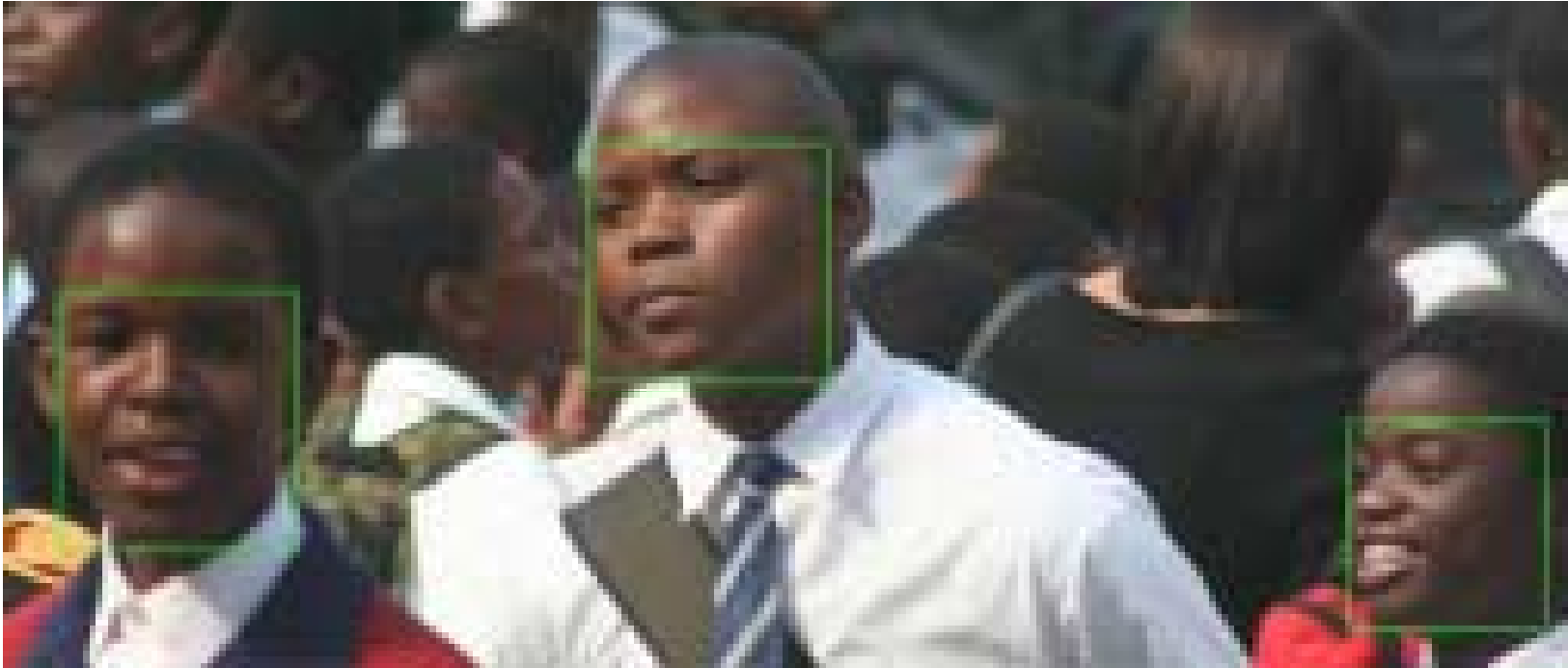


Facial ID

Identification of problem gamblers



Presented by *Barry T. Fryer Dudley*

(MBA {IT}; MSc {Image Analysis})

"..any sufficiently advanced technology is indistinguishable from magic." Arthur C. Clark



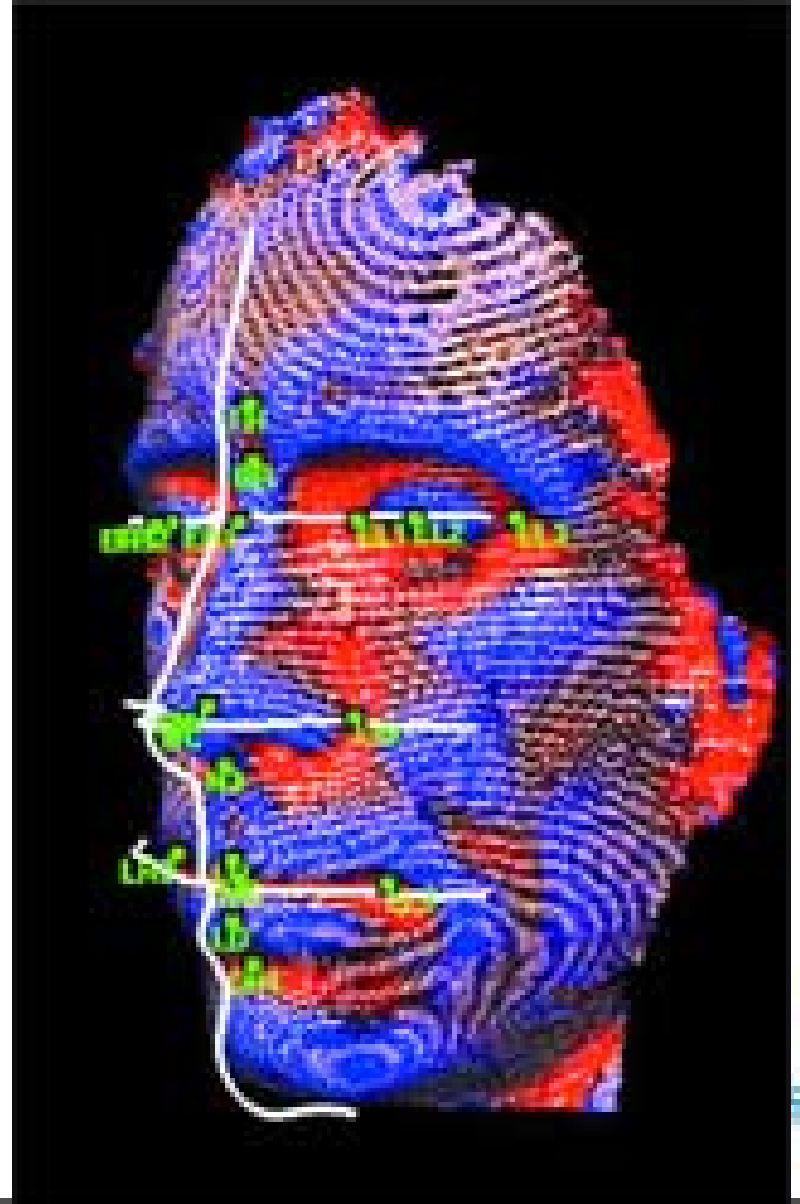
INTEGRATED • INTELLIGENT • IMAGING

I-CUBE

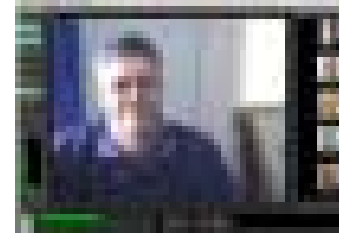


Requirement:

To provide advanced
3D Facial ID (FRS)
technology to
automatically ID
known problem
gamblers on
entrance at a single
site in SA



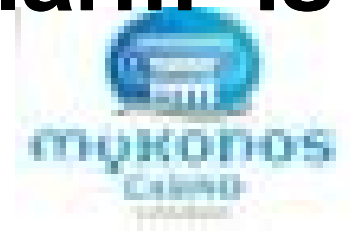
Solution:



Single camera placed at the metal detector, capturing images of all who enter the casino.

