

Do humans dream of talking objects? Repairing as listening to unanimated objects' stories

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ABSTRACT

It is well known in the medical practice that an important part of the strategy required to achieve any good result always includes listening to what a patient has to say regarding its symptoms. Planning any medical treatment, hence, begins with listening to a story of the subject (the symptoms identified by the patient) together with the story of the body (chemical / physical analysis). Considering now a broken object as a subject of treatment, would listening to its story provide an aid to its repair? We here claim that the answer to this question is affirmative and that such process might work also for unanimated objects, granted that the right stories are coded, preserved and told. Two suggestive questions hence emerge: how can objects tell their stories? And, continuing, what should an object say in order to guide its repair process?

Author Keywords

Repair, storytelling, talking objects, gesture recognition, symptoms.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

1. TALKING OBJECTS

The typical process that leads to the diagnosis of a disease walks through an initial phase where a doctor listens to its patients' stories, then searches for any visible sign of the reported symptoms, finally evaluating the results of a number of relevant lab tests. Hopping back and forth between these information sources, a doctor typically ends formulating a theory regarding which are the possible causes of the observed symptoms and proposing a treatment plan for their definite eradication. All in all, we can summarize this process in two basic steps: (a) listening (i.e.,

to a patient, to visible symptoms, to lab test results, to medical know how) and (b) taking action (i.e., formulating a diagnosis and a treatment plan). Now, it is important to emphasize the importance of the words that a patient says. Without those words (e.g., treatment of infants) the clinical evaluation of a subject lays additional difficulties in front of a medical doctor. Hence, listening, in its widest meaning, that embraces both any general (e.g., medical science) and specific knowledge (e.g., any chronic disease) of the subject under study, represents the initial step of any treatment, or repair, process.

Interestingly, we can find similar situations also in the realm of unanimated physical objects. For example, when electronic components were not as pervasive as today, mechanics typically diagnosed the *diseases* of motor vehicles by simply listening to the sounds that they emitted. Today such type of approach has been augmented, mechanics can still listen to the *symptoms* that their patients report, but can also perform lab tests connecting computers to the sensors that modern cars mount.

Clearly, not all objects are capable of telling their stories and not everyone is capable of interpreting them, when available. When a mechanical wristwatch stops, no particular sound provides a hint regarding the cause that made it stop. But also when an object emits sounds that indicate how well it works, like in the motor vehicle example, a casual person might not be able to distinguish those that are made when broken (e.g., a seized engine) from normal ones.

Now, in a contemporary scenario where the process of repairing, just as those of reusing, re-scoping and recycling, represents a fundamental component of a sustainable society, we here aim at discussing the possible approaches that could be taken when answering to the following two questions: (a) how can objects report the nature of their symptoms, and, (b) how can those reports aid anyone (i.e., also the unskilled) in their repair process?

In order to make a step in the direction of answering to both questions, let us now jump a long way forward and imagine a scenario where an object *contains* all the information required to accomplish its repair. We hence imagine that when an object breaks, a system is capable of indicating the type of repair that it needs, along with the tools and the gestures (i.e., practices) that the specific repair requires. Remaining open to imagination, this entails that a person could view a video showing how the repair could be accomplished, or wear a pair of gloves that physically guide through the performance of a set of mending gestures, or listen to a succession of detailed instructions that explain what actions should be taken.

2. HUMANS LISTENING TO

Moving on to turning imagination into reality, the first technical problem that emerges amounts to how an object can contain any information at all. Interestingly, the authors of [1] recently addressed this problem proposing a system capable of integrating digital information into objects. In particular, they designed and implemented Spyn, a system based on mobile platforms that is capable of supporting the pinning of digital data on fabric. In brief, while knitting, a person can mark positions on fabric with special ink. This ink is used to create patterns that can be easily recognized by any simple visual recognition algorithm. These patterns are then utilized as virtual links between locations on fabric and digital data of any kind. A knitter can then *insert* a piece of information (e.g., an audio recording) directly from its smartphone by: (a) marking a position, and, (b) linking that information to the given position. Hence, simply pointing that smartphone's camera at that position it is then later possible to retrieve the information that was there stored.

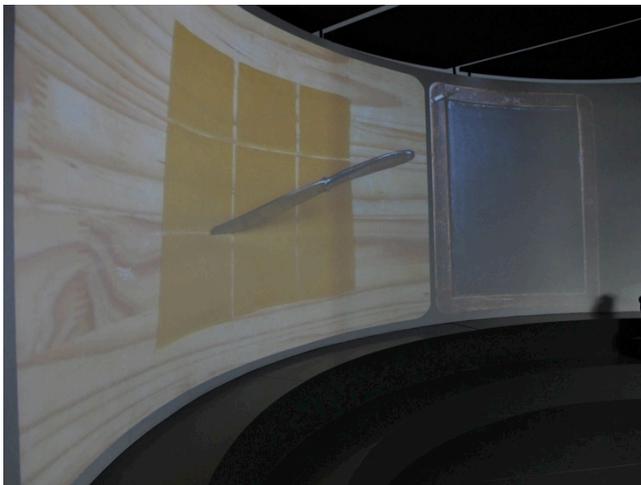


Figure 1. Tortellini X-Perience: recognizing when you cut the dough

The first draws its inspiration from the Tortellini X-Perience system [2]. Tortellini X-Perience teaches how Tortellini pasta can be prepared implementing a set of steps where it: (a) shows on a video the actions that are required during each preparation phase, (b) requires that a person repeats those actions, and, (c) checks (utilizing a set of gesture-recognition algorithms) whether the person has repeated the given actions correctly (see Figure 1 and 2 above). In case the actions that a person performs are wrong, Tortellini X-Perience requires their repetition in order to move forward to the next step of the preparation recipe.

