Hierarchical MindMap Generation from Purely Textual Description (US Patent Pending)

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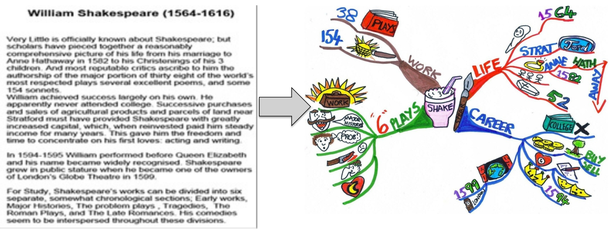
Introduction

With today's vast and rapid increase in the use of electronic document readers, smart phone, tablets, there is an eminent need to develop tools for visualizing and summarizing textual contents. MindMapping [2] is not only a note-taking tool, but also a very powerful tool for text summarization and visualization. Converting a text paragraph to a MindMap would provide an easier way to visually access the knowledge and ideas in the text.

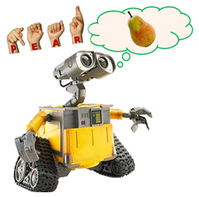


Applications

1) Audio of a lecture to Text to MindMap.
2) Automatic Generation of Mindap Presentations.
3) A novel way to visualize and summarize text documents for electronic book readers.

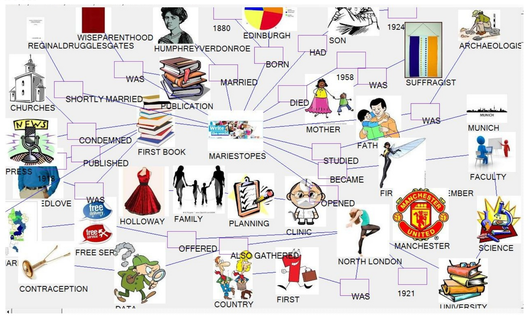
Areas

- ❖ Education
- ❖ Presentation
- ❖ Electronic document readers
- ❖ Human computer interaction



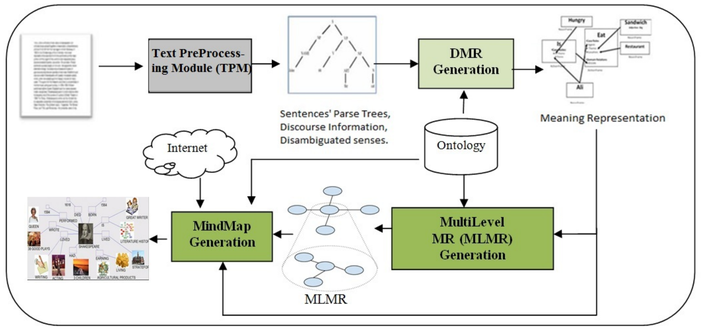
Why Hierarchical Mind Maps?

Single level MindMap defies the purpose of comprehension speed, simplicity, and clarity for larger text.



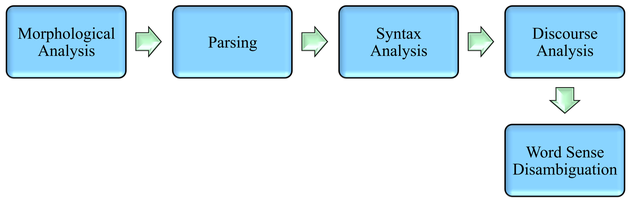
System Architecture

This figure illustrates the architecture of English2MindMap system, where the blocks are color-coded according to the contribution in each block. Gray blocks almost used existing approaches and/or technologies (e.g., the TPM), while green blocks constitute the main contribution. The following subsections describe the functionality of each component.

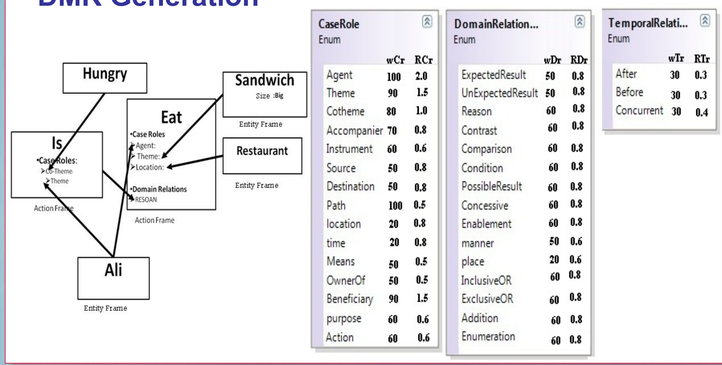


Text Preprocessing Module (TPM)}

This is the first phase in the system, it extracts sentence-wise information from raw text. It takes as an input the English plain text, and then generates for each sentence a parse tree, discourse analysis results, and the intended sense for each word in the sentence. In this stage, we utilized the current approaches for such a well-studied phase in NLP.



