Viewing preferences of TVRO users in Sabah: Identification of distribution patterns using spatial statistics

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Abstract

The usage of Television Received Only (TVRO) medium was widespread in the Sabah state of Malaysia based on ground observations. The TVRO users were scattered all over Sabah. They were not only located in the interior regions, but also in the densely populated urban areas. The need to understand the reasons behind this widespread use of TVRO had garnered attention from the authorities, such as the Malaysian Communications and Multimedia Commission (MCMC). This paper focuses on the geographical aspect of the usage of TVRO users by presenting the measurement of its distribution and the identification of the spatial behavioural patterns. The method involved a combination of spatial and statistical analyses using the GIS software ArcGIS 9.3. The statistical mean centre and standard deviational ellipse were used to measure the spatial distribution and the local and global Moran's I statistical techniques were employed to identify the spatial patterns. Using principal component analysis (PCA), the original 60 variables captured on the ground were simplified into six main components representing the viewers' preferences. These significantly identified components were referred as TVRO-centric, Astro-centric, Free-To-Air (FTA)-centric, sexual, pride and conventional behaviours. The results showed that there were behavioural similarities in all of the six types of viewers in terms of spatial distribution and patterns. They seemed to be concentrated in the same area with different degrees of strength. The study also provided an opportunity to prove the capability of spatial statistics in producing a better description, prediction over space, and optimisation of the spatial data.

Keywords: GIS, spatial analysis, spatial pattern, spatial statistics, Television Received Only (TVRO), viewing preferences

Introduction

Television Received Only or TVRO is a term used to describe both the free-to-air satellite and paid programming over similar equipment. Observations on the round show that Sabah can be safely assumed to be one of the states with the highest number of unlicensed TVRO users. This phenomenon has been persistent in Sabah since the 1970's and detectation has been very difficult due to its geogrpahical layout. It is this factor that makes the illegal practice of TVRO extremely common in East Malaysia (Syed Agil Alsagoff et al., 2007; Zainoor S., 1993).

The conclusion by Syed Agil (2007) and Zainoor (1993) is further verified by the research findings of Dambul et. al (2010), which exhibit that the two major aspects contributing to the relatively more extensive use of TVRO in Sabah are geographical attributes and technological elements. These two aspects has become the stumbling block for the government to deal with the issue. Other contributing factors include: the lack of manpower and the high demand in terms of financial resources and time. Due to these constraints, it is hard to do a constant monitoring on the ground i.e. uidentification of TVRO users in a particular areas. This paper attempts to show

how the spatial statistics can assist to simplify the monitoring process. In order to illustrate this exercise better and more clearly, this study will use only the selected results derived from the project by Dambul et al. (2010); and use those samples to map the geographic distribution and describe the patterns from spatial perspective.

Why spatial statistics?

Spatial statistics comprise a set of techniques to describe and model spatial data. It has the capability to assess spatial patterns, distributions, trends, processes and relationships. As opposed to the traditional (non-spatial) statistical techniques, spatial statistical techniques actually employ space area, length, proximity, orientation or spatial relationships directly in their mathematics (Scott & Getis, 2008). With these attributes, spatial statistics are more powerful in dealing with spatial data.

The complete statistical treatment of the spatial and attribute components of spatial data signifies spatial statistics. Thus, we have methods dealing with the attribute components, as well as dealing specifically with the spatial components. Many studies have optimised the strength of spatial statistics. For example, this technique had been applied to determine the disease outbreaks, build a highway, plan a city and many more (Taher Buyong, 2006).

Spatial statistics provide useful tools to describe and analyse how various geographics objects (or events) occur or changes across the study area and over time. These statistics are formulated specifically to take into account the locational attributes of the geographic objects. Spatial statistics can be used to describe patterns formed by geographic objects in one study area and compare them with patterns found in other study areas (Wong and Lee, 2005).

Based on the above previous studies, the decision to employ spatial statistics in this research is deemed appropriate. The tool is suitable to analyse the subject, which is to investigate the spatial distribution of viewing preferences of TVRO in Sabah.

The data

The data had been obtained using both quantitative and qualitative methods in which 822 households were involved in a survey of 14 districts all over Sabah. The data had been tested for reliability and subsequently simplified using principal component analysis (PCA) that reduced the variables into few significant components. This is an important procedure before the spatial analysis is employed. There are six main components generated from the PCA. These components are FTA-Centric, Astro-Centric, TVRO-Centric, Sexual, Pride and Conventional. The specific characteristics of each PC component (which represents the preferences of the viewers) are described in Table 1.

