

Hybrid Technique for Effective Knowledge Representation in Normal Life

Poonam Tanwar, T. V. Prasad, Kamlesh Dutta



Abstract: Knowledge is essential for daily life. People can gather knowledge from their routine work like reading newspaper, watching T.V, discussions, experience and many more are the source of knowledge. An artificial intelligent (AI) system must be able to do the same. So there is a requirement of effective knowledge representation (KR) technique that is able to represent the knowledge from above defined sources and works for daily life. An inference mechanism is also required for reasoning the knowledge from artificial intelligent system. The purpose of this paper is to present the implemented conceptual view of hybrid KR technique that works for representing the knowledge required for daily life.

Keywords: Knowledge Representation (KR), Semantic Net, Script, Supervised Learning, Forward Chaining.

I. INTRODUCTION

(Tanwar, Prasad, Datta, 2011) Objects, properties, categories and relations between objects, situations, events, states and time, causes and effects are the things that AI desires to represent [5]. KR techniques are divided many categories like Declarative, Procedural, Relational, Hierarchical representations. (Rich, E., Knight, K., 1991), (Tanwara, Prasada, Aswala, 2010) is the simplest form of logic works for the statements that are either true or false not both. (Russell, Norvig, 2009) Statements in propositional logic are called propositions, are atomic sentences (that cannot be decomposed further), e.g. "The apple is red". In propositional logic there are three logical connectives "and", "or", "not". These connectors can be used to connect the different propositions. Semantic Networks used to represent the Knowledge as networks using the property of Inheritance. (Rich, E., Knight, K., 1991), (Tanwara, Prasada, Aswala, 2010). Frame representation is like objects and attributes in OOPS. Conceptual Dependency (CD) is used to represent the knowledge in terms of primitive action. (Tanward, Prasadd, Duttad, 2012) To combine the advantages and overcome the disadvantages of individual KR techniques the hybrid KR technique came to present the combine advantages under one umbrella based on the user demand and application like RT-FRORL, SOL, AAANTS etc. (Brachman and. Schmolze, 1985) KL-ONE hybrid KR tool was the backbone for maximum KR hybrid technique.

The comparative study of hybrid KR system is given below in table 1.

II. KNOWLEDGE BASE SYSTEM ARCHITECTURE (PROPOSED SYSTEM)

In this part the architecture of KR system and the parts of that are explained in detail. The model /Architecture of the system is divided in to two parts external and internal. The external part of the system deals with the user one side for giving the inputs and other side for system usage for different applications. The system has the capability to work for maximum requirement in daily life shown in fig 1. The user interface provides the user friendly environment as user need not to go through the lengthy manual to use the system where as the internal part is the core of the system used for preprocessing the input and after applying the numbers of steps the knowledge to be represented in the valuable form. So that user can use them for different domains. (Tanwar^b, Prasad^b, Datta^b, 2011) The hybrid knowledge representation technique used here is the integration of script and semantic net KR techniques. The external part of KR system takes the input from the outside world through user interface. A book, novel, News paper can be the source of input (Tanwar^b, Prasad^b, Datta^b, 2018). In continuation with previous paper (Tanwar^c, Prasad^c, Duttac, 2012), (Tanward, Prasadd, Duttad, 2012) the input is a concept can be divided in to the following categories: substance, quality, action, generality, particularity, inherence and negation and each substance can be earth, water, light, air, ether, time, space, soul and mind as in case of Indian logic. The Input from the user is divided into following categories either it can be a new information, can be a stored information and it can be the query. If incoming input is the new information then it goes to the Acquisition and learning process to check whether that knowledge is already in knowledge base if yes then system will discard that. Otherwise system checks was made to see whether that knowledge will be accommodate by the existing system if yes then segmentation process has been applied to the input to check in which categories it lies and separates the action /Predicate with the other. The methodology used for system implementation is shown in fig 2.

