Interaction Patterns and Music Fans Identification in Conversational Social Network

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***Abstract*— Social network services provide social network mining, especially conversational / interaction. Social network services that offers music as its one of entertainment contents is a very interesting topic to be discussed in online forums. In online forums, there is diverging conversation that is considered to be a common way of interacting. Users are utilized with technology for various purposes including engaging in a social interaction and sharing contents. A biggest online forum are quantify behavior by Social Computing. Social Network Analysis will help produce a visualization of interaction that occurs, based on the interaction between the members on forums which subsequently generates community. A community that has the biggest value among other communities in the network is going to be calculated using the community detection analysis. Social Network Analysis method is able to calculate and recognize the big groups in online forums. The research was conducted by observing a community Last.fm users on Kaskus forum. Last.fm user community shows representative music fans in Kaskus forum. On Kaskus, community of music fans showed the development in music fans that could be used as good reference by Indonesian promoters in music concert. Last.fm users on Kaskus could facilitate Indonesian promoters to market their concert events.**

Keywords—interaction patterns; social network analysis; community detection; social computing; social media

I. INTRODUCTION

Technology has grown rapidly along with the development of human needs. Not many people are aware that the data provided on the internet can be used to help human in many ways. In the era of social computing, digital application is defined as a platform that allows users to interact, collaborate, and share between one another. Social computing is a computing paradigm where computer science and social science meet involving a multi-disciplinary approach in analyzing and modelling social behavior in different media and platform in order to generate a smart application with interactive results. Users are utilized with the technology of internet for various purposes including engaging in social interactions, contributing their expertise, sharing contents, and distributing information. Web mining technology is one of the ways to get data from the internet. Last.fm is a mix of music recommendation service, internet radio, and social network of music community. This website, which connects its users through music, is the largest database service in the world with more than 47 million active users until March of 2012.Based on Alexa.com ranking on 2013, Last.fm were on the highest position compared to other similar websites. To date, there are around 640 million songs on Last.fm. Kaskus is the largest and most popular online community forum in Indonesia seen from its traffic. It is because it has the largest base of member. In communication, interaction is the most important factor because through interaction people can see the difference between groups of people who share the same activities. Interaction pattern is the basic form of communication between individuals to individuals, individuals to groups, groups to groups, or groups to individuals by providing feedbacks between parties with the intention to achieve their goals. Kaskus shows there are interactions in the quantity and the size of groups of dominant music fans in Indonesia that can be mapped using Social Network Analysis method. Music genre that has the largest fans will inevitably attract other music fans with different genres, seen from the interaction patterns between music fans.In this research, it was found that music performances business had to consider the interactions between dominant music fans who were also Last.fm users on Kaskus as a visualization of the quantity and the size of music fans development in Indonesia for artists, musicians, and promoters.

II. BASIC THEORY AND METHODOLOGY

Social computing deals with the study of social behavior and social context based on computing system (calculation). Behavior modelling reproduces social behavior and allows experiments, scenario planning, deep understanding of behavior patterns, and potential results. The use of computer technology and internet creates an environment that is never formed before from other social activities. Social computing facilitates behavior modelling in model formation, analyzing, mining patterns, and predictions. Many inter-disciplinary systems depend on what is made and used to represent various social and physical systems in order to investigate the interactions between groups, communities, or nations. (Liu *et al*, 2009:v)

According to Zdravko& Larose (2007) and Russell (2011), the activity of data mining from the internet, such as blog, Twitter, Facebook, and other social media is known as crawling. Hanneman& Riddle (2005:24) said that social network analysts used only one kind out of many graphs – nodes, showing actors and edges depicting social relationship between members of a group. In analyzing a network using social network analysis method, there are some basic measures that become the starting point of mathematical calculations in order to determine the patterns of connectivity within the network. The basic measures used, for example: network size, degree, density, reachability, connectivity, distance, and the flow of information. The size of a network is important in order to know the scope of the research conducted and provide boundaries for the conclusions.

The development of Internet technology, especially social media, communities are no longer just a community that is formally established. Conversations that occur in social media inadvertently form a community. This informal form of community can be detected by the method of calculation of modular (Blondel et al, 2008: 2). So it will be seen individuals who have a stronger interaction on any other individuals in a group that is identified than the interaction with individuals outside of the identified groups. The result of this calculation will show how many large group of music fans and how large groups dominant music fans that exist in a network.

Community is formed of a bipartite network where individuals meet at the same event, creating a network (network) that has many nodes and events. This will lead to an affiliate network in which each actor has more than one group or in other words, they are a member of more than one group, creating a large complex structure of society. (Alamsyah et al, 2013).

