A Text to Image Story Teller Specially Challenged Children - Natural Language Processing Approach

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ABSTRACT
Every human relishes happiness when he or she becomes a creator. This happiness does not have any metrics. A person who plants a tree, to a person who works on the most complicated flight engines feels happy on his creation. The work attempted in this paper is to make children the creators. Children have wonderful capabilities to create and innovate new things. Specially challenged children are equally talented in their own way. Challenged children identified with capability outperform everybody in their competitive line. This research work is an application which can be used by such children which kindles their creativity and helps them showcase their abilities. These children can create their own pictorial story board in a fashion as it comes to their mind. The text story is handled as a natural language input and translated to a scrolling layer of images, which are picked by the user.

General Terms
Natural Language Processing, Software tool.

Keywords
Natural Language Understanding, Image story board, Natural Language toolkit, Tokenization.

1. INTRODUCTION
The most wonderful time in anybody's life is always the childhood, invariably for some reason. This age happens to be the most joyful and enjoyable part of life. There are adequate causes for this; one very important aspect is the 'story time'. Children generally wait for story time as an inevitable part of every day. This awaits and inquisitive nature is the same for all children. Physically challenged children are also to be treated with the same requirement. Physically challenged children need a lot more attention and when the effort is put, the results are always doubly proportional. This work aims to solicit an application that can be used by physically challenged children, enabling or allowing them to enjoy their choice of stories in their own small world. The application developed in this research work is an "image story board" that allows the enthusiasm and creativity of challenged children to come to reality.

The aim of the research work is to develop software which will convert a text story into its corresponding image story. The software can present a story with images corresponding to each sentence in the story. Each sentence of the given story is analyzed for its meaning and images matching the text are extracted from the web using Google Search Engine. The sentences would be replaced by images which can convey the meaning of the text data, so that, the end user obtains an image story line as an output for the text story line given as input. For finding which words in each sentence make it meaningful, NLTK module available in Python is used prior to image search.

The research work was developed in three different stages the web page, image gallery and the story board. In the first stage the user is provided with a web page with an editable text area, where the text or the content can be typed into or uploaded. Second stage is, each and every content which is in text area is analyzed, processed and linked to the web page, where the images corresponding to each of the text content is searched and placed in another display area. From this display area the user is given a chance to select the type of image required as per each individual's or users choice. After the selection is done, in the next stage the complete story board with the images and text content is displayed which can be viewed as a scrolled story, and can be printed or shared in social networking sites.

The users targeted are mainly students at the school level, and for students who are specially challenged, specifically for children with hearing difficulties. This software makes learning creative. It is developed to enable each child to create their own stories pictures with relevant and interesting images as per their choice.

2. REVIEW OF LITERATURE
Many applications are available which are focused towards addressing physically challenged children's requirements. Few systems which are already available are described below.

Nokia Storyteller
Nokia Storyteller automatically groups all the photos, videos and cinema graphs into individual events called stories. Timeline is where one can browse all stories and modify them, then view them as slideshows or share them with friends as shown in fig.1. Sorting of photos and videos by location, adding captions and creating a list of favorites options are available. The user can invoke the editing features of the Lumia camera applications for additional creativity on the existing images. Zooming options are available.

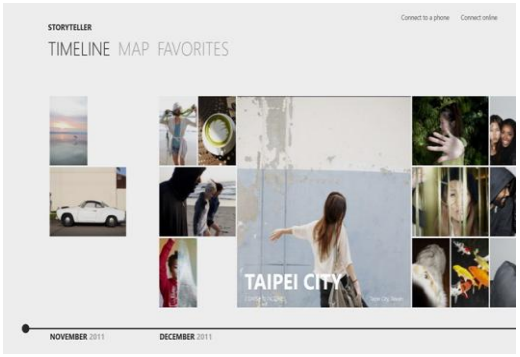

Fig 1. Nokia story teller

In the case of Nokia Storyteller it provides a timeline where one can browse all stories and modify them, then view them as slideshows or share them with friends.

Steller
This software creates multipage stories using photos, videos and text on iPhone. It allows to follow and browse stories from friends, family and inspiring creators around the world as in figure 2. Republishing stories from the community into the collections (e.g., adventures, recipes) is possible. Posting stories to social networks, blog, website, and sharing via email and sms is available. Exploring new trending and featured stories each day on food, adventure, style, etc is an interesting feature.

