

ECAI-2015
7th INTERNATIONAL CONFERENCE on ELECTRONICS, COMPUTERS and
ARTIFICIAL INTELLIGENCE



CERTIFICATE OF PARTICIPATION

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We would like to thank you for your attendance and participations

to ECAI – 2015, 7th International Conference on Electronics, Computers and Artificial Intelligence
on
June 25 - June 27 2015, BUCHAREST, ROMANIA

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7th INTERNATIONAL CONFERENCE
on
ELECTRONICS, COMPUTERS
and ARTIFICIAL INTELLIGENCE
ECAI 2015, June 25– June 27, 2015



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PROGRAM

Wednesday, June 24, 2015

Wednesday, June 24, 18:00-20:00, "Welcome room"

ECAI Welcome cocktail

Thursday, June 25, 2015

June 25, 8:00-8:50, conference desk

Registration of the participants

June 25, 9:00-9:40, OFFICIAL OPENING

Aula Magna, keynote room

09:00-09:40 *Welcome and Opening Addresses*

09:00-09:05 Welcome message of Ion Sima, Chair of ECAI 2015

09:05-09:10 Welcome message of Huseyin Padem, President of the Univ. of S-E Europe 'Lumina'

09:10-09:15 Welcome message of Nicu Bizon, Chair of ECAI 2015

09:15-09:20 Welcome message of University of Pitesti

09:20-09:25 Welcome message of Horia-Nicolai (L.) Teodorescu, c.m. - Romanian Academy

09:25-09:30 Welcome message of Franco Maloberti, President Elect 2016-17 of the IEEE CASS

09:30-09:35 Welcome message of Mircea Eremia, chair of the IEEE Romanian section

09:35-09:40 Welcome message of Takeshi Yamakawa, Honorary Chair of the ECAI 2015

09:40-09:45 Sponsors' message

**June 26, 15:30-17:00 , special ECAI session - B,
Young Researchers session
organized with technical support of IEEE-IAS-RO Chapter
room E308**

