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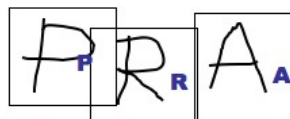
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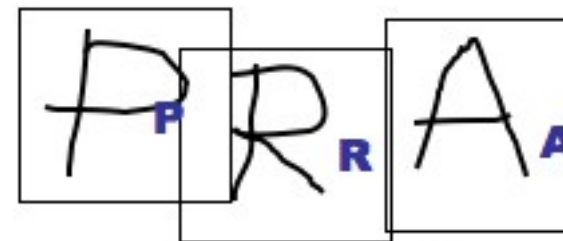
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Pattern Recognition and Applications Group
University of Cagliari



PRA Group

Pattern Recognition and Applications Group

University of Cagliari

Department of Electrical and Electronic Engineering

Pattern Recognition
Biometric Authentication
Computer Network Security
Text Categorization
Image Data Bases
Remote Sensing



Dipartimento di
Ingegneria Elettrica
ed Elettronica



Università degli
Studi di Cagliari



**SARDEGNA
RICERCHE**

Pattern Recognition and Applications Group

There is nothing more practical than a good theory

Kurt Lewin

MISSION

to develop **next generation pattern recognition systems** for real applications in **ambient and computer security**

to address **fundamental issues** for the development of **future pattern recognition systems**, in the context of real applications

APPLICATION TARGET

Ambient and Computer Security

Security is often a matter of **“fast” pattern**

on: recognizing friends&foes, detecting anomaly or

THEORETICAL ISSUES

Engineering design of pattern classification systems

Multiple classifier systems

Adversarial pattern classification

APPLICATIONS

Personal identity verification using **biometrics**

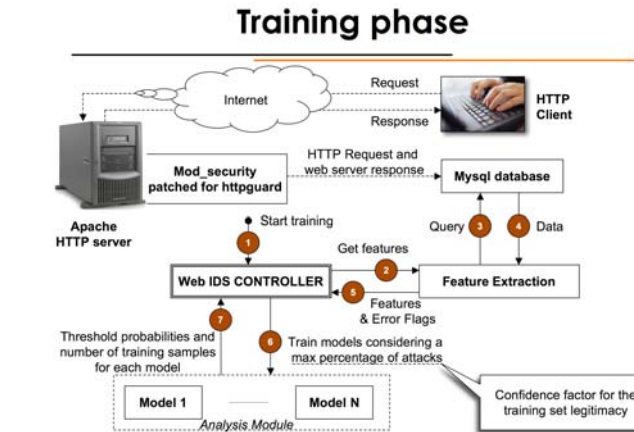
Biometric **video surveillance**

Intrusion detection in computer networks

Spam filtering

Multimedia document categorization and retrieval

HTTPGuard an anomaly-based Intrusion Detection System



HTTPGuard is an anomaly-based Intrusion Detection System designed to detect attacks against the Apache web server.

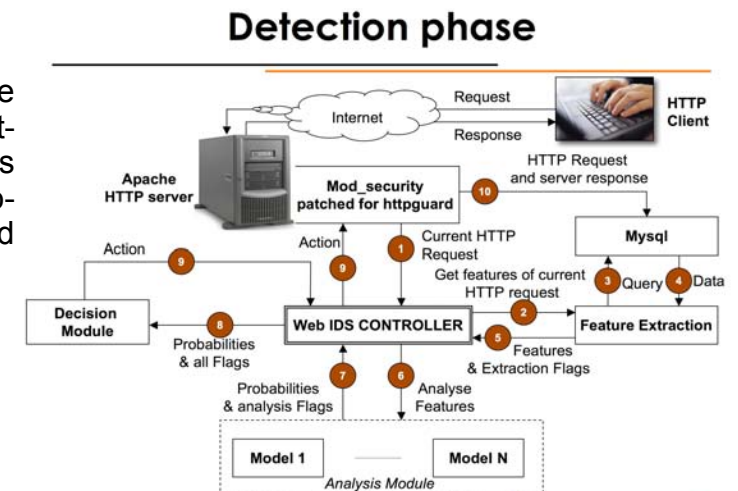
In particular, it is designed to protect web site whose content resides on a database that is queried by an application layer.

HTTPGuard is based on a customised version of ModSecurity that provides for the extraction of the HTTP requests to the web server.

