Proceedings of the Second International Conference on Research in Intelligent and Computing in Engineering pp. 181–186 DOI: 10.15439/2017R31
ACSIS, Vol. 10 ISSN 2300-5963

Hurdles For Designing Flowcharting Process

Aparitosh Gahankari
Project Scholar
Department of Computer Science
and Engineering, G. H. Raisoni College
of Engineering, Nagpur (MS), India
Email: hmntgahankari@gmail.com

Urmila Shrawankar
IEEE Sr. Member,
Department of Computer Science
and Engineering, G. H. Raisoni College
of Engineering, Nagpur (MS), India
Email: urmila@ieee.org

***Abstract*—To develop programming language skills, there are many tools available which have been developed to introduce the basics of programming to new-comers in the area of programming. Whatever tools are there for the programming environment of flow chart based notation depends on the interference of user with the system. The flowchart-based Environment depends on the intermediate code generated but every time human intervention is needed. The development of the environment for teaching aids can be other area where the flowcharts can be used. The main animus of the contemplate research work is to enroot a framework which not only automatically converts the process text but also to deploy it as software to create training materials. That is to automate the flowchart drawing activity based on the text inputs given by the end users hence; this research proposes a strategy that will be used to draw flowcharts without human intervention. It can also be used to represent the basics of programming problems to new users. The feature applied in the system not only automatically converts the text into flowchart but also builds up the critical thinking abilities of new software engineers. It also improves solution designing skill of new software engineers. Otherwise also the system is useful to represent the any given process text into the graphical form using the standard flowcharting symbols.**

***Index Terms*—Text to flowchart conversion, Computer Based Teaching (CBT), keyword extraction, teaching aids, Natural Language Processing (NLP).**

I. Introduction

Importance to generate the flow chart has been on the rise due to the need to solve problems which can be readily used in creating Teaching aids for the teachers. In today's busy life, most of the teachers had to create more teaching material in less time. The teachers do not have enough time to devote for the preparation of new teaching aids. Simiarly a novice programmer can be made to understand a solution easily by using a graphical representation. For his easy understanding, there are many difficult problems which can be shown using the flowcharts [1]. Basically, there are some challenges in solving and designing flowcharting, the common flowchart-based Environments highlighted on creation of flowcharts as well as feature of generating code but no one has focused on spontaneous change in the input given to system.Reserch gap is found when the process text contents in plain English is converted to its flowchart without human mediation. To fill aforementioned gap and to improve the teaching skill of the teacher new system has been proposed. The software tools can be developed, as the procedure of constructing a flowchart till generation of coding, etc. has previously established [2]. In several fields associated with Knowledge and Engineering (e.g. mechanics, Elementary level geometry). To reduce the efforts required to create a teaching aid, the proposed automatic conversion of text to a flowchart will help in reduction of time required in preparation of teaching aids.

II. Related Previous Work

A. Semantic & Syntactic Analysis

In this technique, they used the iconic based surroundings and flowchart based representation to improve the logical intellectual skills for the development of the new programmers [1]. The research in [2] mainly exposed the absence of problem-solving skill in the programming languages of new software users. By considering this as research gap basic algorithmic programming problems skills required by the new programmers and the need of human intervention they [1, 2] proposed text-to-flowchart conversion methodology. There are multiple techniques which are used for the knowledge-based system to draw the flowcharts and dialogue-based tutoring system. The techniques are Semantic & syntactic analysis is done Maintaining the Integrity of the Specifications.

B. Knowledge base FlowchartNet

This technique is applied for searching of common programming problems faced by new programmers, ActionNet, the knowledge base is applied to expand the query by finding a synonym. In [1] a methodology has been developed as an outline to provide solution in developing designing and skills of solving problem by a new systems users with the help of a programmed English text into flowchart translation [2].This technique has been used to produce flowchart for both sighted and blind users.