Chairs: NICU BIZON, MIRONELA PIRNAU

Arva Mihai Cătălin, Nicu Bizon

SOME ASPECTS ON MODELING OF THE SIGNAL AND POWER INTEGRITY IN A PCB
BASED ON WAVEFORM ANALYSIS

Stănică Dorin – Mirel, Şişman George Robert

TRENDS IN COMPUTATIONAL INTELLIGENCE APPLIED IN NUCLEAR ENGINEERING
FOR NON-DESTRUCTIVE EXAMINATION TECHNIQUES

Mironela Pirnau

CONSIDERATIONS ON THE FUNCTIONS AND IMPORTANCE OF A WEB CRAWLER

Ionut Emil Iacob, Alex Apostolou

A QUANTITATIVE RISK ANALYSIS FRAMEWORK FOR BOW-TIE MODELS

Cătălin Lupu, Vasile-Gheorghită Găitan, Valeriu Lupu

FINGERPRINTS USED FOR SECURITY ENHANCEMENT OF ONLINE BANKING
AUTHENTICATION PROCESS

**June 26, 15:30-17.00, 3rd International Workshop on Systems Safety
& Security - IWSSS 2015 - B
room VIP**

Chairs: DAN POPESCU, EMIL PRICOP

Mariam Ibrahim, Jun Chen, Ratnesh Kumar

AN INFORMATION THEORETIC MEASURE FOR SECRECY LOSS IN STOCHASTIC
DISCRETE EVENT SYSTEMS

Jingxuan Wei, Yutaka Matsubara, Hiroaki Takada

HAZOP-BASED SECURITY ANALYSIS FOR EMBEDDED SYSTEMS: CASE STUDY OF
OPEN SOURCE IMMOBILIZER PROTOCOL STACK

Jaouhar Fattahi, Mohamed Mejri

SECRECY BY WITNESS-FUNCTIONS UNDER EQUATIONAL THEORIES

Omar Abdulwahabe Mohamad, Rasha Talal Hameed, Nicolae Țăpuș

SMART HOME SECURITY BASED ON OPTIMAL WIRELESS SENSOR NETWORK
ROUTING PROTOCOLS

Paul Padure, Adela Vintea, Octavian Mihai Ghita

SAFETY MEASURES IN TESTING AIRCRAFT WHEELED PARTS

ECAI 2015, June 25 – June 26, 2015, Timetable and Program

| Date | Time | Session or activity | Location |
|----------------------|------------------------------------|--|---|
| June 24 | 20:30-22:00 | ECAI Welcome cocktail | "R" –restaurant |
| June 25 | 8:00-8:50 | Authors Registration | "CD" - Poster Hall |
| | 9:00-9:40 | ECAI Opening Ceremony | Aula Magna |
| | 9:40-12:10 | ECAI KEYNOTE LECTURES I | Aula Magna |
| | 11:00-11:30 | Coffee break & Brokerage events | Poster Hall |
| | 12:15-12.45 | RT1: ANSYS Electromagnetics – A short tutorial of applications | Room E310 |
| | | RT2: Lifelong Learning Programs in Engineering Education: IWLLPEE'14 | Room E309 |
| | | RT3: Research & Technological Transfer & Business | Room E308 |
| | 12:15-14.00 | Brokerage events | Poster Hall |
| | 14:00-15.30 | Lunch | "R" –restaurant |
| | 15:30-17:00 | ECAI Afternoon sessions | |
| | | Software & Computer Applications - A | Room E210 |
| | | Bio-medical applications | Room VIP |
| | | Workshop WAITS 2015 | Room E310 |
| | | Workshop WRMC 2015 | Room E308 |
| | | Workshop IWAE 2015 | Room E335 |
| | | Workshop IWFEED 2015 | Room E321 |
| | | Workshop WSGPLC 2015 | Room E309 |
| 17:00-17:30 | Coffee break & Brokerage events | Poster Hall | |
| 17:30-19:00 | Concert of Classic Music | Aula Magna | |
| 19:00-21.00 | ECAI Welcome dinner | "R" –restaurant | |
| June 26 | 9:00-9:30 | Authors Registration | "CD" - Poster Hall |
| | 9:30-11:00 | ECAI KEYNOTE LECTURES II | Aula Magna |
| | 11:00-11:30 | Coffee Break & Brokerage events | Poster Hall |
| | 11:30-14:00 | ECAI morning sessions | |
| | | Software & Computer Applications - B | Room E309 |
| | | Electronic Circuits & Equipment – A | Room E310 |
| | | Communication | Room E210 |
| | | Young Researchers session - A | Room E308 |
| | | Workshop IWSSS 2015 - A | Room VIP |
| | | Workshop WWSD 2015 | Room E321 |
| | | Workshop LLPEE | Poster Hall |
| | ECAI Poster sessions | Poster Hall | |
| | 14:00-15:30 | Lunch | "R" – ECAI restaurant |
| | 15:30-17:00 | ECAI Afternoon sessions | |
| | | Software & Computer Applications C | Room E309 |
| | | Electronic Circuits & Equipment - B | Room E310 |
| | | Young Researchers session - B | Room E308 |
| Workshop IWSSS 2015 | | Room VIP | |
| Workshop WOCSC 2015 | | Room E210 | |
| Workshop WALNLF 2015 | | Room E321 | |
| ECAI E-session | | PCs on Poster Hall | |
| ECAI Poster sessions | Poster Hall | | |
| 17:00-17:30 | Coffee Break& Brokerage events | Poster Hall | |
| 17:30-18:00 | ECAI Closing Solemnity | Aula Magna | |
| 18:00-20:00 | ECAI Gala Dinner | "R" –restaurant | |
| 20:00-23:00 | Free time (shopping & sightseeing) | | |
| June 27 | 9:00 – 17:00 | ECAI Trip Participants departure | Departure at 9.00, June 27, from UNIVERSITY OF S-E EUROPE 'Lumina'. Arrival will be at about 17.00, June 27. |
| June 28 | | Participants departure | |

"R" –restaurant inside the UNIVERSITY OF S-E EUROPE 'Lumina'.