These requests are analysed by a number of modules developed by the PRA Group to detect anomalous requests.

These modules are automatically tuned on the specific content of the protected web site, to avoid the production of large volumes of false alarms.

The system is able to detect known attacks as well as novel attacks tailored to the protected web server.



Anti SPAM Technologies

The word "Spam" is always used as a synonym of "unsolicited commercial message"

Architecture of an Anti SPAM filter

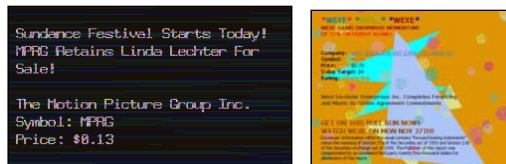
An anti-spam filter is made up of a number of different modules, where each module is designed to recognise a particular type of 'trick' used to evade filters. Each module outputs a score, and the scores are combined (e.g., by a sum), so that messages whose score is higher than a prefixed threshold are filtered out.

Image Spam

Recently, spammers began embedding their messages in images attached to emails, so that traditional filters are evaded. These kind of modules developed by the PRA Group are aimed at analysing text message embedded ("hidden") in images attached to emails. Text categorization techniques are used to recognise spam messages.

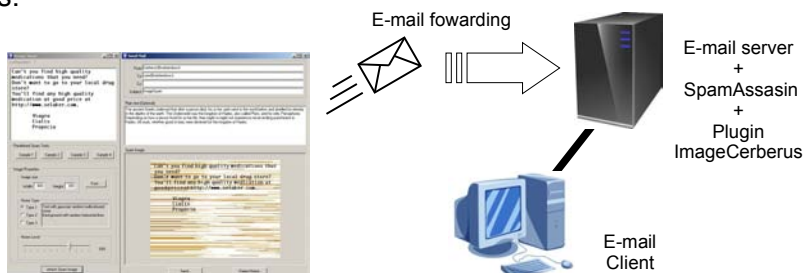
This tool **BayesOCR** is available as a plug-in for SpamAssassin.

New Problem: this tool actually recognises text over a regular background. Spammers are trying to evade OCR by using dark or low contrast backgrounds.



To solve the new problem of obscured image the PRA Group developed the following tools:

- **ImageSpam:** a generator of artificial ImageSpam, to evaluate in a supervised environment the performance of anti-spam softwares
- **ImageCerberus** (Obscured ImageSpam Classifier): available as a plugin for SpamAssassin, allows detecting spam embedded in images with dark backgrounds. ImageSpamGen is a generator of new image-spam messages, that allows assessing the performances of new anti-spam techniques.



ImageSpam:
artificial ImageSpam

<http://prag.diee.unica.it/amilab/?q=video/imagespam>

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PRODUCTS

Biometrics for ambient intelligence and computer security based on **face and fingerprints**.

Adaptive biometric systems

Fake fingerprint vitality detection

Anomaly-based **Network Intrusion Detection** Systems.

HTTP-guard - Web based Intrusion Protection System

Anti-spam software.

Multimedia document **categorization** for web-page and spam filtering

Content Based Image retrieval systems

Part of these products are made in collaboration with Sardegna DistrICT – Sardegna Ricerche.

PRA team has a 12 years experience

PRA researches are published in international conferences and journals

2007 PRA budget is around 700 KEuros

Image Hunter

A new tool for content based image retrieval with relevance feedback has been developed