Table 1. Description of the six Principal Components (PC) of TVRO usage study

Name of the Component	% of Variance Explained	MOST DISTINCTIVE Characteristics
PC1 ASTRO-centric	21.2%	These users are using TVRO, but heavily attracted and influenced by programmes/channels provided by ASTRO.
PC2 FTA-centric	20.1%	These users are using TVRO, but heavily attracted and influenced by programmes/channels provided by FTA.
PC3 TVRO-centric	9.8%	These types are the hard-core users of TVRO.

PC4 Sexual	8.6%	These users tune to TVRO mainly because of the explicit content.
PC5 Pride	4.1%	These users are using TVRO mainly because they regard the ownership of TVRO is a symbol of social status (e.g. rich, trendy, etc).
PC6 Conventional	3.3%	These users tune to TVRO because it is recommended by family and friends for the obvious reasons: it is cheap (economic) and because it offers more open political content. The socio-eco-political reasons merge together.

Source: Dambul et. al (2010)

The outcomes of the PCA were then transfered into the ESRI's ArcGIS 9.3 software to get the measurement of geographic distribution; and then the pattern of the TVRO usage behaviour were analysed.

Measuring geographic distributions of the TVRO behaviour pattern

In order to summarize the characteristics of a spatial distribution, the geographic distribution has to be measured. There are certain statistical techniques that can be used for this purpose such as mean centre, standard distance and standard deviational ellipse.
The mean center tool is a measure of central tendency. It computes the geometric center – the average *X* and average *Y* coordinate – for a set of geographic features. It is commonly used to compare distributions of different types of features or to find the center of features based on an attribute value. Figure 1 shows the mean centre of the FTA-centric, Astro-centric and TVRO-

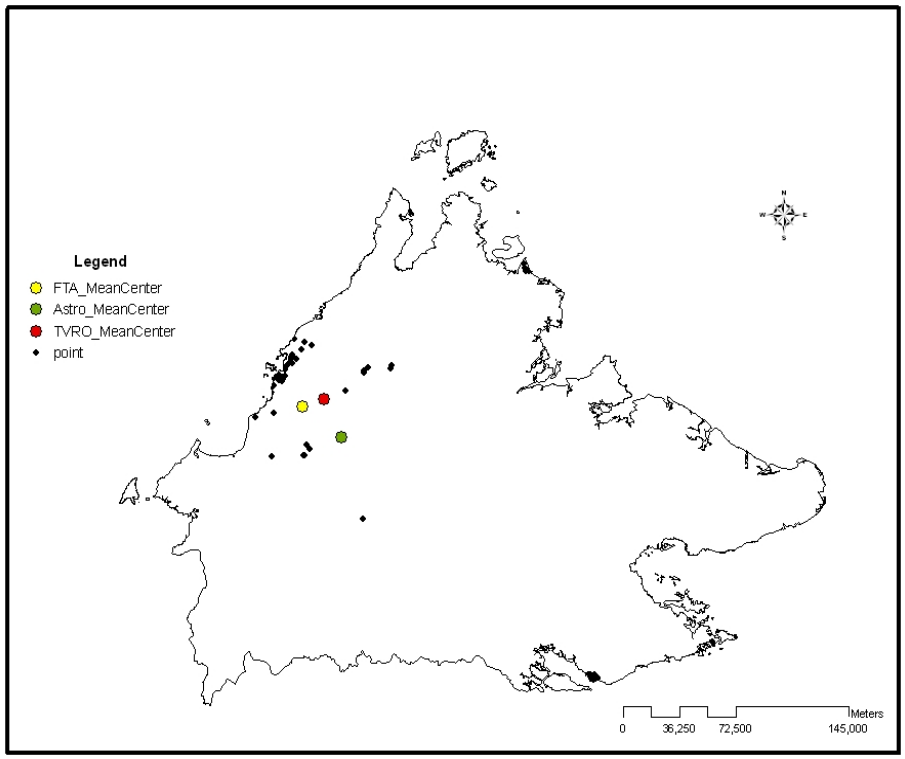

Figure 1. *Mean Centre of TVRO, FTA and Astro centric usage in Sabah*

centric in Sabah. It seems that all the viewers were concentrated in a similar location which is the West Coast of Sabah. Therefore, in general it can be concluded that TVRO users are more common in the western parts of Sabah than its eastern areas.

All the three mean centres seem to cluster on one area which is situated in the district of Kota Kinabalu. This contradicts an earlier assumption that the TVRO users are thought to be mainly in the rural areas based on studies carried out by some researchers from other countries such as Dahlan (1986) and Lochte & Warren (1989).

