National Border Agency Communication Behaviour Clustering Using Centrality and Meanshift

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Abstract—Indonesia is Island Based Country with 1.905 million kilometers per square area. This territory area watching by National Border Agencies consists of a collaboration of many departments and government organization to make Indonesia strengthening the border. Indonesia has 6 neighboured country, Singapore, Malaysia, Philippine, Australia, Papua New Guinea, and Timor Leste. In Kepulauan Riau, have a direct border with Malaysia, Singapore, Vietnam, and Kamboja. This issue makes Kepulauan Riau have particular National Border Agencies from many Government Institution. In this research, conduct communication analysis between government Institution to run the task as National Border Agencies. The Analysis using Centrality from communication pattern in every institution. The centrality data clustering with meanshift to get a cluster of communication National Border Agencies.

Index Terms—Social Network Analysis, Centrality, Meanshift, Clustering

I. INTRODUCTION

Kepulauan Riau has four direct borders with other Country. This issue makes Kepulauan Riau strategic Province build special task force for National Border Agencies. Indonesia Government assembling Badan Pengelola Perbatasan in Kepulauan Riau to watch the border from many possibilities of a disturbing problem with other countries.

Decree of the President of the Republic of Indonesia Number 78 the Year 2005 on Management of Small Outlying Islands which states that there are 19 small outermost islands in Riau Islands Province. Malaysia, Singapore, Vietnam, and Cambodia have a direct border to the 19 outermost islands in 5 districts/cities. BPP Kepulauan Riau itself has compiled the document of Strategic Plan of Border Management Board of Kepulauan Riau Province 2010-2015. In the document, BPP Riau Islands Province has identified various problems that exist in Riau Islands Province, whether related to cross-border issues to national insight issues. Related to the problem of "weak government institution in managing border area". BPP Kepulauan Riau has also conducted inventory of the problem

into 3 (three) main issues namely; 1) The issue of border areas has not been a priority development agenda that is handled comprehensively and integrated; 2) Increased illegal activities in border areas, and 3) Weak law enforcement against illegal loggers, smuggling of goods, human trafficking, piracy and piracy, smuggling of weapons, human smuggling (such as power smuggling work, baby trade, and trafficking), as well as fish theft, especially in the gray area.

Various problems above should be solved or minimized if between parties who have authority in managing the border are synergized and even collaborate with each other. Planning as a starting point in collaborating on programs and activities related to border governance between countries is not visible. This issue reflected in the long-term planning (blueprint) act as a reference in managing the border, but not every Agency has participated in it. Head of Karimun Regency Border Management Agency, Suwedi conveys as follows; "The existing Blueprint is currently formulated unilaterally by BNPP without involving other border managers such as the Border Management Agency in the regions and the Marine Security Agency, the Indonesian Armed Forces (TNI) and the Police as well as the communities in the border areas".

The above problems should be easily solved by Collaborative approach among state institutions as stipulated in Presidential Regulation No. 12 of 2010 on National Border Management Agency and reinforced by Law No. 23 of 2014 on Regional Government. With the availability of regulations that enable cross-stakeholder engagement at both the central and regional levels, it is expected that the existing problems in the border areas can be effectively resolved.

Analyzing communication behavior between National Border Agencies in Kepulauan Riau is crucial to help with this issue. This research is conducted Communication Behavioral modeling for National Border Agencies(BPP) in Kepulauan Riau. The study uses centrality as part of social network analysis and using meanshift for clustering.

II. RELATED WORKS

Communication behaviour analysis spreading widely in aspect of technology. VoIP user level Communication Behaviour using statistical model from user communication [1]. Human behaviour using mobile data gives network human communication pattern [2]. User behaviour on E-mail communication producing pathological behaviour by using social network analysis [3]. In the International Engineering Project, research about communication over different culture also conducting between Chinese and South African [4]. On the Aerospace field, Pilot Communication behavioural data gathered to predict pilot flight operation [5]. On personal communication behaviour, data mining was used to detect user anomalies [6] and SMS Spammer [7]. To prevent terrorisms use psychologically warning behaviour using written communication [8]. Study in User behaviour on social network sharing activities gives pattern of characteristics of communication [9].In the team communication behaviours, the study presenting optimal communication inside team [10]. The study applies the Ontology method where the ontology is a theory about the meaning of an object, the property of an object, and the object relation that might occur in a knowledge domain. Ontology is an explanation of a concept and has a relationship or connection from a particular science [11] [12].

