Webot

A Web application for digital story-telling

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Abstract

This work focuses on the creation of a Web Application, *Webot*, to support digital story-telling activities in the environment of primary schools.
It builds on top of *Fiabot!*, an application running on iPads for creating digital stories. Until now it has been used by children in a school context, including pre-schools, primary and intermediate schools.
Through this application, kids can create a fairy tale by choosing protagonists, antagonists, and other main characters, and define the plot of the story. Then children combine text and multimedia elements into their digital story.
Previous studies observed how children were limited by having to open different applications when preparing multimedia material for their stories and by the fact that *Fiabot!* was only available on tablets. They needed a tool to provide them direct access to writing and drawing facilities. They wanted to work on their stories at home not only a school. More importantly, they were eager to share and show their stories to family and peers in an easy and convenient way.
These necessities led to the development of a Web Application.
A Web Application as *Webot* runs on any computer and does not require any specific installation, all is needed is a web browser and an Internet connection.
This system allows to create and modify stories in every environment and situation.

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1 Introduction

1.1 Context and Background

Storytelling is the act of creating or sharing stories. Usually, storytelling produces fairy tales, that have common characteristics: the setting is an enchanted place or a castle, the main characters are: the hero, the antagonist, the princess that has to be saved by the hero, magical objects and eventually helpers of the hero and the antagonist.

This activity support the development of the imagination and a better way to express creativity, the social skills, the ability to listen and concentration; all of these are important for the identity formation of a human being, especially if learned during the formation process that occurs in the environment of primary schools[1] [2].

Kids, practicing storytelling, expand their vocabulary, knowing new words and creating more difficult and complex phrases. Storytelling has also an educative role: useful for teaching values, ethics and cultural norms and differences.

According to Bruner [3], the narrative is a fundamental function of human psychology and a significant phase in the construction of meaning.

The usage of the technology in the creation of stories provides kids with the opportunity to use multimedia content as audio, video, and multiple images allowing them to have freedom of expression and a greater stimulus to their imagination.

Furthermore, the usage of technology can support educational activities useful for supporting children not only in being creative but also in organizing their work and exploring a digital media opportunity.

For taking advantage of all the benefits above-mentioned of storytelling sessions, in a primary school in Lugano, Switzerland, is used in years a Mobile Application called *Fiabot!* during storytelling classes.

Fiabot! gives the possibility to create your own stories, choosing all the main elements of a fairy tale.

Having seen the positive effect this application has on the kids, in collaboration with the teachers we decided to continue and improve this class experience.

However *Fiabot!* has some limitations: to create the multimedia elements of the story kids should go through multiple applications creating confusion and loss of concentration. Furthermore, since it is an application running on iPads, it's not always possible to use it at home, or on other devices.

Hence *Webot*, a Web application born to guarantee children all the necessary tools to create digital stories during the digital storytelling activities conducted in class.

An additional purpose of *Webot* is to understand childhood gender stereotype in the choice of the gender of heroes and antagonists.

1.2   Hypothesis

The main hypothesis of this study is that when creating and disseminating fairy tales in a primary school children will get a better overall experience with a tool that provides direct access to writing, drawing and editing multimedia content. This will avoid them to get confused and distracted. In this sense, a Web Application is a better solution than a Mobile Application in that is more easily accessible and shareable with peers and relatives.

1.3   Research questions and method used to find answers

The project aims to answer the following research questions:

RQ1. How could we create an application that is easily and everywhere usable by kids in a primary school environment?

RQ2. What are the functions that this application must have in order to guarantee rewarding experience of storytelling creation?

RQ3. And which tools and techniques should we use to develop these functions?

To answer these questions we have to learn from the past experience of *Fiabot!* in schools. Past evaluations pointed out that the main problem of *Fiabot!*, as we already said, is that it can be used only on tablets; having a Web Application seems the best approach to solve this problem.

To use a Web Application all that is needed is a device with the possibility to connect to internet. It's not necessary any kind of installation or software.