Research using Gephi software (0.8.2 Beta) to process the data and visualize data. Louvain also called modularity methods that implement common form calculations below

$$Q \quad \frac{1}{2m}\sum_{i,j}\left|A_{ij} \quad \frac{k_i k_j}{2m}\right|\delta(c_i c_j) \qquad (1)$$

Louvain method is a method that is simple, efficient and easily applied to identify communities in large networks. In the journal Blondel et al (2008: 2) states the general form for the calculation of community detection with methods of modularity in the above calculations. The study illustrates how the interactions that occur, a large number of music fans and music fans majority group on the social networking users community of Last.fm in the Kaskus forum, forming patterns of interaction between the user, then the network formed from the interaction of the group found dominant music fans in the social network users community of Last.fm in the Kaskus forum that can be helpful and beneficial to the industry in the Indonesian music performances for artists, musicians, and promoters.

So that the framework of this study can be described as follows:

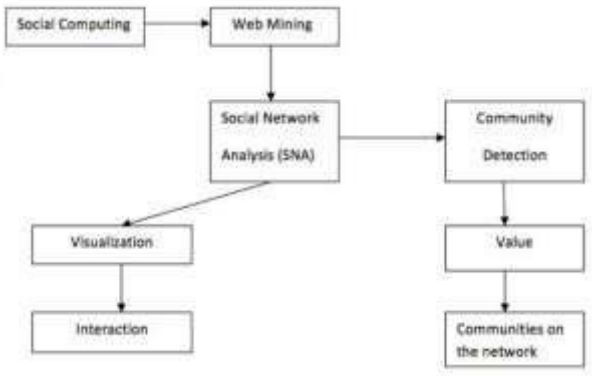

Fig. 1. Flowchart of the Proposed Scheme

Source: Pascu (2008); Kumar *et al*(2010); Waserman (2008); Hanneman& Riddle (2005); Cheliotis (2010); WikiBook (2011); Blondel*et al* (2008).

III. Simulation And Analysis

Here is the data that will result from the observation of writing analyzes performed using Social Network Analysis methods of in The Social Network Users Community Of Last.fm On Kaskus Forum started that on February 23, 2011 to June 24, 2014.

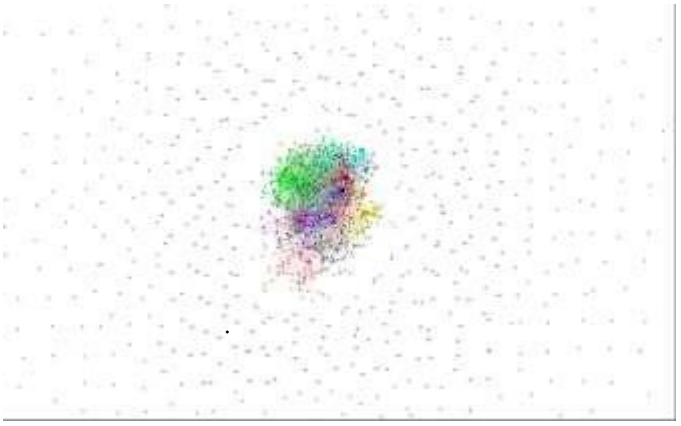

Fig. 2. The Social Network Users Community of Last.fm on Kaskus Forum

TABLE I. The number of nodes and edges

Nodes	1317
Edges	1740
Graph Type	*Undirected*

TABLE II. GRAPH REPORT

	Density	Distance	Clustering	Components	Degree
Result	0,002	7	0,280	661	2.642

The density of the network graph Social Network Users Community of Last.fm in the Kaskus Forum on February 23, 2011 until the date of June 24, 2014 was 0,002, or two per thousand. The diameter of the network much as 7 hops (steps). Level clustering coefficient is happening on the network by 0.280 or 280 per thousand. Connected components are components that are connected with different community. Components connected in the network of Last.fm users on Kaskus were 661 components. Average degree found in the network of Last.fm users on Kaskus from 23 February 2011 to 24 June 2014 was 2.642 (2.6%).

A. Community Detection

The following table shows the value of modularity in the network, which was 0.429, calculated using randomized parameter and edge weights. It also shows the resolution value of 1, based on the quantitative calculation.

TABLE III. MODULARITY REPORT

Parameters		***Results***	
Randomize	*On*	*Modularity*	0,429
Use edge weights	*On*	*Modularity with resolution*	0,429
Resolution	1.0	*Number of Communities*	670

The distribution percentage of the size of the communities can be seen from the following table.

