

Analysis of Uganda's Presidential Elections since 1986 using GIS and Spatial Analysis Techniques

Abstract

Uganda's presidential elections under Museveni since his inauguration as the President in 1986 have been poorly run and managed by the Electoral Commission so much that every election has been disputed by the opposition. As a result, a significant portion of the public has lost interest in the political process and there is a downward spiral. This process is now characterized by low voter turnout and energy. In this study, I propose to map and analyze the voting patterns during Museveni's tenure using geographic information systems (GIS) and spatial analysis techniques. The study will not only facilitate a scientific understanding of the political process, but also strengthen the reporting systems. I envision a more visible/transparent political landscape so that the media can accurately and analytically inform the public just like we have recently witnessed with the 2008 U.S. Presidential elections. Upon successful completion of this study, I wish to write a monograph to offer guidance to Uganda's political landscape that will advance our understanding of humanities in terms of enhancing democratic systems. The report will suggest practical solutions to eliminate reporting biases and improve the accuracy of electoral data, promote dialogue, and encourage the growth of democracy through citizenry involvement. A preliminary analysis on 2006 presidential election data is now complete and I wish to extend it to the 1996 and 2001 elections with the same motivation of extracting fundamental insights and relevant potential trends.

Key Words: Uganda Elections; Voting Patterns; Political Landscape; Visualization; GIS; Spatial Analysis

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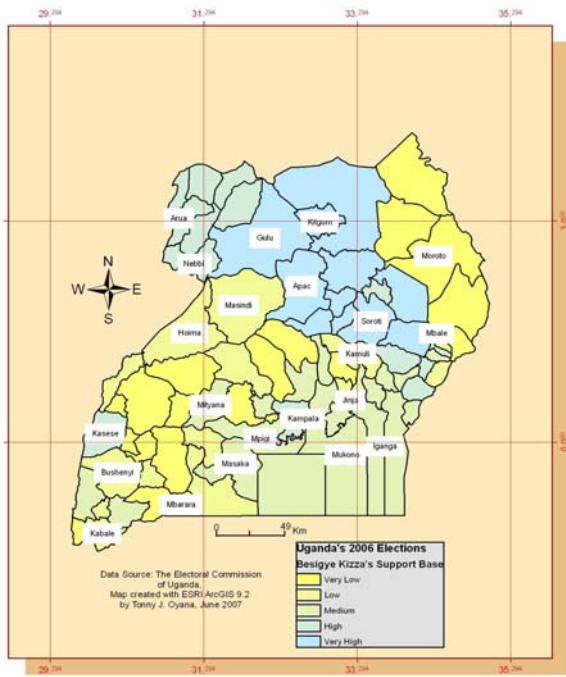
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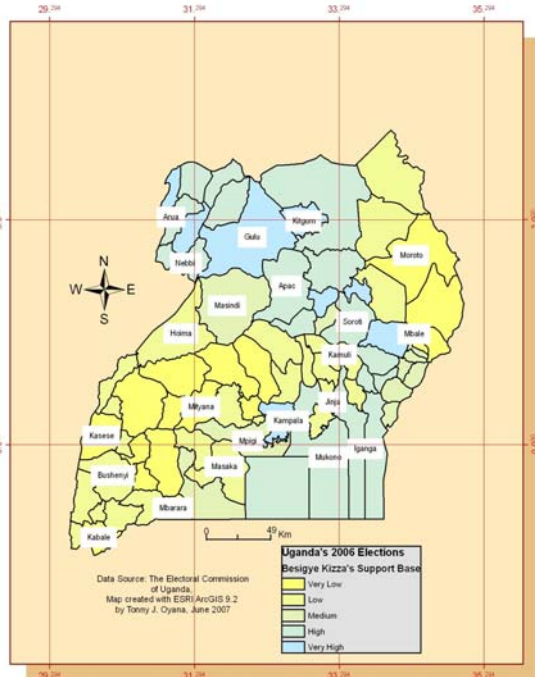
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Here is a Preliminary Report on Uganda's 2006 Elections (For additional information contact me via email at tjoyana@siu.edu)

In Part I of the series, we should focus on Besigye's votes. Describe the data using these GIS maps.