C. Stanford POS Tagger.

In [3] the method to generate an activity and sequence diagram from given set of specification has been proposed. This method uses the intermediate structured representation for the possible automated generation of UML. Illustrations were proved from industries. They also proposed a solution for the textual representation which is accepted by the users also. This can be considered as a limitation which is restricted to UML diagrams based on simple statements having a length less than four sentences.[3]There are multiple techniques which uses the knowledge-based system to draw the flowcharts and dialogue-based systems which works as tutoring system. The technique which is comely used is to use

Stanford POS Tagger. The Problem statement is broken down into compact chunks which are differentiated on their functional aspect, it incorporate the use of grammatical regulations. Uses preposition to identify interactions. The accuracy of above approaches is limited.

In [4] UML and behavioral diagrams are drawn without considering any repetition in data. However, repeated data and ambiguity are, often, present in the documents of requirements specifications and not considering them is one of the limitations [4]

D. PoS tagger and NP chunking

Considering the work in [5] which is restricted to Keyword Extraction only. Techniques which are used are PoS tagger and NP chunking (parsing technique) to achieve keyword extraction.

E. XML tag set

Very huge time needs to be invested in reading documents hence in [6] they introduce a method of generating a diagram by presenting the given text as XML tags and used techniques to generate XML tag set which uses semantic structure of a text and applies Structural classification which uses a linguistic functions of a diagram (like inclusion, arrangement, indication & order.

F. NLP(Natural language processing)

The research in [9] generates geomatric diagram by conversion of text but the research is restricted to geometry problems stated in English language which generally appeers in text books used by schools [9], For the implementation they used techniques which uses NLP for syntactic and semantic analysis then Knowledge base of generic mathematics is used which they termed as "GeometryNet", after that Diagram generation Module is created[7,9].

III. SYSTEM MODEL

The overall outline of the paper is graphically exhibited in figure.1 the process text is given to the system as input pre-handling steps are performed on the content with a specific goal to discover improved catch phrase. This works importance can be justified if following points are considered which talks more about why automatic generation of flowcharts is need of the day. if used judiciously it can be used to effectively solve following aspects i.e.

- In creation of Training Materials,
- Workflow Management and
- In Continuous Improvement and Troubleshooting Guides.

Firstly we will focus on selection of the Input Text. Following are some of the sample input text used to test the roubustness of the system. working of the system. Basically they are collected from diverse domains ranging from industrial process ,reparing process to simple day-to-day activitie like preparation of tea.Table 1 can be refered.

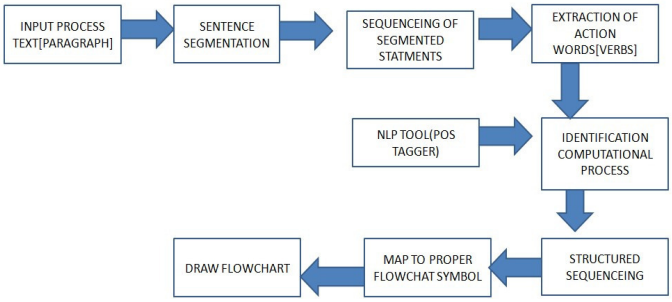


Fig 1 :The Proposed Framework Of Process Text To Flowchart Conversion

The main work which will be done is a generation of the framework which will show the path to how to convert the English language sentences into the flowchart. This framework i.e. proposed framework may be utilized in many ways to generate diagrams, problem-solving and much more[3].By many techniques, the keywords or keyphrase are extracted. The natural language processing methods are then applied to the text as shown in fig.1.

Table 1: Sample Input Text used to test the System

Sr.no	Domain	Sample Input Text
1	Real Estate	Start Your Research Early.Determine How Much House You Can Afford. Get Prequalified and Preapproved for credit for Your Mortgage. Find the Right Real Estate Agent.Shop for Your Home and Make an Offer. Get a Home Inspection.
2	Call Center	Complaint can be delt by remaining calm - even if the customer becomes angry. As quickly as possible the complaint should be solved. Keep corrsponding records of all complaints of customer. Begning from the first problem to the last solution.
3	Operating System Installations	Enter your computer's BIOS. Find your BIOS's boot options menu. CD-ROM drive should be starting boot device of your System. Save the changes of the settings. Shut off your computer.Start the PC and put the Windows 7 CD-ROM into your CD/DVD drive. Boot your system from the disc.
4	Finance	Open a stock broker account in XYZ Pvt.Ltd Brokrage Firm. Find a good stock broker and open an account. Read books. Read articles. Find a mentor. Study the greats. Read and follow the market.Consider paid subscriptions. Go to seminars, take classes.

