

Selected Slides from Fall 2008 Speaker's Talks

Presented by,

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Digitization & Recognition of a Fingerprint

U.S. Patent

Jan. 11, 1977

Sheet 3 of 5

4,003,024



FIG. 6

Fingerprints of Twins & Same Man at Different Ages

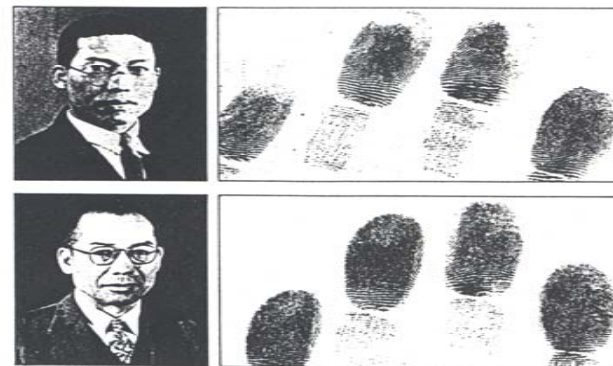
Automated Fingerprint Identification System



The number of criminals recognized has increased gradually since 1974. In 1980 it counted 1.35 million, the highest in the past 15 years.



“Unique throughout the world”



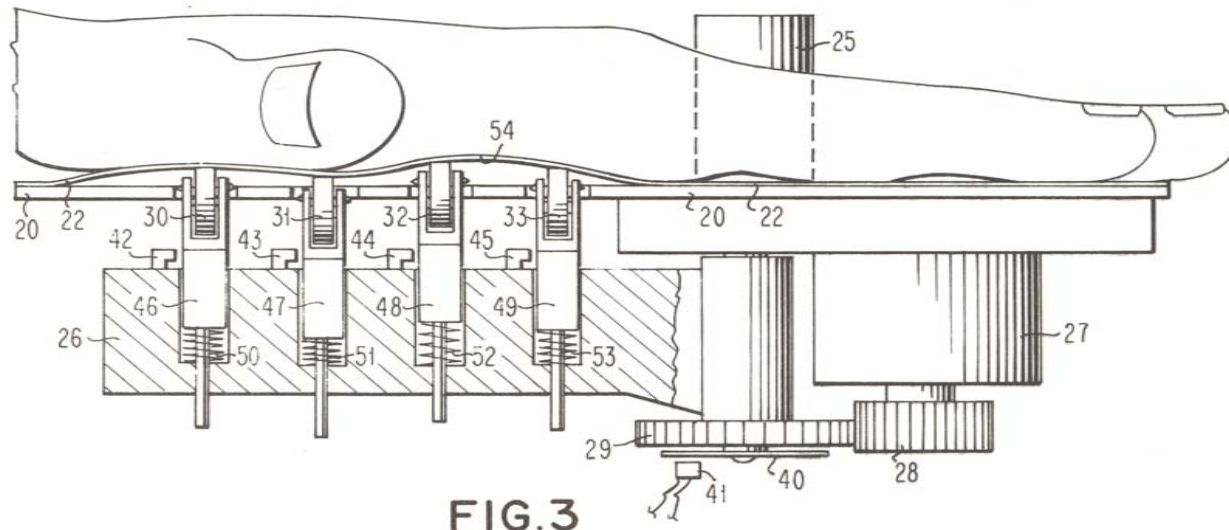
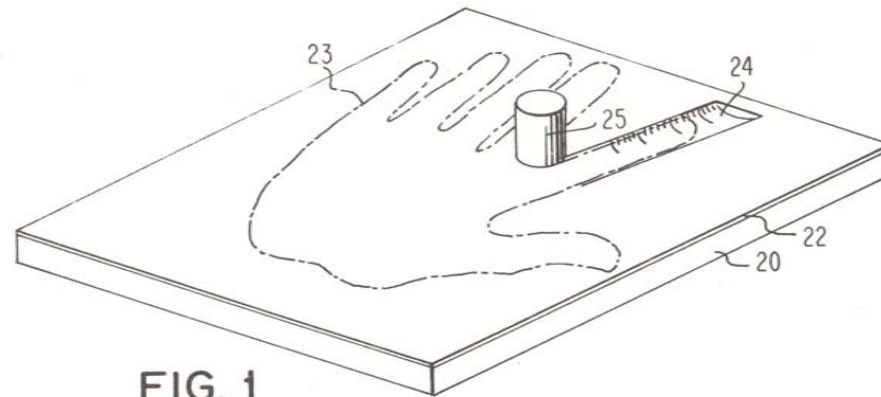
“Permanent throughout the life”

