving from outside to inside the onion, the movement favors the identification, articulation, and formalization of relevant aspects of the social world (e.g., stakeholders' values, culture, expectations, tensions), generating new knowledge and awareness of the social context. Therefore, when returning, moving from inside to outside the onion, the movement occurs in an informed way, reflecting an understanding of the social world, making sense to stakeholders and, potentially, promoting acceptance and adoption. Therefore, Baranauskas' socially aware approach to design will be adopted as a theoretical and methodological frame for this research scenario, as it has been proved to provide a systemic and socio-technical understanding and acting towards interactive technology design.

In Project Socio-enactive Systems, this socio-technical view is articulated with the concept of enactive systems mentioned before. The results from our work group "GT Hospital" shall contribute, among other things, to the definition of the socio-enactive concept.

This report is organized as follows: the remaining of this section describes our research partner/scenario; Section 2 presents the related work and presents a proposal for organization under the view of Organizational Semiotics; Section 3 informs our preliminary investigation and its results; Section 4 discusses challenges and possibilities and Section 5 concludes this report.

1.1 SOBRAPAR

SOBRAPAR stands for "Sociedade Brasileira de Pesquisa e Assistência para Reabilitação Crânio-facial" (Brazilian Society for Research and Assistance on Craniofacial rehabilitation). SOBRAPAR[1] is a private institution with philanthropic nature. The hospital was created in 1979 and since then has been treating patients with craniofacial deformities, including anomalies (birth defects) and traumas (e.g., resulting from tumors or other conditions). The hospital's structure includes 3 operating rooms, 19 rooms, a pediatric ICU, post anesthesia recovery with 5 beds, orthodontists, a research lab, as well as a "toy library" (brinquedoteca), among other resources. The hospital also offers residency programs on Plastic and Reconstructive Surgery; and courses and talks on speech therapy, psychology and plastic surgery. Moreover, SOBRAPAR also hosts important scientific events themed according to its main services and treatments. These activities are summarized in their mission statement: "to rehabilitate those in need with craniofacial deformities, integrating them in the society and promoting their well-being throughout a multidisciplinary performance with ethic and humanized quality; and also to carry out the activities of: Assistance, Education and Research."

SOBRAPAR is located in the neighborhood of the University of Campinas (UNICAMP), to which the members of our research team are either affiliated or compose its alumni group.

2. Related work

We conducted an exploratory search of scientific literature and computational systems related to the concept of enaction and its applicability within a hospital context. The search of scientific literature was conducted between May and August of 2017 on ACM and IEEE bases, combining terms such as "children hospital" or "hospitalized children" with "interaction design" or "human-computer interaction". The search of existing

[1] http://www.sobrapar.org.br/

computational systems was conducted in curated galleries of examples made with the hardware-oriented prototyping frameworks OpenFrameworks (http://openframeworks.cc/) and Processing (https://processing.org/). OpenFrameworks is an open source C++ toolkit for "creative coding", Processing is a "flexible software sketchbook and a language for learning how to code within the context of the visual arts", offering a simplified Java syntax. We included examples from the galleries that we judged to be related to the concept of "enactive system" as well as applicable within a hospital context.

2.1 Scientific Literature

Solutions for hospitalized children can be found as robots in the forms of an animal (Jeong et al. 2015; Blom et al., 2011; Akabane et al.); wearable device (Teh et al, 2009); or tangible systems (Akabane et al., 2010; Pykhtina et al., 2012).

The simplest solution is the CareRabbit (Blom et al., 2012). The authors argue it is quick, easy and secure to implement. It is a device in the form of a white rabbit that receives and plays mp3 files. Family and friends can send messages, stories and music to children in hospitals.

In the category of tangible interactions, most of the solutions presented mix manipulation of an object with the visualization of video in monitors. Zootopia is a system composed by a board game (map made of cardboard) with action figures and a monitor. For the action figures, there are those in the form of animals, and an avatar to represent the child. This avatar can be moved freely around the map and it is embedded with RFID reader. The map has RFID tags and whenever the avatar is placed in one of them, a video starts playing at the monitor. The video is related to the corresponding animal placed in the map. The same authors of Zootopia proposed Puchi Planet (Akabane et al., 2011). The last one keeps the idea of displaying videos of different animals via a monitor. However, they use other material, without the need of a cardboard base. These materialinclude a stuffed planet (a soft ball covered with an atlas made of fabric), a wooden airplane to simulate flights around the planet, among other toys. They also rely on the RFID technology for interaction. The fabrics that cover the toys are removable and washable.

Billow (Rueb et al., 1997) is an older tangible proposal from 1997 that is still appropriate for today's settings. The child handles an object in the shape of an egg to control the images of clouds that are displayed on a video monitor. The egg can command the clouds to play different kinds of music. The egg has buttons, a microphone and it connects via radio signals to a local computer, placed under the child's bed. The egg can also be used to command the establishment of voice connection with a child from another room in the hospital.

