# Tag-IT: Embedding Audio in Objects and Surfaces

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## Abstract

In this paper we present Tag-IT an interface that consists of a module and a set of tags in which children can record and then playback audio, the tags can be attached to objects and surfaces. Tag-IT allows users to create their own digital content without the need of a computer, which makes it flexible for various contexts. Tag-IT was used in a workshop in Iskandar– Malaysia in the scope of the ACE 2015 Children Creativity Labs. During the workshop children used Tag-IT to create their own activities, playfully engaging in collaborative work.

## Author Keywords

Tangible Interfaces; authoring tools; story listening system; children; exploration.

## ACM Classification Keywords

H.5.2 Information Interfaces and Presentation (e.g., HCI): User Interfaces, user-centered design. K.3.0 [Computers and Education]: General.

## Introduction

The work presented here is the result of a study performed during a workshop at the Children Creativity Labs held at the 12th International Conference on Advances in Computer Entertainment Technology ACE 2015 in Malaysia [10]. The workshop provided a unique

opportunity for researchers to come together with children from around the world. As stated in the call for proposals each workshop "*should seek to empower and support children in exploring materiality and functionality using any mixture of physical materials and digital technology*" [2].

The concept behind the presented system was to develop an interface that children (and adults) can use to create their own digital content with no need for a computer, thus contributing to the development of authoring instead of consuming tools. Further, we envisioned a system able to support and promote collaboration between users. So, the conceptual framework behind Tag-IT is given by Constructivism [8], Social Constructivism [1] and Constructionism [7]. According to these learning theories children capture the world through their exploratory actions upon the objects [7][8], emphasising the importance of collaborative tasks [1].  Tag-IT allows users to record and play audio on NFC tags that can be attached to any object or surface, and used in various scenarios, such as enhancing drawings with audio, or creating games, as for instance recording tags with instructions to find objects. The aim of the workshop was to understand how children would use the interface, to observe the kind of activities that they would create with it, and to which extent the interface was capable of engaging them in collaborative and exploratory activities.

## Related Work

Tag-IT falls within the *story telling systems* [3]. These systems are non-screen-and-keyboard-based technologies, which focus on the audio component of the language. Other relevant examples of such systems are TellTale [1], StoryMat [4], t-words [11], or Jabberstamp [9]. TellTale has the form of a centipede,

it allows children to record audio into each part of the body, and hear it by pressing a button. The pieces can be randomly sorted and rearranged. StoryMat is a play mat where children play using stuffed toys. The gestures and the story told by the child on the mat are recorded and then compared with stories from children that have previously played on the StoryMat. The story with a similar pattern is than recalled and played, acting as inspiration for the creation of new stories. t-words consists of rectangular blocks in which children can record and play audio. The blocks can be snapped together playing the recorded audio in a sequence. Additionally, children can draw on the surface of the blocks. Jabberstamp allows children to enhance their narratives by adding audio to their drawings. To record the audio, users press a special rubber stamp on the paper, to play it users touch the marks of the stamp with a small trumpet. Other examples that combine digital information with objects are the WebStickers [6], barcode stickers that can be attached to physical objects making them act as bookmarks to the worldwide web, or Smart-Its Friends [5], which are small embedded devices that become connected when a user holds them together and shakes them.

Tag-IT brings together elements that are present in the above referred interfaces, namely recording and playing audio, however instead of using "blocks" the interface uses NFC tags in a novel way. The tags can be placed on drawings (adding voice or sounds to children's compositions, similar to Jabberstamp), but they can also be attached to objects, paper, or other materials and surfaces. This allows creating a wide diversity of activities. In the following section we present the interface.
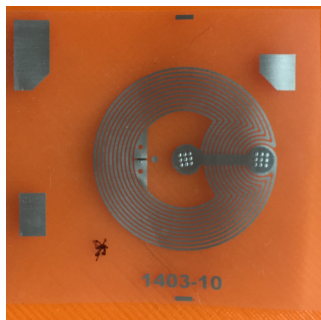
**Figure 1-** Child holding a white module (top) a NFC Tag (bottom).

