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A Review Paper on Text Summarization

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Abstract: Text summarization is a process of extracting or collecting important information from original text and presents that information in the form of summary. Text summarization has become the necessity of many applications for example search engine, business analysis, market review. Summarization helps to gain required information in less time. This paper is an attempt to summarize and present the view of text summarization from every aspect from its beginning till date. The two major approaches i.e., extractive and abstractive summarization is discussed in detail. The technique deployed for summarization ranges from structured to linguistic. In Indian many languages also the work has being done, but presently they are in infancy state. This paper provides an abstract view of the present scenario of research work for text summarization.

Keywords: Text Summarization, Natural Language Processing, Extractive Summary, Abstractive Summary.

I. INTRODUCTION

Text summarization is a process of extracting or collecting important information from original text and presents that information in the form of summary. In recent years, need for summarization can be seen in various purpose and in many domain such as news articles summary, email summary, short message of news on mobile, and information summary for businessman, government officials, researchers online search through search engine to receive the summary of relevant pages found, medical field for tracking patient's medical history for further treatment [1].

On the internet, many such examples are available like, news article summarizer such as Microsoft News2, Google1 or Columbia Newsblaster3 [1]. BaseLine, FreqDist, SumBasic, MEAD, AutoSummarize & SWESUM is few popular biomedical summarization tools [2]. Text Compacter, Sumplify, Tools4Noobs, FreeSummarizer, WikiSummarizer & SummarizeTool are online summarization tools. Open Text summarizer, Classifier4J, NClassifier, CNGLSummarizer are few widely used open source summarization tools [3]. The need of having information in abstract form on a click has increased as, the need for automatic text summarization has also increased in many areas namely, news articles summary, email summary, short message news on mobile and information summary for business, government officials research, online research engines to receive summary. In late 1950, the first system came in term; The automatic summarizer in general selects important sentences from the document and groups them together, it consume less time or time saving to understand the content within the large document. The aim of automatic text summarization is to convert large document into shorter one and store important content [4]. The automatic summarization of text is a well- known task in the field of natural language processing (NLP). Significant achievements in text summarization have been obtained using sentence extraction and statistical analysis.

Text summarization approaches can be broadly divided into two groups: extractive summarization and abstractive summarization. Extractive summarizations extract important sentences or phrases from the original documents and group them to produce a summary without changing the original text. An extractive text summarization system is proposed based on POS tagging by considering Hidden Markov Model using corpus to extract important phrases to build as a summary [5]. Abstractive summarization consists of understanding the source text by using linguistic method to interpret and examine the text. Abstractive methods need a deeper analysis of the text. These methods have the ability to generate new sentences, which improves the focus of a summary, reduce its redundancy and keeps a good compression rate [1].

II. TEXT SUMMARIZATION FEATURES

Text summarizers identify and extract key sentences from the source text and concatenate them to form a concise summary. A list of features as discussed below can be used for selection of key sentences in Table 1 [2, 4].

TABLE 1 TEXT SUMMARIZATION FEATURES [2, 4]

Features	Description
Term Frequency	Salient terms provided by statistics are based on term frequency, thus salient sentences are those words that occur repeatedly [4].The frequently occurring word increases score of sentences. The most common measure widely used to calculate the word frequency is TF IDF [2].
Location	It depends on the intuition that important sentences are located at certain position in text or in paragraph, such start or end of a paragraph [4]. First and last sentence of paragraph has greater chance to be included in summary [2].
Cue Method	Effect of positive or negativity of word on the sentence weight to indicate importance or key idea such as cues: "in summary", "in conclusion", "the paper describes" [2].

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Title/ Headline word	Words in the title and heading of a document that occur in sentences are positively related to summarization [2]. Words that appear in the title are also indicative of the topic or subject of the document [4].
Sentence length	Keeps in view the size of summary. Generally, very long and very short sentences are also not suitable for summary [2].
Similarity	Similarity can be calculated with linguistic knowledge. It indicates similarity between the sentence and title of the document, and similarity between the sentence and remaining sentence of the document [2].
Proper noun	For document summarization sentences having proper nouns are important. Like, name of a person, place or organization [2].
Proximity	The distance between text units where entities occur is a determining factor for establishing relations between entities [2].

