

Interactive Learning Environments for Children: User Interface Requirements for a *Magic Mirror* and *Diary Composer* Environment

C. Koutra, N. Kastis, G. Neofotistos

Lambrakis Research Foundation
3, Paparrigopoulou St.
10561 Athens, Greece
Tel.: +30 1 3311848
Fax: +30 1 3230668
E-mail: chryssa@lrf.gr
URL: <http://www.lrf.gr>

W. Van de Velde, M. Ramalho

Starlab
Excelsiorlaan 40-42
1930 Zaventem, Belgium
Tel.: + 32 2 7215454
Fax: +32 2 7215380
E-mail: wvdv@starlab.net
URL: <http://www.starlab.org>

M. Panayi

Natural Interactive Systems Laboratory
Faculty of Science and Engineering, Odense University
Science Park 10 DK-5230 Odense M, Denmark
Tel.: +45 63157304
Fax: +45 63157224
E-mail: panayi@nis.sdu.dk
URL: <http://www.nis.sdu.dk>

Abstract: This paper presents the framework and the operational, functional, and layout requirements and considerations, which have been taken into account for the design of the concept prototype for the *Magic Mirror* and *Diary Composer* environment, developed within the framework of the TODAY'S STORIES Project. TODAY'S STORIES project promotes an approach to learning for young children (aged 4-8) that aims at the development of social, communicative and emotional skills in the context of the everyday activities of children, by creating and testing a wearable KidsCam, the Diary Composer, and the 'Magic Mirror'. The present paper focuses on the Diary Composer requirements and concept prototypes, which aim to serve distinct purposes such as: to allow children to review material collected by a KidsCam or by several KidsCams, to allow children to annotate and edit the material collected in a collaborative setting, to allow children to retrieve and review the edited material and link it with other such material.

1. INTRODUCTION

This paper presents the framework and the operational, functional, and layout requirements and considerations, which have been taken into account for the design of the concept prototype for the *Magic Mirror* and *Diary Composer* environment, developed within the framework of the TODAY'S STORIES Project.

The requirements and considerations presented in this paper, have been implemented in the design of a prototype user interface (developed, as the outcome of the work on user interface design, conducted by the Assistive Technology & Human-Computer Laboratory of the Institute of Computer Science of FORTH, on behalf of the Lambrakis Research Foundation), which is presented in this workshop in the paper prepared by D. Grammenos, A. Paramythis, and C. Stefanidis.

TODAY'S STORIES (ESPRIT Long Term Research, I3 - ESE P29312) develops an approach to learning for young children (aged 4-8) that aims at the development of social communicative and emotional skills in the context of the everyday activities of children. It essentially aims to involve children, teachers, and parents in extended episodes of playful learning based on the interesting events in a child's daytime. The underlying idea behind this project is a) that children may learn from reflecting on their actions and, b) that children may learn from other children's perspectives on their own actions. By providing the technologies that allow them to capture and document such reflective experiments in living children will be encouraged to build up their own but inter-related diaries of their days interesting events.

The project partners include STARLAB (in Belgium), the Lambrakis Research Foundation (in Greece), the Computer Technology Institute (in Greece), the Center for Futurism in Education of the Ben-Gurion University (in Israel), the NIS Laboratory of the Odense University (in Denmark), the Gotteborgs Univ. - Dept of Education (in Sweden), and the Halmstadt University - Nordic Center for Research on Toys and Educational Media (in Sweden).

2. OBJECTIVES, FRAMEWORK, AND INFRASTRUCTURE

Among the aims of the TODAY'S STORIES project is addressing the issues that impinge on software design in relation to a 'composer' tools that will be accessible to children of age 4-8 years old, for the exploration of video data collected through interaction and supported by wearable technology.

The TODAY'S STORIES hardware and software infrastructure comprises:

- a wearable KidsCam
- the Diary Composer, and
- the 'Magic Mirror' (which serves as the interface for the exploration of the video in the Diary Composer)

The present paper focuses on the Diary Composer requirements and concept prototypes, which aims to serve distinct purposes such as:

- to allow children to review material collected by a KidsCam or by several KidsCams

- to allow children to annotate and edit the material collected in a collaborative setting
- to allow children to retrieve and review the edited material and link it with other such material.