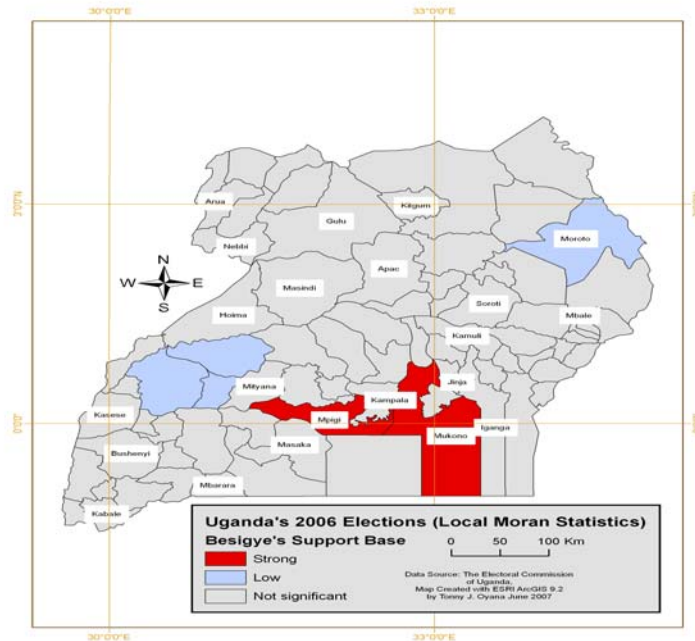


Map I



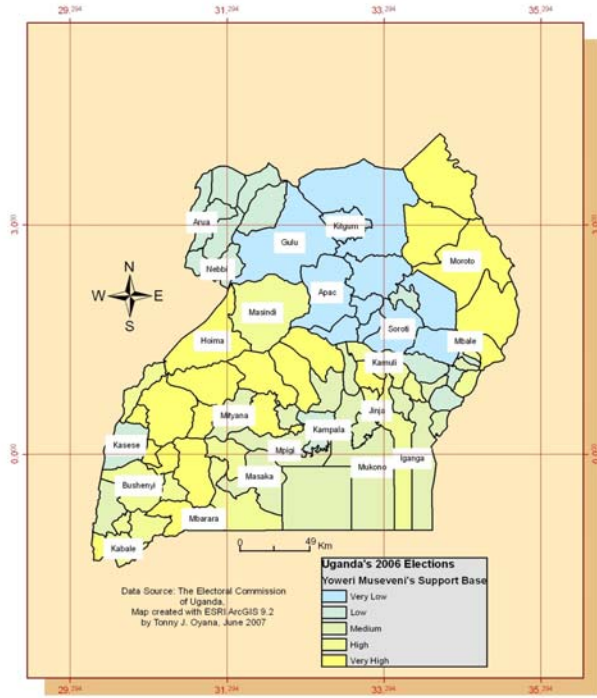
Map II

Map I shows Besigye's vote normalized by total votes counted and Map II shows kriged Besigye vote normalized by kriged total counted



Map 3 shows kriged Besigye vote after running local moran statistical analysis. *Interpretation:* Besigye's has a very strong political base in Kampala, Mukono, and Mpigi, but his votes in other parts of the country are either low or statistically insignificant.

In **Part two** of the series, we should focus on Museveni's votes. Describe the data using these GIS maps.

