Conducting Free and Fair Elections in Africa through Biometrics

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Abstract— An election has been the way by which political positions are filled in a democratic setting. While it remains the heart cry of the electorates to see that nothing but eligible and valid votes count, this remains a mirage due to election irregularities. Information and Communication Technology has changed the way activities are run in the world today. It has become a major tool in driving efficiency and reduction in fraudulent activities. Failure toappropriately conduct elections and making the votes count without fear or favour have made electorates wonder whether or not the declared result actually speak to the voting pattern.This work proposed a biometric solution to preserve free and fair elections.The research used fingerprints and revealed 0% false acceptance rate (FAR) with 0.02% false rejection rate (FRR).

Index Terms— Election, Biometrics, Electorates, Votes and Authentication.

I. INTRODUCTION

Elections are generally known as a game of numbers where the lower or lowest can never win. Whatever therefore that has to be done must be but losers do not always take it lightly which can result to violence. Election violence has become like a recurring decimal in most developing countries, especially in Africa. This is because of the notion that an election is thought to be a must win by each party. For that to be, parties attempt election malpractices. When there is a perceived cheat, losers may want to seek redress through legal means which is a more civil way. However, party loyalists may take to protest of varying dimension. However, Information and Communication Technology (ICT) is known to bring the world a relief. Thus, this research proposes a solution that allows only registered electorates to vote through fingerprint authentication.

II. JUSTIFICATIONS FOR THE WORK

Elections in the developing countries are mostly manual and thus faced with various frauds. Where a party loses, it is not always treated with kid gloves. Countries are fraught with violence. The outcome may render the populace homeless, loss of lives and properties. Sometimes, it may lead to migration to other places for safety thereby stressing the facilities of the new settlement. This study is therefore important so as to reduce global spread of violence by placing credence on the electoral process when an electorate can only once.

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I. PREVIOUS RELATED WORKS

Amankwaah (2013) while working election-related violence in Ghana observed that there was an upsurge in the spate disruption brought about by loss of an election. She explained that both youth and adults were involved in snatching boxes when policemen were overpowered. Yego (2015) traced the conduct of elections in Kenya between 1992 and 2013. He observed that Kenyan were always afraid of any upcoming election because of the extent of violence witnessed so far. Election violence is dreaded. The Commonwealth (2018) did an independent assessment of elections in Zimbabwe and noted that after long day of monitoring votes, the electoral officers would count the polls. For fatigue, inadvertent errors can be committed. Taylor (2018) conducted a review of four different countries of Kenya, Malawi, Sierra Leone and Sri Lanka. He noted that measures for preventing election violence can have a spill-over effect on other countries. These all revealed that elections need to be effectively handled by giving some level of assurance: that only eligible electorates would be allowed to vote and only once.

III. PROPOSED SOLUTION

The proposed method used a laptop with a fingerprint scanner (Secugen Pro). Fifty (50) persons were captured with ten (10) fingers of both hands. This is for the purpose of backup. Should any finger be lost due to an injury or an accident, that person is not disenfranchised since any of the fingers can be used to authentication. As soon as a voter is enrolled, details such name, date of birth, address, gender and phone number. For ease of identification, the location of capturing can be automatically added to aid tracing. A voter's unique number is automatically generated. Where an individual deliberately or inadvertently captured in more than one location, only the one and the first unique voter's number is generated. On the Election Day, a voter supplies his fingerprint to the scanner and he is accepted or denied on the basis of eligibility. If authenticated, he is allowed to cast his vote and stored as used. Otherwise, he is denied from voting. The denial can be as a result of more than one attempt to vote or not enrolled: details not found in the database. It should be noted that at the authentication phase, the unique identifier, Voter's number is used to identify the electorate while authentication is done with the supplied fingerprint.

The research revealed that among the fifty persons captured and tested, only a finger of one electorate was denied – other fingers were all accepted. No single attempt by individuals who were not initially registered succeeded. Thus,

FAR defined as $\dfrac{Number\ of\ wrong\ electorate\ accepted}{Total\ number\ of\ registered\ electorates}$ x 100%

$= \dfrac{0}{50 \times 10}$ x 100%

$= 0\%$

FRR defined as $\dfrac{Number\ of\ true\ electorate\ rejected}{Total\ number\ of\ registered\ electorates}$ x 100%

$= \dfrac{1}{50 \times 10}$ x 100%

$= 0.2\%$

This is an error rate which is insignificant and can be managed. However, another attempt by the same electorate yielded a positive result when his other fingers were used. This rejection could be due to issues relating to just that finger.

IV. CONCLUSION

From the results obtained, false acceptance rate was found to be 0% implying that impersonation was not possible and false rejection rate was 0.2% suggesting that a bona fide electorate can rarely be denied opportunity to cast his vote for candidates of his choice. Since it only happened to one of his fingers, while the others able appropriately scanned, it is possible that the particular finger had an issue at authentication. From the research, it follows that rigging by bringing ineligible electorate to vote or have several votes is ruled out. This also mean that African countries can conduct free and fair elections where only one electorate is entitled to vote a candidate but once. Thus, free and fair elections are achievable in Africa. The proposed method will also go a long way to assist the countries adopting it to save cost of buying indelible ink, hiring security apparatus and risk of snatching ballot. To a large extent, the proposed solution will assist in conducting free and fair elections by disallowing the ineligible electorates. Thus, this method will reduce the spill-over effect on populace migrating from a violence-affected area to a peaceful location.

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