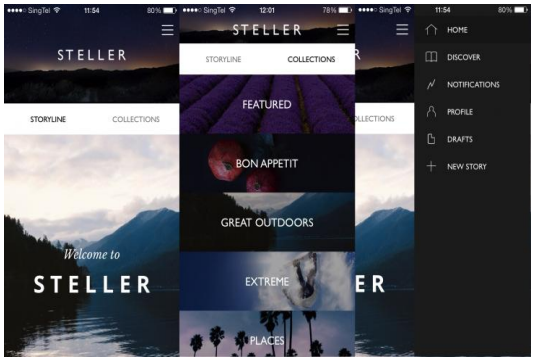

Fig 2. Steller Story Teller

Steller is a story teller app, which posts stories onto social networking sites, blog and share via email [2].

Contour
Contour Storyteller brings video and location together into a single experience. When GPS videos are played one will be able to watch path as we bomb down the hill while interacting between the map and the video player to fast forward to your favorite parts. "places" feature can be used to track all the places in the world you've been or to quickly find videos from favorite locations as given in figure 3. Contour Storyteller brings video and location together into a single experience [3].

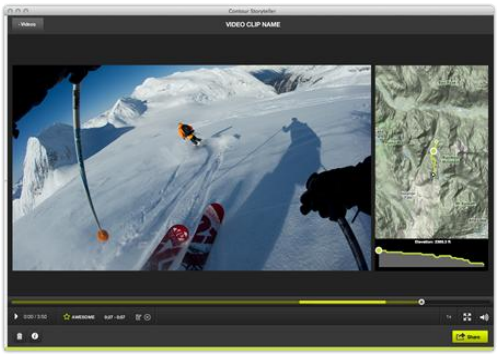

Fig 3. Contour story teller

The common drawbacks that exist with the systems reviewed are listed below.

- These story tellers can only be used on android or MacBook
- Same features as in the case of social networking site posts
- Images should be provided by the user, there is no automatic selection of images
- Response time and memory occupied is more
- It is platform dependent
- Images cannot be edited as per the users interest

Content Based Image Retrieval (CBIR) is a sought after area in the area of image processing [4]. CBIR is an area which usually retrieves images from a respective database. There is enough literature which supports retrieval of images from an entire stock of database [5]. A novel image retrieval model based on relevant features is discussed in [6]. A good set of performance evaluation proposals on image retrieval is catalogued in [7]. In [8] a smart content based image retrieval system is explained in detail. A content based re-ranking on text based image search is elaborated in [9]. Using sketches of images a retrieval system is discussed in [10]. The research work developed in all these papers are mostly on proprietary software and targeted as mobile apps.

3. METHODS AND MATERIALS

The work is focused to benefit kids, which basically converts the story in text into an image board. There is a user interface webpage created for kids to make reading more fun. The web page contains a text box were the story is put and using NLTK (Natural Language Tool Kit) the story is tokenized into sentences and in turn words. These words are connected to the Google image through the Google app engine and the related images are taken into the image gallery of the web page. The user can choose the most related image or as per personal preference. The chosen image gets stored into a story board as the final output.

The implementation is done in python. Python code can be packaged into standalone executable programs. Python interpreters are available for many operating systems. It tokenizes the words from the story. NLTK tokenizes the words without losing the meaning of the original statement. NLTK divides the words according to the English category as verb, noun, adjective, etc based on the placement of the word in the statement. NLTK is intended to support research and teaching in NLP or closely related areas, including

empirical linguistics, cognitive science, artificial intelligence, information retrieval, and machine learning. NLTK has been used successfully as a teaching tool, as an individual study tool, and as a platform for prototyping and building research systems.

The system is divided into 3 parts:

- Inputting the story into the textbox. The story is given as input into python.
- The story is tokenized into words using NLTK imported in python. The words are connected to Google using the app engine. The first 5 images are selected and put into the gallery of the web page and an option is provided to the user to select the image for the story.
- The selected image is put into the story board as the final output.

