Bio-ID: Biologically Inspired Identification and Recognition System

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Abstract —**This paper addresses the issue of multiple options in biometric identification technology. Bio-ID is a biometric identification systems combining many options (DNA, Iris, Palmprint etc) especially the fingerprints and face to correctly identify the individual for purposes of financial transactions, personal identification, immigration documentations (passport) and transportation licenses (drivers licenses). It is a complete nature inspired identification and recognition technique. Bio-ID means no more Bank cards (debit or credit cards), no more even store cards, no more Plastic or paper ID-cards, no more paper or e-passport and no more plastic drivers' licenses. Simply there is no more wallet and its contents. We implemented a holistic identification system that requires only man and his natural fingers. This new technology will create new employment opportunities without over-emphasizing the novel softscanner and softcamera technology innovations.**

KeyWords–Bio-ID; Biometric; Identification; transaction; fingerprints; cards; security; softscanner; softcamera

I. INTRODUCTION

Bio-ID focuses on utilizing all biometric options (such as DNA, Iris, palmprint, facial expression) to eliminate the use of bank cards, Cheque books carriage of wallets and all transactional, social and travel documents. The Bio-ID system consists of input platform, transaction platform, application platform and confirmation platform (Digital Stamp). It requires a cloud or global database of biometric features with activation and authentication achieved with fingerprints.

The fully implemented BioID provides cardless, chequeless, and cashless payment transactions together with virtual passport and unified virtual personal identification system. This system enlists new technologies in form of virtual scanner called ***softscan*** and virtual camera called ***softcam***. At the point of contact (POCIS) there is a Touch Screen with embedded fingerprint scanner and camera. The scanner icon on the touch screen is labelled scan-window under which the fingerprints capturing device is smartly embedded among the LED or LCD components activated on touching the scan window icon.

Application of BioID technology in shops, banks, at entry borders of countries, with the police or the security Agencies and the transport officers, an individual is only required to have his finger with its print (i.e. fingerprint), to have access to his bank accounts, passport information, and for self identification. This system completely eliminates identity frauds, or identity theft, card fraud, making operations difficult for criminals and terrorists, and thus creates new economy with its new wealth.

II. ALGORITHMIC CONCEPTS

Our aim here is to design a BioID that is a completely interactive and demands little or no training as the user interface is very simple and iconized (graphics user interface) hence, can easily be identified. In addition Language translator applet is embedded for clearer understanding of each feature of the technology.

The Bio-ID technology performs a complete and comprehensive identification of individual person exploiting the natural uniqueness of the human fingerprints. It is a nature-based technology. However, this technology still allows the immigrations to keep individual passport records (information), the banks maintaining account information of their clients, Department of Transport to still keep individuals drivers license information, and employers still keep personal data of their employees. All these are with the usual security requirements but the mode of sharing or usage would radically change. The system concept is shown in the flow chat diagram in figure 1 below. The system is made up of five semi-dependent modules platforms namely: Point on Contact Input system (POCIS), Digital Processor(DP), Application Platform(AP), Transaction Platform(TP) and Confirmation Platform(CP)- Digital stamp.

The POCIS system is an integration of the following digital devices: High end Processor (HEP), Special LED touch screen monitor with embedded scanner (softscan) and camera (softcam) which leverages touch screen technology, optical printing device, Signature capture device, Integrated account processing system, POCIS driver software, optical reader system, Digital Stamp and Iris capture technology.

A finished prototype is a simplified integrated system that sits in two simple visible hardware not more than the size of a standard laptop. The following databases are the enabling facilities of the BioID: Global database of fingerprints, Global database of face images, Global database of Iris images and Global database of DNA. The availability of these databases tends towards realizing an integrated world or a realtime global village. Most importantly these global databases are already taking shape through the present transformation of ICT infrastructures that ranges from important needs to utility essentials with various data centres springing up here and there. Seamlessly however, cloud computing is the enabling utility to this global integration. The paragraphs below explain the various modules of the system:

A. POCIS Platform

This unit is made up of a virtual scanner that can capture the fingerprint or palm print, and the virtual camera that captures the face. The softscanner and the softcamera have the the ability and capability to scan, read and capture the DNA data as well as the Iris data. When any of these biometric features is captured, it is processed and compared with the cloud of global data of fingerprints for example. Once a match is identified, one is then prompted to the 'select application platform (AP). Fingerprint is a biometric feature of choice given its widely acceptability and invariant of its other characteristics. The POCIS is applicable and necessary front-end tool for any transaction options. Beside the functions listed, the POCIS can be adapted to take care of any future needs for changing situations.

B. Application Platform

Fingerprint and face can be the biometric choice for now while the DNA chip will be added in due to course to fortify security. Once on the Application Platform window, the action options would be displayed. These would include but not limited to the following Five-key options, (i.e. which action would you want to carryout?):

- **Virtual ID**
- **Virtual Passport**
- **Virtual Banking details**
- **Cardless Shopping payment**
- **Virtual Driver's License**

These options are already widely held by the respective organs or agencies. The INPUT and Application are to be embedded in a Point of sale (POS) kind of machine in shops, entry points and point of initial contact. The POCIS must be touch screen with a back-end system for the transaction monitor (Sales person or Border officer or Police traffic officer). When you select the option of your choice yours detail appears and at this point the transaction platform module takes over.

