

An Algorithm for the Declaration of Executive and Legislative Election Results in Nigeria.

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ABSTRACT

Since independence in 1960, elections in Nigeria have been plagued by a variety of malpractices. The problems with elections in the country have reflected on the lack of development in other spheres of endeavour and infrastructure. The electoral problems are best addressed by the deployment of electronic voting systems which will ensure faster declarations of results and hence enhance confidence in the electoral process. An algorithm that could be used in conjunction with an electronic voting machine to declare results of elections for executive and legislative positions has been developed. The implementation of the algorithm assures accurate and fast tabulation of election results thus removing tedium in the process from poll workers. Although the algorithm has been implemented in Java programming language, any suitable high level language can be used.

(Keywords: algorithm, election, electronic voting)

INTRODUCTION

The first general election in Nigeria that was conducted by a central electoral commission was held in 1959, preparatory to the country's independence in 1960. Since then, the country has witnessed several general elections [1]. Most of these elections have been rigged (in perception or in reality) thus causing confusion, inter ethnic tension, and even a civil war [2]. All of the previous elections, including the general elections held in May, 2007 have used the ballot box and paper ballot method of conducting elections.

Politicians and many other groups involved in the electoral process have devised various corrupt means of defeating this method of conducting elections. The various methods that have been used to rig elections in the country in the past

include violence, under-age voting, multiple registrations of voters, stuffing of ballot boxes/multiple voting, inflation of votes cast, and bandwagon effect [1, 12, 17]. It is generally accepted at the moment that the best possible alternative method of conducting elections that will give accurate and acceptable results is the use of the electronic voting systems [13, 14, 15]. This realization has led many democracies to begin to shift from the traditional method of conducting elections using the ballot box and paper ballot to this modern way of conducting elections [3, 4, 5]. Problems that affect the conduct and results of elections are generally specific to the election environment. The peculiar nature of these problems implies that voting machines must be developed to solve problems that are inherent in the particular environment [16]. Thus a global electronic voting machine may not be realizable and a machine developed for a particular environment may not solve all the problems of another environment.

MATERIALS AND METHODS

Elections in Nigeria can be classified into two main types: legislative and executive. The legislative positions include Senate, House of Representatives, House of Assembly, and Councillorship. The executive positions are Presidency, Governorship of a state, and Chairmanship of a local government area. The constitution of the Federal Republic of Nigeria [6], and the Electoral Act [7], specify the rules guiding the declaration of election results for the legislative and executive positions.

The rule for legislative positions requires the winning candidate to score only a simple majority over his opponents. This rule does not change even for run-off elections. Thus the simple flow chart depicted in Figure 1 can be used to develop

the algorithm for the legislative elections. The results of elections from various polling stations are assumed to have already been transferred from the electronic voting machines such as has been developed in [17] into various files in the computer. The scores for each contestant are then read from these files. These scores are compared to determine the highest votes polled by any of the contestants.

Having verified whether or not more than one candidate has attained this highest score, a decision is taken to determine and declare the winning candidate. In the event that more than one candidate scores the highest vote, the candidates that qualify for run-off election will have their names printed out.

The rule for determining the winner of an election to any of the executive positions is much more complex than that of the legislative positions. The winning of election for any executive position requires that not only should the successful candidate score the highest number of votes, but also that he should score his votes in a wide geographical spread, thereby denoting his constituent-wide acceptability. For instance, the rule for determining the winner of a presidential election is as follows [8]:

A person is duly elected as president, where if there are more than one candidate, he scores a majority of votes as well as at least one-quarter of the votes cast in each of two thirds of the states of the federation. Where, however, there is only one candidate, he must obtain a majority of YES votes over NO votes as well as not less than one-quarter of the votes cast at the election in each of at least two thirds of all states in the country and the federal capital territory.

The legal statements that formulate the rule stated above are logically complex. We must first be able to determine the number of constituent units for the executive position being contested. These units are the states (36 in all) and the federal capital territory (1) thus making the presidential constituent units to be 37. We should next be able to determine two-thirds ($\frac{2}{3}$) of these constituent units.