Algorithm for tokenizing the sentences into words. Steps followed are as follows:

- Import NLTK.
- The content is assigned to a variable.
- Using NLTK.data.load function the paragraph is tokenized into sentences.
- NLTK.word_tokenize() function to tokenize the words
- These words are tagged with appropriate tags used in NLTK

The Table 1 shows the Part Of Speech (POS) tags used by the NLTK tokenizer. The NLTK follows POS-tagger the tags used are as follows:

Table 1. POS table

POS Tag	**Description**	**Example**
CC	coordinating conjunction	And
CD	cardinal number	1, third
DT	Determiner	The
EX	existential there	*there* is
FW	foreign word	d'hoevre
IN	preposition/subordinating conjunction	in, of, like
JJ	Adjective	Big
JJR	adjective, comparative	Bigger
JJS	adjective, superlative	Biggest
LS	list marker	1)
MD	modal	could, will
NN	noun, singular or mass	Door
NNS	noun plural	Doors
NNP	proper noun, singular	John
NNPS	proper noun, plural	Vikings
PDT	Predeterminer	*both* the boys
POS	possessive ending	friend*'s*
PRP	personal pronoun	I, he, it
PRP$	possessive pronoun	my, his
RB	Adverb	however, usually, naturally, here, good
RBR	adverb, comparative	Better
RBS	adverb, superlative	Best
RP	Particle	give *up*
TO	To	*to* go, *to* him
UH	Interjection	Uhhuhhuh
VB	verb, base form	Take
VBD	verb, past tense	Took

V BG	verb, gerund/present participle	Taking
V BN	verb, past participle	Taken
V BP	verb, sing. present, non-3d	Take
V BZ	verb, 3rd person sing. present	Takes
W DT	wh-determiner	Which
W P	wh-pronoun	who, what
W P$	possessive wh-pronoun	Whose
W RB	wh-abverb	where,when

Natural Language Tool Kit

The Natural Language Toolkit, or more commonly NLTK, has a well built set of libraries and programs for symbolic and statistical natural language processing (NLP) for the Python programming language. NLTK includes graphical demonstrations and sample data. It is accompanied by a book that explains the underlying concepts behind the language processing tasks supported by the toolkit, plus a cookbook.

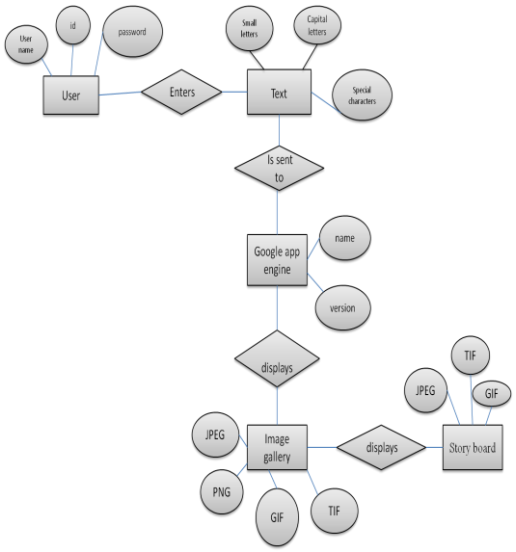

Fig 4. Complete flow or functioning of the system.

4. EXPERIMENTAL RESULTS

This figure 5 shows the web page screen or the input entry screen for placing the text. When a story is copied, the first sentence is tokenized. The figure 6 and figure 7 shows the sentence and word level tokenizing respectively. The first line which is split into word tokens is placed into the google images search page and relevant images are displayed. As a test sample when a story begins with the line "Long Long ago there was a king who was courageous" the google images fetch images related to the tokenized sentence. The figure 8 shows the output of the google search engine. The child can now click on the image which needs to be placed on the story board. In the same manner every sentence of the story is tailor made by the child as per his preference or choice. This would surely make them feel as a creator and would probably bring out their potentials in a very amicable way. Teaching children to be creative is an arduous task but shaping them to be creative can be done.