III.TECHNIQUES USED FOR TEXT SUMMARIZATION

Text summarization as discussed is broadly divided into abstractive and extractive. The brief description about each approach is discussed in following section:

A. Abstractive Summarization Approach

Summarizations using abstractive techniques are broadly classified into two categories: Structured based approach and Semantic based approach [1].

1) Structured Based Approach:

Structured based approach encodes most important information from the document through cognitive schemes such as templates, extraction rules and other structures such as tree, ontology, lead and body phrase structure [1].

Brief abstract of all the techniques under structured based approach is provided in Table 2.

TABLE 2
ABSTARCTIVE TEXT SUMMARIZATIONMETHODS: USING STRUCTURED BASED APPROACHS [1, 2]

Methods	Description	Advantages	Limitation	Author & Year
Tree Based Method	-It uses a dependency tree to represent the text of a document. -It uses either a language generator or an algorithm for generation of summary.	- It walks on units of the given document read and easy to summary.	- It lacks a complete model which would include an abstract representation for content selection.	Barzilay and McKeown (1999, 2005) [2], Yuta Kikuchi, Tsutomu Hirao, Hiroya Takamura, Manabu Okumura, Masaaki Nagata (2014) [17], Tsutomu Hirao, M. Nishino, Y. Yoshida, Jun Suzuki, N. Yasuda, and Masaaki Nagata, (2015) [18].
Template Based Method	-It uses a template to represent a whole document. -Linguistic patterns or extraction rules are matched to identify text snippets that will be mapped into template slots.	-It generates summary is highly coherent because it relies on relevant information identified by IE system.	-Requires designing of templates and generalization of template is to difficult.	Harabagiu and Lacatusu (2002) [2], Tatsuro Oya, Yashar Mehdad, Giuseppe Carenini, Raymond Ng (2014) [19].
Ontology Based Method	-Use ontology (knowledge base) to improve the process of summarization. -It exploits fuzzy ontology to handle uncertain data that simple domain ontology cannot.	-Drawing relation or context is easy due to ontology - Handles uncertainty at reasonable amount	-This approach is limited to Chinese news only. - Creating Rule based system for handling uncertainty is a complex task.	Lee and Jian (2005) [2], Meghana viswanath(2006) [9], Ramezani Majid, Feizi-Derakhshi Mohammad-Reza(2015) [20], R. Ragunath and N. Sivaranjani (2015) [23].
Lead and Body Phrase Method	- This method is based on the operations of phrases (insertion and substitution) that have same syntactic head chunk in the lead and body sentences in	-It is good for semantically appropriate revisions for revising a lead sentence.	-Parsing errors degrade sentential completeness such as grammaticality and repetition. -It focuses on rewriting techniques, and	Tanaka and Kinoshita (2009) [2].

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	order to rewrite the lead sentence.		lacks a complete model which would include an abstract representation for content selection.	
Rule Based Method	-Documents to be summarized are represented in terms of categories and a list of aspects.	-It has a potential for creating summaries with greater information density than current state of art.	-The drawback of this methodology is that all the rules and pattern are manually written, which is tedious & time consuming.	Genest and Lapalme (2012)[2].

2) Semantic Based Approach

In Semantic based approach, semantic representation of document is used to feed into natural language generation (NLG) system. This method focuses on identifying noun phrase and verb phrase by processing linguistic data [1]. Brief abstract of all the techniques under semantic based approach is provided in Table 3.

TABLE 3
ABSTRACTIVE TEXT SUMMARIZATION METHODS: USING SEMANTIC BASED APPROACHES [1, 2]