The Diary Composer will be used in different settings and in different phases of the pedagogical process, namely:

- As part of the collection process
- As part of the reflection process in the school setting
- As part of a review process within or without the school, e.g., from home.

Interaction, in the first instance, is classroom-based. The classroom infrastructure consists mainly of a 'Magic Mirror' (MM) equipped with an active touch screen with video camera, and a LAN connection network that manages the video data from the KidsCam. In the normal mode the Magic Mirror's fixed camera output is displayed/reflects what is happening in the classroom, this mode is changed when children wearing a KidsCam approach the Magic Mirror.

The pedagogic profile of the children currently involved in the validation studies, from Israel and Denmark, includes children 5/6-10 years old, which are at early stages of linguistic/language development (emergent readers). In terms of access to technology they have access periodically to the (Danish) school communal area resource of Macintosh and the newly installed iMac machines. Typically exposure may have been limited access to games, simple graphics and text programmes with significant staff support. Compared to some other European countries there is a higher rate of personal home computers per household. The majority of children at Nr. Broby School (Denmark) have access to a home computer (typical usage at home is for game applications.)

The proposed tool could have widespread use across the curriculum as it becomes embedded in the educational culture. Areas of the curriculum for which support material (for cognitive and physical development) could be created (both by the manufacturer of the system and the students and teaching staff), include:

- *Flexible support for emergent literacy, early literacy*
- *Support for spatial awareness*
- *Supported 'visual literacy', pre text literacy*
- *Situated learning, personal, social, cultural education*
- *Support for children's theory building, linguistically*
- *Supporting knowledge integration*
- *Early problem solving*
- *Early concept mapping*

3. THE NOVEL ASPECTS UNDERLYING THE *DIARY COMPOSER* ENVIRONMENT

The novel aspects of the system being proposed lay in the potential of the system to allow for two key features that will support social interaction:

- ‘Multi-User Multi-Perspective’ [MUMP] capture of events
- ‘Co-construction context and tools’ [CCCT] that would facilitate and support exploration of these perspectives in a pedagogic context

The environment is particularly distinguishing itself from existent implementations by providing the option of multi-perspective editing. Children have the opportunity to record events from different perspectives and reflect on them afterwards by editing and annotating a collection of perspectives. The latter also introduces the notion of collaborative editing and annotating which is innovative and will also enable the Diary Composer implemented for Today’s Stories to gain a distinction among existent commercial products. Children have the opportunity to gather in teams of two or three, view their recordings, reflect on them, discuss the events recorded and annotate them in a collaborative manner.

The aim is to enhance children’s development both at cognitive, physical and social communication level. Scenarios are being developed for use in Israel in the context of the AOE philosophy and in Denmark within the education culture of the Nr. Broby Skole.

4. REQUIREMENTS OF THE DIARY COMPOSER ENVIRONMENT

The Diary Composer's internal structure consists of:

- the Video Explorer
- the Composer, and
- the 'Worlds'

Interaction with the video material from the KidsCam occurs at two initial levels and through the metaphor of a ‘video explorer’. The ‘video explorer’ is essential a platform for the first stages of reflection. These include the software and interface functionalities of location, navigation, individual or collaborative viewing and annotation/editing and a ‘composer’.

Annotation functionality is provided through a ‘palette’.

Composition is offered through the metaphor of ‘*Worlds*’ where children can re-create the video clips, create new compositions using additional material from e.g. web, scanned photographs, audio captions, stories. These ‘Worlds’ provide a range of environments for the further stages of reflection giving opportunity for open-end creative compositions i.e. blank canvas/environment, to guided composition e.g. ‘World of Emotions’ such as happiness, sadness, excitement, ‘World of Friends’ etc.

