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Interpretation of Human Interactions In Meetings Using Tree Based Mining

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ABSTRACT

In this paper, mining methods are used to extract frequent patterns of human interaction Based on meeting contents. Data mining is the entire process to uncover hidden patterns for evaluation. Data mining is the process to extracting or mining knowledge from the large amount of data. That is knowledge mining from database. Here we create data set of human interactions that includes several categories: propose, comment, acknowledgement, and request information, Ask opinion, positive opinion, and negative opinion. The meanings of the various categories are as follows: propose – a user proposes an idea with respect to a topic, comment – a user gives comments on a proposal, acknowledgement – a user confirms someone else's comment or explanation, request information – a user requests information about a proposal, ask opinion – a user asks someone else's opinion about a proposal, positive opinion – a user expresses positive opinion and negative opinion – a user expresses a negative opinion. The flow of human interactions in discussion sessions are represented as a tree. The tree based mining algorithms are used to recognize and analyze human interactions in meetings. The propose system shows the result based on data mining by using tree based mining to find frequent patterns so they used frequent interaction tree mining and frequent interaction subtree mining algorithms.

Keywords – Frequent interaction subtree mining, frequent interaction tree mining, human Interaction, Interaction flow

I. INTRODUCTION

Human interaction is one of the most important characteristics of group social dynamics in meetings. We are developing a smart meeting system for capturing human interactions and recognizing their types, such as proposing an idea, giving comments, expressing a positive opinion, and requesting information. To further understand and interpret human interactions in meetings, we need to discover higher level semantic knowledge about them, such as which interactions often occur in a discussion, what interaction flow a discussion usually follows, and what relationships exist among interactions. This knowledge likely describes important patterns of interaction. We also can regard it as a grammar of meeting discussion.

Meetings are an important communication and coordination activity of teams. In this paper, we focus on the human interactions that are defined as behavior among meetings participants with respect to the current topic, which are different from physical interactions, such as proposing an idea, giving comments, and expressing a positive opinion, and requesting information.

In this paper, we capture various categories of meetings and trying to develop several applications based on the

discovered patterns in human meetings. So I propose my work with the various categories of meetings such as, debate, interview etc. On the basis of previous work we extract frequent patterns by using two algorithms first is frequent interaction tree pattern mining and in second it is frequent interaction subtree pattern mining algorithm.

II. PROBLEM DEFINITION

We propose a mining method based on meetings to extract frequent patterns of Human interaction. Human interactions are such as proposing an idea,

giving comments, and expressing a positive opinion, indicate user intention toward a topic or role in a discussion session of meeting. Human interaction flow in a discussion session is represented as a tree. So to analyze the structures of the trees and to extract interaction flow patterns we are designed tree based interaction mining algorithms.

In the meeting discussions, we can extract several interesting patterns that are useful for the interpretation of human behavior such as determining frequent interactions, interaction flows, and relationships between different types of interactions.

III. RELATED WORK

There are different ways available to capture human interaction in meetings. In the fields of image/speech processing, computer vision, and microphones much research has been attracted by human Interaction in meetings. Different projects are proposed [3] for studying human interaction issues in meetings such as turn-taking, gaze behavior, influence and talk activeness, gesture, utterances, speech tone etc. Overall studies depend on the physical actions of the human. In general, the above systems detecting and visualizing human interactions in meetings so our work focuses on discovering higher level knowledge about human interaction. Therefore by using the concept of data mining / tree based mining it shows the frequent interactions, interaction flows and relationships between different types of interactions like natural interactions are those initiated by person spontaneously, and reactive interactions are triggered in response to another interaction which is shows in the form of a tree in the dataset. The previous works not capture the meetings of the different categories. Sometimes they used only one dataset but we have to enhance our approach with various categories of tree dataset.

IV. HUMAN INTERACTION AND INTERACTION FLOW

In this research, we focus on different interaction types like propose, comment, acknowledge, request information, ask opinion, positive opinion, and negative opinion. These are all the task-oriented interactions. In this kind of meetings users propose an idea with a topic. I.e. on particular action reaction must be there in meetings. That is called interaction.

The human interaction flow designed as tree which is shows in the above figure [4].