Methods	Description	Advantages	Limitation	Author & Year
Multimodal semantic model	-A semantic model, which captures concepts and relationship among concepts, is built to represent the contents of multimodal documents.	-An important advantage of this framework is that it produces abstract summary, whose coverage is excellent because it includes salient textual and graphical content from the entire document.	- The limitation of this framework is that it is manually evaluated by humans.	Greenbacker (2011) [2].
Information Item Based Method	-The contents of summary are generated from abstract representation of source documents, rather than from sentences of source documents. -The abstract Representation is Information Item, which is the smallest element of coherent information in a text.	-The major strength of this approach is that it produces short, coherent, information rich and less redundant summary.	-It rejected due to the difficulty of creating meaningful and grammatical sentences from them. -Linguistic quality of summaries is very low due to incorrect parses.	Genest and Lapalme (2011) [2], Daniel Mallett, James Elding, Mario A. Nascimento (2004) [15].
Semantic Graph Based Method	-This method is used to summarize a document by creating a semantic graph called Rich Semantic Graph (RSG) for the original document, reducing the generated semantic graph.	- It produces concise, coherent and less redundant and grammatically correct sentences.	- This method is limited to single document abstractive summarization.	Moawad & Aref (2012) [2], Kavita Ganesan, ChengXiang Zhai & Jiawei Han, (2010) [30], Laura Plaza, Alberto Díaz & Pablo Gervás, (2011) [31], Manjula Subramaniam, Prof. Vipul Dalal(2015)[37]

B. Extractive Summarization Techniques

An extractive summarization method consists of selecting important sentences, paragraphs etc. from the original document and concatenating them into shorter form. The importance of sentences is decided based on statistical and linguistic features of sentences [4]. Table 4 shows the brief abstract of techniques of extractive based approach.

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TABLE 4 EXTRACTIVE TEXT SUMMARIZATION TECHNIQUES [4]

Methods	Description	Author & Year
Term Frequency-Inverse Document Frequency Method	-Sentence frequency is defined as the number of sentences in the document that contain that term. -Then this sentence vectors are scored by similarity to the query and the highest scoring sentences are picked to be part of the summary.	M.Fachrurrozi, Novi Yusliani, and Rizky Utami Yoanita, (2013) [27], Mr s. Pimpalshende A. N. (2013) [38].
Cluster Based Method	-It is intuitive to think that summaries should address different "themes" appearing in the documents. -If the document collection for which summary is being produced is of totally different topics, document clustering becomes almost essential to generate a meaningful summary. - Sentence selection is based on similarity of the sentences to the theme of the cluster (Ci). The next factor that is location of the sentence in the document (Li). The last factor is its similarity to the first sentence in the document to which it belongs (Fi). Si =W1 * Ci + W2 * Fi+ W3 *Li Where, W1, W2, W3 are weight age for inclusion in summary. - The clustering k-means algorithm is applied.	Zhang Pei-ying and Li Cun-he(2009)[9], Mehdi Bazghandi, Ghamarnaz Tadayon Tabrizi and Majid Vafaei Jahan (2012) [14], Anjali R. Deshpande, Lobo L. M. R. J. (2013)[16].
Graph Theoretic Approach	-Graph theoretic representation of passages provides a method of identification of themes. -After the common pre-processing steps, namely, stemming and stop word removal; sentences in the documents are represented as nodes in an undirected graph.	Rada Mihalcea, Niraj Kumar, Kannan Srinathan and Vasudeva Varma, (2013)[33], Sarda A.T. and Kulkarni A.R.(2015)[34] .
Machine Learning Approach	-The summarization process is modelled as a classification problem: sentences are classified as summary sentences and non-summary sentences based on the features that they possess. -The Classification probabilities are studied statistically using Navie Bayes Classifier rule: P (s ϵ <S | F1, F2, ..., FN) = P (F1, F2, ..., FN | s ϵ S) * P (s ϵ S) / P (F1, F2,..., FN)	Kamal Sarkar, Mita Nasipuri,, Suranjan Ghose(2011)[10], Mehrnoosh Bazrfkan And Muosa Radmanesh(2014)[35].
LSA Method	- It gets this name LSA because SVD applied to document word matrices, group documents that are semantically related to each other, even when they do not share common words.	Patil Pallavi D, Mane P M(2014)[22],Hanane Froud, Abdelmonaime Lachkar and Said Alaoui Ouatik (2013)[23], Mr. S.A.Babar and Prof. S.A. Thorat(2014)[28], Josef Steinberger, Karel Jezek (2014) [36], Ozsoy Makbule Gulcin, Cicekli Ilyas and Alpaslan Ferda Nur (2010)[40].
Text summarization With Neural Networks	-This method involves training the neural networks to learn the types of sentences that should be included in the summary. -It uses three- layered Feed Forward neural network.	Khosrow Kaikhan(2004)[13], Sarda A.T. and Kulkarni A.R.(2015)[37].
Automatic TS based on fuzzy logic	-This method considers each characteristic of a text such as similarity to title, sentence length and similarity to key word etc. as the input of the fuzzy system.	Ladda Suanmali, Naomie Salim, and Mohammed Salem Binwahlan (2009)[11], Ms. Pallavi D.Patil, Prof. N.J. Kulkarni (2014) [22], Patil Pallavi D. , Mane P M(2014) [25], Rucha S. Dixit, Prof. Dr. S. S. Apte(2012)[26], Mr. S.A. Babar and Prof. S.A. Thorat(2014) [28], S. Santhana Megala Dr. A. Kavitha Dr. A. Marimuthu (2014) [29].
Query Based Extractive Text Summarization	-In query based text summarization system, the sentences in a given document are scored based on the frequency counts of terms. -It uses Vector Space Model [11].	Ibrahim Imam, Nihal Nounou, Alaa Hamouda, Hebat Allah Abdul Khalek(2013)[12], Ahmed A. Mohamed, Sanguthevar Rajasekaran, 2006[32], A. P. Siva kumar, Dr. P. Premchand and Dr. A. Govardhan(2011)[33].