For children who are not confined to a hospital room, Huerga et al (2016) have conducted two design play workshops, one for each game: Doctor Giggles and X-Safari. With Doctor Giggles, the image of an interactive operating room is displayed on a video monitor and children can interact with its elements, like X-ray machine, scissors, and syringe. These objects, however, have different uses in the game (e.g., syringe is a magic wand) and the objective is to make the character (a doctor) laugh. The authors asked children to create their own play characters using X-ray sheets. It is not clear how the characters were incorporated in the game. With the second game, X-Safari, children wear a glove device to hold the characters they create – again they create their play characters out of hospital supplies (e.g., cotton, medical gloves, band aid). With the glove device children control a horse character that is displayed in the video monitor.

One solution for playful communication system between child and parent is The Huggy Pajama (Teh et al. 2009). This system allow parents to send hugs to their children. At one side, the parent hugs a doll. The doll, equipped with 12 sensors, senses the hug and transmits it to a wearable device. The wearable device consists of a pajama that changes color and it has 12 air actuating devices. The air actuating devices correspond to the 12 sensors in the doll. Air is pumped into the devices in a way that the pressure it exerts simulates the feeling of being hugged. Moreover, the pajama has a flower pattern made of thermodynamic ink that is activated by conductive yarn. The changes in color indicate the distance the parent is from the child and the warmth contributes to the sensation of being hugged.

Another proposal involving the idea of hugging is Huggable (Jeong et al. 2015). Huggable is a robot developed at the MIT. It is a teddy bear that can be operated remotely; it moves its joints (elbow, shoulder, etc.) and nods and tilts its head. Given a specific coordinate, which is transmitted via wireless communication, Huggable can point and look at specific directions. The joints of Huggable are flexible enough to allow not only its movements by command, but also to allow children to manually move the robot's arms and legs, as they would in a regular teddy bear. Moreover, Huggable has eyelids that can move and pupils that can vary in size. All these movements together provide Huggable with emotional expression and nonverbal communication skills. Capacitive touch and pressure sensors are spread throughout the body of the robot. The pressure sensors located in its paws are meant to let children express intensity of pain by pressing the paws in a harder or softer way. These sensors located at the bear's arms can be replaced by other sensors or parts. For example, in order to let children pretend that they are applying an injection to the bear, a place for injection can be attached to the arm. Also, like in Puchi Planet (Akabane et al., 2011) the fur is removable and washable. This was intended as an infection control mechanism at hospitals. Even though Huggable was designed based on medical staffs' suggestions, it stills needs further testing. The initial user study had only four participants, from which two were healthy and not under hospital treatment.

Very similar to Huggable, there is Probo (Saldien et al., 2008). Probo is also intended to be huggable. It looks like an elephant and it can also express emotions via its eyes, which can move and tilt. Also Probo's trunk, ears and mouth move to aid to the expression of emotions. The remote communication with family and friends takes place from Probo's belly, which has a touch screen interface. Probo is expected to make sounds, as a non-existing, affective language.

These robots, Huggable and Probo, gather many elements that were used separately in other solutions described before. The authors have considered many important aspects, not only in terms of sensors and adaptability, but also in terms of safety in health environments.

2.1.1 The Semiotic Framework as a tool to organize findings

Inspired by Almeida and Baranauskas (2008), who proposed an analysis of results from literature using artefacts from Organisational Semiotics, we organized proposals related to 'children at hospitals' also using the Semiotic Framework. Figure 1 summarizes the main elements of the Semiotic Framework instantiated for our research.

The physical world includes devices – mainly hardware or other objects – that are used to build the solution. Most of them are in the form of sensors that are set inside an object of interaction. Be it animal toy, board game or wearable device, usually the interaction happens via a tangible object. The sole presence in the ambience was not explored in the articles found. Also relevant for the physical layer are power supply issues: How the object of interaction will be powered? Do they fit hospital environment and children's conditions in it?

The concerns related to the empiric layer were also related to the object of interaction: how many users can the object handle at a time? Does the internet server or connection support this amount of information? How long does it take since the recognition from a given sensor takes place until a feedback is displayed?