DMR Generation

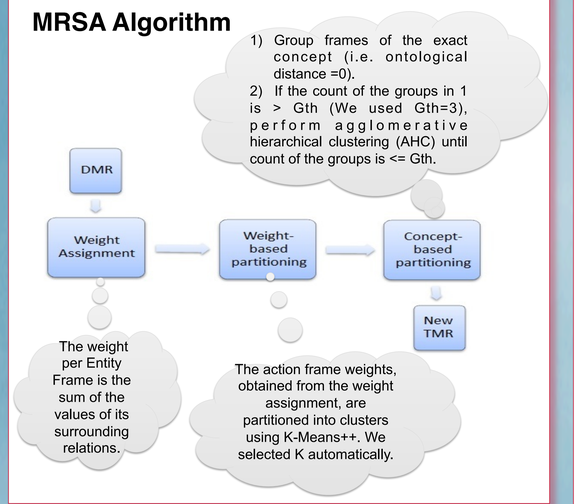


MLMR Generation

ALGORITHM 1: MLMR Generation(DMR)

$topMR \leftarrow MRSA(DMR)$
Display MindMap of topMR to the user and Highlight group frames
while *true* **do**
  Wait until user select group frame, exit if user choses to exit
  currentMR ← MRSA(regionInDMR(Selected Frame))
  Display MindMap of currentMR to the user and Highlight group Frames
end while

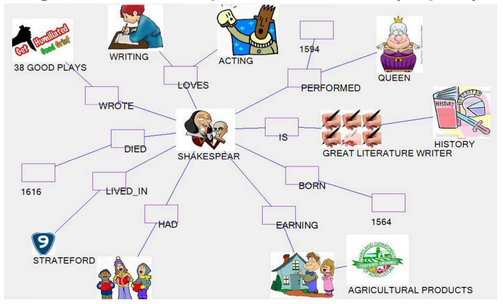
MRSA Algorithm



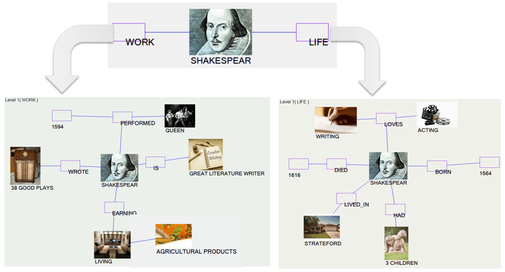
MindMap Generation

This phase converts either the DMR or MLMR to a MindMap that contains images for visual frames then it automatically allocate it on the screen

Singe Level MindMap from Pure Text (ClipArt)



Hierarchical MindMap from Pure Text (All)



Experiments (4900 Mturk Responses)

(1) Correct?, (Regardless the pictures) ? Grade.
(2 Relevant Pictures ? Grade.
(3) How many missing Actions in the MMap)?.
(4) How many missing Entities?.
(5a) How Many redundant frames ?
(5b) Satisfactory Hierarchy? Grade.

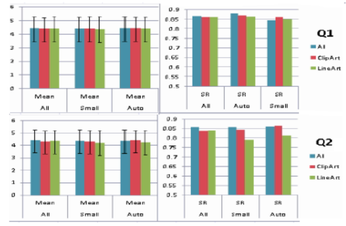
Experiment 1					
	Q1	Q2	Q3	Q4	Q5
Mean	4.42	4.34	0.54	0.59	0.48
StdDev	0.84	0.87	1.58	1.74	1.68
SR	0.86	0.84			

Experiment 2					
	Q1	Q2	Q3	Q4	Q5
Mean	4.51	4.27	0.45	0.5	0.23
StdDev	0.65	0.82	1.25	1.47	0.58
SR	0.92	0.79			

Experiment 3					
	Q1	Q2	Q3	Q4	Q5
Mean	4.48	4.34	0.59	0.61	0.25
StdDev	0.87	0.94	1.51	1.55	0.93
SR	0.89	0.84			

Image Search Specs analysis

Expr 1



Expr 2

	Q1			Q2		
	Mean	StdDev	SR	Mean	StdDev	SR
All	4.56	0.63	0.937	4.31	0.825	0.8
LineArt	4.53	0.61	0.939	4.24	0.827	0.76
ClipArt	4.46	0.71	0.91	4.26	0.825	0.81

Conclusions and Future Work

We have designed and implemented an automated tool that takes English text as input and generates a Mind Map visualization out of it. The system was comprehensively tested under different parameter settings by MTurk Human Subjects and high satisfaction rates have been recorded. Hence, we aim to extend the system such that it's reliable in handling very large text (e.g., a book) and also to try different approaches of Concept Combination. We will also work on enhancing the performance of the system to handle large text in reasonable time (i.e. ML MindMap Generation of a 250 word document take about 40 seconds on a 3.3GHZ-2GB machine).

References

[1], M. Elhoseiny, A. Elgammal ,"English2MindMap: an Automated System for MindMap Generation from English Text," ISM, Dec, 2012.
[2] B. B. Tony Buzan and J. Harrison, The Mind Map Book. BBC Archive, 2010.