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Table 1. Comparative Study Of Hybrid Knowledge Representation Techniques

S.no	Knowledge Structure/ properties	Year	KR technique USED	Declarative	Procedural	Distributed	Variants'	Graphical representation	User friendly
1	KRYPTON	1983	Frame and First order predicate logic.	Yes	No	No		No	No (User need Prior knowledge to apply query)
2	Oblog-2	1987	Frame, Predicate logic, Rule based	Yes	Yes	No		No	No (User need Prior knowledge to apply query)
3	Babylon	1987	Frame and Rule based	Yes	Yes	No	TEX-I-bylon	No	No (User need Prior knowledge to apply query)
4	MANTRA	1991	First order logic , frame , semantic networks and Production systems	Yes	Yes	No		Graphical Knowledge base	yes
5	FRORL(frame-and-rule oriented requirement specification Language)	1992	Frame and Production rule	Yes	Yes	No		No	
6	Loom	1996	Object Oriented and Rule based system	Yes	No	No	Power Loom	No	No (User need Prior knowledge to apply query)
7	AAANTS(Adapted autonomous , Agent colony interaction with Network Transparent Services	2003	Frame based knowledge representation with reinforcement learning technique	Yes	Yes	Yes		No	
8	Extended Semantic Net	2009	Proximal network model and Semantic network model	Yes	Yes	No		No	
9	Proposed system	-Under Process	Script, Semantic net,Rule based	Yes	Yes	No		Yes	Yes(No prior knowledge required)

2.1.1 ACQUISITION/ LEARNING:-

An AI system required extensive knowledge to solve the problem. In real life things are changing daily. Machine Acquisition/Learning is used to improve the system performance by acquiring/Integrating the knowledge repeatedly. The system can learn by Examples, Experience, Training, Observations and Environment. These methods are used to make the self learning system. The learning is divided in to two categories Supervised and Unsupervised. The supervised learning was used in the system implementation as shown in fig 3. The symbol δ in fig 3 represents the difference between the expected output and the desired output. Learning Component accept the input from the expert/person (i.e. a teacher), from various resources like news paper magazines, journals, books etc. The acquisition part checks whether incoming knowledge is already stored in the system or not if not than it accept the

input and stored in to the knowledge base otherwise it reject the duplicate input.

2.1.2:- FEATURE EXTRACTION :-

This part of the system was used to check whether there is an activity can be perform or some process is to be present in the incoming text for Ex. Mobile is ringing then the process is going on in this incoming knowledge means some sound is coming and the root of ringing is ring. If the sentence is like ram is a boy then no action will be performed. If the incoming knowledge is simple sentence then we can represent it by using semantic net, frames and predicate logic but when some activity could be performed by the entity then we need a structure that could be dynamic in nature and must be expressive.

2.1.3 KNOWLEDGE STRUCTURE:-

This part of KR is used to represent the incoming knowledge by using best knowledge representation technique. The KR

was the combination of Semantic Net and Script techniques. The aim was to build a system that is able to represent event based as well as non event based and relational knowledge. The KR Algorithm that works for the system is given below.