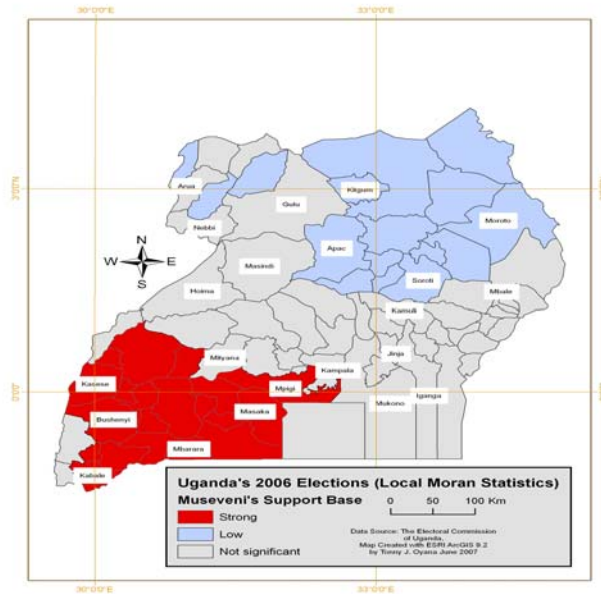


Map I



Map II

Map I shows Museveni's vote normalized by total votes counted and Map II shows kriged Museveni vote normalized by kriged total counted



Map 3 shows kriged Museveni vote after running local moran statistical analysis. *Interpretation:* Museveni's has a very strong political base in Western Uganda, but his votes in other parts of the country are either low or statistically insignificant.

Implications of 2006 Presidential Election Outcomes

Preliminary results suggest that both Besigye and Museveni's support are confined to specific portions of the country. The 2006 kriged presidential election offers some new fundamental insights into Uganda's electoral process based on spatial contiguity. Although Museveni had a significant electoral success during the 2006 presidential election, his overall support is confined to certain geographic regions. The same was observed for Besigye, who had his success predominately confined to two contiguous regions. While this representation in the maps may lead to the conclusion that Museveni is very popular in Uganda (followed by a strong performance for Besigye) this may only speak for part of the complete story. Additional analysis and scrutiny of attribute data revealed that Museveni's strong performance was confined to western Uganda, while Besigye's was among areas surrounding Kampala and the northern portions. [The implication of this finding is that other political parties have an excellent opportunity to build their political bases because the central, eastern, and northern portions of Uganda are still open for political competition.](#)

Preliminary data also suggest that support for Besigye and Museveni will not hold if these regions are offered stronger representation from traditional or new political parties with a promise of some form of alternatives from the current status quo. This information was derived from the results of newcomers such as Abed Bwanika who performed well in the eastern and northern portions (Arua, Apac, Lira, Kampala, Nebbi, Gulu, and Kumi districts) of Uganda, while Obote Kalule Miria was strong in the Lango region (Lira and Apac districts), and Ssebana Joseph Kizito was also strong in some parts of the Buganda region, especially in the districts of Wakiso, Kampala, Masaka, Mukono, and Mpigi. [In a future study, it would be quite interesting to analyze the 1996 and 2001 election data to extract fundamental insights and reveal potential trends. It would also be wise to integrate polling data that has been conducted since 1986 into the GIS database for comparative analysis and use this to detect potential patterns and trends.](#)

Data and Methods

The 2006 Uganda presidential election was held on February 23, 2006 with five participating candidates—Abed Bwanika who stood as an independent; John Ssebaana Kizito for the Democratic Party; Kizza Besigye for the Forum for Democratic Change; Miria Obote for Uganda People's Congress; and Yoweri Museveni for the National Resistance Movement. Given that the data for Abed Bwanika, John Ssebaana Kizito, and Miria Obote were inconsequential in influencing the election outcome, our experiment predominately focused on the two key candidates (Kizza Besigye and Yoweri Museveni). The election outcome was obtained for 69 districts from nearly 20,000 polling stations around the country with a 99% provisional reporting. I believe the final results may have only slightly affected the overall out-come. The total number of registered voters was 10,450,788 with a record turnout of approximately 68%. The presidential election data was obtained from the Electoral Commission of Uganda.

The analytical methods used to study Uganda's 2006 presidential elections included a strange but very popular technology called geographic information systems (GIS), mapping techniques, kriging, and local moran statistics. The datasets were normalized to reduce the noise and minimize any uncertainty in the election data. Kriging is a powerful mathematical and statistical algorithm for accounting for spatial variations and providing better local estimates (prediction) that are more reliable than the raw data. Local moran is a powerful technique that detects spatial relationships among neighborly districts and 9,999 statistical runs were done to the compute the final outcome.