"Ștefan cel Mare" University of Suceava, Romania
Faculty of Electrical Engineering and Computer Science



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**IEEE 7th International Conference on Electronics, Computers and Artificial
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București, România, June 25-27, 2015**



Fingerprints used for security enhancement of online banking authentication process

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Contract no. POSDRU/159/1.5/S/138963

Priority Axis 1 – “Education and training in support for growth and development of knowledge based society”

Key area of intervention 1.5 – “Doctoral and post-doctoral programmes in support of research”

Background



- Online banking services have become one of the most important applications on the Internet, being provided by most of the banks all over the world
- The end-user can manage the accounts or make some payments without being forced to go to the physical bank office
- That's why security concerns regarding authentication have to be taken into the account and the bank should provide various and combined methods for login, in order to increase the confidence in their services



- In other words, the bank should provide a multi-factor authentication.
- This paper will present a model for user enrollment and authentication, using three basic methods, based on:
 - ✦ what user knows (a username),
 - ✦ what user has (a digipass) and
 - ✦ an intrinsic characteristic of the user, e.g. a fingerprint.
- Combining these three characteristics will lead to a great security improvement in authentication or order signing



- **Classical methods are based only on the first two characteristics (what user knows and has), without the most habitual one, that cannot be lost or stolen: an intrinsic characteristic of the user, like a fingerprint or an iris.**
- **This paper will also present an application developed during our researches, for user enrollment that can be used in the bank-side environment.**

Introduction



- **The idea of using biometric characteristics for online banking authentication isn't a new one**
- **There are only a few implementations of this concept, especially for testing purposes.**
- **Also, only a few researches have been done in this field, and especially after 2000's**



- **A very interesting paper** (S.S. Hoseini and S. Mohammadi, *“Review banking on biometric in the world’s banks and introducing a biometric model for Iran’s banking system”*, Journal of Basic and Applied Scientific Research, Part III 2(9), September 2012, pp. 9152-9160) **was published in 2012, where the authors are describing their researches in using biometrics for various forms of banking:**
 - ✦ ATMs (1st place - 45% from 121 studied banks),
 - ✦ access control to the bank’s computers (2nd place – 24%),
 - ✦ branch-banking (3rd place, almost equal to access control – 22%),
 - ✦ internet banking (4th place – only 10%),
 - ✦ POS devices (with only 2%)