The closest existing applications to create fairy tales and be flexible in terms of basic functions is Keynote for Mac OS or PowerPoint for Windows, so what we were looking for was a Web Application where it's possible to add texts of different sizes and colors, images, multimedia files like video and audios recording, but eventually also the possibility to draw their own characters. And of course, the possibilities to save everything and subsequentially modify. Figured the feature out, the tools to be used is the last point of this section. Later the technical aspects are going to be explained in detail, for now, what is necessary to know is that a front-end and a back-end software are necessary. Furthermore a consistent database for saving sessions and stories.

2 Related Works

In the past years Rubegni and Landoni conducted an investigation on how mobile technology can support educational activities as defined by a school curriculum; in particular they focused on the literary field and developed a Digital StoryTelling (DST) application, *Fiabot!*, to support this activity[4].

The study had the purpose of test if *Fiabot!* supports children in their schools activity and if it's useful for teachers to have a different ITC-approach, and to what extent children like using it for the creation and sharing of their stories.

Their findings show that the application has a positive impact on educational activities. Overall, *Fiabot!* was demonstrated to be very effective in stimulating children's discussion of a story's plot and characters. Furthermore, *Fiabot!* supported children not only in being creative but also in organizing their work and exploring a digital media opportunity. These two experts also carry out a study about the quality and the engagement of every story with the child.[5]

But a deep discussion of how to design a digital storytelling Tool is described in [6].

First point is why using technology and which benefits can actually technology give during the process of learning in school. *Fiabot!* helped children to learn how to create media such as drawings, picture-drawings, audio and video in a way that children can express themselves as never before.

From the data, it emerged that children quickly learned how to creatively use the different media opportunities (e.g. using the sound to interpreted the characters), however they had a limit in combining the different pieces in the whole story and they missed out on the overall understanding. Thus, it seems that children can easily get a basic understanding of how to use the technology but they struggle with the most conceptual aspects of creating a story. However, this is in line with the pre-operational stage of typically developed children.

The benefits were the reductions of performance-related stress, the increase in attention, the training of children in overcoming individuality and acting more collaboratively, the development of their emotional and social skills, as well as their improvement in communication and language abilities. All these aspects contribute to reinforce the children's cognitive development.

It was discovered that also teachers get benefits from this experience:

they appreciated its potential as an inspiration for teaching different subjects, and for creating a very positive collaborative atmosphere with their pupils. Teachers were amazed by the level of competence of their pupils and how independent they quickly became in using the various applications. By examining the teachers' comments on the role played by researchers it becomes clear how, given their levels of expertise, children effectively became editors and publishers of the story.

Stefania Randazzo, in her Masters Thesis *the design of fiabot! a digital and mobile application for formal learning at school* analyzes deeply the main iPad applications for storytelling and aims at finding the best functionalities to be included into the design requirements. Each app has been classified according these three criteria:

Structure: the application has a default content architecture and/or it helps to structure the story.

Content: the application has elements of inspiration that could help the child to create the content of the story.
Editing: the application allows to edit the elements of the story
Sharing: the application allows to share the output as media format or on web.

Let's go through each application:

Voicethread app allows to create dynamic conversation around documents, snapshots and videos. It is possible to record voice, type and draw right on the screen. The media used are images and camera pictures.

StoryKit allows editing existing and famous fairy tales or creating new ones. The user can write text, illustrate by drawing on the screen, taking pictures, attaching photos from album and recording voice/sound. Elements of the story: TEXT BOXES, IMAGES and SOUND CLIPS. Story can be saved/share and make available on: www.childrenslibrary.org/

Story Wheel helps to build the story through the spinning of the wheel. In fact, the child is stimulated to use his cognitive ability to compose the story, use the imagination and his oral skills to tell the story. The story pattern is given by the spinning of the wheel, with which you can choose themes and characters.

Story Dice is a creative tool to prompt ideas for plot, character, and setting. This idea generator can be used effectively for both written and oral storytelling.

With *YouFable* it is possible to create a personal fable by choosing 10 cards random from three different decks: Themes, objects and characters. Starting from the first until the last card, the user can get inspiration from the image and record his voice on it.

Among the functionalities of *Story Patch*, there is one that helps to set the story. After the child has selected a theme, the app asks a series of questions and builds a story based on the responses. *Story Patch* inserts all the text so that the children has to illustrate each page of the story.