The facial software compares all those entering with a database of known gamblers. Comparison takes 700 ms.

When a match is found, an alarm is generated in the control room.



Solution: Neural networks

Operating in real time, are being utilised extensively world wide.

I-CUBE uses NEURAL NETWORKS to illustrate the concept to identify and track suspected vehicles and people.

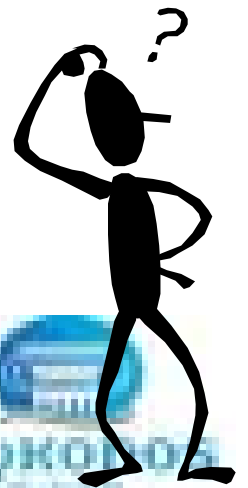
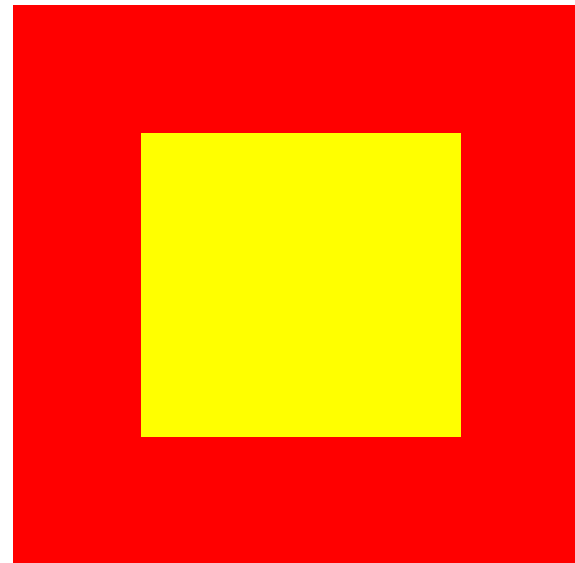
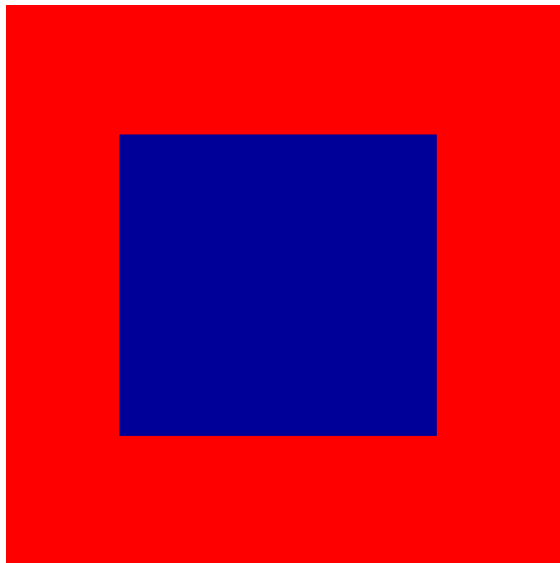
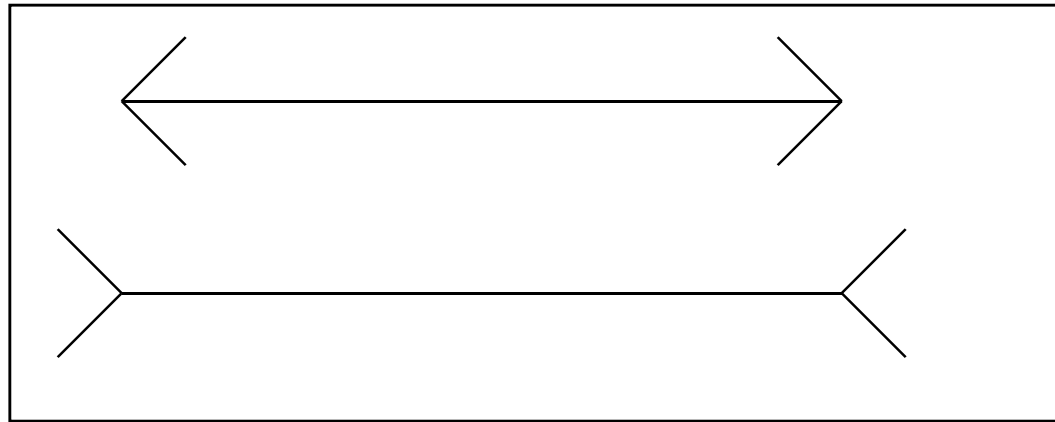
The ability to automatically predict and identify vehicles or people involved in theft or wrongful unitization of resources greatly empowers Sun Coast.



A Word About Our Eyes

- ! Eyes are very good contrast adjusters, but not good for distinguishing subtle variations in color
- ! Eyes can discern about 30 continuous levels of gray or color in a field of view
- ! Eyes are not good judges of distance
- ! Eyes cannot accurately reproduce measurements
- ! Eyes can not work in the dark or 24/7

SAME SIZE???



Why do Image Analysis?

- ! Improved Precision
/Accuracy in Measurements
- ! Reproducibility of Results
- ! Higher Throughput than
Manual Methods
- ! Better Definition of
Contrasting Areas
- ! More Measurements / Faster
- ! Real Time Link to Databases

Vehicle:

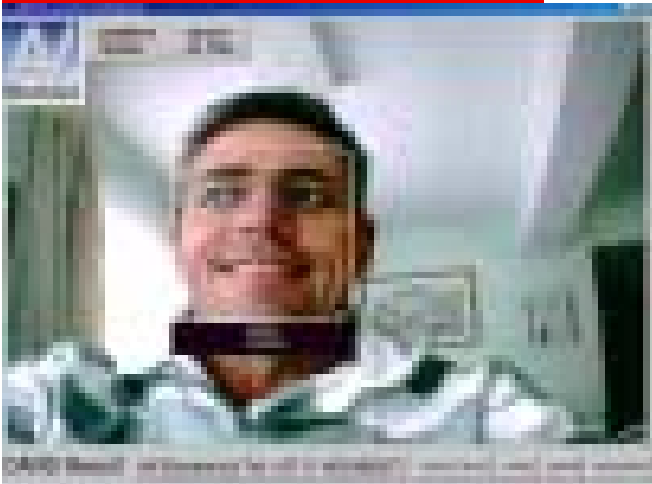
- Size
- Colour
- Shape
- Texture
- Grey level



Facial Recognition

What is facial recognition?

- ! **Face recognition is a non-intrusive, biometric method of matching a given face to a database of faces.**
- ! **Can be used to ID a known suspect against a previously stored template or image (s)**



WHY FACIAL?