4.1. Layout requirements

In designing the Diary Composer, it has been taken into account that interface layout characteristics depend considerably on the children’s age. Different layout considerations must be taken into account for children of age 4-5, 5-6, 6-7, and 7-8. In this section, layout considerations are presented for each age category:

- a) **Children of age 4-5.** Children of this age come to school for the first time. For many of them, the school environment provides their first experience with technology, as well. A

characteristic of this age is ‘action/play’ (experience/learning through playing), that is, children’s need for motion and movement, a condition which usually limits the attention span and time of engagement in a certain focused activity. Such a child may well be in the company of other children, however, a high degree of co-operation should not be expected. The sense of time is not well developed yet (the present is well comprehended, but the future and the past can be not clearly oriented). Events are experienced in a highly subjective way. In this framework, the use and utilization of the Diary and Kidscam technologies should be implemented in an incremental way. ‘Easy-of-use’ and simplicity should guide the layout development, and advanced functions (such as zooming’) could be omitted at this stage (or should be implemented cautiously).

Using the Diary for the first time is an important experience and both the teacher and the ‘more advanced’ children could assist and support the entire class in using and utilizing the technologies (‘First Day’ Stories can be an important moment and entry). A simple layout environment, a rather limited use of colors, and a small number of ‘tools’ (single operation for each ‘tool’; assume a slow learning curve – of two ‘tools’ at a time) in a large touch-screen environment, could fit well to that age level. Magic mirrors is advisable to be implemented later in the school year and emphasis should be placed on the number of ‘magic mirror’ units (one unit for every one or two children), since children of this age do not co-operate for long times and do not stay in a queue.

The teacher can be part of the process and specific activities include ‘who are here and who is missing’ (identification of children present, which would lead to think, i.e., of classmates who are ill) [creating a Today’s Story for that classmate], birthdays, theatrical play, dramatizing a fairy tale, olfactory responses, celebrations, class tenders (children who are responsible for setting-up and tidying the room), working on certain themes. In the latter case, annotation via a suitable icon could characterize the Diary sequences. The same is true for groups of children (assigned certain ‘names’ such as rabbits, mice, etc.) This kind of annotation will also support retrieval and reviewing. Finally, video processing activities (adding sequences and effects, putting the sequences in order etc.) would, most probably, not be of interest for the children of that age (could be introduced later in the class year).

- b) **Children of age 5-6.** At this age, children cooperate more easily and act in a more conscientious way. Their time span increases as is their structuring ability. Their vocabulary is richer so that they can describe events, feelings etc. They are aware of their ‘image’, develop social relations, better control their moves, show interest for reading and writing, and become more aware of the flow of time (timeline). Groups of 3 or 4 children can now form easily (use of mouse and keypad could be considered) and the Diary Composer could now include zoom-in, zoom-out, and freezing-a-frame.

The technologies can now be utilized to show (i.e. magic mirror) frames or sequences when a kid is entering the room, and, as described before, ‘who is here and who is absent’. The Diary could now include a calendar-type window where the date (as well weather conditions, temperature etc.) would be selected from a monthly-type of calendar (special dates set in different colors) or written, and annotated. Icons can be selected from a set (symbolizing themes or group names or another characteristic) and additional editing tools could be added (synthesizing icons, drawing, facial input from the kid itself, sound annotation, sound input). Video processing activities become important (e.g.

adding/subtracting sequences from same or other kids) adding value to timeline representation and annotation. Beside archiving and retrieving the material by day or kid, it is important to archive/retrieve it by subject (of activity) or by ‘our best moments’, ‘our tough moments’, ‘we laughed a lot’ themes too. Transferring-the-story capability should be easily accessible (that is, sending Today’s story to other kids in other schools). Visiting places can also provide a nice opportunity to use and utilize the technology.

- c) **Children of age 6-7.** At this age children are more developed. They can cooperate, observe, describe with ease. They can help themselves, control their bodies, relate better, choose friends, have developed spatial-temporal capability, can add and subtract, read and write. Diary can become a motivator and a problem-solving facilitator, among other things. Children should know from the beginning what the Diary can offer to them (in order to fully exploit its capabilities). The layout can be more complex, more effects can be added (i.e. adding music, not only sounds), more colors, voice input, a greater selection of icons. Timelines, annotation, and the magic mirrors become more important as the children are more aware of their environment and they show more interest for their classmates. The process of creating their Diary can become more systematized.