## Tag-IT

Tag-IT is composed by a module and a set of NFC tags (which look like thin transparent round stickers) see Figure 1. The module has two buttons, one for recording the other for playing the audio on the tags. To record a tag, users press the record button on the module and slide it over the tag. A green light flashes when the interface is on recording mode, and as long as this function is activated, to stop recording users press the record button on the module once again and the green light turns off. To play the recorded audio users press the play button on the module and slide it over the recorded tag. The tags support multi-recordings. Every recorded sound is saved and stored in a flash drive with a micro-USB interface, and can be downloaded via USB to the computer. The firmware update is done automatically and wireless through the flash drive.

## The Workshop

The workshop took place at the international Marlborough College in Malaysia, and had the duration of three hours.

*Participants*

The intervention was carried out with eleven participants aged between six and seven that were selected by local teachers. Six participants were boys and five were girls, they were from various nationalities, and all spoke English fluently.

*Design and Procedure*

The workshop was hold in a school room, which we had previously prepared for the activities. The game consisted in identifying and finding objects, which were distributed in the room. For this, we had previously

recorded four pairs of tags that we attached to a board (using adhesive tape), see Figure 2. Each tag was recorded with information to find a certain object that was in the room. Each object was identified with a second tag. To achieve this the participants needed first to scan the tags on the board containing the instructions, decode the "spoken message" and then find the object, which was identified with the second tag. For instance, the instructions in tag number one were: "*You can use me to rest or to work*", children needed to identify and search the suggested object, which was marked with the corresponding tag. In this case the tag was attached to the back of a chair in the room, see Figure 3. After finding the object with the tag, children could scan it with the module and hear: "*Awesome, you found me, here you can sit when you want to rest or to work*".



**Figure 2-** Children holding a white module and preparing to scan the four tags attached to the board.

Another example, the instructions in tag number two were: "*I have the power to make you dream with my stories*", children needed to find out that the "spoken message" referred to a book, and look for it in the room, once they found a tag on a book, they could scan it with the module and get the confirmation that they had found the right object: "*Yes, I have the power to make you dream with my stories. I am a book*".

*Using Tag-IT*
After the first warming up, we demonstrated how to use the module and the tags. Then, we asked the children to create three groups, and gave each group a module. Children gathered together in front of the board where the instruction tags were attached, they took turns to hold the module and scan the tags. After hearing the "spoken message", they first discussed with each other which object was suggest and then they all tried to find it, see Figure 3.

Children were very amused with the idea that objects could have a "voice", and all actively participated in the game. The activity stimulated children's problem solving skills while promoting collaboration, as children discussed with each other about the content of the messages. Besides, it promoted the exploration of the physical environment, as children moved around in the room, looking in every possible location (e.g., under the chairs, in the drawers, books) to discover the tagged objects.

*Creating their own Games*
After completing the activity, the children invented a new game, which consisted in attaching the tags to the "wrong" objects creating their own "crazy world". As an example, they placed one of the pre-recorded tags on a

book and scanned it. After hearing the recorded message: "*You can use me to rest or to work*" the children laid the book on the floor and one of them sat on it, laughing and saying: "*oh it says: You can use me to rest, so I'm doing that!*".





**Figure 3-** Children looking for the tagged objects.

Another example, a boy attached a tag to his shirt and told the others: "*now scan me!*" the tag played: "*You found me, I am a book*" and they all laughed amused, saying, "*Oh, a book, he is a book!*", see Figure 4.

**Figure 4-** Scanning the shirt of one of the children.

The other children liked this idea very much and started to attach the different tags to their shirts asking each other and the researchers to scan them.