Casino Exclusion Technique Exploration

- Framework Development

80%

B. T. DUDLEY MSc (Image Analysis, UNP, Cum Laude)

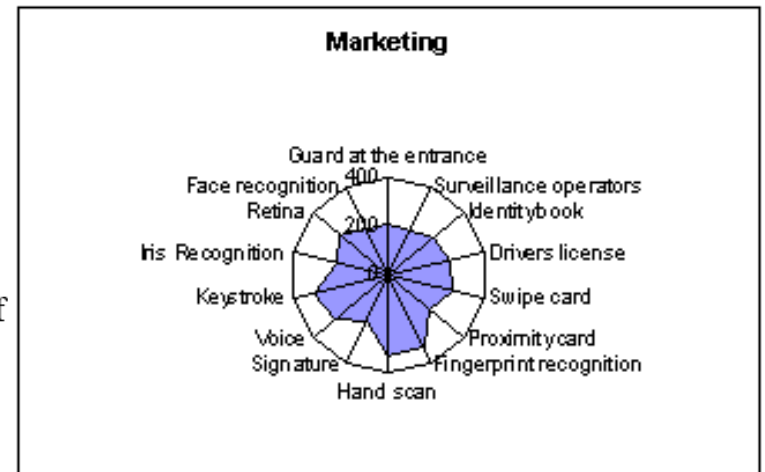
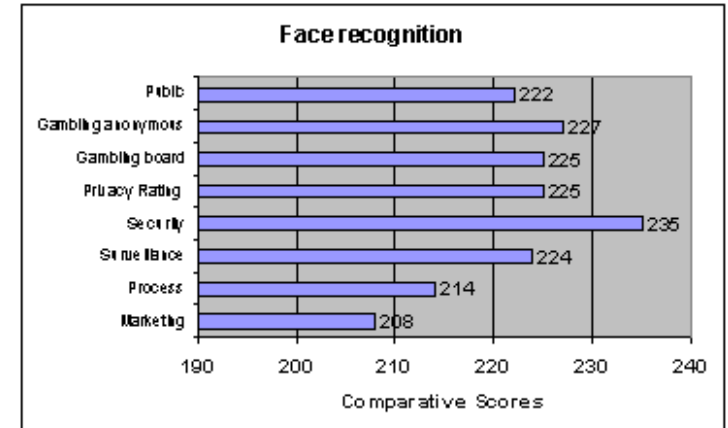
882207268

Submitted in partial fulfilment of the academic requirements for the degree of

MASTERS IN BUSINESS ADMINISTRATION

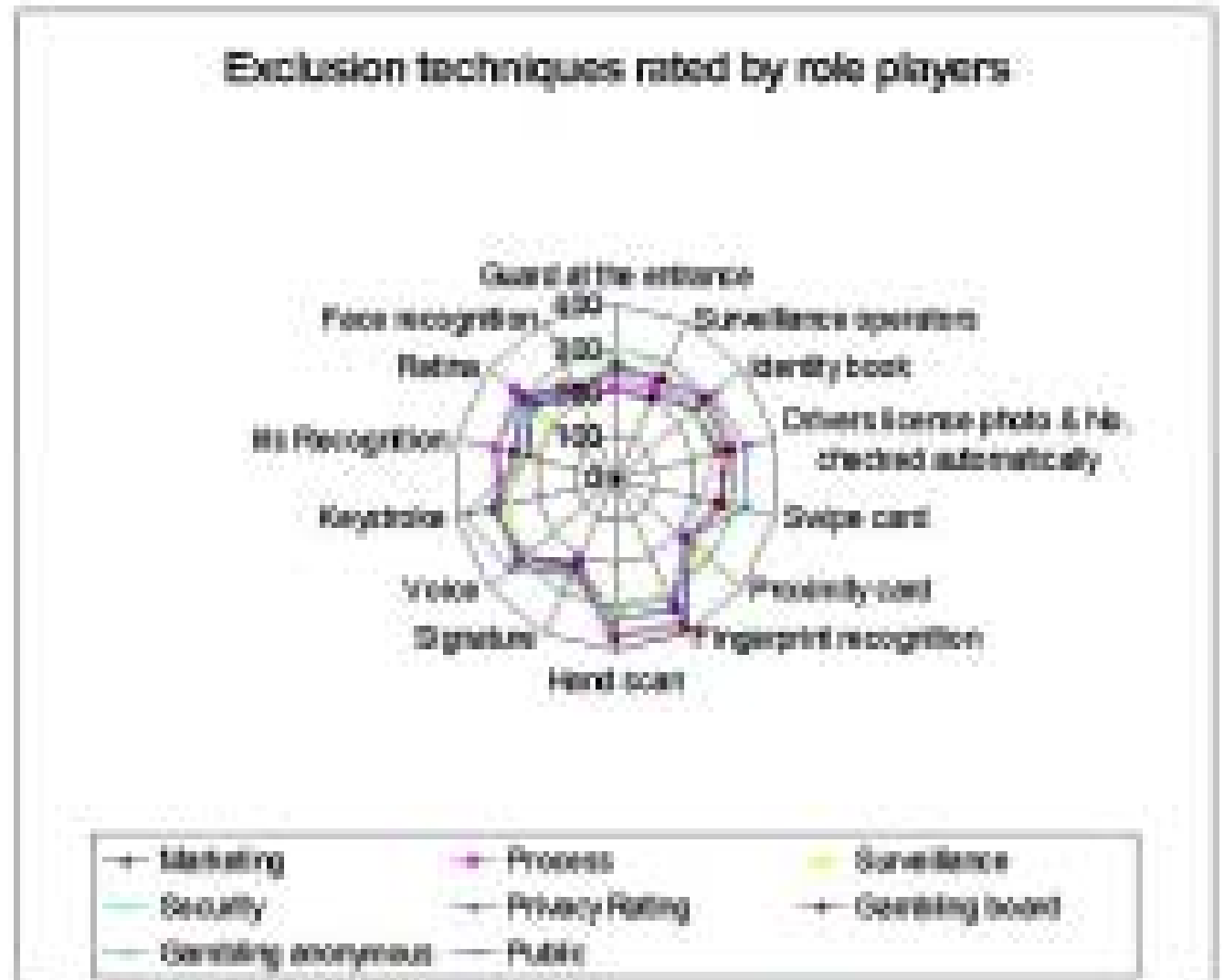
Graduate School of Business, Faculty of Management

University of Natal (Durban)



Obtain MBA dissertation for more details:

TO OBTAIN A COPY:
Send an e-mail to:
I-Cbe@I-Cube.co.za
A 2 MB file will be sent to your e-mail address