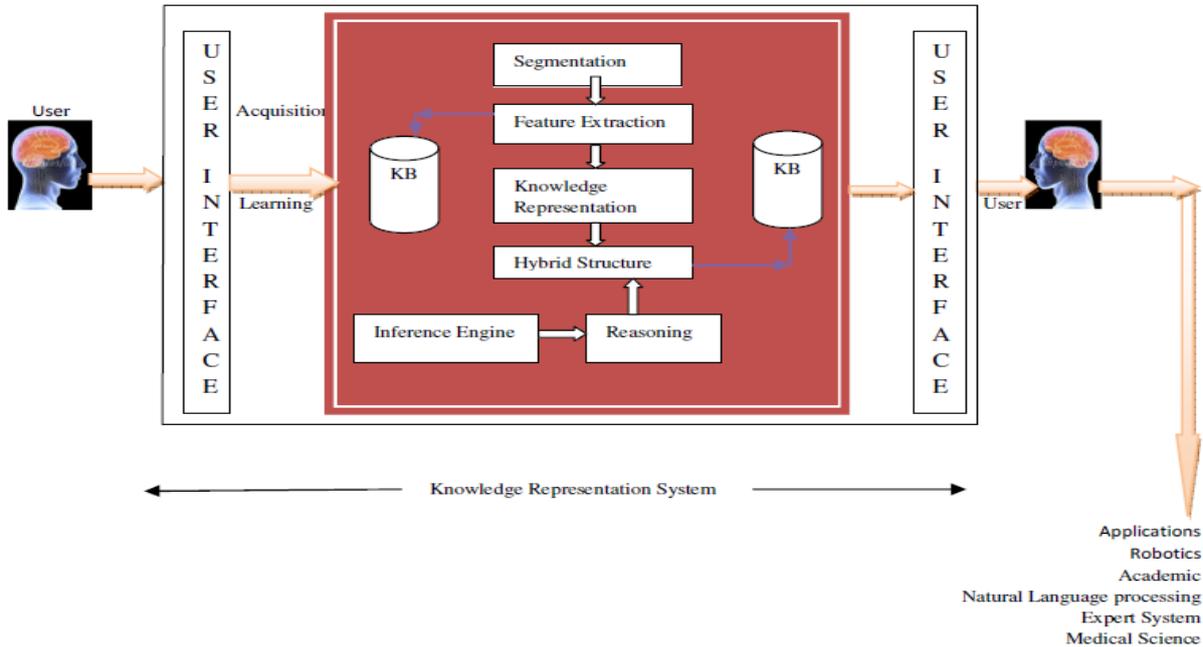


Fig 1. Represents Model / Architecture of Knowledge Base System

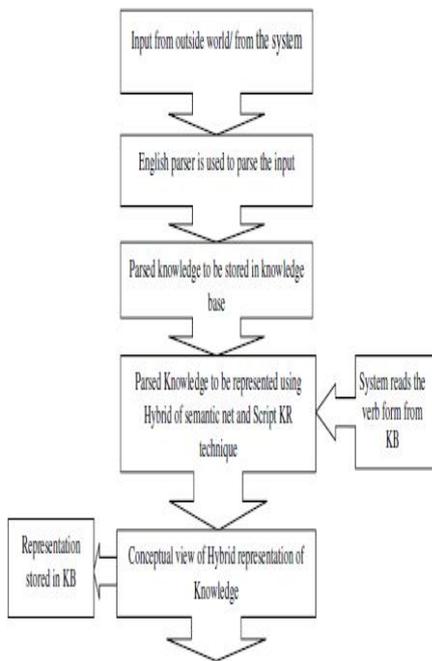


Fig 2. Represents the methodology used.

Input

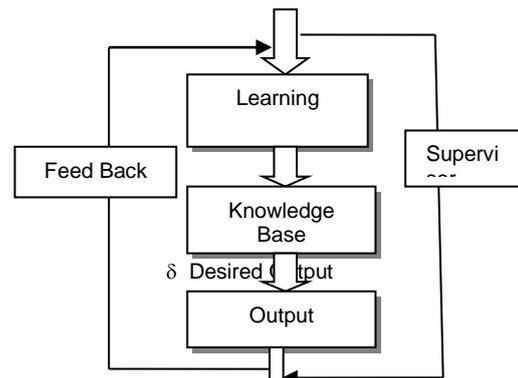


Fig.3 Represents supervised learning.

2.1.3.1 ALGORITHM

START

- 1 Enter the knowledge (Sentence).
- 2 Parse the new knowledge (Sentence). If there is any Predicate (consist verb and all words followed by verb in the sentence) than go to step 3b), otherwise go to step 3a).
- 3 Check if this new knowledge is in Knowledge base.
 - a) First compare with the knowledge stored in semantic net.
 - I. Check with all existing relational predicate*.
 - II. Check with all attributes of that relational predicate. If all match found than ignore the new knowledge otherwise store it in semantic net.
 - b) Compare the new knowledge with the knowledge stored in script i.e compare with all the entities in the script(actor, props, action).

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If there is any match found then ignore otherwise represent it by script KR.
END

2.1.4 KNOWLEDGE BASE:-

Knowledge base consist all the knowledge required to solve the problem. The knowledge base can be general or domain specific. Relational knowledge base and Inheritable knowledge base was used in the system. The relational knowledge base is used to store approximate all the verb

forms available in English dictionary where as Inheritable knowledge base is used to store the parsed token for each sentences in the stories/ paragraphs. The fig 4 shows the resulted parsed table for corresponding input and table1 shows the knowledge base for storing the verb forms which is available online. Knowledge base was used to store the parsed token for each sentence in the stories/ paragraphs. The third Knowledge base which was also relational type was used for storing the rules required to solve the system. The system is capable for accepting the sentence in all tense with any form i.e ing also.

