TODAY'S STORIES

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Abstract. Research frameworks are being developed that involve very young children in the process of development of future technologies. Children, their teachers and parents from schools in Israel and Denmark are coming together with researchers, educationalists, psychologists, designers and technologists to develop a wearable technology - the KidsCam. This example of a hyper-camera will facilitate and support the development of social, communicative and emotional skills in the context of the everyday activities of children. It is envisioned that such digital technology will become embedded in educational culture and create opportunities for shared reflection on early life experiences. Issues that surround the development and deployment of new technology including those of appropriateness, need, value and ethics are an integral part of the project.

1 Introduction - Pedagogy and Interaction Technology Perspectives

The Today's Stories project is evolving a technology facilitated approach to learning for young children (4 to 8 years old) that is aimed at supporting the development of social, communicative and emotional skills of children in the context of the everyday activities. The facilitating role of technology will be complemented by the discovery of novel forms of educational interaction and the development of new media that often follows new technologies. Wearable technology will allow children to learn from reflecting on their actions and learn from other children's perspectives on their own actions. The technologies will facilitate capture and document such "reflective experiments in living". Children will build up their own but interrelated digital portfolio of their day's interesting events. A community memory of a group of children will be co-created and evolve through a didactic process of dialogue and reflection, leading to understanding. Children, teachers, parents, educationalists, developers, researchers and designers are focusing on the co-exploration of technology development in the context of a model knowledge sharing. At the Israeli site a future-oriented educational framework, *The Autonomy Oriented Education* paradigm is geared towards the development of autonomy, morality and belonging in children, Aviram [5]. In Denmark researchers are working both in local schools and focus groups to set up 'Communities of Enquiry'.
These children form groups of 'KidSearchers' ™, that are contributing to the development of this future technology. These interactive research paradigms have arisen

from previous work by Roy et al [6] and Panayi and Roy [7] and are being developed within a Danish cultural context. The conditions for acceptance and success of deploying such technology in a social, cultural and ethical context are being investigated, Beach et al. [8]. It is envisioned that these interactive digital artifacts will enhance and also contribute to cross-cultural understanding and critical technology awareness.

2 KidsCam - A Deployment Scenario

The technology embodiment is currently envisioned as a **KidsCam** a 'wearable' device that audio-visually captures events in the child's daily life, and relays them to a collective memory of interrelated episodes. KidsCam is a hyper-camera, i.e. an ad-hoc network of communicating cameras that record a hyper-video document of interleaved episodes from different perspectives. The KidsCam is designed to have image and audio processing capabilities operating over a wireless local area network. The network will connect the computers to a server with two modes of operation for the KidsCam: 1) on-demand operation controlled by the children and 2) autonomous mode where the camera notices interesting events occurring and triggers the recording of cameras that share the same view.

Wearable cameras have been proposed by Starner et al [1], Healy et al in [2] and Mann in [3]. In [2] Healy describes a camera called the Startle Cam, which is triggered upon the detection of the "startle response" indicated by the wearer's skin conductivity. Techniques suggested in [2] and [6] for gathering information about the physchological states of the wearer using physiological signals, maybe of interest to Today's Stories in later stages of development. Mann proposed in a recent paper [4] the possibility of automatic generation of photo albums. These techniques maybe of interest to Today's Stories in optically determining which cameras are sharing the same visual view given that an interesting event is happening or about to happen.

Today's Stories differs from previous work by specifically targeting the ease of pedagogical implementation of new technologies in learning environments. The children will be wearing the hyper-camera during school-time. Usability issues are being explored and the interplay between functionality, novelty and intrusion are example of elements of the interaction being traced. Recognition algorithm will have two functions: 1) detection of interesting events occurring and 2) determining which children are sharing the same view given one particular interesting event. Machine vision techniques such as optical image flow are to be investigated to calculate distances between children as a feature for *"interest value"* of events. Image flow calculations can be aided by inertial data, received from accelerometers and gyroscopes as described in [9]. In [10] Davis and Bobick present a temporal template approach to represent and recognize actions such as aerobic exercises. Starlab already has a prototype of a camera that is able to gather inertial information about the camera motion, called the Metacam.

It is envisaged that temporal templates could be created, from different points of visual view. These representations of actions from each child's perspective could be used to infer specific information about interest in the visual field. Joint audio and

video analysis of events may result in more robust decisions about the '*interest value*' of events. Coupling the KidsCam with biosensors is also a promising way of improving the '*interest value'* criterion. Feedback from children, during the authoring stage, could also be used to improve the recognition algorithm.

3 Artifacts for Reflection -'Composer' and 'Memory Boxes'

'The Composer' is a multi-media environment under development that will allow children to form their ongoing portfolio out of the different sequences that capture events from various perspectives. Digital events will be augmenting with voice, graphics and sound effects. A suite of annotation features will include stylized faces to express various emotions and special sound effects to highlight for example surprise or fear. A survey of state of the art multimedia editing and authoring packages and current use in educational settings is being carried out and incorporated into Roadmaps that will support the technology development [11]. A novel feature that is proposed with the 'composer' is the option for children to interact with the scene and objects at different levels of abstraction thus creating rich artifacts for reflection.

The interpretation of an event from its visual effect already influences the space that is being given to a child to express what it is that she found interesting about the event. For instance if a child gets emotionally involved in the face of a fight of two other children over a toy; and a teacher or other children see the scene depicted by images, the obvious interpretation of the scene is that it is the fight that has engaged the child. However, it may well be that the child is good friends with one of the children involved, or that it has a special emotional attachment to the toy itself.

Among the issues highlighted has been that of how to deal with the amount of information that one captures in the record. In order to explore the other end of the continuum, we are developing the **Memory Boxes**, a 'constrained record'. A Memory Box can be used to collect memories of objects, places or people (i.e. information item) which have been marked by special Memory Tags. By opening the little box in the presence of objects, places or people, a memory of them is stored into the box. Technically, a memory could be a pointer to a multi-media document that is associated with the information item - but not necessarily a representation of it. By opening the box next to a computer screen its content is visualized. By opening boxes near to each other their contents are mixed. And by shaking, a box it is emptied. With the boxes, the only 'recording' of the event will be in the collection of three pointers, 'memories' of e.g. the two children and the object. This leaves the initiative to explain what it recollects about the event and in what way it experienced it, completely with the child, and thus stimulates an alternative basis for reflection.

The 'Memory boxes' are currently being used with children to explore a number of notions of representation, relationship and interaction e.g. containment, information capture and exchange, proximity, intimacy, privacy, space and time. Digital portfolios are being created for both individual and collective using existing traditional technologies e.g. cameras, video cameras and digital toys and the new technologies as come on stream. This project provides the opportunity to explore how new technolo-

gies become embedded in educational culture, Panayi and Roy [12]. Prototypes and mock-ups of the Memory Boxes and the KidsCam will be available.

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