Children have interests to pursue and they are embedded in a school curriculum. Teamwork becomes more prominent (working on a story or a play or a science experiment) as is archiving/retrieval through subjects and themes. Writing text is not a big problem. Exchange of certain experience or learning activity to kids in different schools would be more needed.

- d) **Children of age 7-8.** Children at this age can decide themselves for certain things and have defined interests. They can read and write well and they are more confident to explore. They want to create and they (can) become competitive. Gender issues are emerging. They argue and they can join together to argue, e.g. ‘against’ their teacher. Technologies come under their control (i.e. create own music to annotate sequence). Layout environments can become more complex. Layout characteristics for Diary interfaces aiming at children of this age should take into consideration requirements and characteristics already developed for higher ages and ‘weighted’ toward learning environments.

4.2. Operational requirements

The following requirements have been highlighted in order to satisfy the central aim of stimulating reflection through the *confrontation* of viewpoints and perspectives:

- Diary Composer should be essentially shared (as opposed to single user). Although it must be possible for children to reflect on their own material alone, we expect the most productive sessions to be based on collaborative confrontation of children’s interpretations. Thus, the environment should take this multi-user feature into account in a fundamental way. This requires us to consider interface issues such as the choice between a mouse (essentially single user), a split mouse (multiple devices, but one pointer), and a touch screen (more multiple use).

- Diary Composer should be as much as possible language neutral. Not assuming literacy means that text will not be used (or used when it should be used). However, this does not preclude the use of text in the transition to literacy, which requires particular secondary material (as opposed to primary, i.e., raw from the KidsCams) to be used in annotation and interleaving of material. We also envisage that the spoken word is a powerful means of annotation, allowing the children for example to narrate, in their own language and words, an interpretation of an episode. A related issue has to do with cultural neutrality. Material for annotation will incorporate cultural features that may differ between user groups (geographical and age differences will play together). The tool should be open to include arbitrary libraries, including those that have been co-created by children (symbols from scanned drawings for instance).
- It should allow for multiple abstraction levels. We have argued before that abstraction is necessary for effective reflection. It is unlikely that there will be a single level of abstraction. First the system must allow for the creation of abstractions from raw material. This ranges from simple selection of relevant material (thus making abstraction of the rest), over creating stylised versions of such material (cartoon versions), to the creation of a fully new iconographic representation of an event or episode. The project will need to explore a variety of these, and probably in the order as mentioned. We think the metaphor of the time line should be preserved. Children may compose a story board based on abstract figures in a series of snap shots on a separate time line.
- It should allow to make explicit meaning and interpretations. The core of interpretation is by annotation with symbols that children can select from a given repository. These symbols stand for particular meanings, which can be interpreted by others to check an interpretation of a memory episode. The collaborative aspect is essential here. The tool should allow to make explicit comparisons and confrontations of interpretations. We think the resolution of conflicts *is* the process of reflection, so the environment should allow for conflicting interpretations, possibly guiding participants to identify any possible such conflicts (but this is not essential, as forms of human guidance may be better). As a particular operationalisation of this idea, we think that annotations that are made in a multi-user setting should be anonymous with respect to the individuals in that group, reflecting the fact that they are made by consent and possibly after resolving conflicts. However, annotations contributed from different and separately prepared perspectives may need to be kept apart, expecting future work to resolve any conflict that may exist. Another design choice that follows from this is to use a single repository of annotations, also when different video frames are rolling. This highlights the fact that annotations are not to the perspectives, but to the collection of perspectives, i.e., to what is happening. We think this is essential for the hyper-video idea (compare to annotating a 3-D model from various 2D perspectives - although conflicting interpretations may exist in the end a consistent whole has to be found. This does not mean that there is only one such consistent interpretation, and the project should not exclude pluralism of interpretations - or truths - but foster mutual understanding of these.
- It should act as a self-organising memory support. For example, we want to avoid file naming and saving operations. We think that within a session, the different episodes can be easily organised on a time line reflecting the duration of that session. Beyond

that, especially younger children still have trouble with the time organization and a more semantic organisation will be necessary. This can be done easily using, first, the information collected while the KidsCams are recording, and second, the additional information contained in the annotations and abstraction (representing as many categories that can be used to retrieve scenarios, or find similar ones). When multiple children are involved the tool will help to focus (filter) on the related perspectives (based on trigger information from KidsCam).