TABLE IV. SIZE DISTRIBUTION PERCENTAGE

Size	The Number Of Groups	Percentage
123	1	9,34%
115	1	8,73%
78	1	5,92%
76	1	5,77%
56	1	4,25%
50	1	3,8%
49	1	3,72%
45	1	3,42%
40	1	3,04%
15	1	1,14%
3	1	0,23%
2	8	0,15% x 8
Total	19	100%

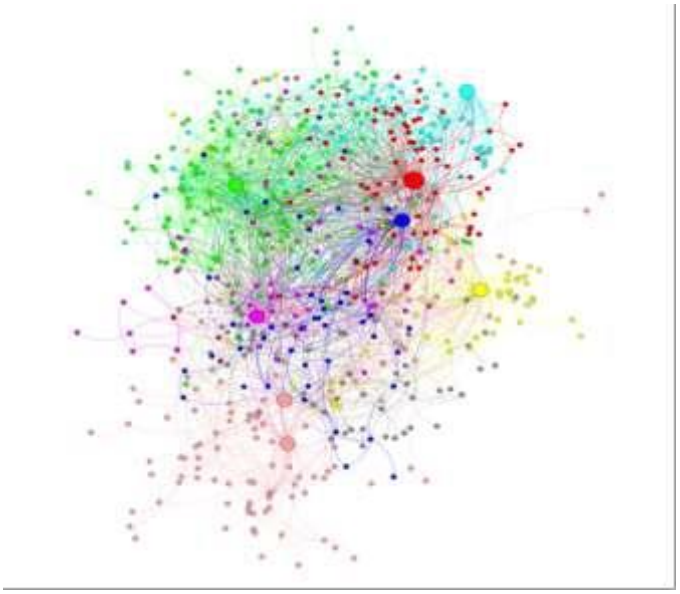

Fig. 3. Communities in the network

From the existing groups found in the network of Last.fm users on Kaskus, there were 2 big groups that were successfully identified. Those groups were collections of nodes of modularity class 1 and modularity class 2.

1. Modularity Class 1

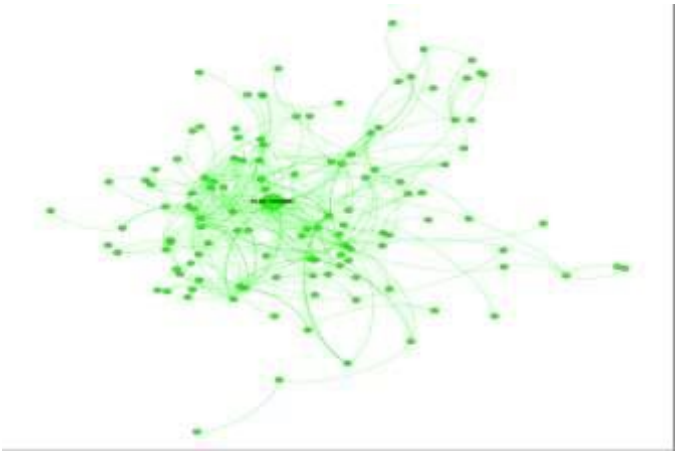

Fig. 4. The modularity class 1 of electronic music fans, consisting of 123 nodes

Fig. 5. Electronic music fans interactions.

2. Modularity Class 2

Fig. 6. The modularity class 2 group of metal, death metal music fans, consisting of 115 nodes

Fig. 7. Metal, death metal music fans interactions

IV. Conclusion And Recommendation

The interaction patterns found in the network of Last.fm users on Kaskus were 1317 accounts (nodes), from 23 February 2011 to 24 June 2014, with 1740 interactions (edges). Graph density was 0,002, considered not dense. Interactions between nodes were 95,862% with integrity of 1 or only occurred once. The highest integrity was at the number of 3 done by 0,115% of the existing interactions. Network diameter of Last.fm users on Kaskus was 7 hops with the average clustering coefficient of 0.28 (280/1000). It could be concluded that the clustering coefficient level was not dense with the connected components consisted of 661 components. Lastly, the average network degree found in the network of Last.fm users on Kaskus was 2.642 (2.6%). Last. fm users in the Kaskus forum facilitate finding patterns of interaction among music fans. This research suggests that the promoter of the data interaction is mostly done on online forums such as Kaskus can lead to interaction patterns among music fans.

Modularity calculation detected 2 big groups found in the network of Last.fm users on Kaskus. In online forums such as Kaskus, Social Network Analysis method can be used to map the interaction, in addition to the Kaskus forum can find interactions. The interaction of finding groups that exist in the network through the community detection analysis with modularity calculation. The two big groups were collections of nodes with modularity class 1 and modularity class 2. The two upper groups had influence on the network of Last.fm users on Kaskus and had more than 100 members, clearly seen from the interval distance comparison with the numbers of members of other communities. The modularity class 1 community discussed about electronic music, while the modularity class 2 community discussed about metal and deathmetal music. Large communities formed from the interaction of relationships between individuals in a network of Last.fm users in the Kaskus forum. This study suggests that the Promoter may see developments genre of music community on online forums such as Kaskus.

According to modularity calculation, the modularity class 1 group was the largest group, having 123 nodes of music fans listened to electronic music genre. This research suggests that

the majority of electronic music genres favored. Fans of electronic music at Social Network Community Users of Last.fm in Kaskus Forum will be a good reference to the music promoter. To develope a music show business industry in Indonesia.

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