Image databases are becoming The evolution of techniques fo All these factors have spurred Existing CBIR systems based In this paper a well-built segm Segmentation is a challenging Its main purpose is to filter the This is more reliable segmenta The approach is demonstratec Three segmentation methods This greatly facilitates the ima	Image evolution great CBIR paper Segmenta main reliable approach segmentat image	NNP NN JJ NNP NN NNP JJ JJ NN NN NN	becoming allowed spurred Existing developed is fused crossing demonstrated experimented facilitates	investigation databases techniques approaches process construction results hand process methods recognition
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Fig 4 Represent the output of Knowledge base for Parsed data

Table1.Represents example of Knowledge base for verb forms.

zBase Form	Past Form	Past Participle Form	'ing' form
Abide	Abided	Abided/ Abidden	Abiding
Arise	Arose	Arisen	Arising
Awake	Awoke	Awoken	Awaking
Be	Was/Were	Been	Being
Bear	Bore	Born/Borne	Bearing
Beat	Beat	Beaten	Beating

2.1.5 QUERY APPLIER:-

Query Applier is used for getting the facts from the system and then passes the data to the inference mechanism for reasoning. Whenever the new query comes system will learn whether that query is related to the previous query or it generates from the previous query and check how many time users ask the combination of these. We have use the

association learning rule mining for learning the system at this stage for making the system intelligent.

3 CONCEPTUAL VIEW OF HYBRID KNOWLEDGE REPRESENTATION TECHNIQUE FOR DIFFERENT

III. APPLICATIONS

Let us consider the HR structure one by one for different applications.

3.1 Medical Science

In Today life peoples have very busy schedule. Because of work pressure they generally avoid to get the routine medical consultancy. Huge information related to particular disease are available online but every search outcome /document consist thousand of worlds and again it takes lot of time to read. The detailed information is not expressive in nature also.

If we have a system that has the capability to visualize the discussion than no one required to spend separate time to meet the doctor. Even they don't need to spend time for 1000 word of information. Let us consider a scenario which is related to normal routine of a person as well as patient and a doctor discussion. "Yash is the only child of Poonam. He is very sweet and intelligent child. He is very fond of watching T.V and playing Cricket. He could never stop himself from them. His mother always worried and always told him, "Do not watch T.V. Yash never listen his mother used to tell him. One day when he was watching T.V, his Eyes started

to pain and feeling headache also. He started crying. Poonam came running to him. She immediately took him to Eye specialist. The Doctor examined Yash Eye's and asked them to clean your Eye's. After examining the Yash Eyes doctor told Yash mother that Yash eyesight is not 6/6. That is why eyes are paining. Doctor said Yash; you must take proper care of your Eye's. Keep your Eye's always clean and don't watch So much T.V. Yash realized his mistake. Next day onward Yash made the routine to watch the T.V. "The conceptual View of the above using Hybrid KR technique is shown in fig. 5