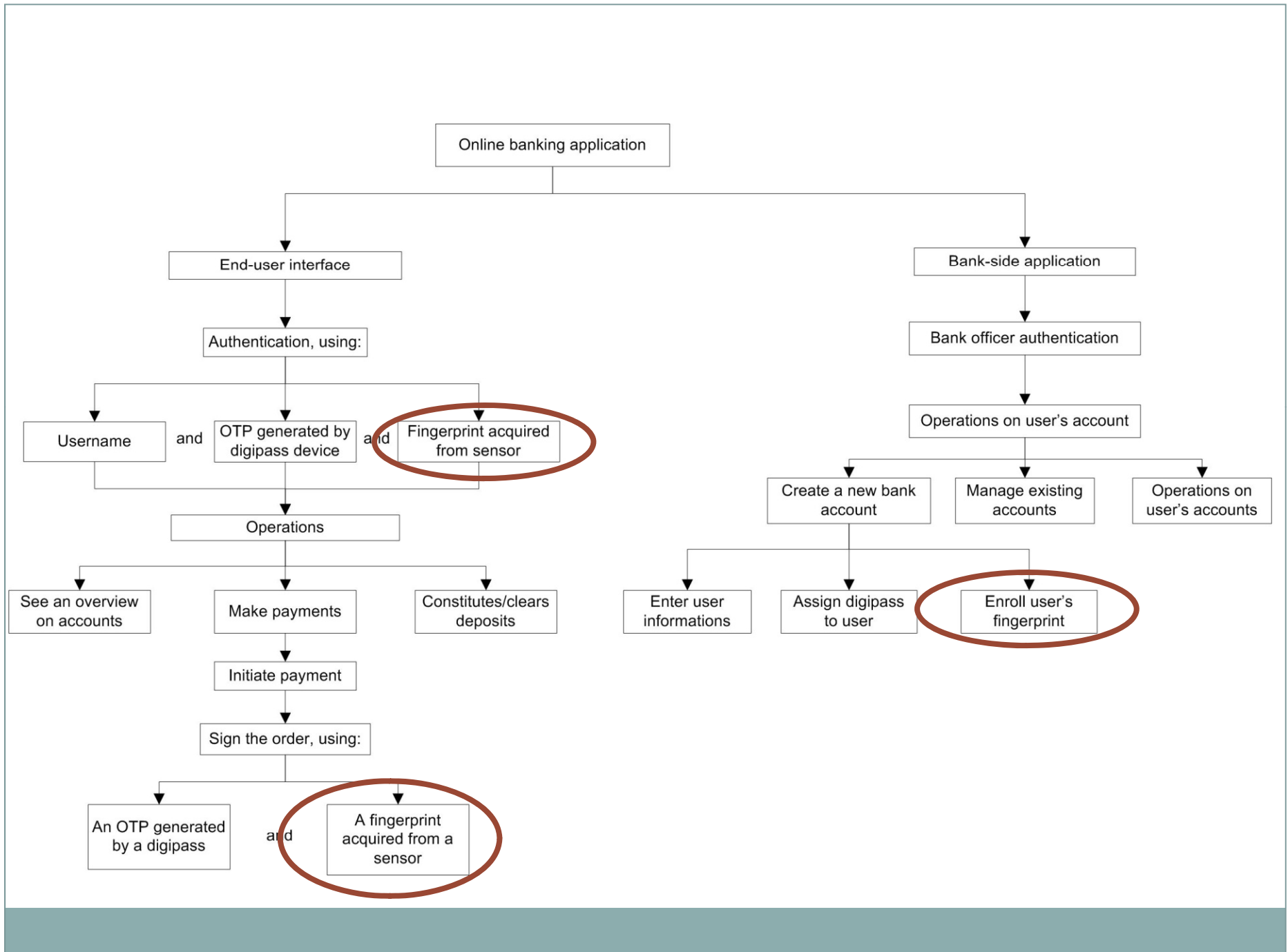


- **Asia is in the front of using biometrics in banking, with a percent of 52%, followed by America (32%) and Europe (9%).**
- **As biometric characteristic, the fingerprints are on the first place (48%), followed by finger vein, voice, hand vein, iris (7.43%) and signature. Other biometrics are under 5% in their researches.**

PROPOSED MODEL FOR ONLINE BANKING APPLICATION



- Online banking application model can be seen from two points of view:
 - ✦ end-user interface and
 - ✦ bank officer application for account management.
- The following picture presents an overview on what we will discuss further.



APPLICATION FOR USER ENROLLMENT



- During our researches, we developed a VB.NET application for initial or further enrollment of a user in an online banking application
- We focused on the development of an application for user enrollment (bank-side software), the authentication part (client-side) being in a developing process.
- The main form of this application is presented in the following picture

Smart bank's fingerprint enrollment system

First attempt



Second attempt



Third attempt



Fourth attempt



Fifth attempt





- We used the Microsoft Fingerprint Sensor, together with GrFinger library from Griaule Biometric's Fingerprint SDK 2009
- We used the Griaule FingerCap USB driver 2.1, provided by the same company, because the original sensor's software doesn't have a SDK that can be used for application development.
- From the GrFinger library, we used only the functions for initializing fingerprint sensor and for acquiring RAW fingerprint images.

