Social Network Analysis of Fragmented Internet using Twitter Media

Metric based Social Network Analysis on Internet Fragmentation using Some Popular Twitter Hashtag Networks

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Abstract - **Fragmented Internet or Cyber-balkanization is gaining its recognition in recent years because of its cap-potential to take 'Spiritual pollution' in control, due to non accessibility to global data, services and media. Restricting access to the world wide internet has proven advantageous to the government to set limits on virtual activities pertaining to the local laws and regulations, yet makes the mini network absolutely isolated leading to issues with interoperability, business exchanges, collaborative storages causing sink down in certain global markets like cryptocurrency, cloud vendors, gaming businesses and advertising industries. A Twitter analysis using NodeXL on fragmented web, was carried out to understand the information flow on the topic in the form of tweets, posts using hashtag networks and discover people's influence and perception on internet fragmentation.**

Keywords - Cyberbalkanization, Splinternet, Twitter, Fragmented Internet, NodeXL, Great Firewall, Future of the Internet.

I. INTRODUCTION

The word "Internet" was coined in 1974 to describe a global computer network that allows for connectivity and information sharing using standard protocols [1]. Despite the fact that the global ecosystem intends to create an efficient platform for consumers to access data from across the world, some countries refuse to embrace the 'Data for All' concept. External threats, political unambiguity, aggressive national policies, censorships, and trade disputes, to name a few, all contributed to this situation [2]. As a result, in some parts of the World, the "Fragmented Internet" has emerged. To spell out in another way, the Global internet is divided into mini networks on the basis of geography where the citizens can only access data and services that their national authorities permit [3].

The 'Great Firewall', implemented in China to regulate internet usage domestically, is one noteworthy example study. This set of legislative regulations was implemented [4] to limit access to specific foreign websites that could create societal harm or hatred, as well as to regulate cross-border internet traffic.

In Russia, internet fragmentation is mainly relied upon in the ongoing Russia-Ukraine war [5]. The Federal government has restricted Twitter and Facebook in Russia since March 2022 in order to prevent the spread of anti-war propaganda and fake news.

This paper aims at studying the people's notion on adding borders to the borderless web and the impact of web fragmentation on the current scenario of the Russia-Ukraine war. In this paper, Twitter media is used to analyze the tweets associated with internet splintering using the hashtags #FutureOfTheInternet [6], #splinternet [7] and #GreatFirewall [8]. The analysis on the number of tweets, users and influencers has been made using NodeXL tool.

II. REVIEW OF LITERATURE

Anderson [9] concluded that though The Great Firewall has isolated China from the Global internet, the Chinese government is always in a conundrum when it comes deciding to choose between integrating with growing new technologies and to refrain from these technologies that challenge their traditional censorship regulations.

The new 'Sovereign Internet Law' implemented in Russia from 2019 to 2021 is nothing different from isolating their network from the Global internet. These amendments were brought into action in order to combat external threats, keep borders under surveillance and create a Centralized Internet System manageable under the State Authority. Epifanova [10] however recommends that Germany and the EU ought to effectively advance the upsides of the world wide web and include significant stakeholders and business methods to maintain furthermore, upgrade its future. Preferably, they ought to foster a typical long haul technique for protecting the web in its current, non-fragmented, genuinely world wide web, which would include broadening the extent of existing stages like the United Nations' Internet Governance Forum.

With respect to interoperability issues of IoT and Fragmented Internet, M.Aly [11] say that the M2M or H2H applications of IoT is severely backed off due to the fragmented internet which leads the IoT industries to face

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difficulty in integrating the diverse service and applications of the IoT objects. Also, the reuse of data becomes questionable with loosely connected networks.