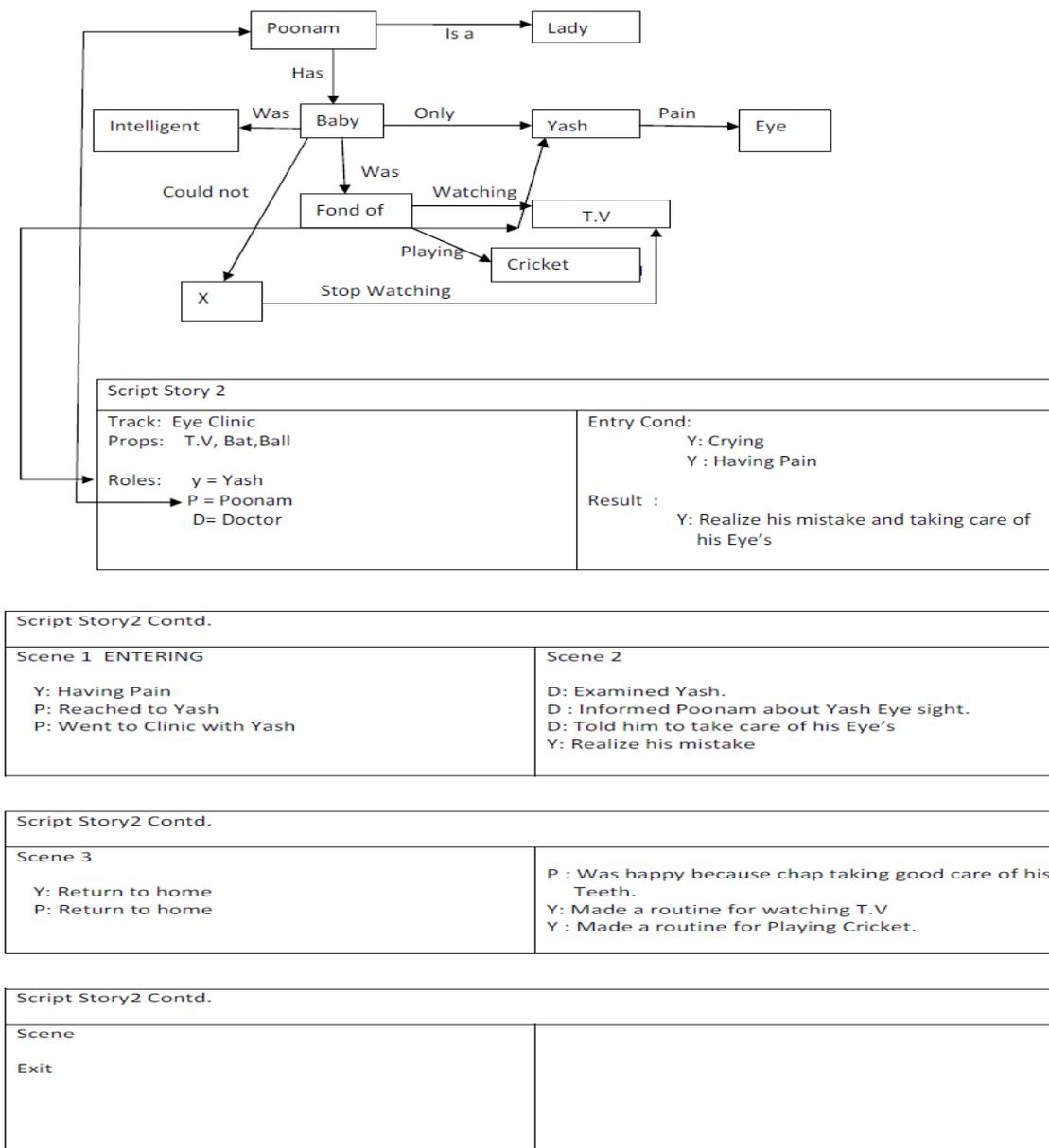


Fig. 5 Represents The Implemented Conceptual View Of Hybrid Representation Contd.

3.2 Academics:-
(Tanwar^d, Prasad^d, Dutta^d, 2012) We can use the hybrid representation in academics also. Let us consider example where we can represent the details of a student and teacher

using a network and the scenario of lecture room using script technique. The conceptual view of the same using hybrid representation is shown in fig 6.

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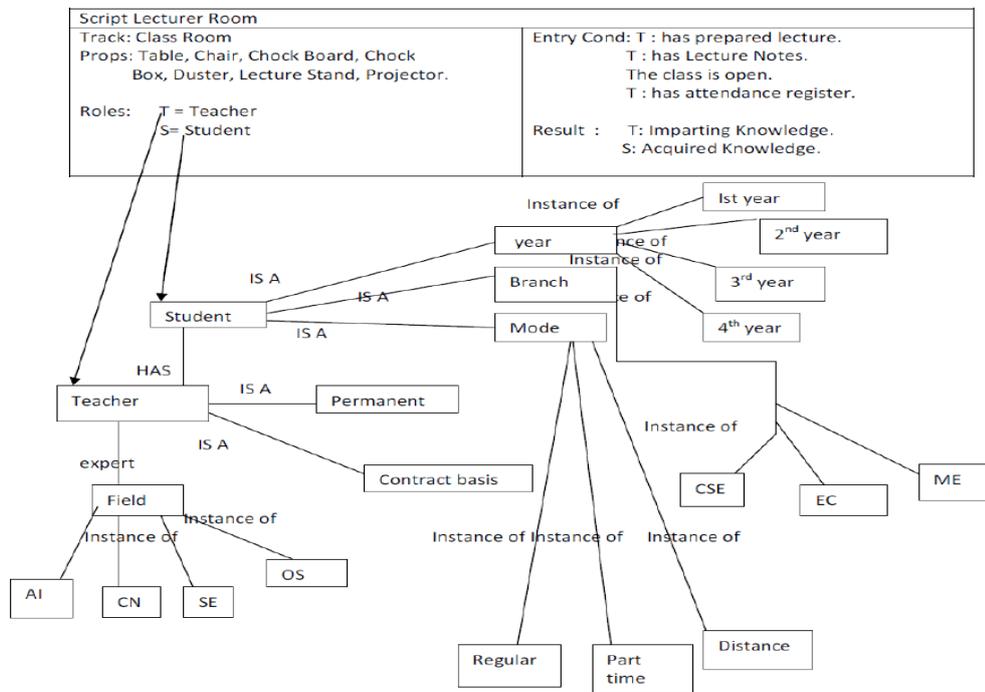