The Standard Deviational Ellipse measures the spatial distribution of geographic features around their geometric center, and provides information about feature dispersion in terms of compactness and orientation. It can capture the directional bias in a point distribution. Three components are needed to describe and define a standard deviational ellipse: an angle of rotation, deviation along the major axis (the longer axis), and deviation along the minor axis (the shorter axis). If the set of points exhibits a certain directional bias, then the direction with the maximum spread of the points can be identified. In Figure 2, the Sexual, Pride and Conventional behaviours seem to have similar spatial direction in terms of distribution. All three types of behaviour are extending from Kota Kinabalu to Tawau. However, the Conventional behaviour exhibits a much bigger magnitude in terms of spatial coverage than the other two (Sexual and Pride). The findings also show that the decision to use TVRO was greatly influenced by the fact that the service could be subscribed at much lower price. Other contributing influences included the encouragement by relatives or close friends.

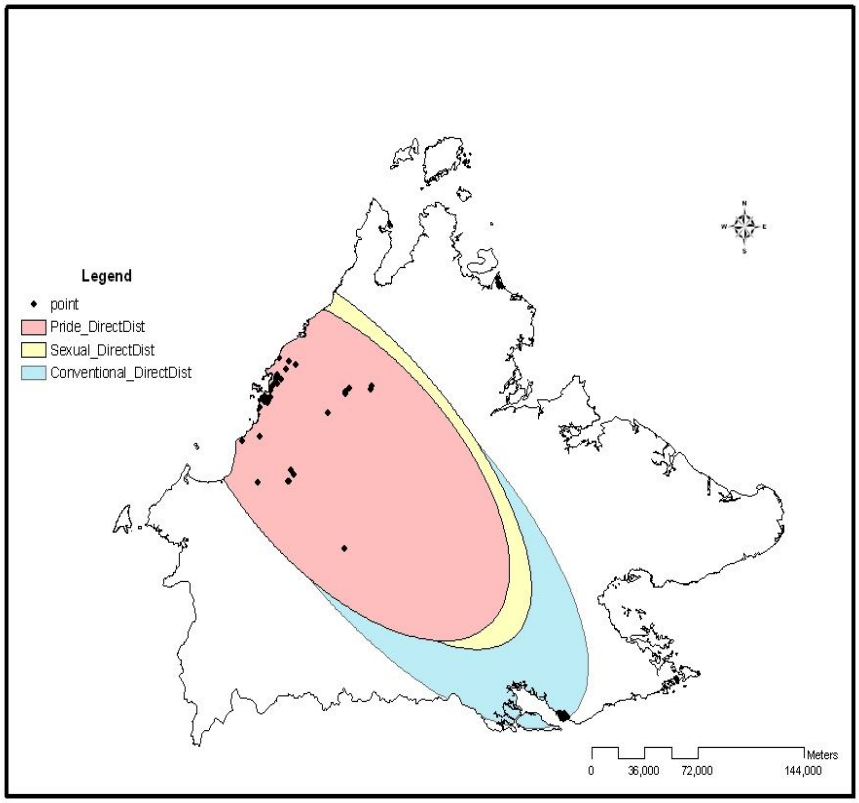

Figure 2. *Directional Distribution of Sexual, Pride and Conventional Influence of TVRO usage in Sabah*

The concentration of the TVRO viewing patterns is distributed at two main areas with the maximum spread of the points. This may lead to the conclusion that the users in the west coast area preferred the more open political and social content offered by TVRO, compared to the programmes offered by free-to-air (FTA) televisions. They sought for more transparent information without being subjected to the government censorship. In contrast, users in the east coast were more motivated by the affordability of the TVRO due to the inaccessibility of free-to-air televisions or perhaps the poor quality of service in these rural areas.

The spatial pattern of the TVRO viewing behaviour

This study also establishes the broad spatial patterns of the TVRO users. Generally, there are three types of patterns which need to be identified i.e. the dispersed, random and clustered patterns. These can be done using two approaches, which are the global and local methods. The global method is used to identify the overall patterns of the data, while the local method is used to identify the extent and locations of clustering.

In this study, the Spatial Autocorrelation (Moran's I) was used as a global analysis tool, while the Cluster and Outlier (Anselin Local Moran's I) was used as local analysis tool. Figure 3 shows how the point patterns look like when it is dispersed, random and clustered.