Toontastic helps to set the structure of story and to dramatize it through the use of predefined set of music that is different for each grade of the story. It allows to create characters by drawing them with fingers. More, it allows to create as final output an .mov.

StoryFree provides children with environments where to establish the story and a wide range of characters and images to include into the story. Simultaneously, it allows including text so that children can invent the story while inserting images. It recognizes typing errors and it has the auto fill of words.

PuppetsPal offers many predefined sets of characters divided per themes. It is helpful for establish roles in the story. Also, it allows to cut pictures in order to use them as characters.

Novek Idea is a collaborative storytelling tool based on creating a sentence at a time. The peculiarity is that it suggests keywords to use for creating the story, which are vocabulary words appropriate to the childs age. It can be used in different game modes, such as Novel Idea (where the first sentence is provided) or Theme (where a story theme is given to stimulate creativity).

Storify allows the user to use social networks resources and user generated content to build stories, bringing together media scattered across the Web into a coherent narrative. The story layer is built above social networks, to amplify the voices that matter and create a new media format that is interactive, dynamic and social. Users in writing his story can use the resources offered by Twitter, Facebook, YouTube, Flickr, Instagram and more.

Ptch app helps to creates video starting either from local files stored on camera roll (such as video, images, sound) to social networks (Facebook, Instagram, Twitter, Tumblr. Google Photos, Viddy). In addition, you can add text and animations between an object (eg picture) and the next (eg text). It is possible to share the movie on the application website.

The Fairy Tale application allows to modify fairy tales by changing text, adding voice recording or modifying images. From the point of view of the experience, the child can interact with the images in the story, which become animated on click and also they make sounds (i.e. touching the tree the sounds is of leaves). It also offers a wide selections of character moods that could help the children to identify the most appropriate status to add in the story moment. The final output is an e-book to be put in a bookshelf (like iBooks).

Doodlebuddy application has been considered for the stamp features: it has lots of images and each one make a different sound when stuck on the stage. The app combines finger paint and image sticking.

Screenchomp allows to draw and record at the same time, so that the results is an animated drawing that can be shared or exported as MPEG-4 format.

Sock Puppets application allows to create story using animated characters and scenes and recording voice. It is nice that it has a selection of "Props and Scenery" that are movable while recording. At the end, the file can be shared on Facebook or Youtube. In Fig. 0 are expressed the rates given by Randazzo.

APPLICATION	STRUCTURE	CONTENT	EDITING	SHARE
Voicethread		★★	★	★★★
StoryKit	★	★★★	★★	★★★★
Story Wheel	★★	★★★★		
Story Dice	★★★	★★★★		
YouFable		★★★	★	★
Story Patch	★★★★★	★★★		★★
Toontastic	★★★★★	★★	★★★★	★★★★★
StoryFree	★★	★★★	★★★	★
Puppets Pal	★★	★★★	★★★	★
Novel Idea		★★★★		★★
Storify	★	★★★★	★★	★★★★
Ptch			★★★★	★★★
Fairy Tale	★★★	★★★★	★★★	★★★
Doodlebuddy		★★	★★★★	
ScreenChomp		★	★★★★	★★★
Sock puppets	★★	★★★	★	★★
AVERAGE	★	★★★	★★	★★

Figure 0: Ranking of the Apps given by Randazzo

What pointed out is that the evaluation of the applications has lead us to believe that currently there are no educational application, but mostly they have an entertainment purpose. As matter of fact, most of the application performs better in providing content to be modified or stimulating content creation (es. Use of keywords, spinning the wheel), but are very weak in teaching what are the elements of a story or how to structure a story: they lack of a clear educational objectives.

3 Methodology

From the previous sections, it is clear what kids and teachers need to perform the best storytelling class. First of all, as it is already pointed out, the possibility the application should run on every device(tablets and smart-phones but also Personal Computer and laptop).

In this way, kids can work at home and also show their stories to the parents. This solution gives the chance also to use the application in an Informatics class, where the main laptop of the teacher has full access of reading-writing of the content, while, kids can only read and modify their own stories.

The requirement of no installation and the possibility to export everything online in a web-server is certainly an additional advantage.

Regarding the functionality and the features that *Webot* should have, from the past experiences it is clear that it has to guarantee as much freedom as possible to kids creating a story and by leaving room for their imagination.