The determination of what constitutes two-thirds of the constituent units is not so simple as experiences with the general elections of 1979 showed. However, the legal interpretation is the smallest integer value that results from the

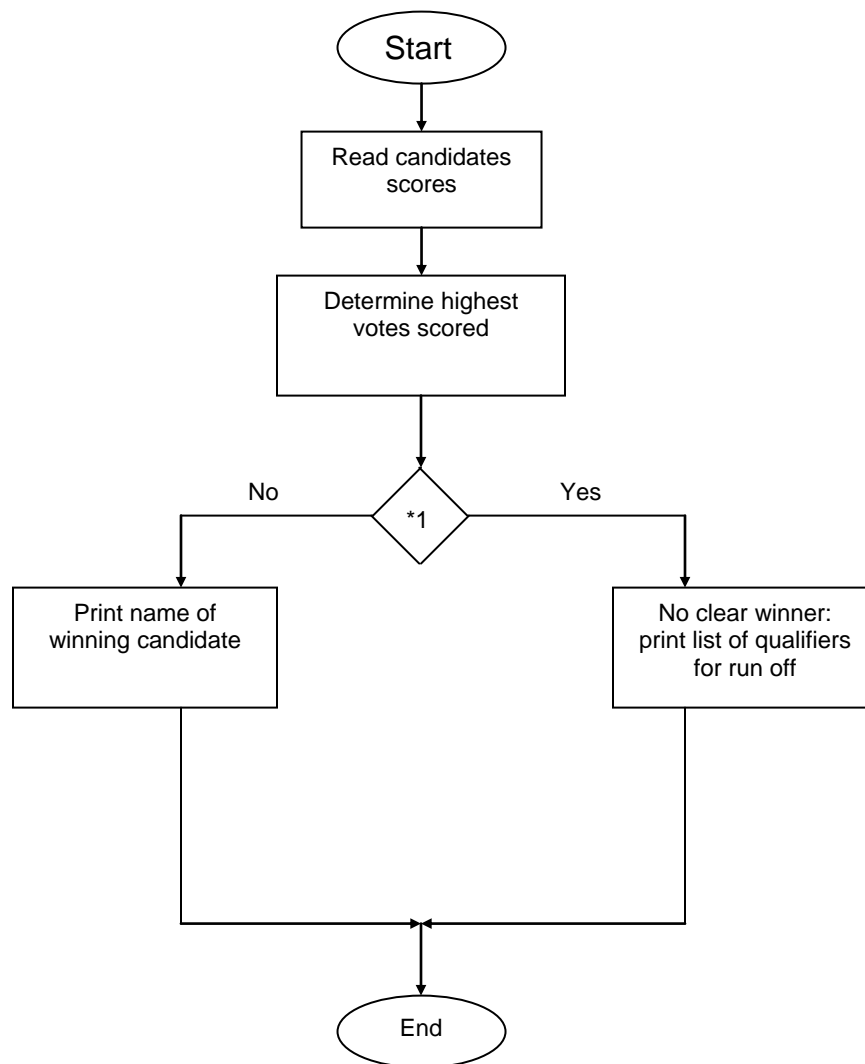
computation of $\frac{2}{3}$ of the number of constituent units. Thus $\frac{2}{3}$ of 37 in this case is 24. The winner of the presidential election must, however, also score at least $\frac{1}{4}$ of $\frac{2}{3}$ (i.e. 16) of the number of votes cast in the 25th constituent unit. This agrees with the ordinary meaning of the computation of $\frac{2}{3}$ of constituent units as was adjudicated by the Supreme Court of Nigeria in the legal battle that resulted from the interpretation of $\frac{2}{3}$ of 19 states in the 1979 general elections [1, 9].