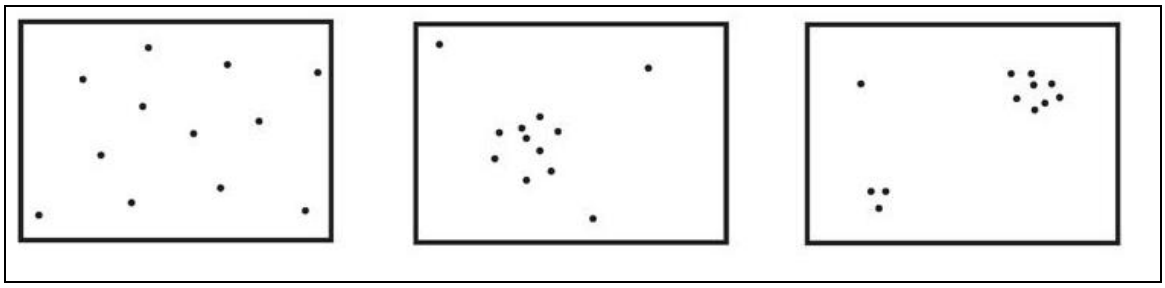

Figure 3. *The dispersed, random and clustered patterns*

If there is any systematic pattern in the spatial distribution of a variable, it is considered spatially autocorrelated. Clustered pattern indicates a *positive spatial autocorrelation* if nearby or neighboring areas are more alike . *Negative autocorrelation* describes dispersed patterns in which neighbouring areas are unlike. The random pattern exhibits *no spatial autocorrelation*.

Analysing Spatial Pattern using Global and Local Moran's I

The Global Moran's I computes a single summary value, a *z*-score, describing the degree of spatial concentration or dispersion for the measured variable (in this case TVRO users). The outcome of this analysis usually answers the question of whether the spatial pattern is significantly clustered or dispersed as a whole.

The results of the comparison of TVRO users with different preferences (i.e. TVRO-centric, FTA-centric, Astro-centric, Sexual, Pride and Conventional) are shows in Table 2. The negative values indicate negative spatial autocorrelation while the positive values indicate positive spatial autocorrelation. Values range from −1 (indicating perfect dispersion) to +1 (perfect clustered) while zero value indicates a random spatial pattern. All components show that the spatial patterns are clustered with the Sexual behaviour generating the strongest cluster.

Table 2. Comparison of the Morans I of PCA of Astro, FTA, TVRO, Sexual, Pride and Conventional

Component	Global Morans I	Pattern Description
Astro centric	0.22	Averagely clustered
FTA centric	0.24	Averagely clustered
TVRO centric	0.05	Slightly clustered
Sexual	0.97	Strongly clustered
Pride	0.1	Slightly clustered
Conventional	0.06	Slightly clustered