Multimedia content such as images, video and audio. Kids can find these multimedia files online. What teachers actually found interesting is an audio narration of the story made by students themselves. Of course, the possibility to draw and create their own images and to write text is mandatory. With multiple text fonts, kids get confused[5], that is why it is necessary to provide only a few fonts, the most popular and legible, to avoid that students waste time choosing between the different styles of text. Of course has to be possible to save the story, modify or delete it.

The most interesting function is that it's possible to choose an already existing character basing on adjectives and characteristic(male/female, blonde). This is going to be useful for the teachers to understand the common choice of the kids about common stereotype as the stereotype of gender.

This is how I designed the front-end structure of the application: in the center a big canvas representing the page of the story where the user can interact, on the left side buttons concerning the basic function of draws, undo/redo, clear, chose of colors, save the images and chose the own character.

On the right side all the functionality of the management multimedia elements: upload the file(audio, video or image) and select it, the text division where it's possible to write and choose the style.

On the bottom all of the pages of the stories and all the other stories where it easily possible to select one page and to import to work on it. This is database supported.

These are the basis that gave birth to *Webot*, that will be the leading of a formative evaluation that has guided the development of a prototype that we need as proof of concept to validate the hypothesis through the heuristic evaluation with the experts.
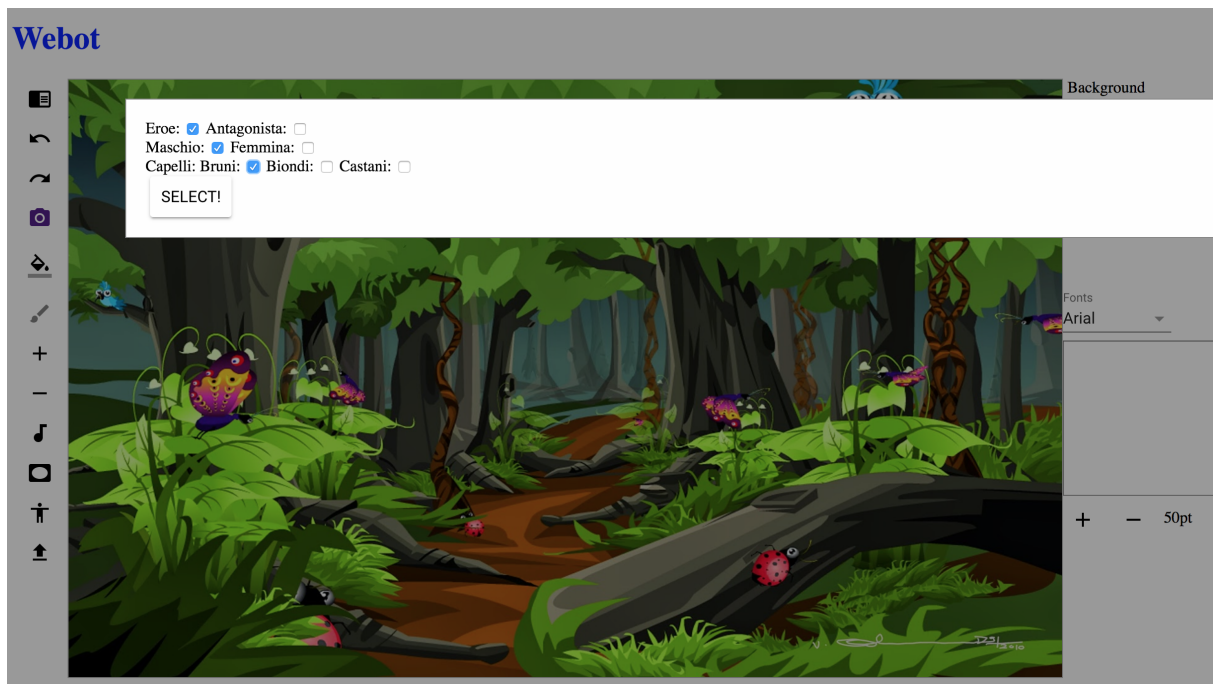
4   Webot: design and implementation