The filters in the kriging technique provided a powerful mechanism to reduce the impact of small population size, strongly positively skewed nature of data, missing values, and smooth the intensity surface in election data over the study region (Uganda). The kriged election data was then visualized using TerraSeer's Space-Time Intelligence Systems (STIS). TerraSeer's Local Indicators of Spatial Association (LISA) statistic and local Moran statistics were both used to analyze spatial autocorrelation patterns within the study region after

conditionally randomizing the data 9,999 times. My task will be to communicate these methods in a very simple way and avoid confusing the readers using non-scientific language.

Additional research questions to think about:

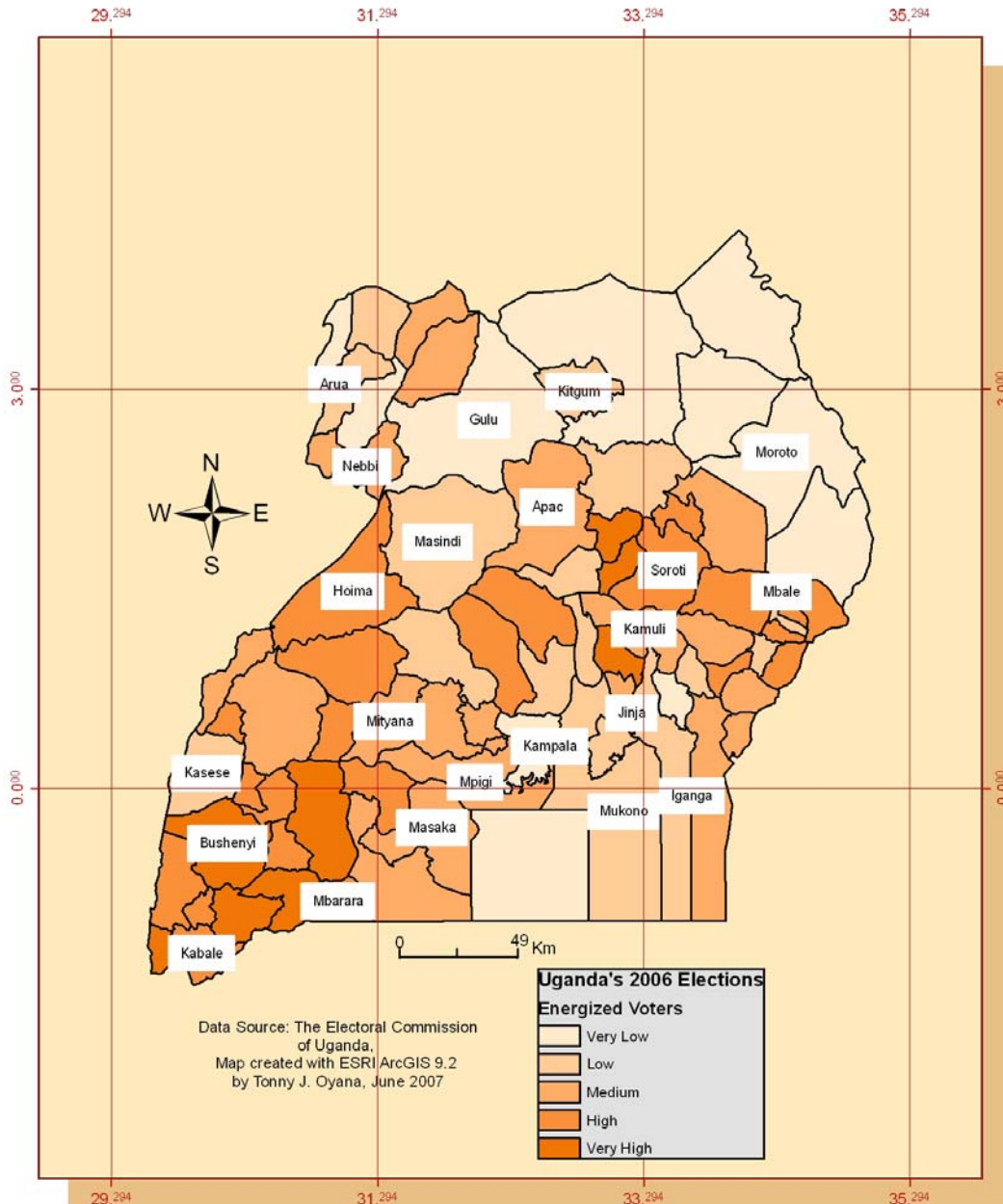
1. Why do Besigye and Museveni’s votes somehow evaporate after applying a filter to the data?
2. Why is Besigye’s or Museveni’s support confined to certain portions of the country?
3. Why does Museveni’s vote in Karamoja region suddenly evaporate?
4. Why do results for both Besigye and Museveni not hold up in Northern Uganda?
5. Why is voter turnout generally low (low energy, lack of overall excitement) in the North and parts of Buganda?