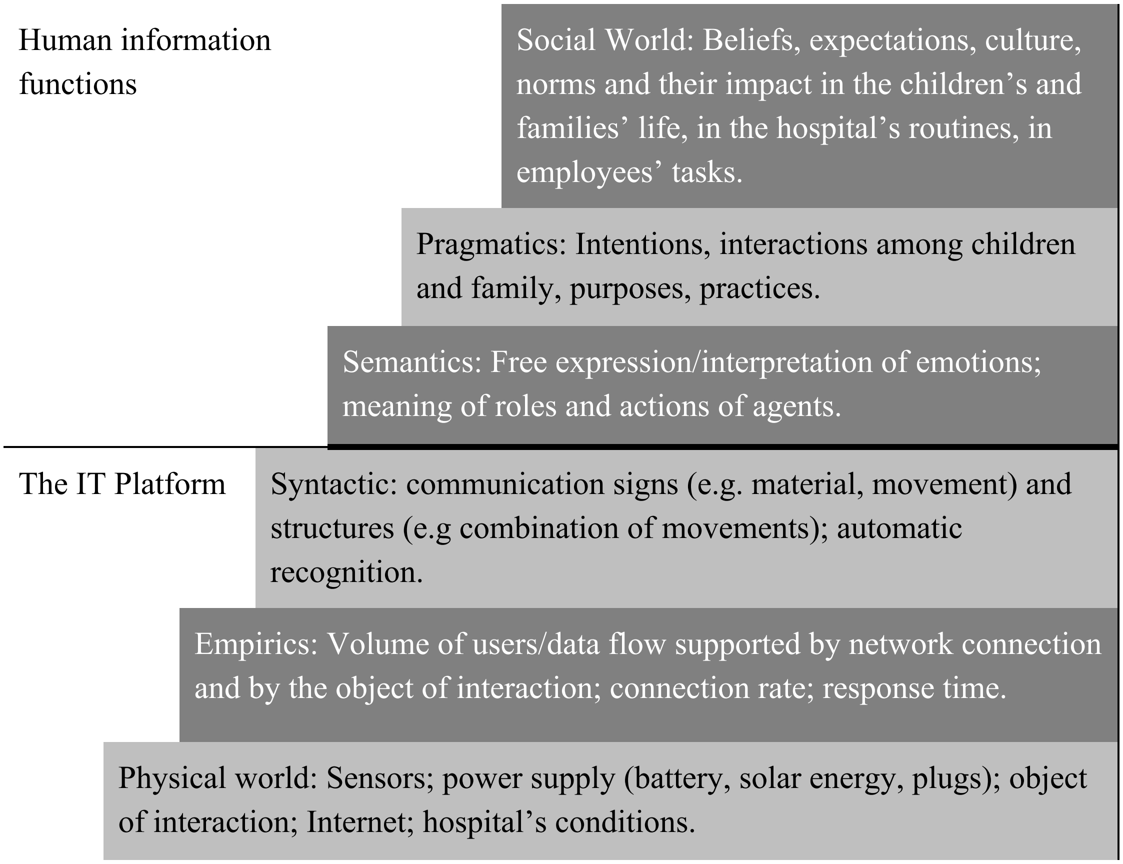

Figure 1 - Semiotic Framework instantiated for systems for children care.

The information captured by sensors or other devices must be treated in a defined structure so that the system can use it. This structure serves as basis for the semantic layer, informing possible ways to treat meaning and sense making. This concerns the syntactic layer. Solutions based mainly on informational approaches are usually focused on these three base layers of the Semiotic Framework. Interactional ones are often more concerned with the top three layers, for which meanings, intentions and social impacts are main issues.

Based on this instantiation of the Semiotic Framework, we organized the main elements from works on digital technology for hospitalized children. The information is listed in Figure 2.