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IV. TEXT SUMMARIZERS FOR INDIAN LANGUAGES AND COMPARISON OF THEIR PERFORMANCE

TABLE 5
PERFORMANCE COMPARISON OF EXISTING INDIAN SUMMARIZERS

Language	Researchers	Method	Features /Accuracy
Hindi Text	Manjula Subramaniam and Vipul Dalal (2015)	Text Summarization using Abstractive Method.	It uses Rich Semantic Graph techniques [38].
	Dr. Latesh Malik (2013)	Single document Summarization using Extraction Method.	It uses statistical & linguistic feature & also uses Genetic Algorithm [41].
	Anitha J., Prof. P. V. G. D. Prasad Reddy and M. S. Prasad Babu (2014)	Text Summarization using Extractive Method.	It uses fuzzy classifier and Neural Network. (Precision = 0.90, Recall = 0.88) [43].
Punjabi Text	Vishal Gupta (2010)	News Document using Extractive Method.	-Accuracy of the system is varies from 81% to 92 % [41]. -It consist of two phases: i)Pre-processing, ii) Processing [38].
	Gupta (2012)	Text Summarization using Extractive Method.	It uses TF-IDF techniques. (F-scores 97.87%, 95.32% & 94.63%) [6].
Tamil Text	Banu (2007)	Text Summarization using Extractive Method.	It uses Semantic Graph [6].
	Jayashree (2011)	Text Summarization using Extractive Method.	It uses TF-IDF techniques [6].
	Kumar and Devi (2011)	Text Summarization using Extractive Method.	It uses graph theoretic scoring technique [6].
Bengali Text	Islam (2007)	Text Summarization using Extractive Method.	Accuracy 40% compression ratio [6].
	Sarkar (2012)	Text Summarization using Extractive Method.	It uses TF-IDF techniques [6].
	Das and Bandyopadhyay (2010)	Text Summarization using Extractive Method.	It uses k-means approach And Page Rank standard approach. Precision= 72.15%, Recall=67.32% and F-Score= 69.65 % [6].
Kannada Text	Jayashree (2011)	Text Summarization using Extractive Method.	It uses TF-IDF techniques [6].
	Jayashree R, Srikantamurthy K and Basavaraj S Anami (2013)	Text Summarization using Extractive Method.	It uses GSS coefficient, TF-IDF [6].
Malayalam Text	Ajmal E. B, Rosna P Haroom (2015)	Text Summarization using Extractive Method	It uses Maximum Marginal Relevance (MMR) techniques with successive Threshold [45].
	Rajina Kabeer and Sumam Mary Idicule (2014)	Text Summarization using Extractive Method.	It uses Navie Bayes, Neural Network & HMM Model of Machine Learning Approaches [46].
	Renjith S.R, Sony P (2015)	Text Summarization using Extractive Method.	It uses TF-IDF techniques [47].
Telugu Text	Rao K Venkateshwar (2011)	Text Summarization using Abstractive Method	It uses Ontology Approaches [48].
	Jagadish S. Kallimani, K. G. Srinivasa and B. E. Reddy (2016)	Text Summarization using Abstractive Method.	It uses IE rules and class based templates. (F score- 0.815, Precision-0.8642, Recall-0.7973, Accuracy- 0.7217) [49].