By definition, a Web Application or web app is a client-server computer program which the client (including the user interface and client-side logic) runs in a web browser. *Webot* runs on Google Chrome. Inevitably I used *HTML5* and *CSS3* and *Javascript* for the front-end(front-end is the part of the application where the users interact directly). *HTML5* is the standard markup language for creating web pages and web applications, so I used it for the creation of the web page, and along with *CSS3*(a style sheet language used for describing the presentation of a document written in a markup language like *HTML*)I designed the separation of the content, including layout, colors, and fonts. On *Webot*, it's possible to draw on a canvas with different sizes of the brush and multiple colors, it's possible to add texts in Italic or bold, with different sizes, fonts, and colors. Furthermore, you can set an image as a background or add one or more images choosing the position and the dimensions you want. You can upload audio files and videos, move them on the canvas and reproduce/stop them. Another function that is designed to help kids in the creation of their story is the possibility to choose the character from a set of images(drawn by kids themselves) selecting from a checkbox the attributes as shown in Figure 1.

Figure 1: An example of check-box selections

If the kids make some mistakes during the creation of the fairy tales they can undo/redo or completely clear the canvas. All these features are written in *Javascript*. This triad of cornerstone technologies is embraced by *Polymer*. *Polymer* is an open-source JavaScript library for building web applications using Web Components. In this project *Polymer* is used to handle icons, buttons, and the *HTML* pages. The last function is that you can save a page online on the Web Application and locally on your machine, and successively modify it, with all the history saved. This is possible thanks to the back-end. The back-

end part(the server and the storage part) is done with *Node.js* and *MongoDB*. *Node.js* is an open-source, cross-platform JavaScript that executes JavaScript code server-side. *Node.js* handles the GET/POST/DELETE request thanks to *Express*(A *Node.js* framework) and the database in *MongoDB*. *MongoDB* is a document database using *JSON* as schemas, that's why is really powerful with *Javascript*. The requests are used to save in/delete from the database and to load every page. In the database is saved every page with all the history of what has be done. The figure 2 is a draft of the environment .
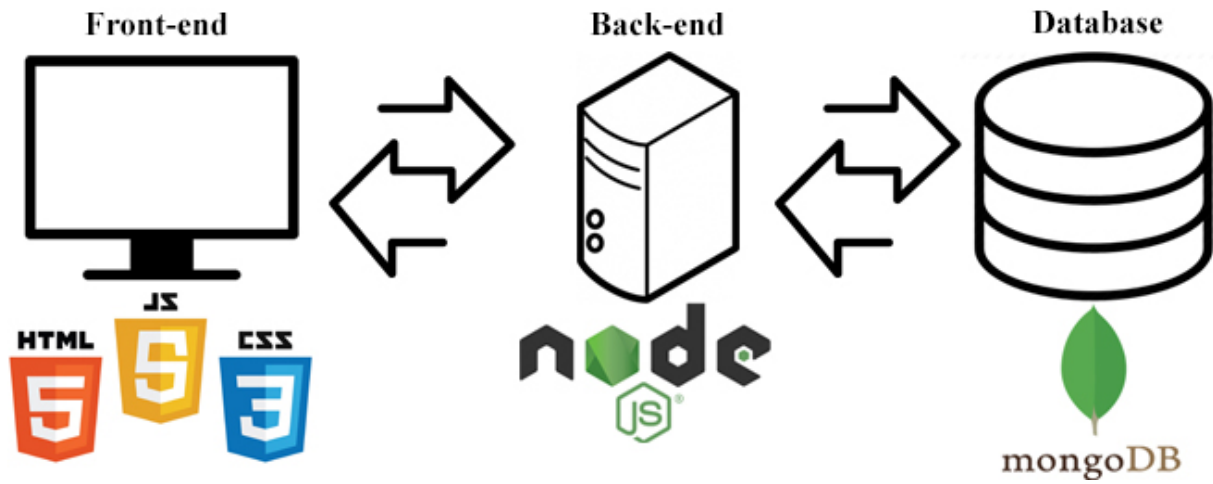

Figure 2: A draft of the above-mentioned environment

5 Heuristic Evaluation

We conducted a heuristic evaluation involving 2 expert, T1 and T2, both school teachers whose students *used Fiabot!* last year for the creation of digital fairy tales. They were shown how *Webot* works starting from the available installation options.