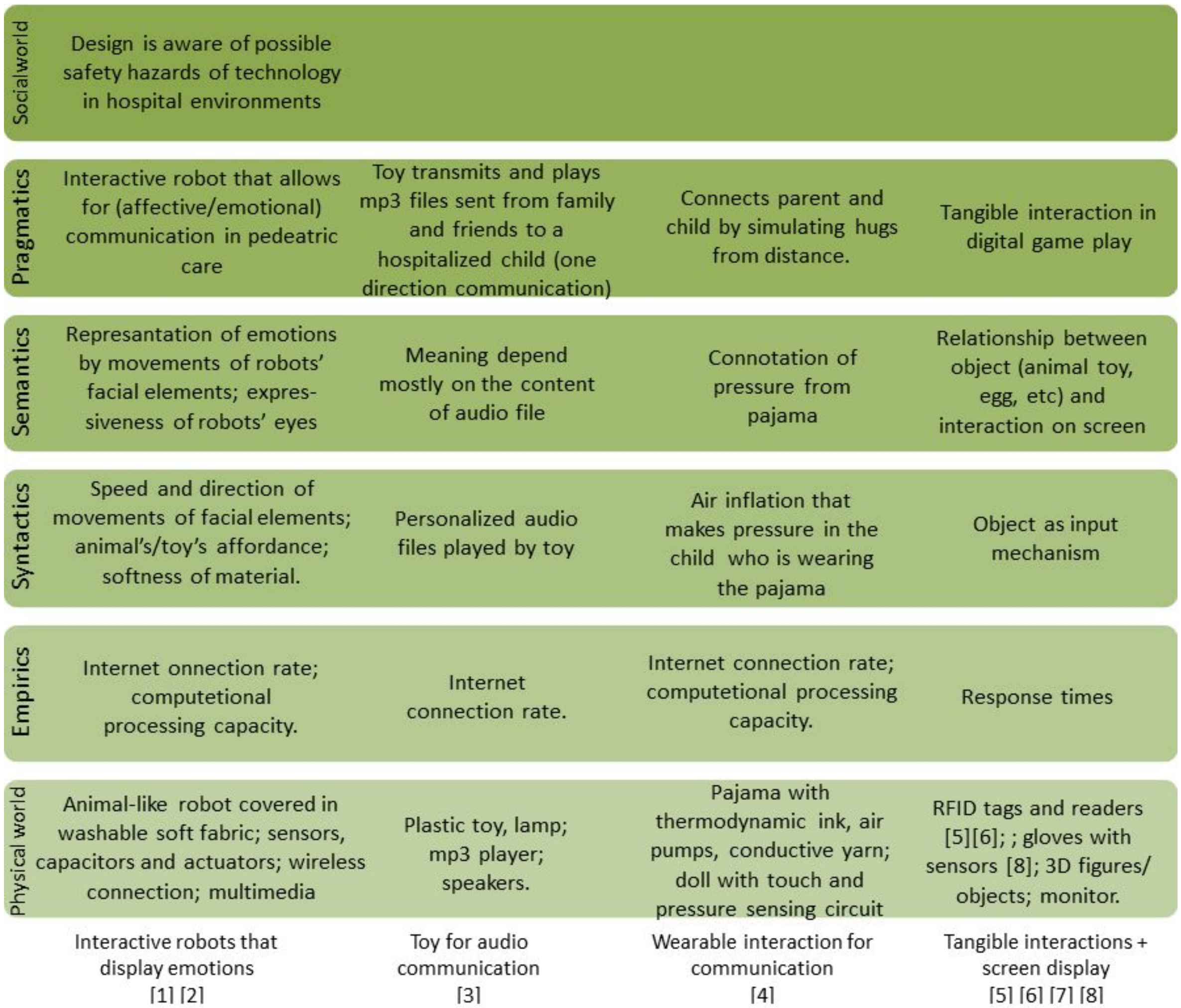

Figure 2 - Organization of related work using the Semiotic Framework; [1] Saldien et al., 2008; [2] Stieh et al., 2009; [3] Blom et al., 2012; [4] Teh et al., 2009; [5] Akabane et al., 2010 and 2011; [6] Ruerb et al., 1997; [7] Huerga et al., 2016.

2.2 Computational Systems

Petting Zoo (http://minimaforms.com/#item=petting-zoo-frac-2) is a "speculative life-like robotic environment that raises questions of how future environments could actively enable new forms of communication with the everyday". The so-called "pets" are tubes with sensors and actuators that react to people's presence and movements and that change those reactions based on artificial intelligence algorithms. Different behavior patterns of animals have been simulated (curious, scared, playful, etc.), and the pets enable multi-user interaction.

Fig. X. A Petting Zoo installation (image source: http://minimaforms.com)

Light Kinetics (http://www.espadaysantacruz.com/projects/light-kinetics) is a generative installation in which light behaves as a matter under the laws of mechanics. In one installation, e.g. light "moves down" a see-saw when manipulated by a person.

Fix X. Light Kinetics (image source: http://www.espadaysantacruz.com/projects/light-kinetics)

Vivolux (http://felixros.com/vivolux.html) is a wearable that measures one's breath intensity and maps it to a light shown "inside" a person's hand. It explores the idea of "finding peace".

Fig. X. Vivolux (image source: http://felixros.com)

Mimic (http://www.creativeapplications.net/openframeworks/design-ios-mimic-putting-emotional-machines-within-arms-reach/) is a project experimenting how to "imbue" a robotic arm with personality to allow socializing with people.

Fix X. Mimic (image source: http://www.creativeapplications.net)

All of the systems presented in this subsection show some aspects of "enaction" in the sense of Kaipainen et al. (2011). They provoke some behavior of a person which in turn provokes a behavior by the system. Mimic, for example, facilitates some simple form of communication. By observing the light intensity of Vivolux, a person might become more aware of her breathing, adapt the breathing pattern and even meditate supported by the artifact. Light Kinetics is probably the "least enactive" example on the surface, since it uses a "simple" physics engine that does not adapt its behavior. The "pets" of "Petting Zoo" interact with a single person, groups of people and even with themselves. They adapt their behavior persistently and thus show some capacity of "learning" or "memory". For example, if a "pet" was "startled" by a person, it might react more "cautious" in future interactions with other people. Petting Zoo and Mimic use artificial intelligence to adapt the systems' behaviors. Vivolux is based on Arduino Lilypad and related components.