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V. CONCLUSION

Text summarization is growing as sub – branch of NLP as the demand for compressive, meaningful, abstract of topic due to large amount of information available on net. Precise information helps to search more effectively and efficiently. Thus text summarization is need and used by business analyst, marketing executive, development, researchers, government organizations, students and teachers also. It is seen that executive requires summarization so that in a limited time required information can be processed. This paper takes into all about the details of both the extractive and abstractive approaches along with the techniques used, its performance achieved, along with advantages and disadvantages of each approach. Text summarization has its importance in both commercial as well as research community. As abstractive summarization requires more learning and reasoning, it is bit complex then extractive approach but, abstractive summarization provides more meaningful and appropriate summary compare to extractive. Through the study it is also observed that very less work is done using abstractive methods on Indian languages, there is a lot of scope for exploring such methods for more appropriate summarization.

REFERENCES

1. Saranyamol C S, Sindhu L, "A Survey on Automatic Text Summarization", International Journal of Computer Science and Information Technologies, 2014,Vol. 5 Issue 6.
2. Reeve Lawrence H., Han Hyoil, Nagori Saya V., Yang Jonathan C., Schwimmer Tamara A., Brooks Ari D., "Concept Frequency Distribution in Biomedical Text Summarization", ACM 15th Conference on Information and Knowledge Management (CIKM), Arlington, VA, USA,2006.
3. Blog.mashape.com/list-of-30-summarizer-apis-libraries-and-software.
4. Khan Atif, Salim Naomie, "A review on abstractive summarization Methods**",** Journal of Theoretical and Applied Information Technology, 2014, Vol. 59 No. 1.
5. Suneetha Manne, Zaheer Parvez Shaik Mohd. , Dr. S. Sameen Fatima, "Extraction Based Automatic Text Summarization System with HMM Tagger", Proceedings of the International Conference on Information Systems Design and Intelligent Applications, 2012, Vol. 132, P.P 421-428.
6. Gupta Vishal, "A Survey of Text Summarizers for Indian Languages and Comparison of their Performance", Journal of Emerging Technologies In Web Intelligence, 2013, Vol. 5, No. 4.
7. Vishal Gupta,"A Survey of Recent Keywords and Topic Extraction Systems for Indian Languages", International Journal of Engineering Trends and Technology (IJETT) , 2013, Vol. 6 No. 6
8. Gupta V. And Lehal G. S., "A Survey of Text Summarization Extractive Techniques", International Journal of Emerging Technologies in Web Intelligence, 2010, Vol. 2. , pp. 258-268.
9. Viswanath Meghana, "Thesis: Ontology-Based Automatic Text Summarization", M. Sc Thesis, Vishweshwaraiah Institute of Technology, India, 2009.
10. Sarkar Kamal, Nasipuri Mita, Ghose Suranjan, "Using Machine Learning for Medical Document Summarization", International Journal of Database Theory and Application, 2011.
11. Ladda Suanmali, Salim Naomie, and Mohammed Salem Binwahlan, "Fuzzy Logic Based Method for Improving Text summarization" IJCSIS, 2009.
12. Ibrahim Imam, Nihal Nounou, Alaa Hamouda, Hebat Allah Abdul Khalek, "Query Based Arabic Text Summarization", IJCST, 2013, Vol. 4, Issue Spl - 2.
13. Khosrow Kaikhan, "Text Summarization Using Neural Networks", Proceedings. 2004 Second IEEE International Conference on Intelligent Systems, 2004, Vol. 1.
14. Mehdi Bazghandi, Ghamarnaz Tadayon Tabrizi and Majid Vafaei Jahan, "Extractive Summarization of Farsi Documents Based On PSO Clustering", International Journal of Computer Science Issues, 2012, Vol. 9, Issue 4, No 3.
15. Mallett Daniel, Elding James, Nascimento Mario A., "Information-Content Based Sentence Extraction for Text Summarization", Proceedings. ITCC 2004. International Conference on, 2004,Vol. 2.