III. TWITTER ANALYSIS OF THE HASHTAGS AND RESULTS

NodeXL (Network Overview for Discovery and Exploration in Excel) is a compelling and user-friendly interactive visualization tool used for network analysis [17]. It's a well-structured word excel workbook template with various worksheets that's supposed to represent a network graph. Finding significant "players" in social media networks is one of SNA's key characteristics. Centrality is the term used to pick out significant vertices in a network graph in accordance with ranking, which is generated by values [12]. In-degree centrality is the number of nodes or accounts which points inwards to a node in consideration. In this context, in-degree is used as a popularity metric [13]. The number of directed links designated from the Tweeter is referred to as out-degree centrality. The major influencers in the network are those Tweeters who have the high value of out-degree. Another centrality metric to explore from the standpoint of social network theory is betweenness centrality. The term " Betweenness centrality" refers to how frequently a vertex appears on the shortest path existing between two other vertices [14]. The bridges in the network are the Tweeters with the highest betweenness centrality. The average distance between a vertex and every other vertex in a social network is referred to as closeness centrality [15]. Low closeness centrality is when the Tweeter is directly in link to, or "just a hop away" from, the most of other vertices in the graph network, assuming vertices can only send messages to or affect their current linkages (vertices) [14]. The eigenvector centrality network metric is calculated considering not merely the degree metric, but also the connections of the vertex [16].

Data Collection

Data is collected from twitter by considering 3 most trending hashtags on fragmented internet which are #FutureOfTheInternet, #splinternet and #GreatFirewall.

Data Analysis

The collected twitter hashtags are analyzed using NodeXL operations such as preparation of data, merging duplicate edges, auto filling of columns, sorting the vertices, creating subgraphs, using dynamic filters and changing the layout options are performed to get a network graph.

Case 1: Using #FutureOfTheInternet

An analysis of the hashtag which is #FutureOfTheInternet is discussed here. The total number of vertices for this network are 1032 and the total number of edges are 1273. The relationship between the nodes is through the mentions or replies to or tweets. Figure 1 depicts a network graph for the same.
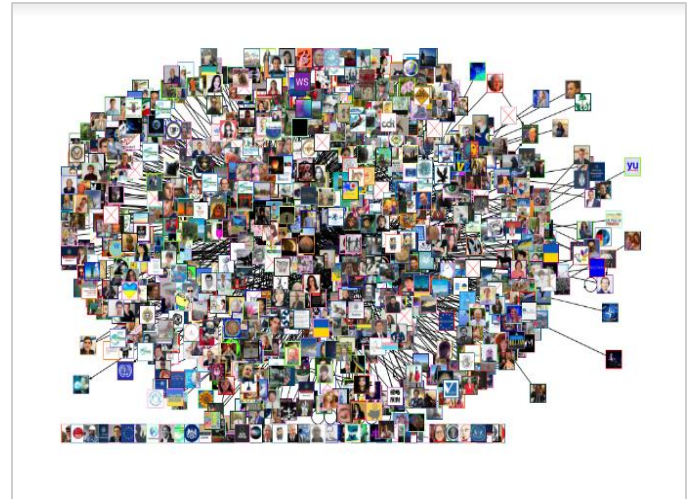

Figure 1: A network graph for #FutureOfTheInternet

In the figure 1, the node with high betweenness centrality is taken into consideration. In this network, user @iingwen has the highest betweenness centrality 3,95,772.935. Hence, if @iingwen is removed from the network then the users connected to him are completely isolated from the rest of the network. The network analysis of this node is described in table 1.

Table 1: Node Analysis of @ iingwen

Graph Metrics	Value
Degree Centrality	277
In-degree	276
Out-degree	1
Betweenness Centrality	3,95,772.935
Closeness Centrality	0
Eigenvector Centrality	0.032
Clustering Coefficient	0

The user @iingwen joined twitter on 15th June 2010. The total number of followers for this user is 19,08,369 whereas he follows 25 people. The total number of tweets made by the user on twitter is 4,003 tweets.

Case 2: Using #splinternet

The total number of vertices for this network are 44 and the total number of edges are 47. The relationship between the nodes is through the mentions or replies to or tweets. Figure 2 depicts a network graph for the same.
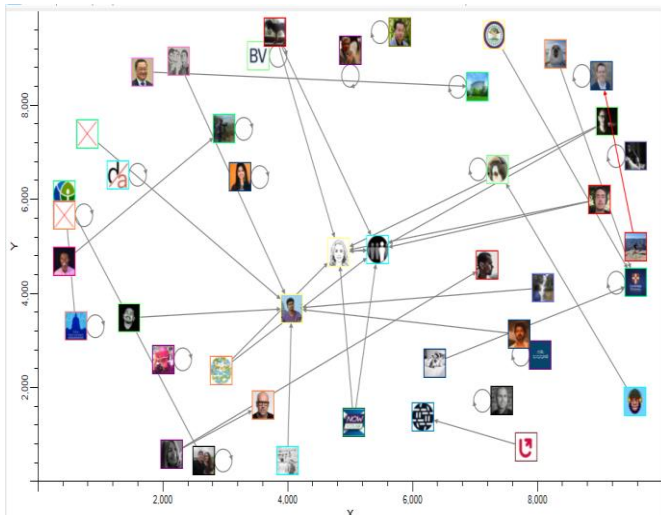
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Figure 2: A network graph for #splinternet