In Part III of the series, we will provide fundamental insights into Uganda’s presidential elections since 1986. We’ll use Table 1, numerous maps (e.g. maps on pages 6 and 7), polling and electoral data for 1996 and 2001 to provide fundamental insights regarding the political landscape during Museveni’s tenure.

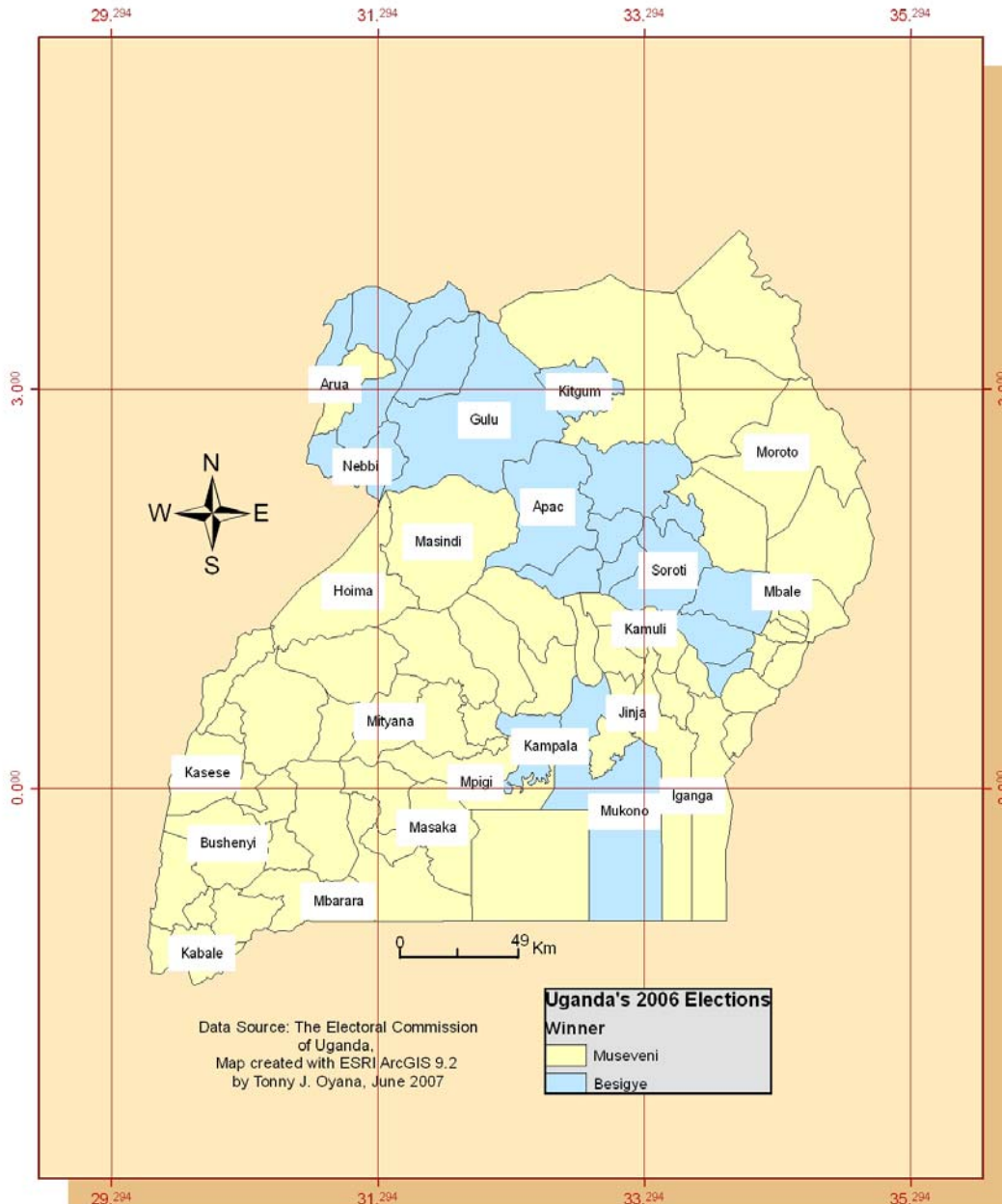
Table 1: The distribution of votes before and after the kriging process