16. Deshpande Anjali R., Lobo L. M. R. J., "Text Summarization using Clustering Technique", International Journal of Engineering Trends and Technology (IJETT) , 2013, Vol. 4 Issue8.
17. Karmakar Surajit, Lad Tanvi, Chothani Hiten, "A Review Paper on Extractive Techniques of Text Summarization", International Research Journal of Computer Science (IRJCS), Issue 1, 2015, Vol. 2.
18. Kikuchi Yuta, Hirao Tsutomu, Takamura Hiroya, Okumura Manabu, Nagata Masaaki, " Single Document Summarization based on Nested Tree Structure" Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Short Papers), pages 315–320, Baltimore, Maryland, USA, 2014.
19. Hirao Tsutomu, Nishino Masaaki, Yoshida Yasuhisa, Suzuki Jun, Yasuda Norihito, and Nagata Masaaki, "Summarizing a Document by Trimming the Discourse Tree", IEEE/ACM Transactions On Audio, Speech, And Language Processing, 2015, Vol. 23, No. 11.
20. Ramezani Majid, Feizi-Derakhshi Mohammad-Reza, "Ontology-Based Automatic Text Summarization Using FarsNet", ACSIJ Advances in Computer Science: an International Journal, 2015, Vol. 4, Issue 2, No.14.
21. Oya Tatsuro, Mehdad Yashar, Carenini Giuseppe, and Ng Raymond, "A Template-based Abstractive Meeting Summarization: Leveraging Summary and Source Text Relationships", Proceedings of the 8th International Natural Language Generation Conference, pages 45–53, Philadelphia, Pennsylvania, 2014.
22. Patil Pallavi D., Kulkarni N.J., "Text Summarization Using Fuzzy Logic", International Journal of Innovative Research in Advanced Engineering (IJIRAE), 2014, Vol. 1 Issue 3.
23. Froud Hanane, Lachkar Abdelmonaime and Ouatik Said Alaoui, "Arabic Text Summarization Based On Latent Semantic Analysis To Enhance Arabic Documents Clustering", International Journal of Data Mining & Knowledge Management Process (IJDKP), 2013, Vol.3, No.1.
24. Ragunath R. And Sivaranjani N., "Ontology Based Text Document Summarization System Using Concept Terms", ARPN Journal Of Engineering And Applied Sciences, 2015, Vol. 10, No. 6.
25. Patil Pallavi D, Mane P M, "A Comprehensive Review on Fuzzy Logic & Latent Semantic Analysis Techniques for Improving the Performance of Text Summarization", International Journal of Advance Research in Computer Science and Management Studies, 2014, Vol. 2, Issue 11, pg. 476-485.
26. Dixit Rucha S., Apte S. S., "Improvement Of Text Summarization Using Fuzzy Logic Based Method", IOSR Journal Of Computer Engineering (IOSRJCE) ISSN: 2278-0661, ISBN: 2278-8727, 2012, Vol. 5, Issue 6, PP 05-10.
27. Fachrurrozi M., Yusliani Novi, and Yoanita Rizky Utami, "Frequent Term based Text Summarization for Bahasa Indonesia", International Conference on Innovations in Engineering and Technology Bangkok (Thailand), 2013.
28. Babar S.A. and Thorat S.A., "Improving Text Summarization using Fuzzy Logic & Latent Semantic Analysis", International Journal of Innovative Research in Advanced Engineering (IJIRAE), 2014, Vol. 1 Issue 4.
29. Megala S. Santhana, Kavitha A., Marimuthu A., "Enriching Text Summarization using Fuzzy logic", International Journal of Computer Science and Information Technologies, 2014, Vol. 5 Issue 1.
30. Ganesan Kavita, Zhai ChengXiang and Han Jiawei, "Opinosis: A Graph-Based Approach to Abstractive Summarization of Highly Redundant Opinions", Proceedings of the 23rd International Conference on computational Linguistics (Coling 2010), 2010, pages 340–348, Beijing.
31. Plaza Laura, Díaz Alberto and Gervás Pablo, "A semantic graph-based approach to biomedical summarisation", Artificial Intelligence in Medicine 53, 2011.
32. Mohamed Ahmed A., Rajasekaran Sanguthevar, "Query-Based Summarization Based on Document Graphs", Document Understanding Conferences, NIST, 2006.
33. Sivakumar A. P., Premchand P. and Govardhan A., "Query-Based Summarizer Based on Similarity of Sentences and Word