In the figure 2, analyzing the node with betweenness centrality, user @akjaiii has the highest betweenness centrality 30. Hence, if @akjaiii was removed from the network then the users connected to him are completely isolated from the rest of the network. The network analysis of this node has been described in table 2.

Table 1.2: Node Analysis of @akjaiii

Graph Metrics	Value
Degree Centrality	6
In-degree	6
Out-degree	0
Betweenness Centrality	30
Closeness Centrality	0.167
Eigenvector Centrality	0
Clustering Coefficient	0

The user @akjaiii joined twitter on 30th August 2017. The total number of followers for this user is 11,315 whereas he follows 2043 people. The total number of tweets made by this user on twitter is 42,720 tweets.

Case 3: Using #GreatFirewall
The total number of vertices for this network are 32 and the total number of edges were 33. The relationship between the nodes was through the mentions or replies to or tweets. Figure 3 depicts a network graph for the same.
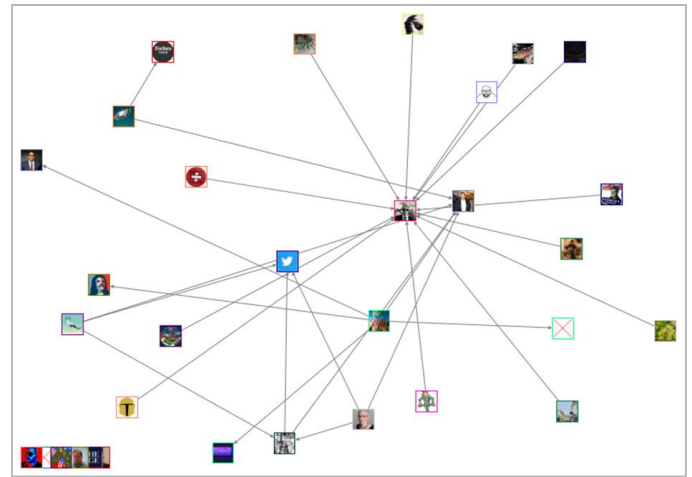

Figure 3: A network graph for #GreatFirewall

In figure 3, considering the node with high betweenness centrality, user @langstrumpfpipo has the highest betweenness centrality 156. Hence, if @langstrumpfpipo was removed from the network then the users connected to him are completely isolated from the rest of the network. The network analysis of this node has been tablulated in table 3.

Table 1.3: Node Analysis of @langstrumpfpipo

Graph Metrics	Value
Degree Centrality	13
In-degree	13
Out-degree	0
Betweenness Centrality	156
Closeness Centrality	0.077
Eigenvector Centrality	0.071
Clustering Coefficient	0

The user @langstrumpfpipo joined twitter on 26th August 2019. The total number of followers for this user is 1,726 whereas he follows 1,524 people. The total number of tweets made by this user on twitter is 27,039 tweets.

IV. CONCLUSION AND FUTURE WORK

Betweenness centrality, as previously said, relates to how frequently a vertex or in this case a user appears on the shortest distance between two other vertices/users in a network. The highly correlated users for each hashtag are discovered using the twitter network analysis with betweenness centrality as the key metric and their influence on other nodes was being inferred using the eigenvector centrality value. Despite the fact that the fragmented internet is thriving in the current environment of network privatization attempts, the analysis shows that social media has yet to take a position encouraging or opposing internet fragmentation. The main cause is considered to be a lack of understanding of the internal framework, as well as the benefits and drawbacks of a fragmented web.

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Further, additional research can be done to determine whether fragmentation is beneficial by analyzing real-time survey data.

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