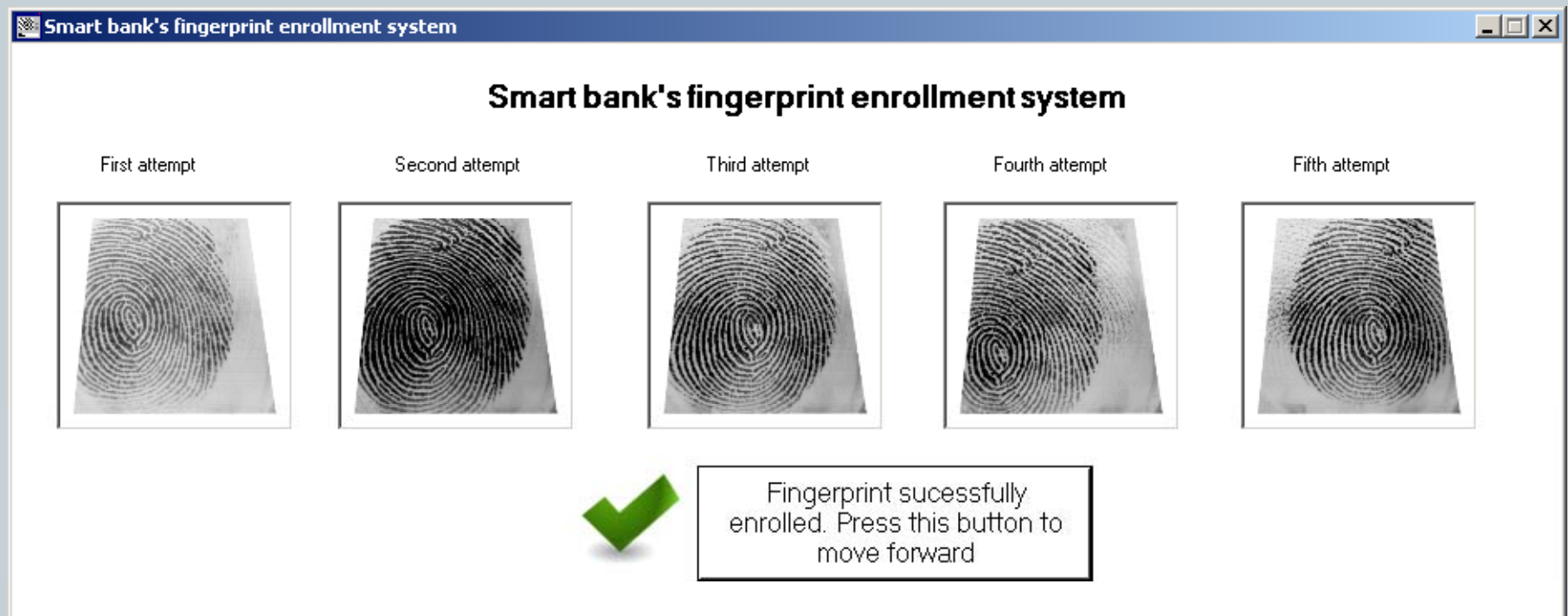


- The main idea is that five impressions of the same fingerprint are taken, each acquired image being compared with the ones already introduced.
- When capturing the fingerprint we decide if it is suitable for personal recognition or not.
- If the fingerprint is rejected, then the user has to repeat the current attempt until an acceptable fingerprint is acquired.



- After the second fingerprint, all further images are compared against the already acquired images, and if the match score is above a threshold established into the software, then the fingerprint is accepted, otherwise it is rejected and the user has to reintroduce it.
- After all fingerprints have been acquired, in compliance with the conditions described above, the enrollment process finishes and the user can use his credentials in order to login to the internet banking application.

- The final page, after successful enrollment, is presented in the following picture.





- **This software can be used both for initial enrollment or further registration, in the following cases:**
 - ✦ (i) the user has only a username and a password and needs a fingerprint to be registered for security enhancement;
 - ✦ (ii) because of a physical impairment that occurs after initial enrollment, the user can provide another fingerprint than the one registered in the system

Conclusions and future researches



- The main problem with actual authentication methods is that they are using only credentials that can be stolen or lost.
- Using a characteristic that a user always possesses (like a fingerprint), together with actual methods, will lead to a security enhancement, being suitable even for the most suspicious and reticent users.



- **The main target in future research is to develop an application that is sensor-independent and that can be used on various devices, not only on desktop or notebook computers.**
- **Also, the designed application must be operating system-independent, being suitable to be used on Linux, Android, iOS or others, not only on Microsoft Windows environment. That's why in the following versions, JAVA environment will be used.**



- Many researches can be done in raising the security level, especially regarding template transfer to the bank's server or predicting spoofing attack that can occur in using fingerprints.
- Many biometrics can be taken into account, like iris or face recognition, but keeping the implementation price as low as possible (for example a basic iris scanner costs around \$100, while the fingerprint sensor presented above is as low as \$30).



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**Thank you for
your attention !!!**

Questions ?