Reduction in Error Rates

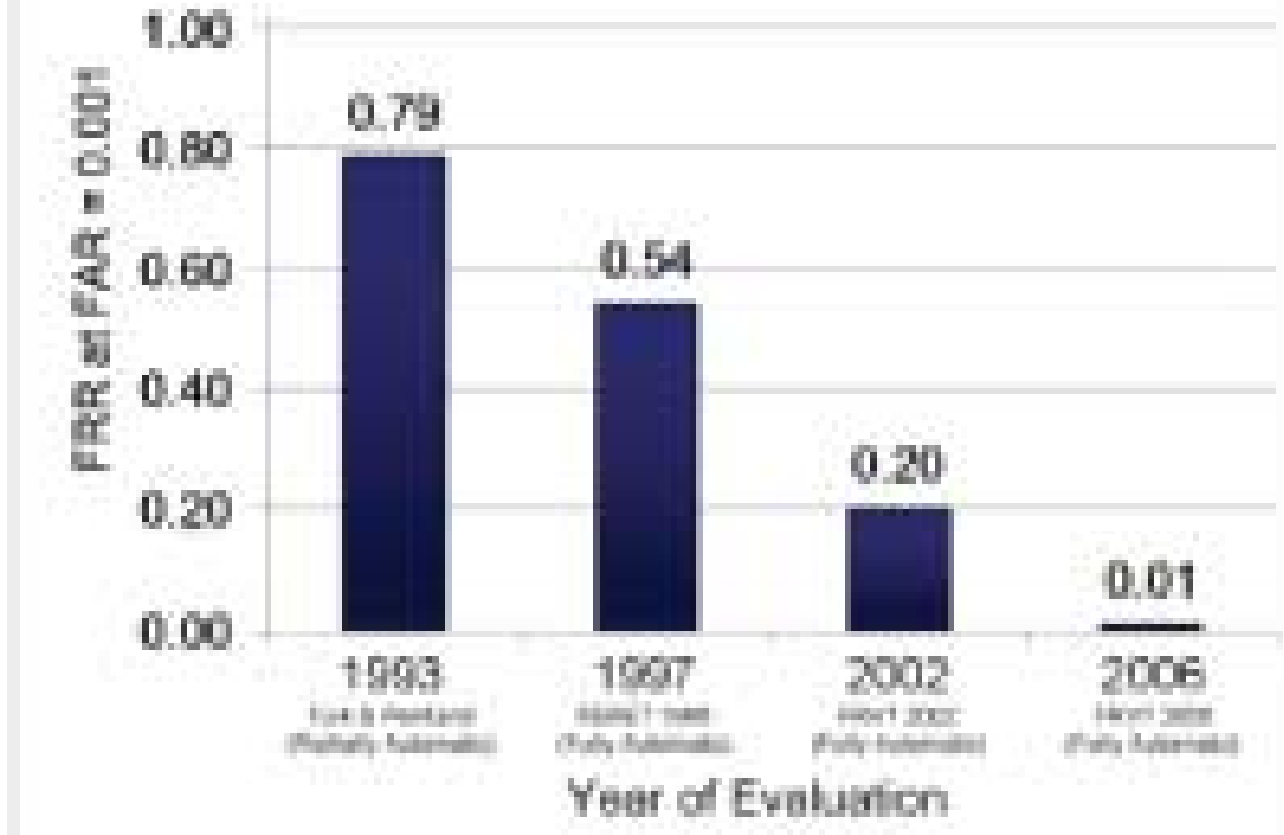


Figure 1. THE REDUCTION IN ERROR RATE FOR STATE-OF-THE-ART FACE RECOGNITION ALGORITHMS AS DOCUMENTED THROUGH THE FERET, THE FRVT 2002, AND THE FRVT 2006 EVALUATIONS.



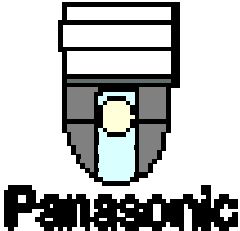


FRS

Facial Recognition System



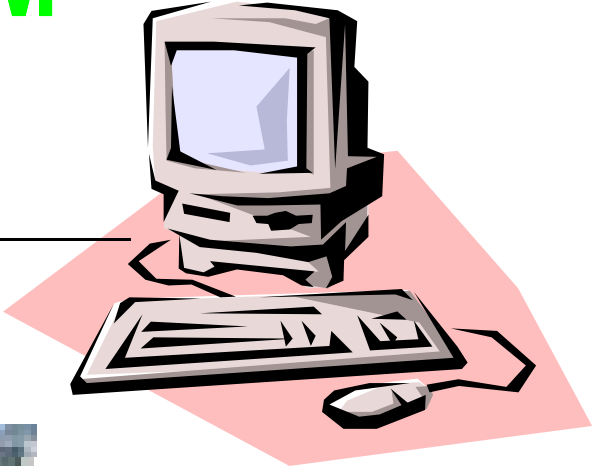
Facial SYSTEM



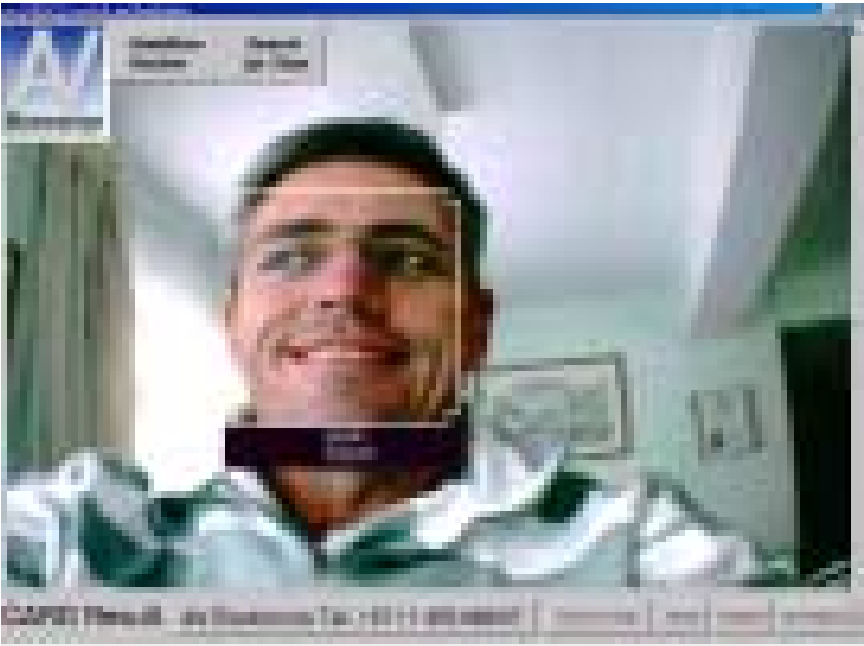
1 Camera (CCTV / or IP)



Frame Grabber



PC Station



FACIAL Software



Facial Recognition

Equipment required:

ITEM	DETAIL	No. Provided
Face Recognition SERVER	Ability to add facial images and personal details, create multiple Databases, view closest matches	1
Recognition CLIENTS	Ability to capture from a VIDEO FOR WINDOWS source and	1 - many
Frame Grabber	Video capture device linked to cameras	1 - many
PC	<ul style="list-style-type: none"> • Microsoft® Windows® VISTA Professional • 1.8 GHz Pentium 4 DUO Processor • 2 GB RAM • 100 GB HDD 	1 - many
Monitor	19" flat screen	1 - many
Key & M	Wireless Keyboard & Mouse	1 - many
Cables	BNC to RCA cable	1 - many
UPS	2 Hr standby	1 - many



FRS - 5 easy steps:

1 – ID no



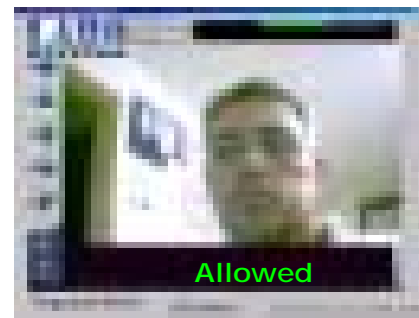
3 – ID



2 – Find face



4 – If below set match value, log and ALARM, if above set value, can depart and log for review