Thus, in order to determine the winner of an election into an executive position we must have information about the scores by each candidate as well as the total number of the constituent units in the election being considered. If no candidate meets all the requirements stated earlier the election will go into run-off. Two run-off elections are anticipated. The rules for determining the candidates that qualify for the run-off elections and the winner are stated as [8]:

- (i) *Election between the candidate that scores the highest number of votes and another with highest majority votes in the highest number of states. Where there are more than one candidate with the highest number of states, the candidate with the highest total votes among them shall be second candidate.*
- (ii) *A failure of either of the candidates to meet the majority of votes and score of over a quarter of votes cast in each of at least two thirds of all the states and Federal capital territory, winner at the third and last run-off elections shall be the candidate who scores the majority of votes cast in the election.*

We observe that the rules for the first election and the first run-off election remain the same. However, when the election goes into second run-off the rule changes from that of the executive to that of the legislative depicted in Figure 1.

Using the rules we determine the flow chart for the algorithm of the executive positions to be that shown in Figure 2. The algorithm must take into considerations all situations that could lead to the declaration of a candidate as the winner and also all cases that would determine the candidates that qualify for runoff elections.



*1: More than one candidate scored equal highest

Figure 1: Flow Chart for Declaration of Legislative Election Results.

CODING, RESULTS, AND DISCUSSIONS

The flow charts are translated into code using the Java programming language [10]. The code was compiled and run using Java 6 [11]. Data obtained from the 1979 Nigeria general election results [1] as well as random data generated by asking voters to cast votes on an electronic voting machine developed by the author [17] were used to test the code. The candidates are represented by the fifty political parties representing the legally registered political parties in Nigeria at the time of the test. The number of parties or candidates can easily be modified to desired values. The results

for the candidates are assumed to have been collated prior to the execution of the code. In an election environment where electronic voting machines are deployed this can easily be done by transferring the election data in the machines containing the voters' preferences into files in the computer. The test data were modified in various ways to simulate different scenarios such as different candidates having the same scores, and no candidate meeting the requirements to be declared winner. The results obtained in each situation were consistent with expected values. Screen shots of a typical result of a senatorial election are shown in Figures 3 and 4.