Image searching engines

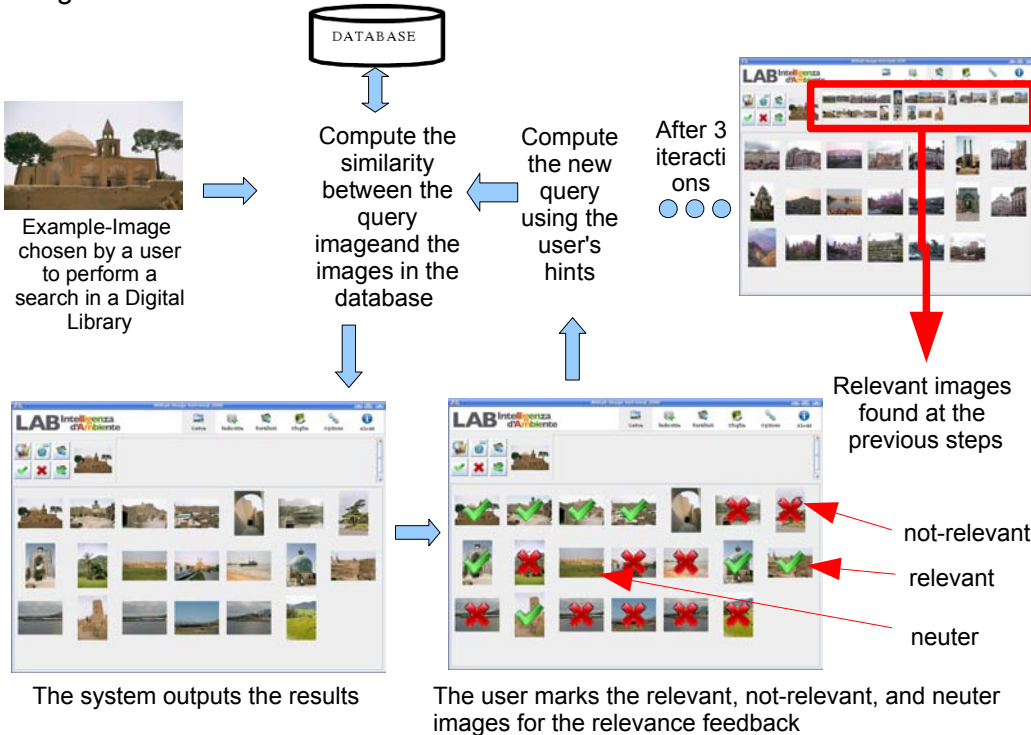
Nowadays the researches on image databases are performed by the means of keywords (for example as Google does).

Results achieved

At present a software that queries an image database by means of Content Based Image Retrieval and Relevance Feedback have been developed.

Content Based Image Retrieval and Relevance Feedback

Content-based image retrieval techniques aim at retrieving images from Digital Library by looking at the visual content of images. Low-level features such as colour, texture, edges, etc. are extracted, and the similarity between images is computed as a function of such features. As similarity of low-level features is typically loosely related with the concept of similarity of the user, relevance feedback is used to refine the search. In relevance feedback, the user marks images as being relevant or not to the search, and this information is exploited by the system to drive the search towards the images of interest to the user.

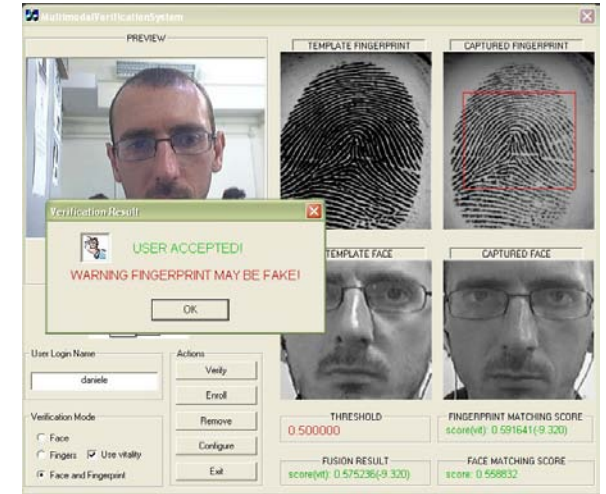


<http://prag.diee.unica.it/amilab/?q=video/imagehunter>

Ambient Security

Security

A new challenge is emerging to devise *intelligent* ambient security system. This need is driven by the need of security of our society, aimed at providing a security environment both for individuals, and for public places (e.g., stadiums, embassies, etc.)



Biometry

There is an increasing interest in techniques and technologies that can be used to improve the quality of living and the security in buildings and private houses, especially those where elders and disabled persons live. The PRA Group has developed a number of tools for assessing the identity of persons by using biometrics such as fingerprints and faces.



These techniques can be used in synergy with distributed video-surveillance sensors not only to improve the level of security, but also to customise the behaviour of intelligent ambient.

<http://prag.diee.unica.it/amilab/?q=video/multimodalverificationtool>
<http://prag.diee.unica.it/amilab/?q=video/intelligentfacelogger>
<http://prag.diee.unica.it/amilab/?q=video/ebgmverification>
<http://prag.diee.unica.it/amilab/?q=video/video/ebgmrecognition>