C. Transaction Platform

At this stage, the detailed transaction choice is displayed and if the choice option is payment for items in a shop then the bank account details will be displayed after verification. In a case of an individual possessing multiple banks with multiple banks accounts, the choice of say bank A, the item will be paid from your choice following the banks authorization processes and procedures already in existence. If a customer is at the bank to deposit or withdraw money, the same transaction process would be followed as obtained presently in the deposit and withdrawal ATMs (Automated Teller Machines).

For the purposes of travel and border crossing, the choice of visas/permits will be the features of the POCIS authorization instruments. As soon as a traveler scans his/her fingerprints, the details and the virtual passport (ID) will be displayed for the back-end officer to verify. If the verification is successful, the digital stamp will be enabled and the automated barrier system will open to allow entry (this is a complete automated border crossing system).

D. Confirmation Platform

The confirmation tools would be the matching face, fingerprint or DNA or any other feature as acceptable by the business or organization. Security is provided at every stage. Password and pin number (PIN) will be required physical inspection of the photos with the person present will also be necessary as may be applicable. The police or traffic officers can carry the POCIS terminal/machines. Sales officers will carry the same POCIS as adapted to accomplish the desired and required transactions.

III. SYSTEM IMPLEMENTATION AND RESULTS

The integration of the five independent and dependent system modules produced the Bio-Identification which puts an end to credit cards, debit cards and ID documentation in cards/paper of any form except the use of natural fingers.

The java software together with C++ was the key part of the implementation algorithm. The databases required for testing and validation included global fingerprint image data,

global face image data, global DNA databank, and global palmprint database as uniquely captured by accredited or authorized institutions. In our experiment we used limited number of the above databases with random mixture of data from various races, colours and tribes. This we called a Rainbow Databank (RD). We were able to demonstrate this with softscan and softcam together in complex java software. A virtual identification and recognition of the RD databank achieved above 90 percent success rate for purposes of business transactions, cross boarder identification, crime and fraud stoppages together with routine identity confirmation requirements.

IV. DISCUSSION AND CONCLUSIONS

The implementation of Bio-ID (nature inspired biometric identity) achieved the following objectives:-

1. **Card-less world:** No more bank cards, credit cards, no identity cards, no more drivers license cards etc. Every card is now virtual.
2. **Paperless passport world would be a reality**: People would not be expected to carry passport when traveling. No chip is embedded in the body. This is a virtual passport. No-more passports getting into wrong hands; no more identity theft.
3. **Cashless Security:-** No more cash movement, cheque and paper needs would have been greatly reduced if not eliminated.
4. **Unified identity:** Identity instruments would have been unified, virtual IDs are easily verifiable; No-more identity theft. At the end of it all, there will be no wallet as nothing would be needed in it. The finger and its print would be enough. For those without finger and its print, the Iris, the Palm, the face and the DNA would suffice. With this POCIS system in shops, banks and Entry borders or with the police or a transport officers, access to bank account information or passport data would be made easier without actually carrying any card or paper for identity.

   The following advantages will be obvious: (a) Most convenient way to pay for goods and services. Payment will be the use of fingerprint (i.e. payment of money at fingertip). (b) There will be no more bank debit cards, and no more credit cards; Paper cheques and voucher would greatly be reduced. (c) Save the Earth campaign will receive a boost as there will be a massive reduction in the use of paper thus reduced cutting down of trees. (d) Massive reduction or total elimination of identity theft or fraud. Loss of passport, personal detail and other data would reduce, since fingerprint is unique and no two fingerprints are the same, (e) Financial frauds will completely be minimised. There will be no fraud either digital or electronic as a result of people losing their money because their data or vital information has been hacked into by fraud stars. All transaction will be fingerprint enabled. (f) There will be new technology and therefore new employment opportunities. (g) Impersonation and identity fraud or mix-up would be greatly reduced or eliminated since no two persons have similar fingerprints or DNA, even identical twins. (h) With this technology in place, criminals would easily be tracked and consequently criminal activities would be technologically eliminated. (i) Terrorist would find it very difficult to operate. The world would not only be a safer place but a global family. (j) Hacking into people's data or organizational database will become herculean task. Accesses and authorization would be bio-inspired and more personalized.
5. **Religious and Cultural Acceptability**: Since there will be no human chips implant as opposed by most religious and cultural bodies, this technology has a high chance of being widely accepted. Hence, Bio-ID is a 100% safe and integrated technology that will seamlessly bring about the much desired global family..

For further work, Bio-ID will be adapted and expanded to health sectors and other allied industries.