| Name of Presidential Candidate | Reported Vote | Percent | Mean Voter (SD) | Kriged Vote | Mean Voter (SD) | Percent |
|---------------------------------------|----------------------|----------------|------------------------|--------------------|------------------------|----------------|
| Yoweri Museveni | 4,078,677 | 59.28 | 59111 ± 40327 | 4,311,376 | 62484 ± 31669 | 58.76 |
| Besigye Kizza | 2,570,572 | 37.36 | 37255 ± 39835 | 2,865,524 | 41529 ± 22650 | 39.05 |
| Others | 160,990 | 2.34 | 2333 ± 1809 | 160,588 | 2327 ± 911 | 2.19 |
| Total Votes Counted | 6,810,239 | | | 7,337,488 | | |
| Total Ballots Cast | 6,880,232 | | 99714 ± 67345 | 7,073,190 | 102510 ± 28947 | |
| Total Registered Voters | 10,450,788 | | 151461 ± 112004 | 10,750,497 | 155804 ± 42308 | |

- **SD** refers to *standard deviation*, n = 69 districts.
- The other candidates were insignificant so I combined them together under one category *Others*.
- As you will notice, the SD and the mean for the kriged results are far better than reported results implying that there are some errors in Uganda’s Electoral Commissions’ election data, thus the need to account for the noise and reduce the uncertainty associated with the data.
- From this table, Museveni’s vote drops by about 1% while Besigye gains about by 2%.



Map shows voter turnout normalized by the number of registered voters. Who was excited to vote? Where did it matter most?



Map shows final vote tally after applying the kriging technique. Museveni is paired with Besigye. The provisional results for Museveni were 4,078,677 votes (59.28%); Besigye Kizza, 2,570,572 votes (37.36%); and others, 160,990 (2.34%). The kriged results indicated that Museveni got 4,311,376 votes (58.76%); Besigye Kizza received 2,865,524 votes (39.05%); and others accounted for 160,588 votes (2.19%). From these preliminary data (see Table 1 and this map), we can infer that Museveni won the 2006 election despite Besigye's 2% gain and his 1% loss after the scientific analysis.

Final Comments and Conclusions

The preliminary analysis of the results of Uganda's presidential election shows that the political landscape was dominated by Museveni. There are three spatial clusters, two of which are for Besigye's votes and one large contiguous region for Museveni's. With this criterion, we observed an improved interpretation of the results of the three applications, especially since spatial clusters were clearly visible. The fact remains that

Museveni won the election, and Besigye was the most competitive among the remaining candidates, thus coming second after Museveni. This preliminary finding was gathered from this study; however, more critical analyses reveal that the election outcome could perhaps have been more complicated.

Intellectual merits and Broader Impacts of this work

The significance of this study stems from the need to develop a solid scientific understanding of the political process. I envision a more visible/transparent political landscape for the media to inform the public just like we have recently witnessed with the 2008 U.S. Presidential elections. I expect to offer guidance to Africa's electoral process, which will advance our understanding of humanities in terms of enhancing democratic systems. The report will suggest practical solutions to eliminate reporting biases and improve the accuracy of electoral data, promote dialogue, and encourage the growth of democracy through citizenry involvement—the same report supports research and information discovery also will support policy improvement and decision making.

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