3. Preliminary investigation of socio-enaction in hospital settings

SOBRAPAR Hospital has different areas with different characteristics, purposes, and public. Clinics, rooms and beds, reception, cafeteria, toy library, etc, they are all an important part of the treatment offered to children and their family. This scenario presents varied interaction possibilities and resources to be explored towards the creation of socio-enactive systems. The previous section presented some related work in hospital setting as well as some interactive enactive systems. However, as can be seen in the Semiotic Framework (Figure 2), few of the initiatives are aware of the social world layer. To conduct a design process that is socially responsible is a challenge, especially in this delicate context, in which the impacts may influence children's life and health. In face of such technical and socio challenges it is of paramount importance to have a clear understanding of the context before starting any participatory activity at the hospital. Moreover, as the concepts of enactive and socio-enactive systems are not trivial, it would be easier to start activities with more concrete examples of systems. In this sense, the preliminary investigation of socio-enaction in hospital settings involved the research team of GT-Hospital. who conducted a preliminary investigation to understand the context and developed initial IoT applications.

3.1 Participants and method

Organizational semiotics and the Socially Aware Design offer tools that support the process of problem understanding and they will be explored with participants at the hospital. We wanted to use the same artefacts for our preliminary investigation. However, gathering the distributed team of researchers is an expensive task. The solution for this problem was to use SAwD.

The Socially Aware Design (SAwD) system (Silva et al., 2016) is a CASE tool designed to support the understanding of a design problem and it articulates artefacts and proposals from Organizational Semiotics (Stamper, 2000) and the Socially Aware Computing (Baranauskas, 2014). Being collaborative and online, SAwD was the ideal tool to help our group in this initial task of identifying main stakeholders and related problems and respective possible solutions. Members of GT-Hospital (including researchers and professionals from the fields of Computer Science and Anthropology) participated, each in their own time and place.

The idea was to gather information as a preliminary exercise. This activity not only helped researchers in the direction of finding a common ground on the subject but also contributed to prepare for a similar activity that shall take place with stakeholders at SOBRAPAR. To support our activity, 2 artifacts available in SAwD were used: The Stakeholder Identification Diagram (SID) and the Evaluation Frame (EF).

The tool and discussions guided the team towards possibilities for development of example systems that will be brought to the hospital. The discussions culminated at the idea of SobraPets. These results are presented next.

3.2 Results

SID is an artifact that invites the analyst to reason and identify interested parties who may be direct or indirectly affected by a problem or its solution. For the Sobrapar context, important stakeholders were identified in advance, as illustrated in Figure 1: Family (especially the mother), school, best friends, school friends, staff from doctors, cooking and cleaning staff, entities such as the National Health System, FAPESP, City Hall, etc.

The diversity of interested parties allowed the group of authors to think beyond obvious class of stakeholders and the scenario scope, prospecting different ideas, problems, challenges and opportunities the identified interested parties would bring to the research scenario - see Figure 2.

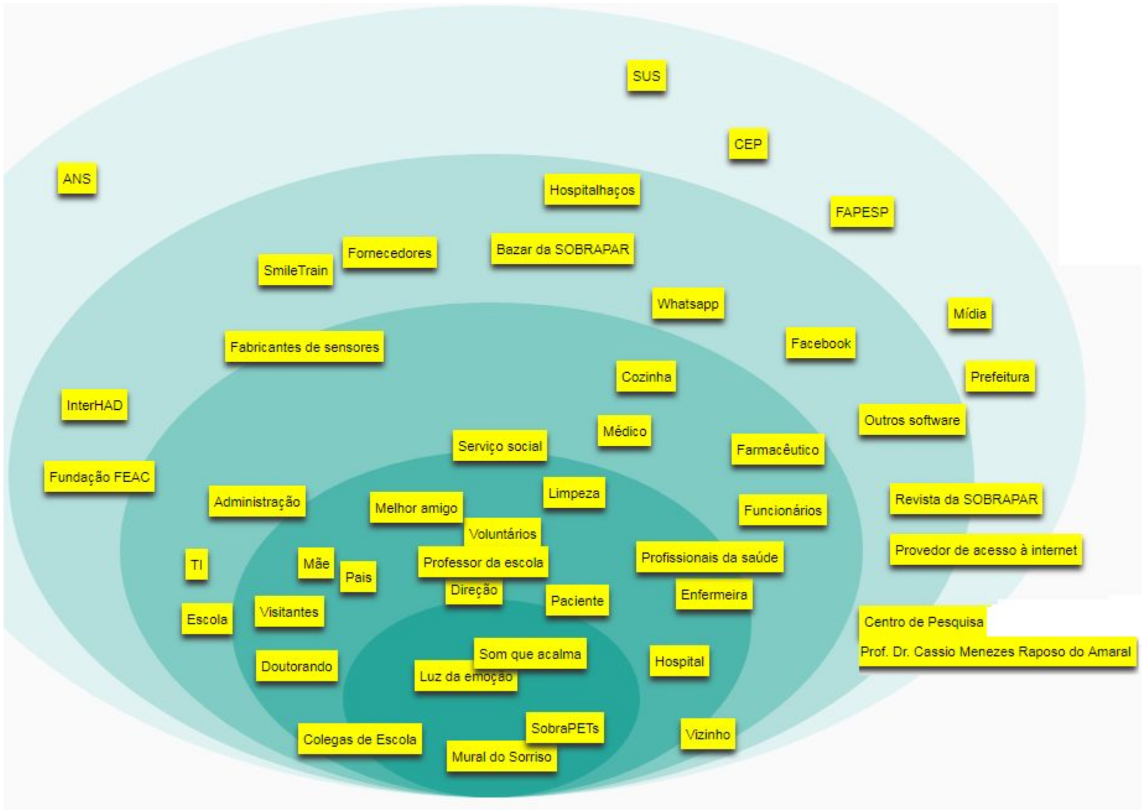

Figure 1. SAwD's artifact to identify interested parties.