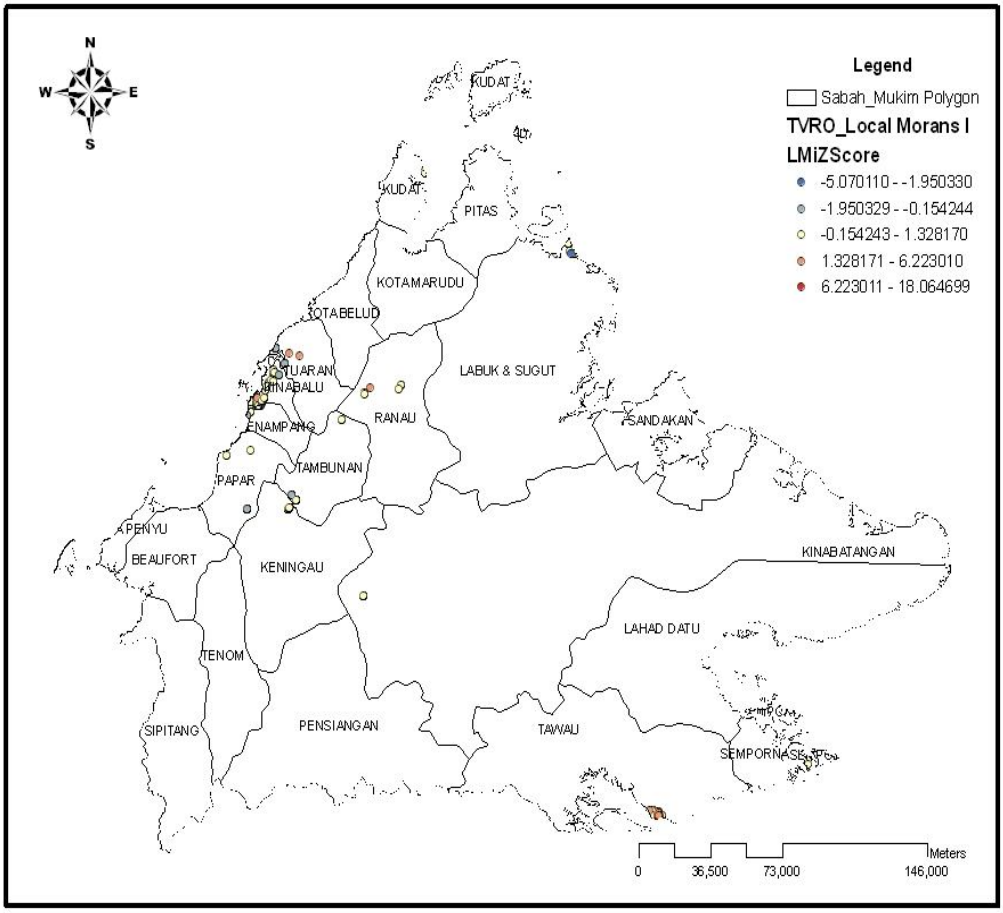

Figure 4. *Local Morans I of TVRO usage in Sabah*

Based on the on-the-ground observations, the main reasons as why the occurrence was heavily clustered in one particular area were threefold: (1) the probable fact that the areas experienced or had a low degree of legal enforcement regarding the use of TVRO; (2) the influences by relatives or neighbours who mostly owned TVRO; and (3) the easily contactable TVRO suppliers. The word of mouth among the people in the area could easily influence others to own the dish especially when it was widely available and difficult to be detected by the authorities.

The objective of applying spatial correlation in the previous analyses is to measure for the entire region. It basically summarises the patterns. However, the effect of spatial autocorrelation is not necessarily uniform over a region but rather varies with different areas. In order to

determine the spatial variability of spatial autocorrelation, we must rely on another set of measures that could indicate spatial autocorrelation at the local scale. The tool, local Moran's I, answers the question "*Where* spatial clustering occurs?".

In Figure 4, the Local Moran's I tool is used to analyse the usage of TVRO. By using the standardized score for the Local Moran's Index, the negative value is associated with dispersed patterns, whereas the positive value the clustered patterns. Therefore, the dark red dots indicate the most clustered pattern of the TVRO users; and the dark blue color dots indicate the most dispersed pattern. Based on the results, the highly clustered TVRO users seem to be located in the districts of Kota Kinabalu and Tawau. The dispersed pattern with the blue dots also seems to cover some areas of Kota Kinabalu and the north eastern region of Sabah. The dispersed pattern seems to conquer the area where there was only a few TVRO users available (the rural part), and obviously not feasible for the authorities to invest their already limited resources in monitoring and law enforcement.

This finding supports the argument of the previous analysis which suggested that the TVRO users were concentrated mainly in the area of Kota Kinabalu and Tawau. The clustered area shows that the TVRO influential locations are near to each other. The dispersed area indicates that the TVRO influential locations are scattered and far from each other.

Conclusion

The findings showed that the usage patterns of TVRO were ones of urban concentrations. This contradicts the earlier assumption that TVRO users were more likely to be in the rural areas given the findings of previous researchers (Dahlan, 1986; Lochte & Warren, 1989). The distribution of TVRO viewing preferences (Sexual, Pride, and Conventional) also exhibited the same spatial orientation. As evident from the findings, the Conventional preference coincided with a longer reach of influential area.

TVRO users in Sabah may thus be summed up as mostly concentrated in two clustered areas i.e. the Kota Kinabalu and Tawau districts. They were attracted to this service because it was cheaper compared to the alternative ASTRO, and it provided more transparent contents for both entertainment and news. From the government perspective, the high number of TVRO users was a threat to national values and probably national security.

The information provided by this study could thus help the authorities and policy makers in prioritising their planning decision. With the identification of various aspects of the TVRO, namely, viewers' behavioural patterns, viewing preferences and spatial distributions – the relevant agencies could allocate their resources more effectively especially when it comes to monitoring, regulating and enforcing processes on the ground. For example, for certains areas which have been identified as having heavy concentration of TVRO users with certain behavioural tendencies specific mitigating activities could be planned to deal with the issues.

This paper also shows that spatial statistical analyses could provide a good interpretation of locational and geographical distribution data. By illustrating the results in graphical maps, readers could understand the information more easily. It could also help readers to obtain the summary of the 'big picture' instantly. This in turn would enable crucial decisions and implementations to be guided more efficiently even when large areas are involved.

Acknowledgement

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