5 – Report



Facial ID

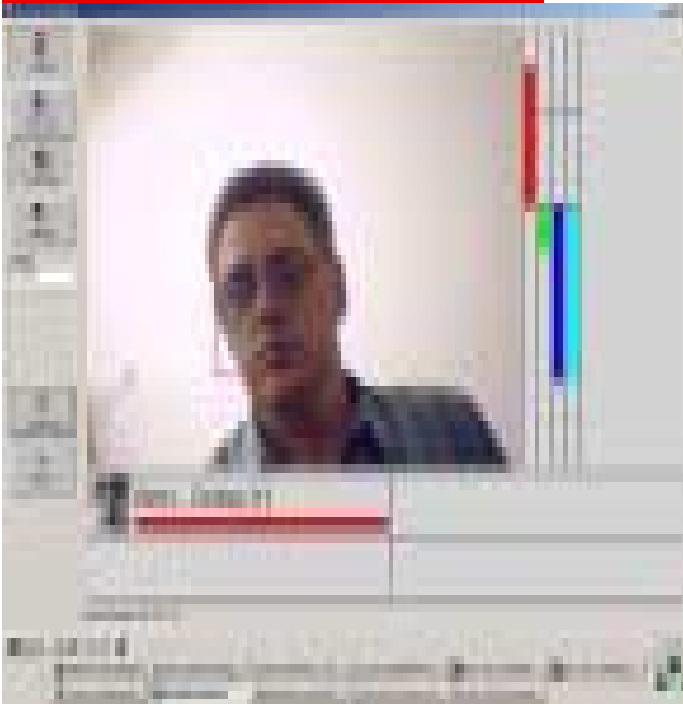


Facial Recognition

Tracking

In order to make face recognition non-intrusive and flexible, the Facial system automatically locates and follows any human face that is within the camera's field of view.

This allows the individual to act in a natural manner with freedom of movement and locomotion, and minimal cooperation with the system.



Facial Recognition

3D System

While operating in Track mode, the facial software will locate any human face within the video frame, place a Tracking Box around the face and follow the face within the frame.



Facial Recognition

3D System – What does it look like to the person using the system?

- ! The display area will show the image forwarded by the DVR and will scan the image and look for facial features and will track onto the faces
- ! The system, once it has tracked onto a face – illustrated by the markings around the face- will then compare the algorithm derives from the image with the database of people enrolled and will look for a match
- ! The match can be identified through a voice module or on the screen or can be output to another device or system

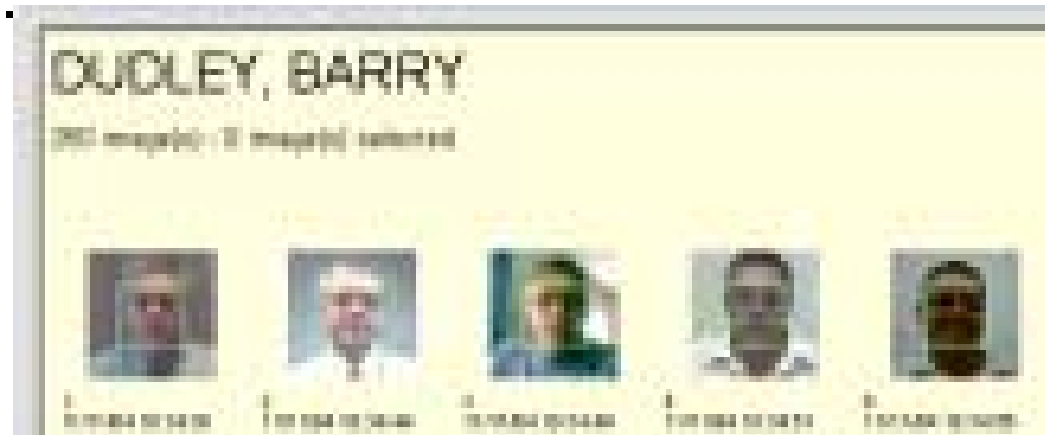


Facial Recognition

3D System – What does this do?

The solution allows for: -

- Image capture of the person from a high resolution colour camera;
- Face finding within the image;
- Searching database and display of results;
- Entry of images/ details not in the database;
- Compilation of image database per individual that includes multiple perspectives, expressions and head placements
- Automatic assessment of people being scanned.



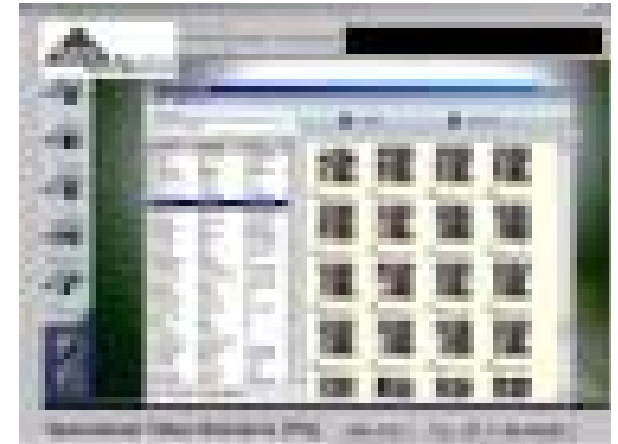
Facial Recognition

3D System – What does this do?



Enrolment procedures and options: -

- Pre-register users from current databases of employee information and images
- Where a person has not been re-enrolled, get them to look at a live camera to enroll.
- FRS will ask you to provide a wide range of different expressions and facial sizes
- When the person is next seen FRS system will update again



Facial Recognition

3D System – Intelligence

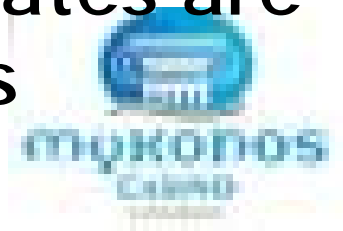
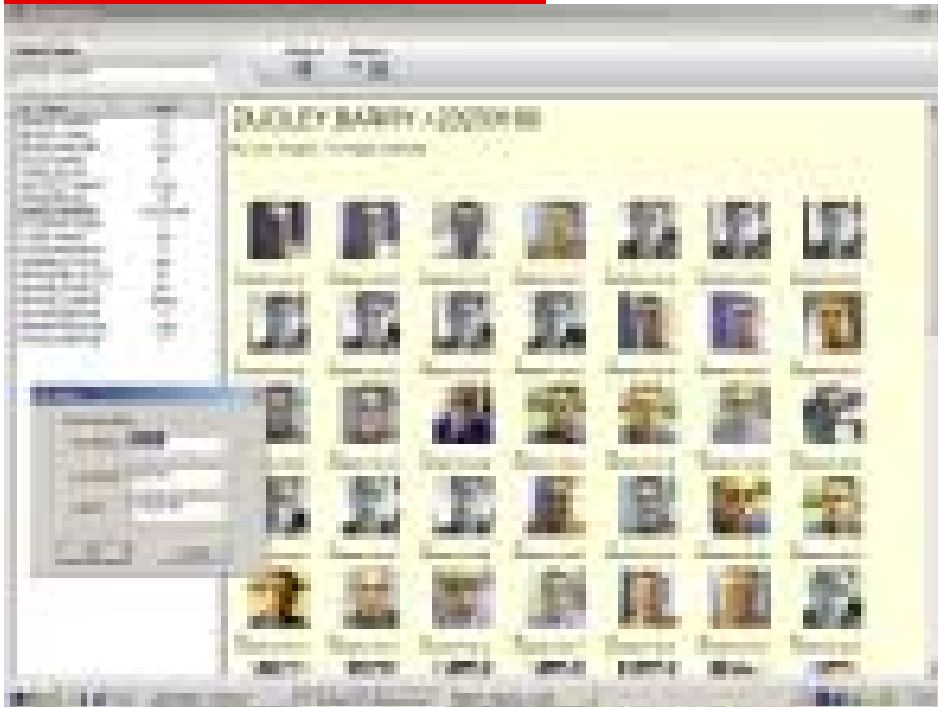
The proposed FRS learns, remembers and recognises, becoming more familiar with your face each time it sees you, adjusting for difference due to aging and cosmetics.