Fig 6 Represents The Implemented Conceptual View Of Hybrid Representation In Academics (Tanwar^d, Prasad^d, Dutta^d, 2012).

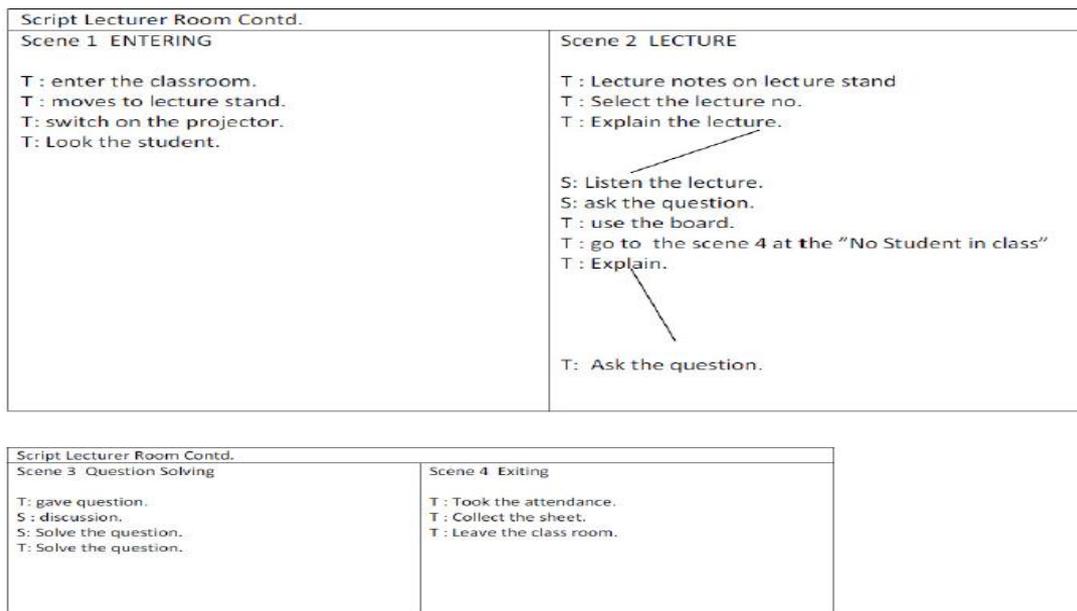


Fig 6 Represents The Implemented Conceptual View Of Hybrid Representation In Academics Contd (Tanwar^d, Prasad^d, Dutta^d, 2012).

3.3 Story Reader.

Let us consider the next example in that system represents the knowledge when input is a story. The advantage of the hybrid representation is reader don't need to spend lot of time (hour's , day, months) to read the story , using the system all the details , event can be visualize and one can reason the knowledge from that representation. Example "A farmer survived on his tiny piece of land. he worked in the field. he saw a huge cobra sitting . The farmer thought that the cobra must be the god. Farmer brought a bowl of milk. he offered it to the cobra. Farmer went to the field. He found a gold coin. After that it became a daily routine. After

sometime the farmer went to other place. He told his son to feed and get. Son was greedy. He thought of killing. He wanted capturing the whole treasure at one go. He went to the field. He took rod. He had seen him there. The son tried killing. Cobra killed him. He died by cobra.