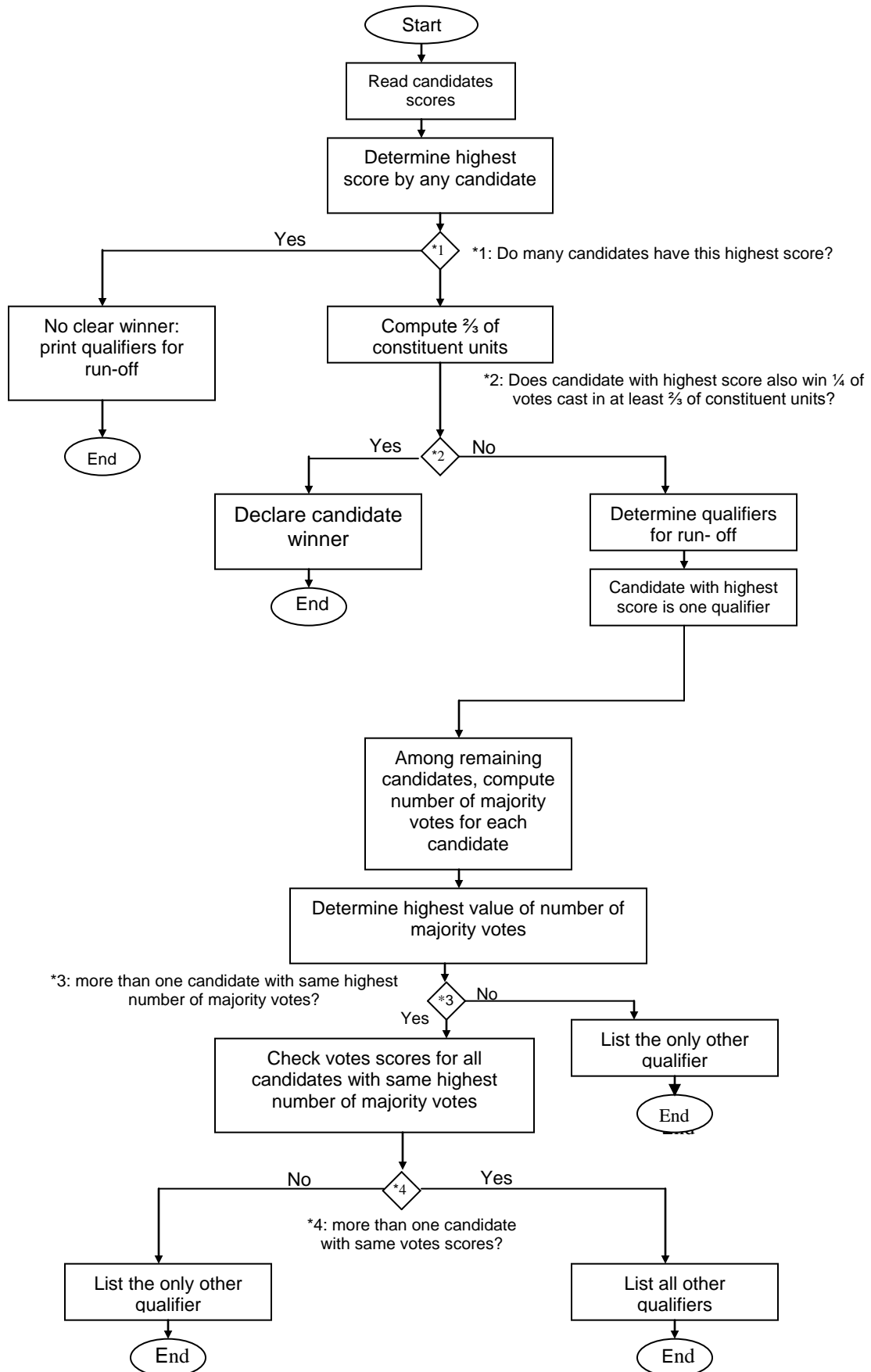


Figure 2: Flow Chart for Declaration of Executive Election Results.

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Command Prompt - java INEC
C:\Program Files\Java\jdk1.6.0_10\bin>java INEC

INEC ELECTION RESULTS

Senatorial Election Results

Date of Election:      23/ 07/ 2008
State:                 BEN
Constituency Name:    BENWESTSen.R0708

Local Govt. Areas in Senatorial Constituency: APA,APA,APA
Number of Registered Voters:405
Number that voted:    216
Percentage Voter Turn-Out:53.33

Party                Scores
A                    0
AA                   0
AC                   0
ACD                  0
ACPN                 0
AD                   0
ADC                  0
ANPP                 0
APGA                 0
APLP                 0
APN                  0
APS                  0
ARP                  0
BNPP                 0
CDC                  0
CPN                  0
CPP                  0
DA                   0
DPA                  27
DPP                  0
FDP                  0
HDP                  0
JP                   27
LDPN                 0
LP                   0

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Figure 3: Typical Results Header and Part of Senatorial Election Results.

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Command Prompt - java INEC
No candidate has emerged clear winner of Senatorial
election in this Senatorial Constituency.
Candidates of more than one party have scored the highest votes.

The candidates of the following parties have qualified for the run-off election
for the Senate in this Senatorial Constituency.

DPA
JP
MRDD
NEPP
NFC
PAC
FDP
PMP

Name and Signature of Returning Officer:
Names and Signatures of Polling Agents:

Party                Name of Polling Agent          Signature/Date

A
AA
AC
ACD
ACPN
AD
ADC
ANPP
APGA
APLP
APN
APS
ARP
BNPP
CDC
CPN
CPP
DA
DPA
DPP

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Figure 4: Concluding Section of a Senatorial Election Result.

CONCLUSION

The algorithm that has been developed and described here is able to use collated results of candidates in multi-party elections to declare results for legislative and executive positions using a computer. This process can significantly reduce the time between the cast of last vote and declaration of results thus enhancing confidence in the electoral system. Although the algorithm has been developed for a specific election environment (Nigerian), it can easily be modified to perform similar functions in other environments.

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