The next major task is to separate out the statements from the given input text. There are many challenges in finding the correct position where to chuck the specific statement. The challenge includes the decision as to which full stop (.) be considered as a end-of-statement as can be seen from Table 1 Sr.no.4.

As the basis of chucking is to find out the full stop (.) but as can be seen from the Sr.no 4 (table 1) the full stop appears twice creating a ambiguity for sentence chunking process.

The next step is to identify the majorly used action words (verbs).So the proposed system finds the correct statements which includes the action words (Verbs).

Next step is to properly sequencing these statements so that they can further be mapped with proper Flowcharting symbols.

Extraction of keywords is next logical step which helps in selection of proper flowcharting symbol.

Using the Graphics drawing tools the Flowchart in drawn.

IV. Keyphrase Eradication Method (KEM) for Keyphrase regeneration

A key expression enhances the essence of intended flowchart [1]. This approach chooses significant expressions from the input. Following steps of is utilized to concentrate phrases from info content

i. Input text gets pre-processed and keepsake gets isolated for further handling.
ii. POS badges are utilized to identify meaningful key phrases
iii. The key phrases thus identified from every sentence.
iv. Then key phrases of suitable length will be used to map with the suitable flowcharting symbols.

V. POS Tagging to Classify Grammatical form of Words

Any word in the speech like a noun, adverb, pronoun, verbs, adjective tags by the POS tagger [5, 6] and denote that output word of speech by using this technique [3]. The steps for POS tagging are mention below:

1. POS tags N,V,Adj,Adv, will be inputted to the system.
2. Specified tags are searched.
3. Probability is found by using following Formula

$$P(ti \mid w) = c(w,ti)/(c(w,t1) + \ldots + c(w,tk))$$

Where
w represents inputted word M,
ti is the tag
c(w,ti) it is the number which represents occurrences

4. The Maximum probability word is tagged

Some tags and their clarification are illuliastrated in the accompanying table 2.

Table 2 Representation of different POS labels

Label Name	Label Description
CC	Conjunction(Coordinating)
CD	Fundamental Number
DT	Clincher
IN	Preposition / Conjuction (Subordinating)
JJ	Adjective

VI. Procedure For Decomposed Term Formation

A exceptional amongst the most utilized procedures of the parsing is natural language processing [5, 7]. In parsed sentence generation an input sentence is transformed into classified organization and grammatical form of term is allotted to every word. Given input sentence will analyze by considering every word from their input and gives the structural format. Grammar and parser are two main components of parsing [8]. It uses the various algorithms and rules for the determining tree structure of the sentence.

Example: I will getup in Morning when alarm and will go to college, if it is raining I will go to college by Four-wheeler, otherwise I will go to college by two-wheeler

1) Tagging

I/PRP will/MD getup/VB in/IN Morning/NN when/WRB alarm/NN and/CC will/MD go/VB to/TO college/NN ,/, If/IN it/PRP is/VBZ raining/VBG I/PRP will/MD go/VB to/TO college/NN by/IN Four-wheeler/NNP ,/, otherwise/RB I/PRP will/MD go/VB to/TO college/NN by/IN two-wheeler/NN

2) Parse

```
ROOT
 (S
  (NP (PRP I))
  (VP
   (VP (MD will)
    (VP (VB getup)
     (PP (IN in)
      (NP (NN Morning)))
     (SBAR
      (WHADVP (WRB when))
      (FRAG
       (NP (NN alarm))))))
```

```
(CC and)
(VP (MD will)
 (VP (VB go)
  (PP (TO to)
   (NP (NN college)))
  (, ,)
  (S
   (SBAR (IN If)
    (S
     (NP (PRP it))
     (VP (VBZ is)
      (VP (VBG raining)
       (SBAR
        (S
         (NP (PRP I))
         (VP (MD will)
          (VP (VB go)
                (PP (TO to)
                 (NP (NN college)))
                (PP (IN by)
                 (NP (NNP Four-
wheeler)))))))))))
        (, ,)
        (ADVP (RB otherwise))
        (NP (PRP I))
        (VP (MD will)
         (VP (VB go)
          (PP (TO to)
           (NP (NN college)))
          (PP (IN by)
           (NP (NN two-wheeler)))))))))
```