4.3. Functional requirements

The functional requirements of the Diary Composer are presented below, by grouping them in several phases corresponding to Collecting and Storing, Annotating and Archiving.

4.3.1 Storing and Indexing

The structure of the database of episodes is based on a time line indexing. The episodes recorded within that time frame can be identified by thumbnails. An index based on recording time is visualised per child. A time line is drawn on the screen that connects the sequence of thumbnails for the different episodes. The time line for a specific child might at times get curved in order to get closer to the time line of another child in order to represent that different perspectives of a same episode exist. For the sake of clarity, not all time lines (for all the children) need to be visualised on the screen but just those that are related to the episodes of the child that is consulting the database.

Functions to be performed on this database are:

- *Adding a new episode:* Every time KidsCam sends a new episode, this episode needs to be included in the database in a manner completely transparent to the child.
- *Retrieval of an episode:* When the child wants to retrieve the last recorded episode, the database needs to be consulted and the most recent saved episode is visualised on the screen of the Magic Mirror. This way, the Magic Mirror will be a mirror that can visualise events that happened in the nearer past.
- *Erasing recorded episode:* would it be interesting for the teacher or the child itself to delete recorded episodes in order to present for further discussion (and annotation) only those that it considers more interesting? This function can also be understood as “*select daily episodes*” in which instead of erasing episodes, the child selects a set of episodes it wants to work on the future and all the others are by default erased.

4.3.2 Annotating

- *Interaction with the video player:* Using either 1) pause, forward, backward buttons or 2) via the window of the video player a click on its surface means to pause the video player, move the finger leftwards means to go back and rightwards to go forward.
- *Preview of the meaning of icons:* If the child keeps pressing a certain icon then an animated cartoon will start explaining what is the meaning of the icon. If the child does not hold on this button for a while, this action is not activated.
- *Inserting annotations:* The episode will be annotated in the following way. While interacting with the video player, the child chooses a certain video frame by stopping the video player. Then, an icon is selected and dragged along to the position in the video screen where it will remain visible. After that, another process of interaction with the video player (play forward) will be done in order to choose another video frame where the icon

does not need to show anymore. Thus, an animated video sequence can be constructed because from the frame where the icon has been inserted till the frame where the icon has been stopped, the icon can become animated. The exact shape of the icon that means to stop an action can be the same for all actions in order to make it easy to remember.

- *Verbal annotations*: registers the story that is narrated by the child *after* having annotated the video
- *Wizard*: the wizard will act as a guide throughout the annotation and retrieval of the video, but will not be a help assistant (desirable feature but not to be considered for the first prototype of the Diary Composer).

3.3.3 Archiving

This set of functions is aimed at maintaining a database of the annotated versions in addition or as a replacement of the original episodes. Two approaches can be followed:

- 1) the previous annotated version should be deleted if a further re-editing is necessary (in this case, this child will start from scratch based on the un-annotated video) or
- 2) an approach whereby old and new versions are always maintained and re-editing means to retrieve the previous annotation. Once changes have been made, the new version will automatically replace the old.

For the first prototype both options will be available (start annotating from scratch, start annotating from previous annotated version) implying that thumbnails for the original video and for the annotated version need to be available and their shape be suggestive of its contents. It is suggested that a dynamic (animated) shape be used to identify the thumbnails of the annotated versions, illustrating the fact that they are being subject to continuing edition. In any case, the simplest thing would be that a video that has been subject to further editing to substitute the old version. This way, the maintenance of annotated versions becomes simpler and the automatic saving mechanism is straightforward.