Frequency", International Journal of Data Mining & Knowledge Management Process (IJDKP), 2011, Vol.1, No.3.

34. Kumar Niraj, Srinathan Kannan and Varma Vasudeva, "A Knowledge Induced Graph-Theoretical Model for Extract and Abstract Single Document Summarization", Computational Linguistics and Intelligent Text Processing - 14th International Conference, 2013.
35. Bazrfkan Mehrnoosh And Radmanesh Muosa, "Using Machine Learning Methods To Summarize Persian Texts", Indian J.Sci.Res. 7 Issue1: 1325-1333, 2014.
36. Josef Steinberger, Karel Je˘zek, "Evaluation Measures For Text Summarization", Computing and Informatics, Vol. 28, pp 1001–1026, 2009.
37. Sarda A.T. and Kulkarni A.R., "Text Summarization using Neural Networks and Rhetorical Structure Theory", International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 6, 2015.
38. Subramaniam Manjula, Dalal Vipul, " Test Model for Rich Semantic Graph Representation for Hindi Text using Abstractive Method." , IRJET, 2015.
39. Pimpalshende A. N.,"Overview of Text Summarization Extractive Techniques", International Journal Of Engineering And Computer Science ISSN: 2319-7242, 2013, Vol. 2 Issue 4.
40. Ozsoy Makbule Gulcin, Cicekli Ilyas and Alpaslan Ferda Nur, "Text Summarization of Turkish Texts using Latent Semantic Analysis", 23rd International Conference on Computational Linguistics (Coling 2010), pages 869–876, Beijing, 2010.
41. Dalal Vipul, Shelar Yogita, "A Survey of Various Methods for Text Summarization", International Journal of Engineering Research and Development, Vol. 11, Issue 03 2015, PP.57-59.
42. Gupta Vishal, Lehal Gurpreet Singh, "Complete Pre-Processing phase of Punjabi Text Extractive Summarization System" Proceedings of COLING 2012: Demonstration Papers, pp 199–206, COLING 2012, Mumbai.
43. Anitha J. , Prof. Prasad Reddy P. V. G. D. , Prasad Babu M. S. , "An Approach for summarizing Hindi Text through a Hybrid Fuzzy Neural Network Algorithm", Journal of Information and Knowledge Management, 2014,Vol. 13, No. 4.
44. Jayashree R, Srikantamurthy K and Basavaraj S Anami, **"**A New Approach to Summarization in the Kannada Language by Sentence Ranking", Journal of Network and Innovative Computing, ISSN 2160-2174, 2013, Vol. 1.
45. Ajmal E. B, Rosna P Haroom, "Summarization of Malayalam Document Using Relevance of Sentence", International Journal of Least Research in Engineering and Technology (IJLRET), 2015, Vol. 1, Issue 6.
46. Rajina Kabeer and Sumam Mary Idicule, "Text Summarization For Malayalam Documents – An Experience", International Conference of Data Science and Engineering (ICDSE), 2014.
47. Renjith S.R, Sony P, "An Automatic Text Summarization for Malayalam Using Sentence Extraction", Proceeding of 27th IRF International Conference, 2015.
48. Rao K Venkateshwar, "New Directions in Automated Text Summarization", Jawaharlal Nehru Technological University, 2011.
49. Jagadish S. Kallimani, K. G. Srinivasa and B. Eswara Reddy, "Statistical and Analytical Study of Guided Abstractive Text Summarization" Current Science, 2016, Vol. 110 No. 1.