Fig.2. Parse of a sentence

General Steps for parser are mentioned below:

1. Parser will begin with a sentence
2. Dictionary is checked to look up every word
3. Corpus is used to identify POS tags fir every word
4. A tree is Built with POS tags of every word

VII. SENTENCE CONDENSATION ALGORITHM FOR SENTENCE GENERATION

Whatever the input statement we take for input that selected words from the paragraph they are parsed into the phase. By implementing above method [7], entire annoying arguments from parsed statements are removed that outcomes into a smaller variety about statements There are many methods feasible for creation of parsed sentence to wanted length.

The steps of algorithm elaborate in sentence condensation are specified as under [11]:

1. Choose S which is most left sided in parsing phase.
2. The Expressions which indicates Time should be eliminated
3. Apart from Time following contents should be removed
    a. words whose reference depends on the circumstances of its use
    b. genitive Pronouns
    c. Words indicating Quantity
4. All words which are not required should also be removed.

VIII. CREATION OF DATABASE TO STORE EXTRACTED KEYWORDS AND RELEVANT FLOWCHART SYMBOLS

The Extracted Keywords[12] (Verbs / Action Words are stored in a database where they are linked with Proper Flowcharting Symbols.Following Diagram shows the set of standard Flowcharting symbols which will be used by the system to generate the output

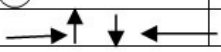
Sr.No	Symbol	Purpose
A.		Start / End
B.		Process
C.		Input/output
D.		Making Decision
E.		Connector
F.		Flow lines

Fig.2: Set of Standard Flowchart Symbols

IX. EXPECTED RESULT

The desired from of the framework is well ordered pre-processing of the steps for the given input English text to find out the correct keywords. To solve the problems regarding creating Training Materials, managing Workflows and for the preparation of Continuous Improvement and Troubleshooting Guides aspects this framework can be used.

A. Case Study

As Discussed in section VI, after parsing the appropriate Flowchart Symbol will be used (depending upon tag the decision making symbol D will be used as shown in fig 2 if the tag comes out to be VB).

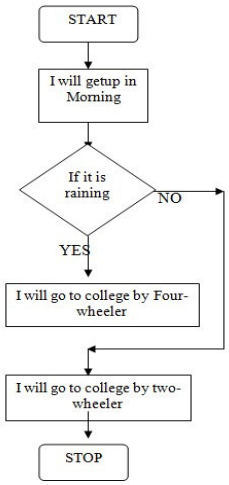


Fig.3: Expected Resultant flowchart

B. Role of Flowcharts in Teaching / Learning Process

A flowchart plays a important role in teaching learning process. If used judiciously they can help in

- Saving paper (paperless)
- Enrich the quality teaching
- Enhance understanding & ideas will be more simplified
- Will improve the learners participation in teaching / learning process
- Students will brace learning
- Save both time & money.

By using the Flowcharts at school level Programming problems can be solved .Following Table 2 shows some of the sample statements & the relevant flowchart symbol use. The other use of the flowcharts can be in demonstrating the logic of a particular competing problem. The other purpose of using the flowchart can be to use it to show some process.

Table 2 Tabular representation of Example of mapping of symbols

Purpose	Use
Calculate total of A, B, C	Process
Indicate that the problem has been solved.	Stop
Find if a number is greater than the other	Decision
Read a number and calculate the factorial of the number.	Loop
Read three numbers	Input
Print the total	Output
Indicate beginning of a problem solving flow.	Start

1) Control Structures

a) Sequence

It is the direct advancing execution of one step of processing step after the other. The global sequence form is as follows

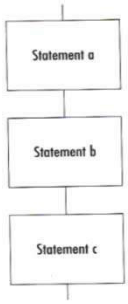


Fig 3: The Sequence form

b) Selection

A condition suggests that selection structure should and the choice in two actions depends upon whether the condition is right or not. The general pattern of the selection construct is as follows