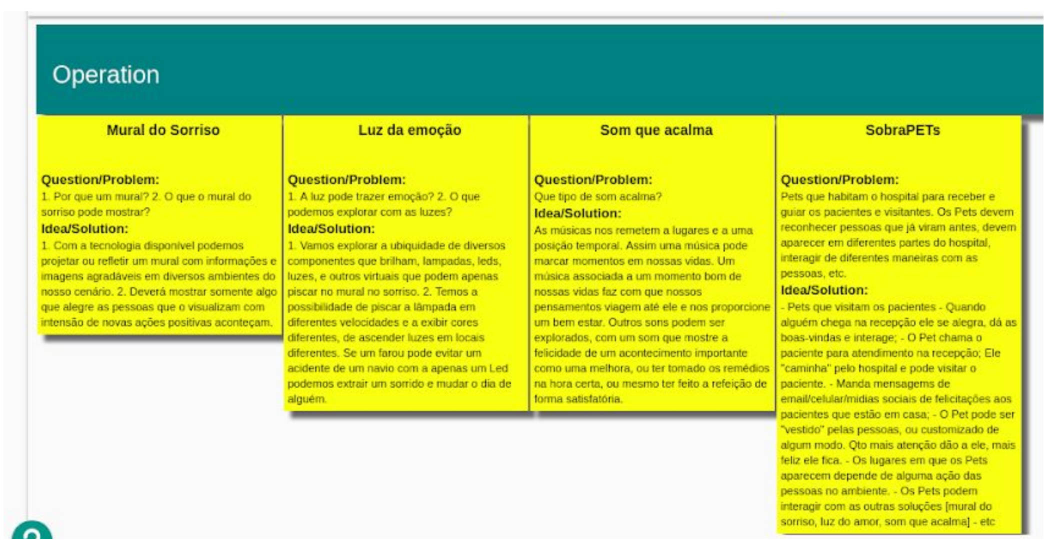

Figure 2. SAwD's artifact to prospect information related to interested parties.

The EF artifact supported the authors to look at the research scenario as wide as possible, previous to any action in the scenario context. Different challenges and ideas emerged, resulting in the proposition of a first exploratory solution to be designed to work with representatives from the interested parties in the Hospital setting.

3.2.1 SobraPet

From the problem understanding activities developed by the authors different proposals were discussed, such as an Interactive Mirror, A huggable pet, software applications, smart interactive devices, and so on - ideas were documented for future design rationale[2]. From the ideas, a theme for interactive solutions engaging different interested parties emerged: the SobraPets - a thematic scenario in which pets inhabit the Sobrapar hospital and interact with people via several modes and devices. The first solution to be designed for participatory practices with interested parties is a huggable pet and its accessories to promote people wellbeing and socialization activities in the hospital reception. The information captured from the interactions with the huggable pet will be stored and will be presented in a "Hug-o-meter". It is expected that the hug-o-meter will provide interesting facts about interactions, showing an affective portrait of general mood of the environment.

In the following subsection, we present some details of the general infrastructure conceived for the research scenario. Figure 3 illustrate one of the first versions of our huggable pet: the SobraDog. It has sensors inside that can perceive if its is being hugged. The information is communicated to the IoA.

[2] https://docs.google.com/document/d/1wER8ufv3dKrFP1a5tmO5vI9opXsIzW1n0LpGwAB-5EA/edit
https://docs.google.com/document/d/1oSJ706PiwvfhJaAtFyijL3Pqz_L-xMGsFjTIGIso0N8/edit

https://docs.google.com/spreadsheets/d/13DrBuEhY2MtPz6ymOoAvKvnFuK_eV9My3JxGhH-yGTc/edit#gid=0

