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EDITORIAL

It is my proud privilege to welcome you all to the Academics World International Conference at Los Angeles, USA. I am happy to see the papers from all part of the world and some of the best paper published in this proceedings. This proceeding brings out the various Research papers from diverse areas of Science, Engineering, Technology and Management. This platform is intended to provide a platform for researchers, educators and professionals to present their discoveries and innovative practice and to explore future trends and applications in the field Science and Engineering. However, this conference will also provide a forum for dissemination of knowledge on both theoretical and applied research on the above said area with an ultimate aim to bridge the gap between these coherent disciplines of knowledge. Thus the forum accelerates the trend of development of technology for next generation. Our goal is to make the Conference proceedings useful and interesting to audiences involved in research in these areas, as well as to those involved in design, implementation and operation, to achieve the goal.

I once again give thanks to the Academics World, Institute of Research and Journals & The IIER for organizing this event in Los Angeles, USA. I am sure the contributions by the authors shall add value to the research community. I also thank all the International Advisory members and Reviewers for making this event a Successful one.

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EVALUATION OF PUBLIC TRANSPORT BUS NETWORK IN BANGKOK

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Abstract: The purposes of this paper were to study and evaluate the network system of public transportation utilizing public bus service operated in Bangkok, in order to understand the efficiency of the network system as well as to search for the main nodes which are highly affect the performance of the network and the shortest routes as the alternative in case of emergency to reach the main nodes. The scope of this research included all Bangkok bus terminals or bus stops. The author had collected the information of path number, path and bus stop, with interviews conducted with the local passengers in order to locate 80 most important bus stops. The PAJEK program was utilized to define the main nodes which were Pratu Nam, Bang Phad and Phahonyothin, which had highest Betweenness Centrality equaled to 0.192991, 0.147541 and 0.138711 respectively, and the three busiest nodes which carried highest amount of buses were Ratchatayothin, Sam Yan MRT Station and Pratu Nam, which had the Weighted Degree Centrality equaled to 24, 23 and 21 respectively.

Keywords- Bus, Network, Public Transportation, Centrality.

I. INTRODUCTION

Bangkok metropolitan is the capital of Thailand occupied by a huge population, those both originally living there, moving or relocating from other places to settle, study and work, and traveling around. People always commute from places to places within Bangkok and to other destinations, resulting in a critical demand of efficient and effective mass transit and public transport. If the public transport is not good enough, it will have many problems such as traffic jam and poor toxic to general health of the population [1]. Currently, land public transport, excluding rail mode operated in Bangkok and neighboring suburbs is public bus service administrated solely by Bangkok Mass Transit Authority. There are currently 115 bus service lines fleeted by 3,008 buses [2].

II. LITERATURE REVIEW

The 2015 report of passenger traffic in Bangkok revealed that there were 224,363,943 passengers' trip using public bus service daily [3]. Especially during rush hours longer time is spent on road travel. Degree of traffic congestion and crowds around bus stops as a result of vehicles traveling at slower speeds and increased queuing becomes even intense caused by unpredictable accidents, events and weather, for example raining, construction, special events and demonstrations or street protests. This requires the buses to change routes, which makes trip times longer. This problem has been likely solved as immediate remedies, rather than promising a long-term effect, yet contributing no real effective performance due to an absence of efficient, accurate and systematic data collection and analysis of the public bus network system.

In this regards, this paper provides an investigation for the structure of the public bus network system in Bangkok, analysis of effective system, identification of significant or main nodes that influence an efficiency of the public bus transport system, and recommendation of secondary shorter routes in case of emergency occurred at the main nodes.

III. DETAILS EXPERIMENTAL

3.1. Materials and Procedures

The study aimed to identify the network system of public bus transport service in Bangkok in order to find main transport nodes characterized as influencing points affecting an efficiency of the public bus transport system; to investigate impacts in case of emergency occurred at the main nodes; and to suggest secondary shorter routes for each bus line. The study was based on the secondary data sought from various sources relating to public bus service in Bangkok. A primary source was the website of Bangkok Mass Transit Authority which is solely authorized in the administration of public bus service in Bangkok. The data involved bus operation that included path number, path and bus stop of each bus line. The collected data was analyzed with readiness of the amount of buses at each stop, the number of passengers with their opinions towards the service at different times: morning time (7:00-9:00 am), daytime (12:00-2:00 pm), and night time (6:00-8:00 pm). This was carried out in order to obtain 80 important bus stops that had high traffic or were used by most passengers and bus lines. After that, these 80 bus stops were employed as the nodes for the analysis of the public bus network system, and for the measurement of distance between nodes on each routes fleeted by different bus lines using Google Map. The PAJEK Program was implemented in building a simulated model of directed network as shown in Fig. 1-2.

Betweenness Centrality of graphs is the value to explain the center link to other nodes in the network.
system, illustrating the network system determined by weighing link between nodes with the distance was calculated. Then, Weighted Degree Centrality of graphs is the value to explain the quantity of buses travel in and out the node and illustrating the network system determined by weighing link between nodes with amount of bus lines performing out-going from nodes was calculated [4]-[5]. Finally, the calculation results were used in considering the significant nodes determined by higher betweenness centrality and weighted degree centrality scores.