Facial Recognition

Training

Biometric templates are continuously updated through a process referred to as "Training" using facial images captured during enrollment operations or during subsequent verify operations. This ensures that the biometric templates are as up-to-date as possible.



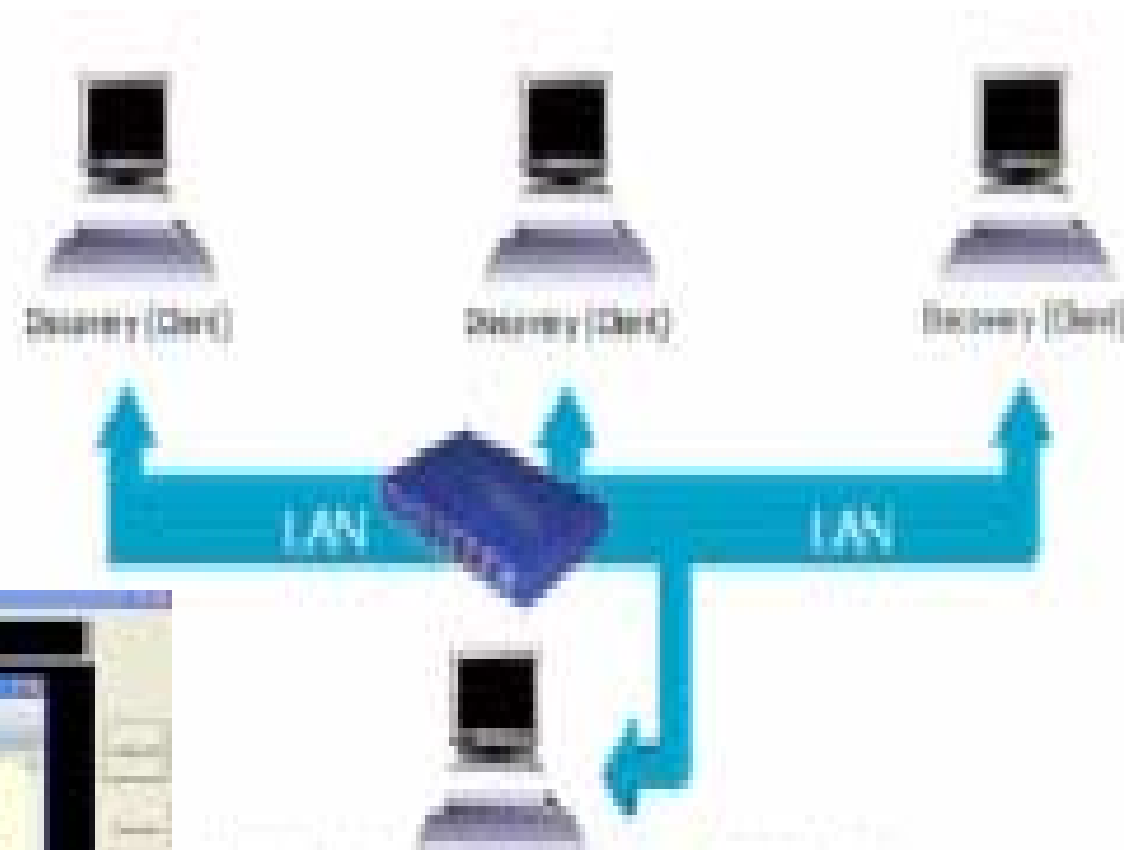
! The Facial system is based upon a two-tier client/server architecture. The system consists of a single Discovery Server application either running as a standalone application, or connected to one or more Discovery Client applications. All FRS data pertaining to images and biometric templates are stored centrally on the Discovery Server and facial recognition operations may be performed on either Server or Client machines.



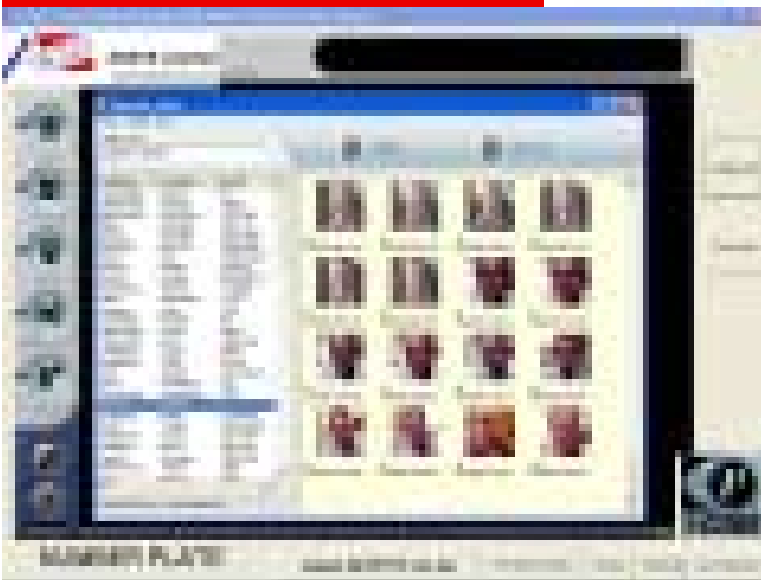
Facial Recognition

3D System – How does this get connected?