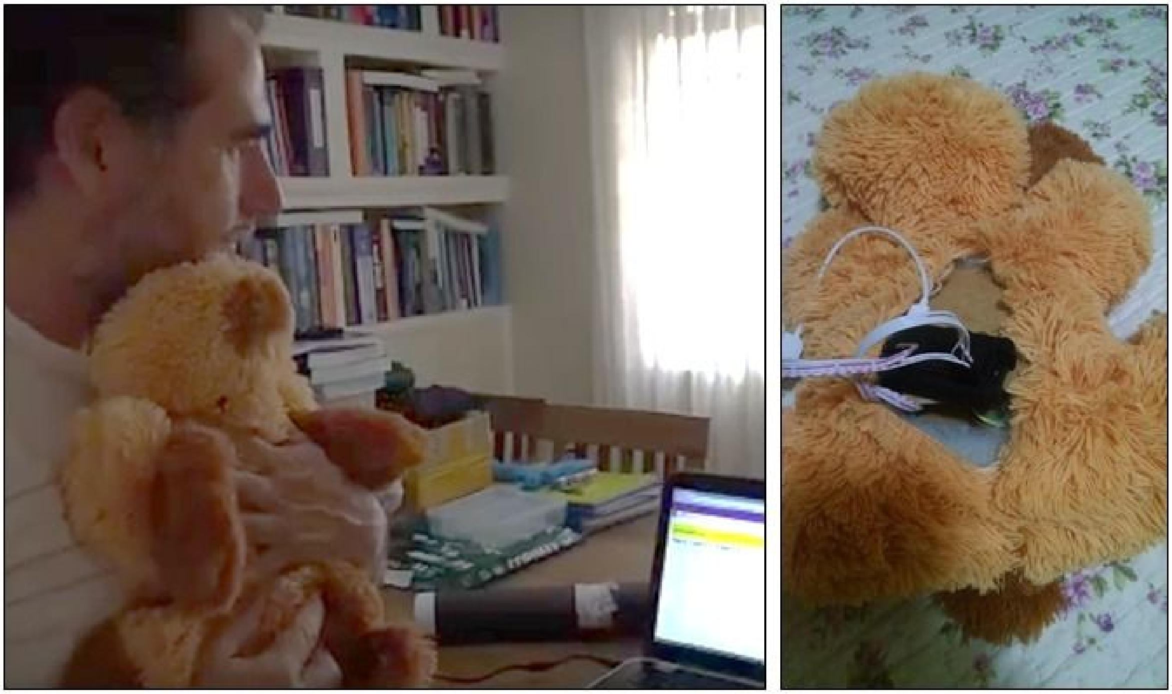

Figure 3 - One of the alpha versions of a SobraPet.

Communication architecture (websocket).

The essence of a system is communication. For an IoT system we need to promote communication between the components. Objects that are part of the IoT system can be input, output, or both agents. These objects are agents that need to exchange information inside the system with other objects or even with objects or services that are on other systems.

The suggested communication proposal was inspired by a chat room. The following cases should be considered:

a) first case, in a chat room, everyone can talk to everyone. Each one captures what interests him, processes the information and can issue response to everyone as well. In the proposed communication architecture, the elements (objects that are part of the IoT system) may communicate (talk to everyone) as well.

b) second case, small groups can exchange information in private chat rooms. Usually in this small group everyone is interested in the same subject. Similarly, our architecture allows sets of objects to communicate.
c) and finally, third case, in which message exchange is restricted to only two participants. These participants connect directly through a communication channel and everything that one sends to the other must be processed. This is the case when two objects that compose the IoT system share interests specific to one other.

A server for requests from an IoT network is under development and is located inside the domain (www.nied.unicamp.br/ioa). It already receives information and sends a response, so it is a structure in which only the logic of each call needs to be addressed before sending a response to the caller or triggering notifications to other recipients (objects, services, systems, etc.).

An important characteristic in this communication architecture for IoT systems, which is detailed next, is that both objects and people are considered stakeholders. In this sense, the Internet of Things becomes Internet of All.

"Objects" are daily objects that are equipped with sensors (accelerometer, presence, pressure, gyroscope, etc.) and compact processing units (e.g. Raspberry Pie Zero) that are connected to the internet. Our System will control the communication among objects (and/or people) following the format described above (the chat room analogy).

Following is the code for data synchronization of a mobile phone or tablet with Android operating system with the IoT server that will be the basis for our studies.

Base code for Android

- **Server Configuration**

```
private Socket socket;
{
  try {
    socket = IO.socket("http://URL:PORTA//");
  } catch (URISyntaxException e) {
```

```
        e.printStackTrace();
    }
}
```

- **Start connection**

```
socket.connect();
```

- **Send data to server (using JSON[3] format)**

```
socket.emit("dataEM", "{'valor':valorX}");
```

- **Receives values processed by the server in JSON format**

```
socket.on("onData", new Emitter.Listener() {
  @Override
  public void call(final Object... args) {
        runOnUiThread(new Runnable() {
        public void run() {
            JSONObject data;
            String tag;
            String id;
            try {
                data = new JSONObject((String) args[0]);
                valueReturned = data.getString("value");

            } catch (JSONException e) {
                return;
            }
            if(logical_expression){
                 callEvent(valueReturned);
            }

        }
      });
  }
});
```

[3] http://json.org

In the server the code structure remains, since it was chosen the same technology, although in another language of programming. Thus, we want the base code to be replicated to components that make objects, and on the server only the logic is coded.

