Recommendation System for Social-aware Personal Processes
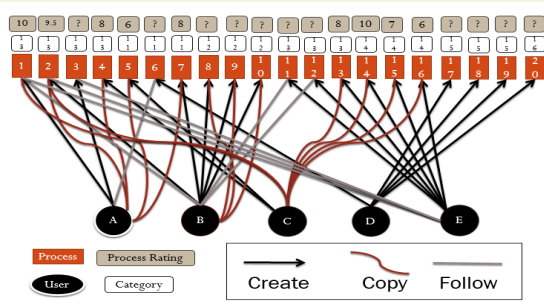
Special Thanks to :

Shawn Fang, Department of Computer Science, University of Texas at Austin
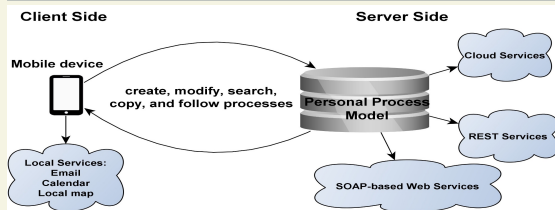Dr. Anne Ngu, Department of Computer Science, Texas State University

ABSTRACT

The rise in popularity of various social network applications has brought the opportunities for Internet users to share and reuse a plethora of things like images, videos, datasets, maps, reviews etc. However, currently there is no effective way to share personal experiences such as the process of filing a personal income tax return or the process of applying a visa. We propose a social-aware personal process model and its implementation as a mobile application that empowers users to create, to execute and to share personal processes in the context of social network. As a social-aware personal process management system it is important to have an effective Recommendation System that predicts processes that a specific user may be interested in using. This prediction is based on the similarity of users in their actions on existing processes. The assumption is: if two users have been copying and following the same processes then there is a decent probability that those two users have similar interests, which would be reflected as both of them will engage in similar personal processes in the future.

DATA AND RELATIONSHIP

- Each number (1 to 20) represents a Process ID, ex., Number "1" means Process ID = 101
- Each letter (A to E) represents a User ID, ex., Letter "A" means User ID = 101 in database
- Each line (Arrow, Curve, Straight) represents a relationship (Create, Copy, Follow, respectively) between a single User and a single Process. Ex., User A creates Processes 1 and 3, copies Processes 2, 4, 5, and 7, and also follows Process 6.

Process | Process Rating | User | Category
Create | Copy | Follow

OVERVIEW OF SYSTEM

Client Side | Server Side
Mobile device
create, modify, search, copy, and follow processes
Personal Process Model
Cloud Services
REST Services
SOAP-based Web Services
Local Services: Email Calendar Local map

RECOMMENDATION ALGORITHM

- Target User = an input user who log in the PPM system
  Target Process = a process that Target User copied/created/follows
  Target Category = a category that a target process belongs to
- Neighbor User = a user who shares at least one process with target user
  Neighbor Process = a process that a neighbor user copied/created/follows but not target user
  Neighbor Category = a category that a neighbor process belongs to

Steps:

// Target User
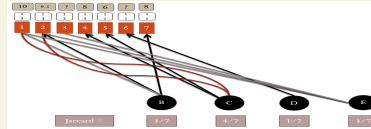(1.0) Find a set of target processes and a set of target categories
(1.1) Find a rating of each target process
(1.2) Find an average rating of each target category.
Ex. Category 13 = (10+9.5+8)/3 = 9.167

//Neighbor User: Jaccard Similarity
(2.0) Find a set of neighbor users

(2.1) Find Jaccard Similarity between each neighbor user and target user and treat Jaccard Similarity as weighting.

$$\text{Jaccard Similarity} = \frac{\text{\# of processes SHARED by both Target User and a Neighbor User}}{\text{\# of Target processes}}$$

//Neighbor User: Voting
(3.0) Find a set of neighbor processes.
(3.1) Weighting all voting of a neighbor user by multiplying Jaccard Similarity. [Assume an action of copy or create a process as **one** vote and following a process as **half** vote]
(3.2) For each neighbor process, collects all weighted voting from vary neighbor users who have either copied/created/follows the process, and assign it as an Voting Score to the process.
// Neighbor User: Rating
(4.0) Assume a rating is given in scale of 1 to 10, find a rating for each neighbor process.
If a neighbor process has no rating, make a prediction of rating for the non rated process:
If the category of this non-rated neighbor process can be found in the list of target categories, assign the average rating that is calculated from target processes with same category as the non-rated neighbor process, to the rating of this non-rated neighbor process. Otherwise, assign zero to it.
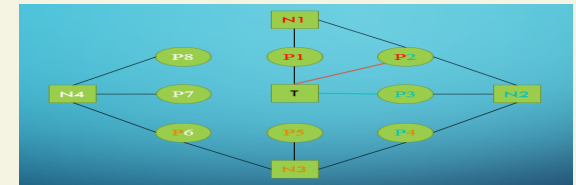// Comprehensive Score
(5.0) Sum the scores of Voting and Rating for each neighbor process
(5.1) Rank comprehensive scores from high to low
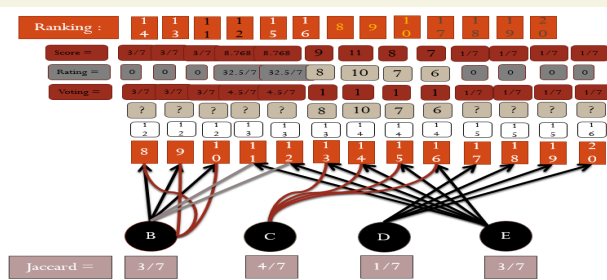
CONCLUSIONS

The recommendation algorithm brings a tree structure to the user of PPM. Once a user shares a common process with other users, all process relates to other users but exclude the known processes to the user, are possibly recommend to the user.

Base on the Data and Relationship, and Ratings of Tasks I established for this project, the recommendation system computes the comprehensive score, and recommends processes in the order correctly to target user.

FUTURE WORK

The current recommendation system doesn't take care of

(1) **If there is many voting to a particular process, the weight of rating score to comprehensive score could be regardless**. Hence, a normalization to voting and ratings score could solve the problem.

(2) **A new process which only connect to its creator will never be about to recommend to other users unless people search for it.** A content-based filtering could solve the problem. Since every process has a category field when they are created and we have information of categories the target user has. That makes a connect between target user and the new process. Since there could be many new processes with same category, we can compare the content of target processes with same category to the new processes.

REFERENCE

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ACKNOWLEDGEMENT