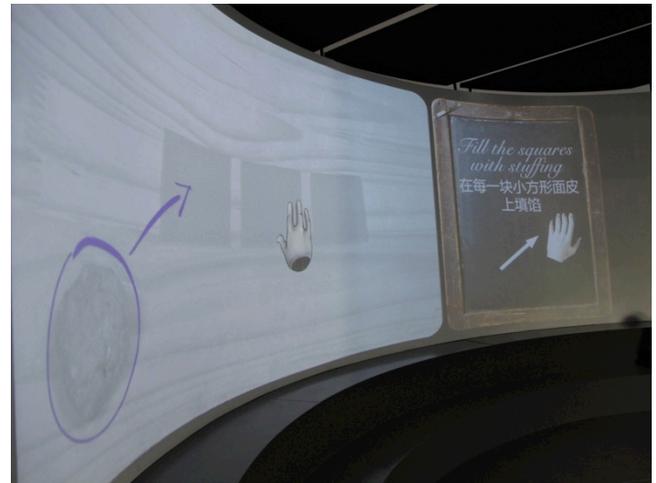


Figure 2. Tortellini X-Perience: explaining how you can fill in the pasta

Hence, taken for granted that some mechanism for pinning digital information on objects exists, the problem moves on to understanding what type of information may be useful in a repair process that an object should carry on. While a general answer to this question is far from being available, we here propose two non-alternative directions of work.

Now, moving back to the repair context, we can envision a system (or a context) that digitalizes and records (in some given form, may it be a video or the codification of their trajectories or whatever) the actions that are performed while creating an object. But why should this information be useful? We here rely on conventional wisdom, considering that often a clear knowledge of how an object is created can also give an insight on how that object can be (or not) repaired. However, recognizing the fact that the knowledge of how an object has been created cannot always be useful or beneficial to its repair process, we also propose the following approach. Such approach origins from another piece of conventional wisdom: most of the objects that we use break in a very limited set of ways in very specific positions. Tears on clothing, for example, will typically occur along seams. Dishwashers, as well as other appliances, have common problems and common solutions

[3]. Many producers of objects and appliances already acknowledge such fact when providing tutorials and frequently asked question sections written on manuals and sketched on parts. How could such existing initiatives be boosted with the aid of advanced computer-based technologies? Again, such initiatives can be supported, just to cite the simplest example, taking videos and codifying the actions required to accomplish given common repairs.

However, an additional step ahead can be taken in such direction. In fact, although breakages typically fall in given sets, each has its peculiarities and can require more or less care when performing certain repair actions. Some degree of customization might be very useful, hence, also when a common type of deterioration occurs. For this reason we envision repair support systems, which will rely on: (a) where an object broke, (b) how it was created, (c) how it is used or naturally decays, (d) how it is typically fixed at that point, and, (e) how a typical fix should be adapted to the peculiarities of a given deterioration.

Generalizing the approach that we have just described, we can hence classify any information related to an object in two groups: (a) preexisting and hence generic (e.g., the design of a sweater), and, (b) related to its own production and lifecycle and hence specific (e.g., how worn out is a given sweater). While any *generic* information can be easily coded according to the standard construction process of an object (i.e., some form of a storyboard that codifies the steps) and does not require any additional technological intervention to be acquired, the same cannot be said when thinking of the *specific* characteristics of an object.

Such type of information, in fact, is related to the peculiar lifecycle of an object and can only be acquired as the object is crafted, manipulated and operated along its life. Two sweaters, for example, may be exactly the same, but depending on how they have been worn, and on the decay process to which they have been subjected, they could present very different problems (i.e., tears and holes). Modern vision technologies and fine gesture recognition and interpretation algorithms, like in [4, 5], clearly appear very promising when searching for mechanisms capable of fulfilling such type of task, but many open questions remain. The prominent one amounts to understand how such two pieces of knowledge can be stored, mixed together and put to good use to support repair operations. In conclusion, following this approach, the problem of repairing an object resembles to humans listening to very different stories told by different objects. Hence, the very final problem will be: will people be with their objects as patient as doctors are with their patients?

3. CONCLUSIONS

Just as a doctor listens to the symptoms reported by its patients, a person could listen to the deterioration symptoms reported by its objects, along with possible ways of repair.

Listening and learning, in fact, are both part of do-it-yourself procedures, where one aims at fixing, rather than at replacing a malfunctioning appliance or tool. Under such perspective, we have here proposed an approach to two fundamental problems in the repair process: (a) how can objects be augmented with digital technologies so as to tell their stories to humans, and, (b) what an object should exactly say to humans to be repaired. As part of our proposal, we have also individuated the existing approaches that fall closest to the implementation of such ideas, for the development of future repair systems [6].

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