**Figure 5-** Children carrying the game proposed by their peer, scanning the tag on the door of the room.

Following this activity, the children started creating "spoken messages" for their peers. This activity was proposed, planned and carried on their own. One of the boys recorded following tags: "*You can open me, you can go out and come in*", and "*You found me, I am a*

*door*". He attached the tag with the "spoken message" on the board, then went outside the room and attached the corresponding tag to the door, see Figure 5. He then instructed the other children about the activity and gave them a module telling them they could start the "object quest". The children were delighted to play the game created by their peer, and enthusiastically collaborated together as a group changing opinions and supporting each other.

## Discussion

During the workshop we observed that the interface was easy to use and that children quickly understood its functioning. The tags enabled creating instead of consuming content, providing opportunities for creativity and collaboration. As the interface does not need a computer, children could move around and explore the space, creating their own activities as well as creating activities for their peers. The children enjoyed creating their world of "talking objects", in which they subverted the rules, by mixing tags and objects and placing the tags on their own shirts.

## Conclusion

In this paper we presented Tag-IT and described a workshop that was carried with the interface. Tag-IT revealed to encourage children's creativity, supporting problem solving activities and collaboration. As highlighted by [7], it is when children appropriate the materials, play with them, making something new, that intrinsic learning can happen. Given its flexibility and the fact that users can create their own content and activities, the interface can be used to carry a great variety of pedagogical activities.

## Future Work

As future work and starting the next school year, we are beginning a project where we work together with teachers, therapists and children with special needs using Tag-IT. Further, we envision different scenarios of use such as collaborating with researchers that are working with elderly people. In this field we see the potential of the interface to record "memories" or tags that can be used to provide information.

## Acknowledgments

## References

[1] Airey, S. Plowman, L. Connolly, D., and Luckin, R. Rating children's enjoyment of toys, games and media. In *Proc. World Congress of the International Toy Research Association on Toys, Games and Media*, London (2002).

[2] ACE 2015 http://ace2015.info/call-for-children-creativity-labs/

[3] Cassel, J. Towards a model of technology and literacy development: Story listening systems. *Journal of Applied Developmental Psychology* 25 (2004), 75-105.

[4] Cassell, J. and Ryokai, K. Making Space for Voice: Technologies to Support Children's Fantasy and Storytelling. *Journal of Personal Technologies 5*, 3 (2001), 203-224.

[5] Holmquist, L.E., Mattern, F., Schiele, B., Alahuhta, P., Beigl, M., Gellersen, H.W. (2001, September). Smart-its friends: A technique for users to easily establish connections between smart artefacts. In *Proc. Ubicomp 2001*, 116-122.

[6] Ljungstrand, P., Johan R., Lars E. H. WebStickers: using physical tokens to access, manage and share bookmarks to the Web. In *Proc. DARE 2000*, 23-31. doi:10.1145/354666.354669

[7] Papert, S. *Mindstorms: Children, Computers, and Powerful Ideas* (2nd. ed.). New York: Harvester, Wheatsheaf, (1993).

[8] Piaget, J. and Inhelder, B. *The Psychology of the Child*. New York, NY: Basic Books, (1969).

[9] Raffle, H., Vaucelle, C., Wang, R. and Ishii, H. 2007. Jabberstamp: embedding sound and voice in traditional drawings. In *Proc. SIGGRAPH 2007*, 137-144.

[10] Sylla, C., Oliveira, E., Dantas, J., Carvalho, V., Branco, P. (2015). Record, Play, Go… In *Proc.* ACE 2015. doi>10.1145/2832932.2832963

[11] Sylla, C., Gonçalves, S., Branco, P., Coutinho, C. 2013. Peter Piper Picked a Peck of Pickled Peppers - an Interface for Playful Language Exploration. In *Proc. CHI 2013*, 3127-3130. doi:10.1145/2468356.

[12] Vygotsky, L.S. *Mind in Society*. Cambridge, MA: Harvard University Press, (1978).