Regarding the installation both experts agreed that having the possibility for them to share the same version of the application with their students when running a writing class in the ICT lab would work very well. They also welcomed the web version but asked for controlled access as they were concerned about intrusions from non-members of their class.

It was suggested to recognize two type of users: teachers with access to all stories produced by their students, and students who could only work on their own stories. The system should also be able to deal with groups sharing the same story and users willing to only read stories created previously.

For drawing, the possibility to draw directly without calling an external application was welcomed with enthusiasm by both teachers, as they recognized drawing being a very popular activity with children last year. Equally important was the option of importing a landscape for the story, as they noted how much time children spent last year working on this part of their story.

The audio was considered particularly import for stimulating creativity in children than in the past limited the production of sound to dialogues, repeating what was already in the textual component of the story. T2 put forward the example of adding to a story a bird and its singing to make it more real. T1 and T2 elaborated on the possibility to add music and sound elements to make the story richer.

Both T1 and T2 appreciated the possibility to select existing images: produced by children and stored in a local database or saved from other sources, as well as using drawings made by using the functions supported by *Webot*.

T1 highlighted how in class they work a lot on describing characters. This seems to have a predominate task compared with the organization of the story plot where children are asked to make sure there is either a happy ending for fairy tales or a moral lesson for fables. Besides, T1 also elaborated on other important ingredients of a story: aristocratic characters, metamorphosis, travels, trails that are suavely 1, 3 or 5, always odd numbers, the choice of colors: light blue, red or blue, and finally stereo-typically blonde princesses.

Both T1 and T2 commented on how aesthetically pleasing the *Webot* application was and were impressed by its functionality. T2 suggested for future development the possibility to support students in making new stories by asking them to complete an existing one, and only create a small part of it, such as the trials, or the magic object, within an existing plot. She was also asking for verbal tenses and modes to be predefined in order to help children with difficulty in writing. The addition of a thesaurus for enriching the amount and variety of adjectives used by children could also help correct some of the common mistakes made by children who tend to repeat the same adjectives over and over in their story.

6   Conclusion

Working on Webot was a challenge in many ways. Mostly because of having children and their teachers as users that meant keeping an open mind and being flexible to accommodate their ever changing needs. Nonetheless, it was an interesting experience and I learned a lot in terms of approaches to design as well as of practical prototype development.

From the heuristic evaluation that has taken place at the end of project has emerged that overall *Webot* it's a really solid start to develop a final Web Application for kids and teacher . Since *Webot* is a proof of concept and as such has some limitations in that only few functionalities were fully implemented and we only run an in-depth heuristic evaluation involving two experts. As it is just a prototype we will needs to further expand and fully test it. The next step in our formative evaluation approach will be to involve a small sample of children in a task oriented evaluation of the revised prototype.

Nonetheless our experts found *Webot* very promising and gave us useful suggestion for future development First of all, moving it on a web-server online can be the best solution, reachable everywhere and from every device. in my opinion, it's important to listen the experts T1 and T2, about having a personal log-in with different user types. The teacher-user, can modify and read all the stories, the student-user can modify and read only his/own own stories. This prevents the access of not authorized people but also that scholars don't interfere on the other stories, creating unpleasant situation for all the class. Adding more interactive exercises to improve problem solving strategy seems a very interesting feature, that can be implement without any particular problem; of course some teachers should collaborate with the developer in order to address the issue.

All the technologies used during this project can easily interface with a lot of other powerful technologies, so there aren't particular limitations (except the imagination).

We run an intensive heuristic evaluation involving experts T1 and T2, thus we have some initial answers to our research questions. For RQ1, moving Webot on a website with a secure log-in, according our experts opinion, is the best solution that guarantees an easy and secure access to the application. T1 and T2 agree that all the functions offered in Webot are important for providing a rewarding experience of storytelling creation. In addition, to answer RQ2, T2 suggested the possibility to support students in making new stories by asking them to complete an existing one, and only create a small part of it, such as the trials, or the description of the magic object, within an existing plot and also the addition of a thesaurus for enriching the amount and variety of adjectives used by children. When looking at RQ3, our experts found Webot easy and intuitive to use, this indicates that the tools used to develop it are good and appropriate.

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