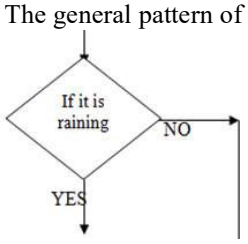


Fig 4: The Selection

X. CONCLUSION

The main attention of this study is to understand the approaches of converting the process text into flowchart and understanding the basic concepts. This paper gives the insight about the project plan and the systems required to construct the experiments. The previous studies and the literature reviews are used to find out the research gaps. It is also helpful to understand the workflow of the newly designed system in creating good teaching aids

REFERENCES

[1] M. N. Dainal Hooshyar, Rodina Binti Ahmad, "Flowchart-based Approach to Aid Novice Programmers: A Novel Framework Dainal," 2014. DOI: 10.1109/ICCOINS.2014.6868826

[2] Danial. H, Maíen .T, Masih .M, "Flowchart-based Programming Environments Aimed at Novices", Int. J. Innovative Ideas (IJII), January-2013, ISSN: 2232-1942 Vol. 13 No. 1. DOI: 10.1109/EduCon.2013.6530276

[3] D. Hooshyar, R. B. Ahmad, M. Hairul, and N. Nasir, "A Framework for Automatic Text-to-Flowchart Conversion : A Novel Teaching Aid for Novice Programmers," pp. 7–12, 2014..

[4] R. Sharma, S. Gulia, and K. K. Biswas, "Automated generation of activity and sequence diagrams from natural language requirements," 9th Int. Conf. Eval. Nov. Approaches to Softw. Eng. ENASE 2014, pp. 69–77, 2014. Online ISBN: 978-989-758-065-9.

[5] Y. Park and Y. Li, "Extracting Salient Keywords from Instructional Videos Using Joint Text, Audio and Visual Cues," Proc. Hum. Lang. Technol. Conf. NAACL, Companion Vol. Short Pap., no. June, pp. 109–112, 2006.

[6] Masashi Murayama, YuichiNakamura, Yuichi Ohta,"Diagram Generation From Tagged Texts Towards Document Navigation",IEEE International Conference on Multimedia and Expo,2001DOI: 10.1109/ICME.2001.1237775

[7] A. Mukherjee and U. Garain, "Intelligent tutoring of school level geometry using automatic text to diagram conversion utility," Proc. - 2nd Int. Conf. Emerg. Appl. Inf. Technol. EAIT 2011, pp. 45–48, 2011.DOI: 10.1109/EAIT.2011.16

[8] Marie-Catherine de Marneffe, Bill MacCartney, and Christopher D. Manning. 2006. "Generating Typed Dependency Parses from Phrase Structure Parses." 5th International Conference on Language Resources and Evaluation (LREC 2006), pp. 449-454

[9] Mukherjee , U. Garain, and Arindam Biswas,"Automatic Text-to-Diagram Conversion: a Novel Teaching Aid for the Blind People " in J.on Educational Technology & Society (ETS),2013, DOI: 10.1109/IC3INA.2014.7042592

[10] M. Habibi , and A. Popescu-Belis ,"Keyword Extraction and Clustering for Document Recommendation in Conversations", IEEE Transactions On Audio, Speech, And Language Processing, Vol. 23, No. 4, pp.746-759, 2015,DOI: 10.1109/TASLP.2015.2405482

[11] Urmila Shrawankar, Kranti Wankhede,"Construction of News Headline from Detailed News Article", 2016 3rdInternational Conference on "Computing for Sustainable Global Development", 16th-18th March, 2016 Proceedings of the 10TH INDIACom-2016; IEEE Conference ID: 37465

[12] N. Kumar ,and K. Srinathan, “Automatic keyphrase extraction from scientific documents using N-gram filtration technique”, in Proceedings of the eighth ACM symposium on Document engineering, Sao Paulo, Brazil, September 16-19, 2008,DOI:10.1145/1410140.1410180

[13] S. Siddiqi , and A. Sharan, “Keyword and Keyphrase Extraction Techniques: A Literature Review”,in International Journal of Computer Applications (0975 – 8887) Volume 109 – No. 2, January 2015

[14] S.H. Atrey, T. V. Prasad, and G. Ram Krishna, “Issues in parsing and POS tagging of Hybrid Language”, in IEEE International Conference on Computational Intelligence and Cybernetics, pp.20-24, 2012. 10.1109/CyberneticsCom.2012.6381609.