FRS Network (multiple clients, one server): -



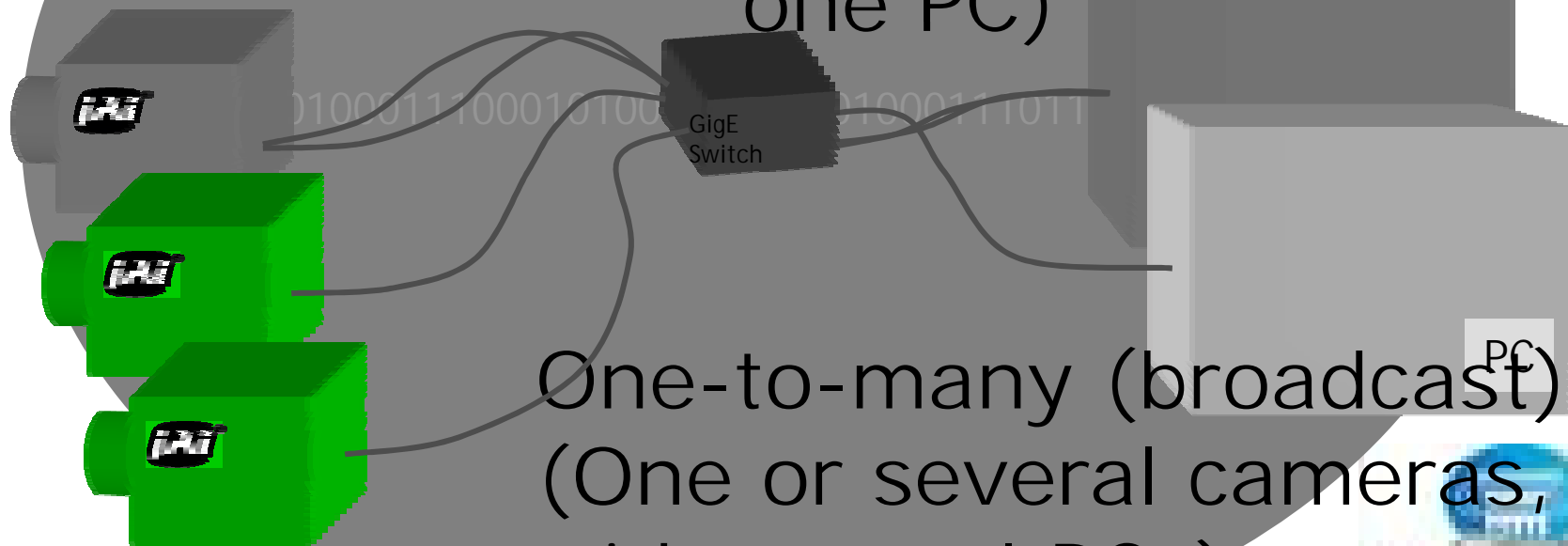
Desktop (Client) in FRS Central Server / Training Server



Possible system configurations

Point-to-point
(One camera, one PC)

Many-to-one
(Multiple cameras,
one PC)

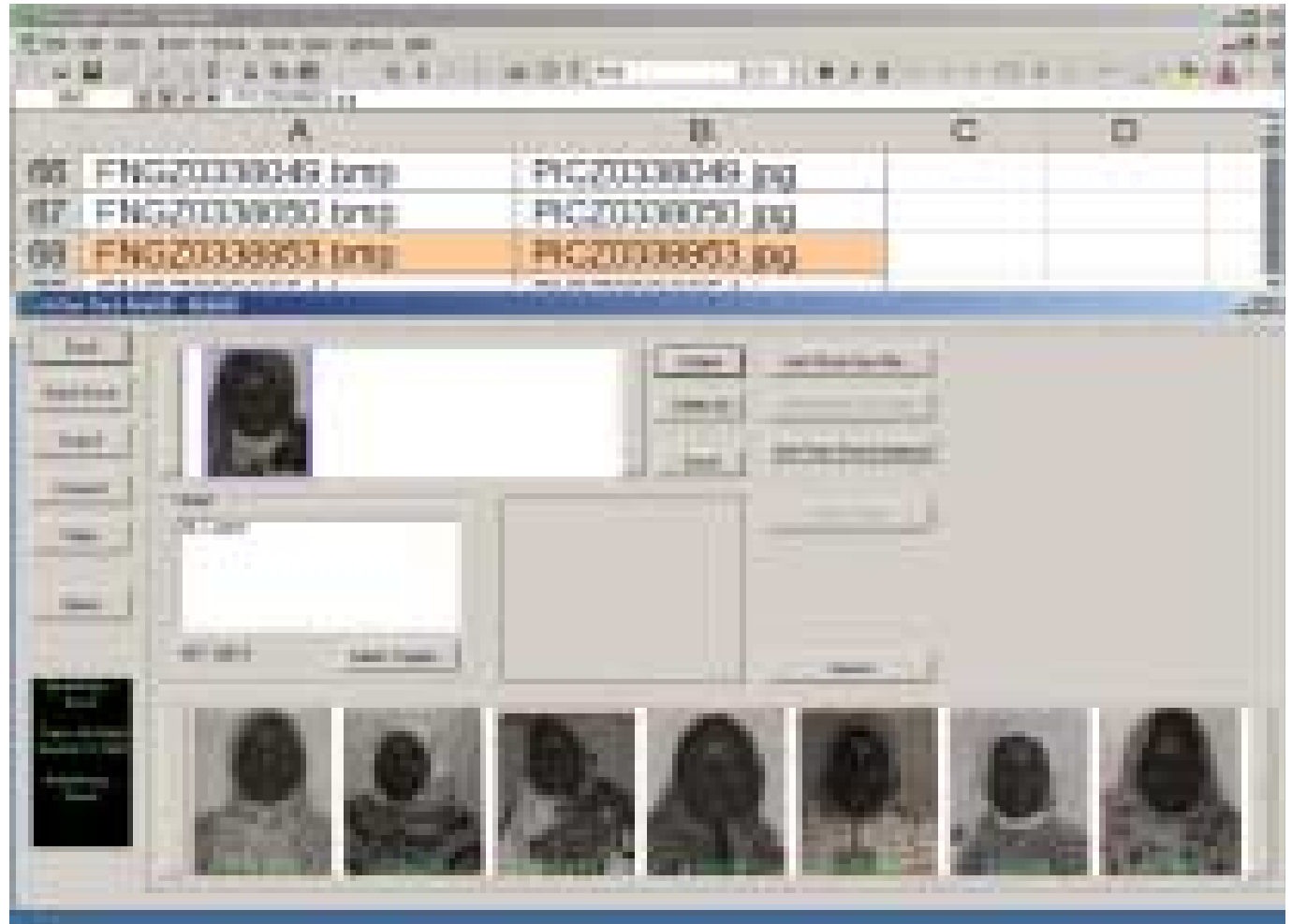


One-to-many (broadcast)
(One or several cameras,
with several PCs)

Facial Recognition

3D System – Speed

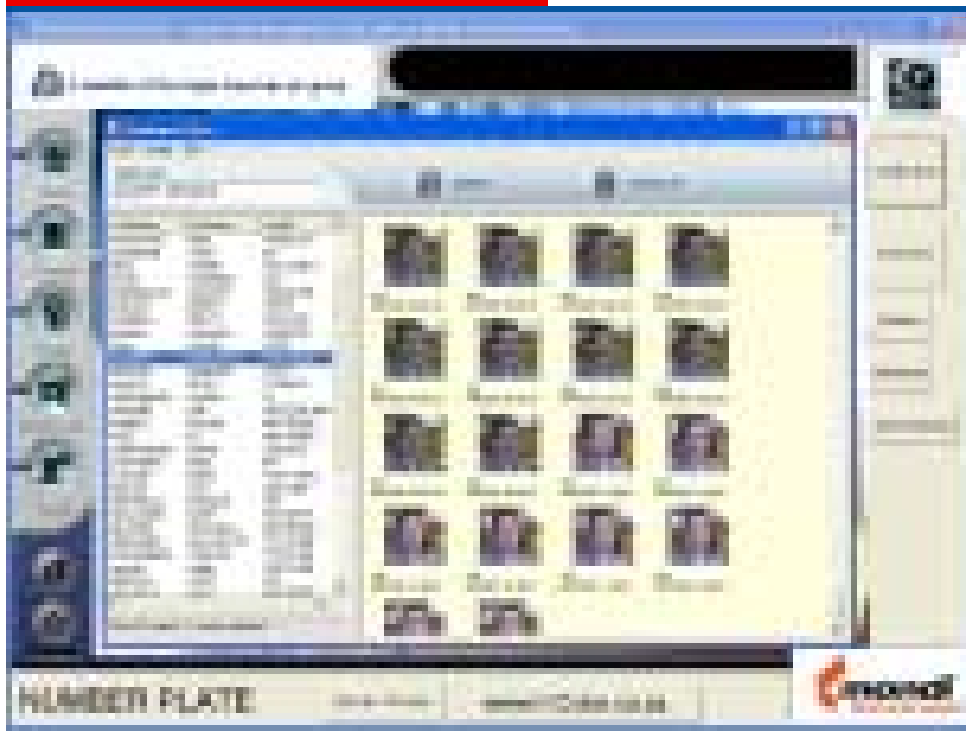
Using a revolutionary core technology HNet, based on neural networks, I-CUBE facial recognition delivers cutting-edge security and split-second processing times.