- *Saving annotated versions*: Saving an annotated video is done automatically. The default option will be to maintain always the original video and the annotations (in case, i.e., of accidental disruption or "delay"). The annotations will be projected with the original video if the child chooses the thumbnail for the annotation; otherwise only the video will be shown. Saving means to update the annotations file. The original video remains unchanged.
- *Erasing annotated versions*: This function would make sense if there will be more than one version of annotated material is maintained.
- *Erasing original episode*: At same point, the original video needs to be destroyed for privacy reasons. Feedback is required on when and by whom (child? Teacher?) should this operation be done. One possibility is to keep the video until the annotation process is over and explicitly allow the teacher or to the child to delete it. This is not at all a transparent process for the child. Thus, a better approach is to automatically delete the video after an expiry date (state as a number of hours or days).

4.3.4 'World' editing

Different 'Worlds' will be used to support different paradigms. So each 'World' will have a special set of tools mostly usable within this 'World'. The selection of 'World' paradigms to be implemented and the supporting tools for each selected paradigm, are to be defined. Nevertheless, some common functions will be present in every 'World'. These include:

- *Import objects*: A newly created 'World' needs to be populated with some base object that will be manipulated in order to form the 'World'. The magic box being opened in front of the environment initiates this function. The relevant codes are retrieved from the Magic Box, and the associated objects are retrieved from the database.
- *Load/Import 'world'*: This is similar to the previous function but refers to an existing (already created and stored) 'World' as opposed to basic objects. The function is initiated when either a Magic Box or a Magic Gift is opened in front of the environment.
- *Move object*: A basic function offered to the children is the ability to position the various objects any way they want. This basic manipulation forms the basis of the creation of a 'World'.
- *Activate object*: Some objects that are used to create a world are active (e.g. a video, sound, an animation etc.) These objects are represented within the 'World' using a thumbnail or an icon. When activated these objects start 'playing'
- *Change perspective*: This function is activated using the Magic Dice and causes the screen to rotate and present another perspective ('world')
- *Record/Replay (narration)*: This is used when the children wish to narrate their story and also activate some object when narrating. The recording will be replayed when the 'world' is opened (e.g. a Magic Gift is presented in front of the environment, the gift open showing a 'World' and the recording is replayed).
- *Save/Export 'world'*: This function is the reverse of the Load/Import function. It results into the 'World' being stored in the database, and the relevant code transmitted to a Magic Gift.

5. EMERGING ISSUES REGARDING THE FUNCTIONALITIES AND THE USER INTERFACE

Following extensive discussion and collaboration at project level, a number of issues, regarding the functionalities and the user interface, have been highlighted and clarified in order to proceed toward the interface design. These 'emerging issues' (and their definition/clarification) consist of the following:

A. General assumptions

1. The demo interface will be designed for children from 5 to 7 years old.
2. The user interface will be constructed for minimum screen resolution of 1024x768. For usability and clarity reasons, this means that the screen size should be no less than 15'' (and preferably 17'').
3. The input devices that will be supported are the touch screen and the mouse (they can be used interchangeably).

[using also communication through infrared link (IR) with the magic boxes and KidsCams]

4. Output will be through the screen and speakerphones.
5. Maximum number of timelines that will be concurrently visible is 3.
6. Children will be able to delete videos from the timeline (*e.g. by throwing them in a trashcan*).
7. If a video has been annotated, then its annotated (and not the original) version is presented on the timeline (including maybe an icon that denotes that this video has already been annotated).
8. Image / symbol annotations will be inserted in a specific point in time (*e.g., by pausing the video and then selecting an annotation symbol*) and they will be automatically included in a number of frames before and after the selected frame in order to be visible for a time period that can be perceived by the human brain.
9. Sound annotations (in the sense of effects not voice) will be treated in a way compatible to the above image annotations.

B. On the 'Timelines'

10. Which is the size / resolution of the videos (episodes)?

Need more experiments with cameras to know what is a reasonable sampling rate and resolution for the videos.

11. How long will each video (episode) last?

- *Upper limit is 2-3 mins.*

12. Which is the maximum number of videos (episodes) that will be transferred from the KidsCam to the magic mirror per child?

No limitation, basically. Videos are stored on the infrastructure, not on the database.