Internet of All (System).

A management software for the Internet of things need to know which objects belong to a specific user indicating a single value as a reference, its type, and rules of communication between objects. We understand that people interact with these objects, which capture the information or are responsible for reporting any type of feedback interactions that should affect people who are close to or interacting with a particular object in specific.

The following are some of the project forms for the Internet of All (IoA) system, which is currently at www.nied.unicamp.br/ioa. Figure 3 shows the login form and igure 4 shows sign up form. Figure 4 is an initial form with the objects already registered and that allows access to a registration form.

Figure 3 - Forms: Login and Signup.

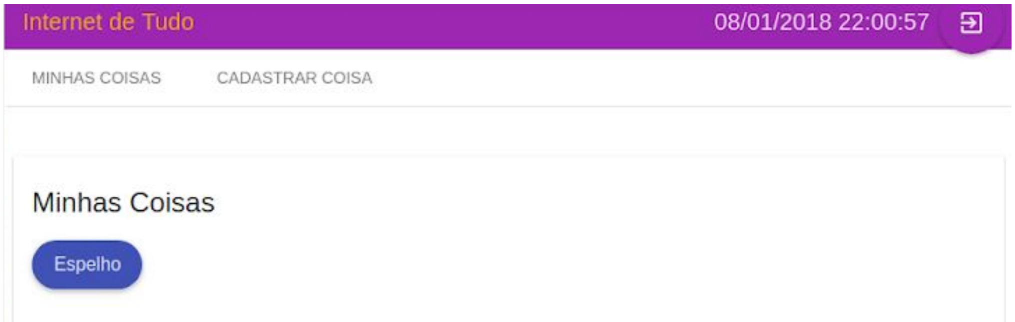

Figure 4 - Start form with my things and Signup things.

The IoA System makes use of the codes described in 4.1.1. allowing communication to occur between the objects and the IoA management system. The next steps the system will increase based on the needs required for setting up an Internet of Things environment.

4. Discussion

The previous section described the architecture of IoA, which manages the communication among Objects or things in an internet of things environment. In the (eco)system in which the IoT solution will be immersed, each Object can be seen as an agent. Agents perform actions; and these actions can be modeled as a representation of invariant patterns of behavior.

The relationships between the System and each Object, or between Objects, can be mapped according to the actions they perform, which follow/determine specific Norms. These Norms may vary according each scenario. Agents and their behaviour depend on other agents' behavior and this relationship can be mapped. This map provides a broader picture, which describes how the management (the IoA system) should work. The ideal result is the composition of an environment (system + people + objects) that not only supports people but also is in harmony with existing habits and culture. It is from this concern that the research questions that guide Project Socio-enactive Systems derived:

1) How to manage socio-enactive systems in an inclusive and socially responsible manner?

2) How can human values be considered in the development of socio-enactive systems?

3) How can meaningful processes inform the design of socio-enactive systems and, at the same time, be constructed from the participation in these systems?
Considering the need to support interaction preserving the existing social settings, it is necessary to understand the formal and informal rules that guide interactions in that social group. This is the main contribution of the investigation conducted with SAwD. SID and EF helped us in this effort and this understanding is an important initial step towards socially responsible design.

In order to start the construction of our concepts for socio-enactive systems for the hospital scenario, we have investigated the literature and existing applications and we have analysed the results under Organizational Semiotics' lens. In order to deepen our understanding, next steps include a study on human values, using tools appropriate for this quest - VCIA, Value Pie and others (Pereira and Baranauskas, 2015) - which are also available on SAwD.

The socio-technical approach to design supported by SAwD and the design process that will be conducted at SOBRAPAR are informed by the Semiotic Onion and, at the same time, they can be analyzed with the Semiotic Onion. At the informal layer, which is where the process starts, are SOBRAPAR itself (with its daily customary activities, habits, culture, values) and the workshops that will be conducted (Semio-participatory workshops, Baranauskas, 2013). The formal layer include the processes that organize daily actions into specific norms, which in turn will guide the development of solutions like SobraPets. SobraPets, hug-o-meter and all base communication architectures are themselves in the technical layer. Also in the formal layer is the process that shall characterize the socio-enactive concept. This concept will be both inform our processes and methodology as well as it will be conceived, formed, structured from these processes.

5. Conclusion

Technologies are created and or modified and incorporated into the daily lives of people who assimilate and try to give meaning to them. In this document we present how practices organized from Organizational Semiotics and Socially Aware Design helped us to develop a shared understanding and proposal of technology solutions to be explored in participatory workshops in the Sobrapar Hospital Scenario.

The technical report presents preliminary results from discussions and proposals of solutions of systems for hospitalized children. The results provided a better understanding of the context, a more comprehensive view of the research scenario. Next steps involve designing the first version of a pilot solution and planning participatory workshops to be conducted in the Sobrapar scenario with representatives from the interested parties.

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