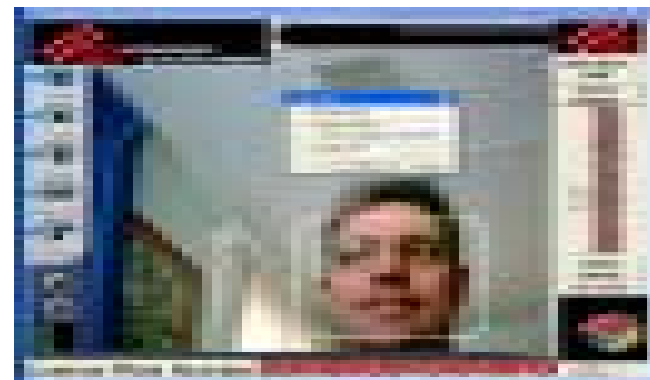
Facial Recognition

Enrollment

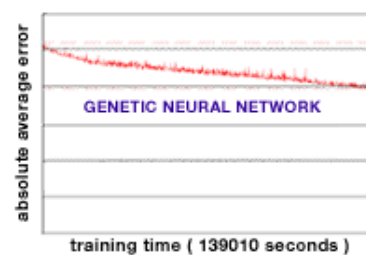
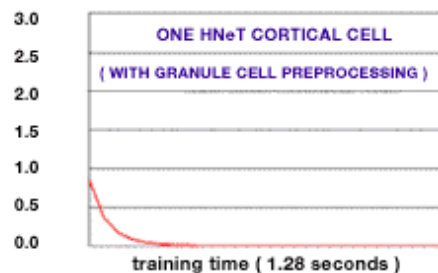
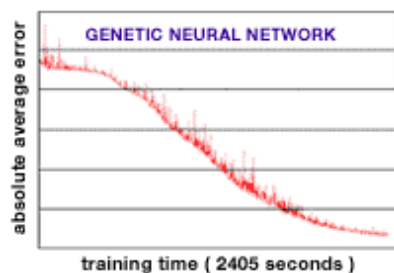
Enrollment is the capturing and storing of facial images of the user, in order to generate the facial biometric template. The greater the volume and quality of the enrollment images, the faster and more reliably the system will recognize the user during subsequent verify or classify operations.



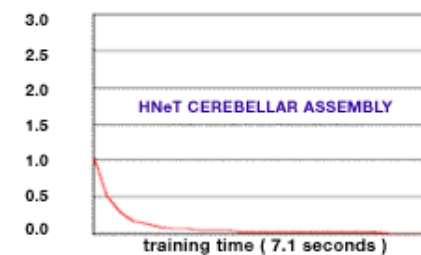
Unique differentiation



- 3D & HNet (Holographic quantum neural technology) automatic continuous learning
- Adjusting for difference due to aging and cosmetics without increasing the size of the biometric template



The Monte Carlo Test



Facial Recognition

System – LOG of all
FACES which
appear in front of
any camera
connected to the
software.



Other problems solved: ID of staff

Templates Used: 0

Click to change Eye position

Image Quality Data	
Face bounding	0.0
Face quality	0.0
Head size	0.0
Orientation	18.0
Yaw	18.0
Roll	0.0
Pitch	0.0
Eye distance	-1.0
Eye glare	-1.0

Current Record Image

Compare Records | Record Operations | Database Operations

SA 47960	Test Image	SA 47960	Sarah Tull	SA 44908	SA David

Other problems solved:

PRINT EDITION

MAKE THIS YOUR HOMEPAGE

SUBSCRIBE TO THE PAPER

Sunday Times

News | Sunday's Paper | Celeb Zone | Entertainment | Sport | Columnists | Business | Careers | Property

Home | Of Interest | Motoring | Special Reports | Document Vault |

Security to be boosted after casino violence

15 April 2007

Teneshia Naidoo

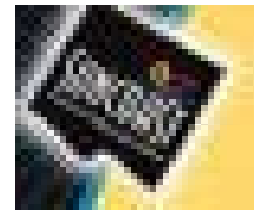
Durban's popular Suncoast Casino has promised to beef up security following a wave of crime and violence over the Easter weekend.

Suncoast marketing manager Robbie Naidoo said the casino was taking increased violence on its premises very seriously and planned to improve security to guarantee the safety of its patrons.

"Suncoast spends the most on security. We intend to crack down on anyone who is slightly suspicious," said Naidoo.

Last week the casino banned several youngsters for 12 months after a fight between two groups left some of them with stab wounds.

In other incidents, a person was mugged and a woman was run over by a car on the premises.



OPTIONS?

Capital amount

Rental option with performance monitoring

Cost per transaction



References



- B.T. Dudley. "Image Analysis and Waste Technology in Africa", *Binary - Computers in Microbiology*, 5, 3-4. (1993)
- B.T. Dudley, A.R. Howgrave-Graham, A.G. Bruton and F.M. Wallis. "The application of digital image analysis to quantifying and measuring UASB digester granules", *Biotechnology & Bioengineering*. 42, 279 - 283. (1993)
- Castleman, K. R. 1998. *Concepts in Imaging and Microscopy: Color Image Processing for Microscopy*. *The Biological Bulletin*. 194 (2): 100-107.
- Russ, J.C. 1995. *The Image Processing Handbook*. 2nd ed. CRC Press. Boca Raton, FL.
- Inoue, S. (1986). *Video Microscopy*. Plenum Press
- Internet: www.I-Cube.co.za



Technical QUESTIONS:

Barry T. DUDLEY

(MBA {IT}; MSc {Image Analysis}; BSc {Brewing}; BSc Hons {Waste Technology})

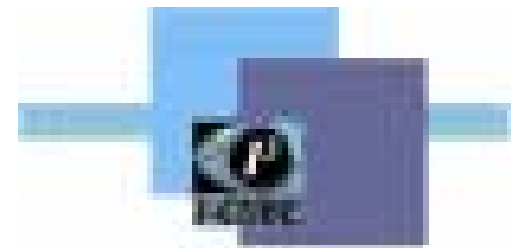
<http://www.i-cube.co.za>

Cell: +27 (0) 82 562 8225

PH +27 (0) 31 764-3077

Fax 0866539659

82 Kloof Falls Rd Kloof, Durban, Kwa-Zulu
Natal, 3610, South Africa



"..any sufficiently advanced technology is indistinguishable from magic." Arthur C. Clark





INTEGRATED • INTELLIGENT • IMAGING

I-CUBE

Contact Details

Barry Fryer Dudley

Ph: 031 764 3077 / 082 562 8225

Web: www.i-cube.co.za