13. What represents the current view of the timelines window?

- Is it based on the number of episodes? *e.g., it always contains the last 5 episodes, independently of the time-frame in which they happened (for example in one case it might contain 5 episodes that were recorded from 8 a.m. till 2 p.m. and in another case 5 episodes recorder between 10 a.m. and 10.30 p.m.)*

In this case, the distance between 2 consecutive episodes on the same timeline will be fixed (*e.g., the distance between each 2 episodes will be X pixels*) or analogous to the time elapsed between the episodes (*e.g., the distance between 2 episodes will be $X * (\text{time elapsed between the episodes})$ pixels*) ?

- Is it based on time? *e.g., it presents a time-frame of the last X (e.g., 2 or 3) hours no matter how many episodes are included in this frame*

In this case, is (in any way) the number of episodes constrained? *e.g., no more than 5 episodes*

The second alternative is more preferable (based, of course, on session time). Whenever an episode is retrieved it is fitted within the session duration in which it was taken (has to be stored in the database too).

14. Will the children be able to move back and forth in the timelines?

When they see the whole session line there is not point in going back and forth. For other 'navigations' we should initially rely on the teachers to do it (through keyboard?). Of course children can always 'import' episodes from other sessions using the magic box solution.

15. When more than one videos refer to the same episode, will all the videos-regardless of which of them is selected- start playing concurrently (up to 3)? In that case:

- What happens to the sound? (*e.g., the sound from all videos is mixed*)
- Should the child be given the option of selecting only a single video to play?

Only the last episode should be playing by default, and all of them together. Being together means to be triggered by one another. It would be nice to have a 3D audio solution in which we can position the sounds from the different videos in space. But then children should also be able to 'close' video frames so that they can focus on one only, and open them again. If it is possible to go on playing in thumb nail format, that would be the best solution.

C. On the 'Annotation'

16. Will there be a function available for removing all annotations (or 'resetting' the video)?

- In the later case is confirmation needed (*e.g., ask the child "you are going to remove all annotations, is it ok?"*)?

Stick close to the 'physical' equivalent of attaching post-its. So yes, resetting is possible, but by removing each of them.

17. Is there a limit on the number of annotations permitted? (*e.g. should only one annotation symbol be allowed on a frame or can a frame have several annotations?*)

Impossible with one annotation. They should be allowed for.

18. Is the number of the annotation symbols presented on the palette restricted?

- If yes how? (*e.g., there will be maximum 10 symbols on the palette*)

No, and the collection should be open, in particular to accommodate annotations from the object and people that had tags when recording, and to allow for importing objects and people (and places) afterwards with the boxes. These annotations are provided automatically from the meta information collected by the KidsCams.

19. Is there any grouping of the annotation symbols presented on the palette or does the palette have a flat structure?

- *e.g. will there be a 'meta' palette which presents categories such as emotions, visual effects, smiles, gestures, etc. through which the type of symbols that are presented on the annotation palette is controlled?*

Sounds useful, but the children should be able to handle it. Maybe this again should be a teacher action, or we can also have a solution where the palette is imported.

20. Will it be possible to insert voice annotation while the video is playing or on a specific (paused) frame?

- *e.g., on the first case the child will add to the movie a running commentary (in the same way that a sports caster describes a football game) by pressing a microphone button, while in the latter, the video will be paused and a comment will be inserted in this point of time. This means, that in the first case, when playing back the annotated video the commentary will play along with the video, while in the latter case when the*

video will arrive at this point of time it will (automatically?) pause, the comment will be played and then the video will be resumed.

Both make sense. It depends on whether the children stop the video, in which case it belongs to the frame, or let it go, in which case it runs in parallel with it and belongs to the episode.

21. When more than one videos (the case of different perspectives of the same episode) are annotated concurrently which of the following statements are true?

- Image and sound (not speech) annotations should be added separately to each one of them.

False

- If an annotation (e.g., a smiley face) is added to one of them then, automatically, it is added to all of them.

True

- If annotations pre-existed on these videos the new annotations replace them.

False

- Previous annotations should be explicitly deleted / removed by the children.

True

- Speech annotation automatically overrides any previous speech annotations that might have been recorded to the individual videos and is concurrently added to all of them.

First is false, second is true.