Centrality algorithm conducting Identifying Influential Spreader [13], Influential on Network Coverage [14], overlapping Community [15], disaster vulnerability [16],scientific social networks [17], also for searching promising researcher [18]. The Research use meanshift for tracking method [19] [20] [21], clustering for Trend Analysis [22], and image processing [23] [24]. In this study conduct communication behaviour clustering using centrality and meanshift to provide characteristic type on Indonesian Border Agencies.

III. METHODS

A. Centrality

Centrality was used for analysing node and vertices in the graph. In this research use degree centrality, betweenness centrality and also Closeness Centrality. Degrees Centrality measure how the nodes influence to others using sum of neigh board nodes [25]. Betweenness centrality measure path from other network to another so the path and node bridge it, is a important node [26]. Closeness Centrality calculate geodesic distances. THis distance bridging other network for an activity [27]. Centrality is a measure at the node level whereas centralization is a measure within the network level. Four measures of centrality that are widely used in network analysis, namely: degree of centrality, closeness, betweenness, and eigenvector centrality. The degree of centrality is defined as the number of incident links on a node. Closeness Centrality or proximity between nodes is the shortest distance to other nodes. For example in the selection of suitable locations for malls / supermarkets in a city with the aim of minimizing the distance of consumers. This size describes the proximity of this node to other nodes. The closer it shows the more connected one institution with other institutions.

Betweenness Centrality marks the importance of the node based on the number of shortest paths through it. If there are two adjacent nodes, i.e. V and W, want to interact and node U is on the path of the relationship between V and W, then U has control over the interaction of both and betweennes measure the control. If U are on the path of some interactions then U is an important or influential node. Degree centrality, which is a measure to give sum of number connected tothe nodes connected.

B. Meanshift

Starting with the data. Mean-shift work to cluster the data input by using bandwidth. The data clustered using bandwidth length and make a centroid as an object. Tracking moving objects or object tracking is a process of following the position of objects in an image. The mean-shift algorithm is one of the object tracking algorithms that is often used in the process of tracking. Mean-shift is a cluster algorithm using for improve detection [21].

The mean-shift algorithm is an effective and fast nonparametric algorithm, but it has not been able to follow an object that changes in size and changes in orientation. In this research, the development of the classical mean-shift method is capable of handling the tracking of objects that have changed the scale and orientation. With the weight of the image coming from the target object and the target candidate, the object can represent the possibility of the area being the target object. The object tracking uses a mean-shift algorithm using a zero order moment and to one of the image weights.

The average shift method classifies internal data. Its search mode directs and moves data to the point area along with iterations a data environment that is built with the Gaussian Kernel. The Gaussian kernel is different multivariate kernel function is used for actual calculations in assumptions. Bandwidth is a free parameter which shows the effect on the estimated density produced [28].

IV. EXPERIMENT AND RESULT

Dataset gathers from two methods, secondary and primary method. Primary method gather from survey and observation using online Google form in several Government Border Agency. Moreover, interview was used in this process to get the depth of data. Secondary data consisting document and archive. The document such as MoU, Rules and Government Law. The graph in Figure 1 shows Government Agency as nodes and edges as communication between them. The list of this node shows in Table I.

A. Centrality Result

After designing Communication Behavior graph of National Border Agency in Figure 1. The Centrality can be conduct in Figure 1 graph. Using Degree Centrality, Betweenness Centrality and Closeness Centrality. The result is showing in the table I.
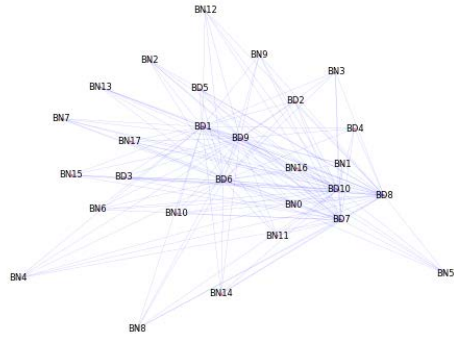
Fig. 1. National Border Agencies Pattern in Communication Behavior