Figures:

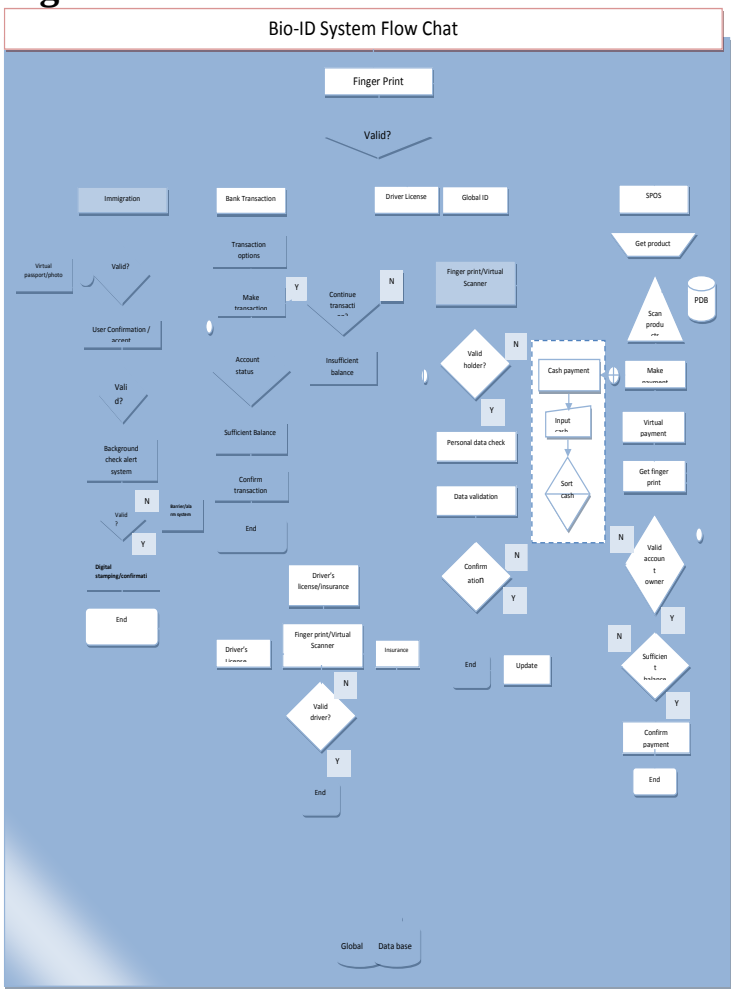

Fig 1: BioID System Flowchart

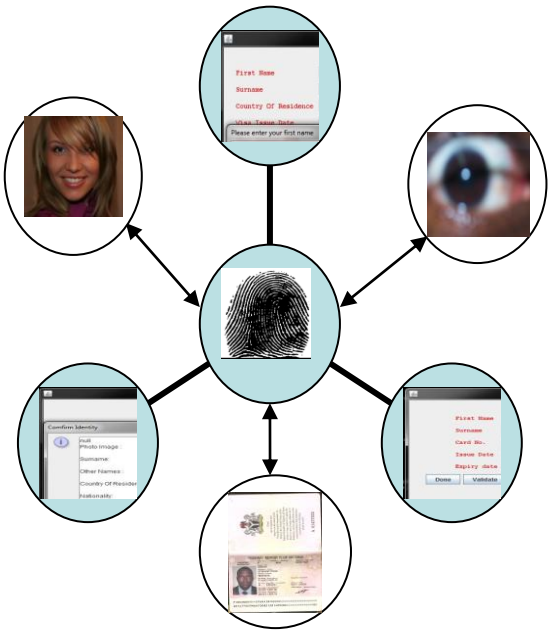

Fig 2: Fingerprint relational cycle.

Fig 3: Bio-ID System components [1-5]

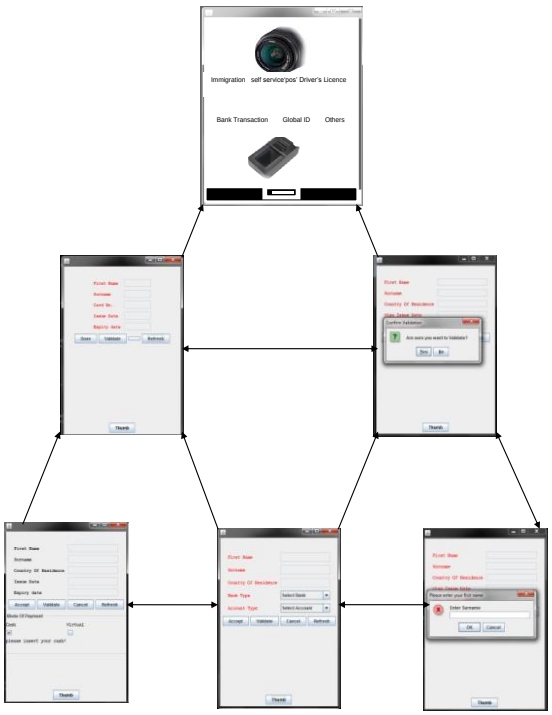

Fig 4: Bio-ID Process Interconnectivity Triangle

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