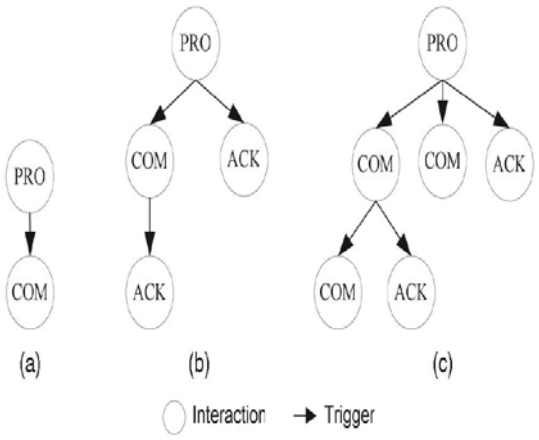

Fig.1.Example tree representation for human interaction flow

Therefore, an interaction flow is a list of all interactions in a discussion session with Triggering relationship between them. I.e. labels are proposed, comment, acknowledge, request information, ask opinion, positive opinion, and negative opinion.

V. TREE BASED MINING ALGORITHMS

1. Frequent interaction tree pattern mining Algorithm

The association rule mining use by tree Based mining algorithms. We have to first construct the data set TD, the data is representing by using string encoding method, and then this algorithm calculates the support of each node or tree in Isomorphic tree data set, ITD. Then it selects the trees whose supports are larger than minimum support [4]. It finally gives the output as frequent trees or we call it as frequent patterns. For calculating the support there is a formula which is as follow:

Support = (number of occurences of required trees / total number of all trees in tree dataset)

TABLE 1
NOTATION

Notation	Description
TD	A dataset of Interaction trees.
ITD	The full set of isomorphic trees to TD
T	A Tree
t^k	A subtree with k nodes, i.e., K-sub tree
C^k	A set of candidates With k-nodes.
F^k	A set of frequent k-sub trees
σ	A support threshold min sup

Algorithm1: FITM (TD,σ) (Frequent interaction tree pattern mining)
Input: Tree database (TD) and a support threshold σ
Output: Frequent tree patterns with respect to σ
Procedure:
(1) Scan databaseTD, generate its full set of isomorphic trees, ITD
(2) Scan databaseITD, count the number of occurrences for each tree t
(3) Calculate the support of each tree
(4)Select the trees whose supports are larger than σ and detect isomorphic trees; if m trees are isomorphic, we have to select one of them and discard the others
(5) Output is the frequent trees

2. Frequent Interaction Sub tree Pattern Mining Algorithm

It first calculates the support of each node and selects the nodes whose supports are larger than σ to form the set of frequent Nodes, F1 (Steps 2-3). It then adds a frequent node to existing frequent i-sub trees to generate the set of candidates with i + 1 node (Steps 4-8).

If there are any trees whose supports are larger than, it selects them to form F^{i+1} and repeats the procedure from Step 4; otherwise, it stops to output of Frequent subtrees. In Step 7, it is joined t^i and t^1 to generate the candidate subtree set of size.

Algorithm2. FISTM (TD ;) (Frequent interaction subtree pattern mining)
Input: Tree database (TD) and a support threshold σ
Output: Frequent subtree patterns with respect to σ
Procedure:
(1) $i \leftarrow 0$
(2) Scan database TD, calculate the support of each node

(3) Select the nodes whose supports are larger than σ to form F^1
(4) $i \leftarrow i$ +1
(5) For each tree t^i inF^i, do
(6) For each node t^1 inF^1, do
(7) Join and t1 to generate C
(8) Subtree Support Calculating (TD;t^{i+1})
//calculate the support of each tree in C^{i+1}
(9) If there are any trees whose supports are larger than, then select them to form F^{i+1} and return to Step (4)
(10) Else output the frequent sub trees whose supports are larger than σ

Subprocedure:
Subtree_Support_Calculating (TD,st)
$count \leftarrow 0$
$supp(st) \leftarrow 0$
(1) For each tree $t \epsilon TD$ do
(2) Create subtree S of t with any item $s \epsilon S$, $|s| = |st|$
(3) $flag \leftarrow false$
(4) For each item $s \epsilon S$ do
(5) Generate isomorphic trees IS of s
(6) For each item $is \epsilon IS$ do
(7) If $tsc(is) = tsc(st)$ then
(8) $count \leftarrow count + 1$
(9) $flag \leftarrow true$
(10) $break$
(11) If $flag = true$ then
(12) $break$
(13) $supp(st) \leftarrow count/|TD|$
(14) $return\ supp(st)$

VI. CONCLUSION

The work of the paper is to going through the different categories of the meetings Such as panel, debate, and interview. The proposed work is recognizing the frequent patterns of human interactions in meetings using tree based mining. The tree based mining results would be useful for indexing, summarization, and comparison of meeting records. There would some differences in frequent patterns with different types of meetings. In the future work we also plan to explore embedded tree mining for hidden interaction pattern discovery. Embedded subtrees are a generalization of induced subtrees, which allow not only direct parent child branches, but also ancestor-descendant branches.

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