

MegaMatcher Case Study



Kenya's New Electronic Voter Registration System

The CODE Inc. Digital Solution (CDS) for Electronic Voter Registration (EVR) is based on MegaMatcher fingerprint and facial multi-biometric technologies.

The Republic of Kenya set out in 2008 to make significant reforms to its electoral processes. In 2009 the government created the Interim Independent Electoral Commission (IIEC) to develop and implement an entirely new process for voter registration and management of elections. The IIEC worked with system integrator CODE Inc. to implement a multi-biometric voter registration system based on secure and reliable fingerprint, facial and multi-biometric technologies from Neurotechnology.

Civil unrest in the aftermath of Kenya's 2007 elections prompted the government of Kenya to completely overhaul its system of managing elections. The IIEC was formed to replace the previous Electoral Commission of Kenya and charged with the mission to institutionalize sustainable electoral processes that would guarantee fair elections. The mandate of the IIEC covered all aspects of implementing elections including reform of the electoral process; conducting a fresh registration of all Kenyan voters to create a completely new voter register; developing a modern system for collection, collation, transmission and tallying of electoral data and promoting voter education.

To undertake such a large and important mandate, the IIEC required a voter registration system that would ensure highly accurate identification of Kenya's 13 million voters and a reliable process for flagging any duplicate registrations in the system. They turned to system integrator CODE Inc. who developed and implemented a multi-biometric fingerprint and facial identification voter registration system based on Neurotechnology's [MegaMatcher](#) biometric technology.

Background

- ◆ **About Kenya:** Located on the equator along the Indian Ocean coast, The Republic of Kenya has one of the strongest economies in East and Central Africa. It is a rapidly growing country with a population of nearly 40 million, 73% of which are under the age of 30.
- ◆ **The customer:** The Interim Independent Electoral Commission of Kenya (IIEC) was established on 7 May 2009 to reform and manage Kenya's electoral process to ensure free and fair elections.
- ◆ **The need:** By mandate of the Kenyan government, the IIEC was charged with creating a completely new register of all Kenyan voters and implementing a modern system for the implementation and management of elections.
- ◆ **The Integrator:** CODE Inc., based in Ottawa, Ontario, Canada, worked with the IIEC to deliver a fully-supported, multi-biometric voter registration solution.
- ◆ **The solution:** The CODE Inc. Digital Solution (CDS) for Electronic Voter Registration (EVR) is based on MegaMatcher multi-biometric fingerprint and facial identification technologies from Neurotechnology.

"CODE Inc. chose Neurotechnology because of the strength of the company and its products," said David Morris, Director of Business Development for CODE Inc. "We are pleased with our choice, not only due to the solution itself but also because of the excellent support provided."

Because Kenya's population is so widespread and diverse, ranging from bustling urban centers like Nairobi to remote rural communities and semi-nomadic groups such as the Maasai, implementing an entirely new voter registration effort required flexible software and sturdy hardware that could be used in the field to collect data and issue identification cards even in areas that are off the power grid.

Also, because Kenya's citizens speak a variety of languages and not all voters can read and write, the IIEC wanted a solution that could provide unambiguous identification to ensure accuracy of the registry and provide a fast, reliable way to check data for any duplicate registrations. For the initial phases of the project, both fingerprint (thumbprints) and facial biometrics were chosen for voter identification, and future project plans call for the use of iris scanning. Using multiple biometrics helps to ensure a higher degree of identification accuracy.



CODE Inc. recognized that Kenya's solution would require a very high degree of biometric accuracy and reliability across a spectrum of variables – from fingerprint quality to wide variations in lighting conditions between urban settings and field registration sites. The biometric solution would need to be resource-efficient, since in some cases it would be running on solar-powered equipment when in remote rural areas. The solution also would need to be economical and easy to implement to allow widespread deployment while keeping the project within budget.

After studying a number of alternatives, CODE Inc. selected the MegaMatcher biometric software development kit (SDK) from Neurotechnology for the development of their CODE Inc. Digital Solution (CDS) for Electronic Voter Registration (EVR). MegaMatcher fingerprint and facial technology is used for biometric enrollment and verification in the field and then the powerful MegaMatcher multi-biometric fingerprint and face identification engine is used for matching and flagging of duplicate registrations in the national voter database. For CODE Inc., the combination of strong NIST test results and the proven reliability of Neurotechnology's algorithms in a number of challenging field implementations were key elements in their decision.

The CODE Inc. EVR solution was developed to provide a flexible, durable hardware and software solution that would enable Kenya's electoral authorities to travel to remote areas and set up temporary voter registration sites. CODE Inc. worked closely with Kenyan authorities to implement the solution, providing tools and support to train and help electoral workers gather information and biometric data to register voters, issue ID cards and compile and process data to generate an accurate, updated registry of voters. Having strong Kenyan Electoral teams in the field helped ensure the success of the project.

"Our experience working with Neurotechnology has been very positive," said David Morris, Director of Business Development for CODE Inc. "They have excellent products and it's very easy to work with them. They have been very responsive to our needs."

Implementation of the Kenya Electronic Voter Registration System

The EVS solution implemented by CODE Inc. includes both hardware and software for field and office use.