Table 1: Betweenness Centrality Analysis

<table>
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<tr>
<th>Node Code</th>
<th>Bus Stop</th>
<th>Betweenness Centrality</th>
</tr>
</thead>
<tbody>
<tr>
<td>45PTN</td>
<td>Pratu Nam</td>
<td>0.192991</td>
</tr>
<tr>
<td>33B^9A</td>
<td>Bang Plad</td>
<td>0.147541</td>
</tr>
<tr>
<td>5M_PY</td>
<td>Phahonyothin</td>
<td>0.13871</td>
</tr>
<tr>
<td>49WS</td>
<td>Wongwianwong</td>
<td>0.125183</td>
</tr>
<tr>
<td>6M_PH</td>
<td>Phetchaburi MRT Station</td>
<td>0.124175</td>
</tr>
<tr>
<td>17KL</td>
<td>Kae Rai</td>
<td>0.127225</td>
</tr>
<tr>
<td>10M_SY</td>
<td>Sam Yan MRT Station</td>
<td>0.118985</td>
</tr>
<tr>
<td>72AP</td>
<td>Victory Monument</td>
<td>0.107362</td>
</tr>
<tr>
<td>50TB8S</td>
<td>Bang Sue Marga</td>
<td>0.106402</td>
</tr>
<tr>
<td>52SY</td>
<td>Sam</td>
<td>0.101725</td>
</tr>
</tbody>
</table>

4.2. Weighted Degree Centrality Analysis

The weighted degree centrality analysis shown in Table 2 portrayed the top 10 nodes with higher score, ranking from the highest to the lowest. The first 3 nodes carrying the highest amount of buses included Rachayothin, Sam Yan MRT Station and Pratu Nam.

4.3. The Analysis of Secondary Shorter Routes in Case of Emergency Occurred at the Main Nodes

The analysis presented the secondary shortest routes as alternative for the existing routes in case of emergency. Table 3 shows the analysis result revealing that there were 10 bus lines receiving an effect in case of emergency occurred at Pratu Nam Bus Stop, and 10 alternative routes were introduced. Table 4 presents 3 bus lines affected in case of emergency occurred at Bang Plad Bus Stop, and introduce 3 alternative routes. Table 5 reports 12 bus lines affected in case of emergency occurred at Rachayothin Bus Stop, and gives 12 alternative routes.

Table 2: Weighted Degree Centrality Analysis

<table>
<thead>
<tr>
<th>Node Code</th>
<th>Bus Stop</th>
<th>Weighted Degree Centrality</th>
</tr>
</thead>
<tbody>
<tr>
<td>43MBR</td>
<td>Rachayothin</td>
<td>24</td>
</tr>
<tr>
<td>10M_SY</td>
<td>Sam Yan MRT Station</td>
<td>23</td>
</tr>
<tr>
<td>45PTN</td>
<td>Pratu Nam</td>
<td>21</td>
</tr>
<tr>
<td>52SY</td>
<td>Siam</td>
<td>21</td>
</tr>
<tr>
<td>5M_PY</td>
<td>Phahonyothin MRT Station</td>
<td>20</td>
</tr>
<tr>
<td>61ASC</td>
<td>Victory Monument</td>
<td>19</td>
</tr>
<tr>
<td>16KS</td>
<td>Kasetsart University</td>
<td>18</td>
</tr>
<tr>
<td>51SL</td>
<td>Samut Luang</td>
<td>18</td>
</tr>
<tr>
<td>6M_PH</td>
<td>Phetchaburi MRT Station</td>
<td>16</td>
</tr>
<tr>
<td>55SK</td>
<td>Saphan Kwai</td>
<td>16</td>
</tr>
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</table>

IV. RESULTS AND DISCUSSION

4.1. Betweenness Centrality Analysis

The result of the betweenness centrality analysis was shown in Table 1, reporting the top 10 nodes with higher score, ranking from the highest to the lowest. The first 3 high scored betweenness centrality presented Pratu Nam, Bang Plad and Phahonyothin.
The findings of this study demonstrated sensitivity of the public bus transport system in Bangkok to scheduled and unpredictable events. Thereafter the public bus service management in Bangkok requires improvements at a certain extent for urban passenger transport mobility, especially traffic around the main bus stops as the main nodes. Alternative routes with shorter distance must therefore be critically sought out as needed in public transport planning. The same nodes may remain as the same stops fleeting in and out for the bus lines, or new nodes may also be proposed as temporary and secondary stops to increase the existing traffic capacity and mobility.

CONCLUSIONS

This study allowed the author to see capability of Bangkok’s public bus service in unusual setting through the simulation. Further studies may utilize other types of mass transit for instance supporting bus service operated by private companies, Bangkok Mass Transit System or BTS and public passenger ferries. Moreover, there should be an integration of data across different public transport services for demonstration of traffic simulation in order to increase an effectiveness of Bangkok’s public transport system as a whole.

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