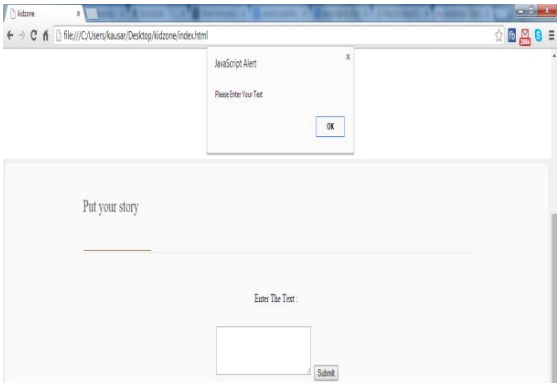

Fig 5. Input Text Area

```
>>>
Hello.
-----
How are you.
-----
How was your day yesterday.
-----
How much fun we had?
-----
what / who.
-----
Mr. Smith
>>>
```

Fig 6. Sample sentence tokenized

```
>>>
[('Mr', None),
 ('?', '.'),
 ('.', '.'),
 ('much', 'AP'),
 ('was', 'BEDZ'),
 ('are', 'BER'),
 ('had', 'HVD'),
 ('/', 'IN'),
 ('day', 'NN'),
 ('fun', 'NN'),
 ('Smith', 'NP'),
 ('yesterday', 'NR'),
 ('your', 'PP$'),
 ('you', 'PPSS'),
 ('we', 'PPSS'),
 ('Hello', 'UH'),
 ('what', 'WDT'),
 ('who', 'WPS'),
 ('How', 'WRB')]
>>>
```

Fig 7. Tokenized word output

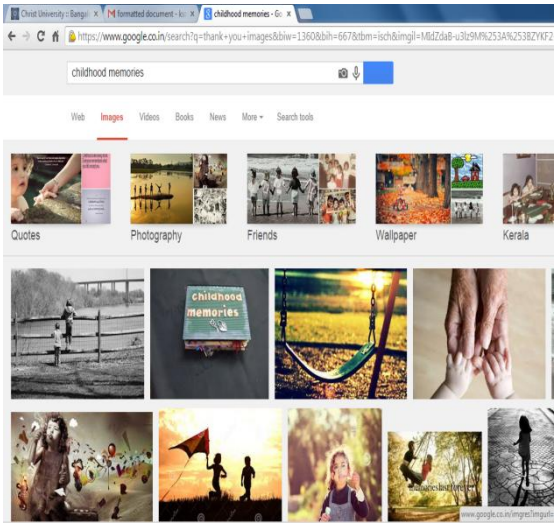

Fig 8. Gallery Display

5. CONCLUSION AND FUTURE WORK

This research work is to make technology reach to all. The work is surely targeted for the specially challenged children who can get access to this application and get benefited. It is built on open source technologies for the reason that it can be hosted freely on the web. All interested people can use it freely. It is affordable and can easily reach all the children.

6. REFERENCES

[1] "Nokiastoryteller".Internet:http://apps.microsoft.com/nokia-storyteller.

[2] "Steller-storyteller" Internet: https://steller.co.

[3] "Contour-storyteller" Internet :http://store.contour.com

[4] Dinakaran, B., J. Annapurna, and Ch Aswani Kumar. "Interactive image retrieval using text and image content." Cybern Inf Tech 10 (2010): 20-30.

[5] Bjarnestam, Anna. "Text-based hierarchical image classification and retrieval of stock photography." In Electronic Workshops in Computing (eWiC)-The challenge of image retrieval, Newcastle upon Tyne. 1998.

[6] El Alami, M. E. A Novel Image Retrieval Model Based on Most Relevant Features. – Knowledge Based Systems, Vol. 24, 2011, No 1, 23-32.

[7] Muller, H., W. Muller, D. Mc G. Squire, S. Marchand-Maillet, T. Pun. Performance Evaluation in Content-Based Image Retrieval: Overview and Proposals. – Pattern Recognition Letters, Vol. 22, 2001, No 5, 593-601.

[8] Lin, C. H., R. T. Chen, Y. K. Chan. A Smart Content Based Image Retrieval System Based on Color and Texture Feature. – Image and Vision Computing, Vol. 27, 2009, No 6, 658-665.

[9] P.Serdyukov,... "Content based image re-ranking of text based image search results", ECIR 2013, LNCS 7814, pp. 618-629, Springer Verlang.

[10] Shadma Parveen, Shweta Yadav, Neelu chauhan, "Sketch4Match-Content based Image retrieval System using sketches", International Journal of Advanced research in computer science and software engineering, vol 3,Issue: 4, April 2013