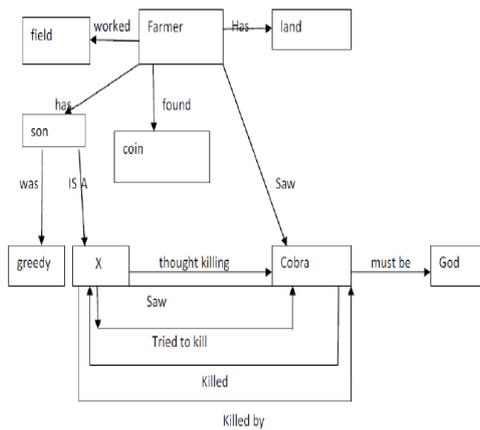


Fig 7. Represents implemented conceptual view of story.

IV. RESULT:

The system was capable of Representing the stereo type as well as non stereo type knowledge. That make the system easy to understand. In this section the result of work was explained properly.

Here the result of the system was compared manually with the conceptual result step by step.

Input 1 :

A farmer survived on his tiny piece of land. He worked in the field. He saw a huge cobra sitting. The farmer thought that the cobra must be the god. Farmer brought a bowl of milk. He offered it to the cobra. Farmer went to the field. He found a gold coin. After that it became a daily routine. After sometime the farmer went to other place. He told his son to feed and get. Son was greedy. He thought of killing .he wanted capturing the whole treasure at one go. He went field. He took rod. He has seen him there. The son tried killing. Cobra killed him. He died by cobra.

Let us represent the input manually. We can consider them as a single input / 20 different inputs (as this story consists of 20 different statements.

Step 1

4.1 a. generates the end markers i.e Full stop.

- A farmer survived on his tiny piece of land
- He worked in the field.
- He saw a huge cobra sitting.
- The farmer thought that the cobra must be the god.
- Farmer brought a bowl of milk.
- He offered it to the cobra.
- Farmer went to the field.
- He found a gold coin.
- After that it became a daily routine.
- After sometime the farmer went to other place.
- He told his son to feed and get.
- Son was greedy.
- He thought of killing.
- He wanted capturing the whole treasure at one go.
- He went field.
- He took rod.
- He saw him there.
- The son tried killing.
- Cobra killed him.
- He died by cobra.

4.1 b. Generates the tokens from each sentences line by line.

Table 2 represents the Tokens generated by the system

S.no	Subject	Verb	Object
1	Farmer	survied	Land
2	he	worked	field
3	he	saw	cobra
4	farmer	thought	god
5	Farmer	brought	milk
6	he	offered	cobra
7	farmer	went	field
8	he	found	coin
9	-	became	Daily routine
10	he	Told, feed	son
11	son	was	greedy
12	he	Thought, killing	
13	he	wanted	treasure
14	he	went	field
15	he	Took	rod
16	he	seen	him
17	son	tried	killing
18	cobra	killed	him
19	he	died	cobra

land 2 generates the end markers i.e Full stop and the generation of Tokens by the implemented system shown below. in addition to generating the tokens system also returns whether the subject is noun or preposition. System has the ability to process the verb in any form present, past, perfect tense. The system in incapable to processed the word "maybe" because it don't belongs to any categories neither subject / object and nor verb. The efficiency of the system is calculated manually . There are two types of input considered it can be a single line of sentence or it can be paragraph/Story. The efficiency of the system is considered on the bases of hybrid representation and question answering system.

Table 3 Represents the Effecency of system

S.no	Input No of lines	Efficiency %	Input No of Stories	Efficiency %
1	10	100	5	100
2	15	90	10	90
3	20	93	15	93
4	25	95	20	95

V. CONCLUSION

Communication style of each one is different from other and it is quite often when relating events, do leave large amount of blanks/gaps or assumed details out of their communication. This may lead to miscommunication. In real life it is not easy to deal with a system that is not able to fill up the missing conversational features, whereas system can predict/ assume unobserved events.



The implemented system can act as an intelligent system. It can be used in daily life activities because the system is capable to represent the knowledge in day to day applications. The result and efficiency of the system is acceptable. The Hybrid of declarative and procedural technique makes the system interactive and user friendly. We tried to provide a system that act as a roof for multiple type of knowledge.

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