The CDS field registration kits include:

Hardware:

- Notebook computer for processing of enrollment data
- Webcam for capturing facial images for each voter registered
- Fingerprint reader for capturing fingerprint images for each voter registered
- Printer for issuance of voter ID cards

Software:

- Microsoft Windows 7 operating system
- CDS/EVR software application based on VeriFinger and VeriLook biometric algorithms

The back-end system includes:

- MySQL for the voter registry database
- MegaMatcher multi-biometric technology for analysis of the biometric data

For each voter registered, one facial image and two fingerprints (thumbprints) are enrolled in the system using the MegaMatcher fingerprint and facial algorithms to verify the image quality and process the biometric data. The voter provides basic biographical information that is then linked with his or her digital face and fingerprint images to provide a unique multi-biometric record for each voter.

The voter is issued an ID card that he or she must present in order to vote in upcoming elections. The entire process, from application to registration of the biometric data to issuance of the voter ID card takes approximately four minutes.



Once the biometric data is registered in the field, it is saved onto an encrypted USB thumb drive for transport back to the national data center for processing. There the data goes to the Adjudication Module, which uses MegaMatcher technology to rapidly search the database for any duplicate registrations, comparing and cross-referencing facial and fingerprint data with all

"It is with great confidence that I recommend the CODE Inc. EVR solution," said Ahmed Issack Hassan, EBS – IIEC Chairman. "In Kenya, it has proven to be an efficient means of registering voters, issuing ID cards, and producing an accurate voter registry. The support provided by your team at all stages contributed to the success of the project."

existing records in the system. If any discrepancies or duplications are found, they are examined on-screen by a trained IIEC operator and a ruling is made. Changes are recorded in the database and the duplicate cards are cancelled. Once all discrepancies have been resolved, the IIEC updates and prepares a clean, accurate voter registry that meets Kenya's stringent new legal and administrative requirements for management of elections.

Accurate Identification Helps Ensure a Fair and Efficient Election Process

To date, the CDS has been used to register and issue photo ID cards to nearly 1.5 million voters all across Kenya. These voters were part of a pilot program implemented across 1600 registration sites in 18 of Kenya's 210 voting constituencies.

Voters who participated in the pilot program used their new IDs for the first time to vote on an August 4, 2010 referendum. Registered voters went to one of Kenya's 2000 local polling stations and presented proof of their eligibility to vote. For those with the new IDs, the right hand thumbprint was then used to "check in" each voter and strike him or her from the list of eligible voters, ensuring that each individual was only able to vote once.



The Kenyan government has been pleased with the results of the pilot program so far and the August 2010 voting process was widely hailed as a success. The polling was efficient and produced accurate, credible results. In so doing, the new system has helped to reinforce confidence in the election process.

Future plans call for rolling out the system across the remaining voting constituencies, and the program is expected to be completed before the 2012 elections. When complete, approximately 13 million Kenyan voters will be registered in the new system.

The next phase of the CDS solution, which is currently in development, will incorporate iris biometrics and will take advantage of even faster multi-biometric matching capabilities offered by the MegaMatcher Accelerator hardware/software solution from Neurotechnology.

About Neurotechnology Biometric Technologies

MegaMatcher SDK is designed for the development of large-scale automated fingerprint identification systems (AFIS) and multi-biometric identification systems using any combination of fingerprint, palmprint, facial, iris or voice biometrics. The identification algorithms in MegaMatcher were designed from the ground up to work alone or in combination to provide very fast 1:N (1 to many) matching with even higher reliability than AFIS or any other single biometric.

MegaMatcher's matching algorithm can match up to 1,200,000 faces per second, 160,000 fingerprint matches per second or 1,440,000 irises per second on a single processor (based on Intel Core2 processor with 4 cores running at 2.66 GHz). With Neurotechnology's fault-tolerant, scalable MegaMatcher Cluster Server cluster software, these numbers can be multiplied across multiple PCs.

For very large applications **MegaMatcher Accelerator** or an Accelerator cluster can be used. Each single MegaMatcher Accelerator Extended system can store 30 million fingerprints or 50 million irises and matches 100 million fingerprints or 200 million irises per second. MegaMatcher's latent fingerprint template editing capabilities also allow it to be used in forensic AFIS applications.

MegaMatcher supports most biometric industry standards. The iris engine in MegaMatcher is NIST IREX-proven, and because the MegaMatcher fingerprint recognition algorithm is NIST MINEX-compliant, it is suitable for use in US Government Personal Identity Verification program fingerprint recognition applications.

For More Information:

CODE Inc.

Since 1987, CODE Inc. has been a leading supplier of voter registration and election materials and services to clients worldwide. The company has proven expertise in product development, procurement, logistics, and project management for time-sensitive, mission-critical applications in almost 70 countries, predominantly in the developing world. As recently demonstrated in Kenya, CODE Inc. has the capacity and experience needed to deliver high quality voter registration solutions in support of the democratic process.

For more information about Code Inc. and Kenya's electronic voter registration system, go to: <http://www.codeinc.com/voter-cds-in-action.htm>

Neurotechnology

For more information about MegaMatcher pricing, product capabilities and specifications as well as other products from Neurotechnology, go to: <http://www.neurotechnology.com>

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