B. Meanshift Result

The result for clustering degree centrality and betweenness centrality get maksimum bandwidth 0.3 for one centroid shows in Figure 2. The result for clustering degree centrality and
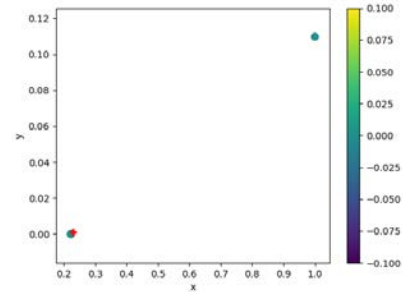

Fig. 2. Meanshift Result on Degree Centrality and Betweenness Centrality

closeness Centrality get maximum bandwidth for one centroid is 0.4 shows in figure 3. The result for clustering betweenness
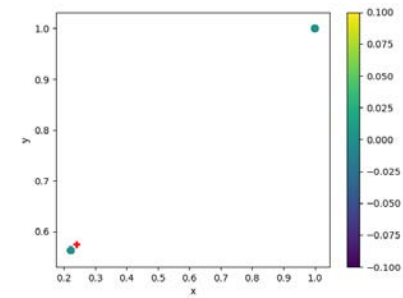

Fig. 3. Meanshift Result on Degree Centrality and Closeness Centrality

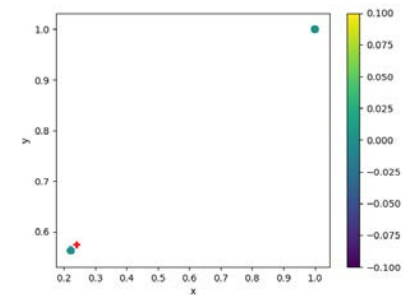Centrality and closeness centrality get maximum bandwidth 0.2 for one centroid shows in figure 4.

Fig. 4. Meanshift Result on Betwenness Centrality and Closeness Centrality

The result of Meanshift from Figure 2, Figure 3, and Figure 4 shows that various of data Bandwidth. The lowest bandwidth in Betwenness Centrality and Closeness Centrality(BCCC). The highest bandwidth in Degree Centrality and Closeness Centrality(DCCC). That means the communication behavior

TABLE I
CENTRALITY RESULT

Division	Centrality		
Code	Degree	Betweenness	CLoseness
BD1	1	0,10968661	1
BD10	1	0,10968661	1
BD2	0,222222222	0	0,5625
BD3	0,222222222	0	0,5625
BD4	0,222222222	0	0,5625
BD5	0,222222222	0	0,5625
BD6	1	0,10968661	1
BD7	1	0,10968661	1
BD8	1	0,10968661	1
BD9	1	0,10968661	1
BN0	0,222222222	0	0,5625
BN1	0,222222222	0	0,5625
BN10	0,222222222	0	0,5625
BN11	0,222222222	0	0,5625
BN12	0,222222222	0	0,5625
BN13	0,222222222	0	0,5625
BN14	0,222222222	0	0,5625
BN15	0,222222222	0	0,5625
BN16	0,222222222	0	0,5625
BN17	0,222222222	0	0,5625
BN2	0,222222222	0	0,5625
BN3	0,222222222	0	0,5625
BN4	0,222222222	0	0,5625
BN5	0,222222222	0	0,5625
BN6	0,222222222	0	0,5625
BN7	0,222222222	0	0,5625
BN8	0,222222222	0	0,5625
BN9	0,222222222	0	0,5625

[a]Centrality.

between National Border Agency have shortest path behavior communication not one to many communication. Shortest path behavior in communication is effective for cost reduce.

V. DISCUSSION

The result showing that using centrality in National Border Agencies can be deployed and meet the calculation. The value is varied and several division has same result. The impact of this several number is in clustering result. Meanshift calculation shows to get in one centroid, there a maximum bandwidth. The maximum bandwidth is an approach in this research to get a model of Communication Behavior.Degree centrality and betwenness centrality has 0.3 maximum bandwidth. Degree centrality and closeness centrality has 0.4 for maximum bandwidth. Betwenness Centrality and Closeness Centrality has 0.2 for maximum bandwidth. This approach can be develop in many ways of Social Network Analysis paradigm.

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