Recognition of a Palm Print

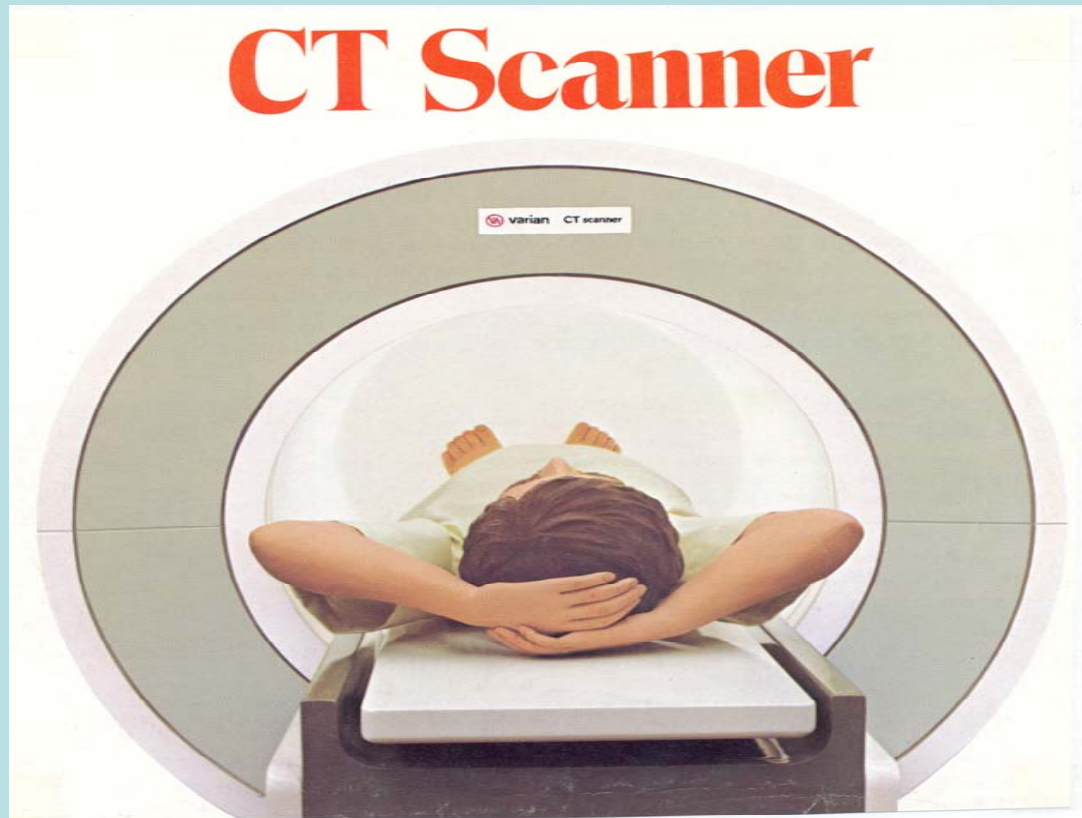
U.S. Patent June 28, 1977

Sheet 1 of 4

4,032,889



Scanning the Human Body



Patient with obstructive jaundice with a dilated common bile duct (arrow) without peripheral intrahepatic ductal enlargement, confirmed by operative cholangiogram.



Enlarged para-aortic lymph nodes filled with contrast following a lymphangiogram in a patient with lymphoma.

Use of Iris Scans at Airports

Customs set to use iris scans at airports

BY DAVID AKIN

Canada Customs will begin using iris scanners this summer to speed air travellers through the country's busiest airports.

The Canada Customs and Revenue Agency will announce in early April the firm that will get the contract to install kiosks equipped with iris-recognition devices in eight of Canada's busiest international airports, industry sources said.

The kiosks would allow some Canadian travellers, when they get off a plane, to move through a customs checkpoint in 30 seconds or less by confirming their identities with quick scans of their irises.

The iris is the eye's coloured portion, which surrounds the pupil. An iris scanner takes a highly detailed picture of the iris, which is analyzed by a computer. The computer notes the iris's patterns, lines, striations, pits and freckles. Like other anatomical identifiers, such as fingerprints, scientists believe no two people have the same iris pattern.

After a traveller's identity is verified with the iris scan, the kiosk, in the customs' arrival area, would prompt the person to declare any goods brought into the country and pay any applicable duties. Users of the service would still be subject to random inspections.

THE GLOBE AND MAIL*
FRIDAY, FEBRUARY 15, 2002

Identity check

Canada Customs plans to install iris-recognition kiosks in airports across the country. People would have to register for the service, which likely would cost \$50 to \$100.

Registration process



- 1 A person's identification is confirmed (birth certificate, driver's licence, etc.) and a picture is taken of the person's eye. A video camera flashes at 90 frames per second to make a black-and-white image of the iris.



- 2 A computer scans the 266 independent characteristics of the iris and translates the digital information into a complex, 512-byte digital barcode. This code is stored in a database, together with limited personal information.

Eye scanning kiosk

- 3 At the airport kiosk, a camera captures a black-and-white image of the passenger's iris. It is processed by computer and compared to the pattern database to confirm the passenger's identity.



The camera can examine an iris as far as 75cm away.

Glasses and contact lenses do not interfere with the imaging process.

A photo of an eye will not fool the camera because the system watches for the constant widening and narrowing of a person's iris.

About the iris

- The eye's coloured iris is a network of randomly arranged muscles and fibres.
- Its function is to control the amount of light entering the eye.
- Your iris doesn't change throughout your lifetime.
- It contains 266 identifiable characteristics while a fingerprint contains only 40.



Recognition of Emotional Faces

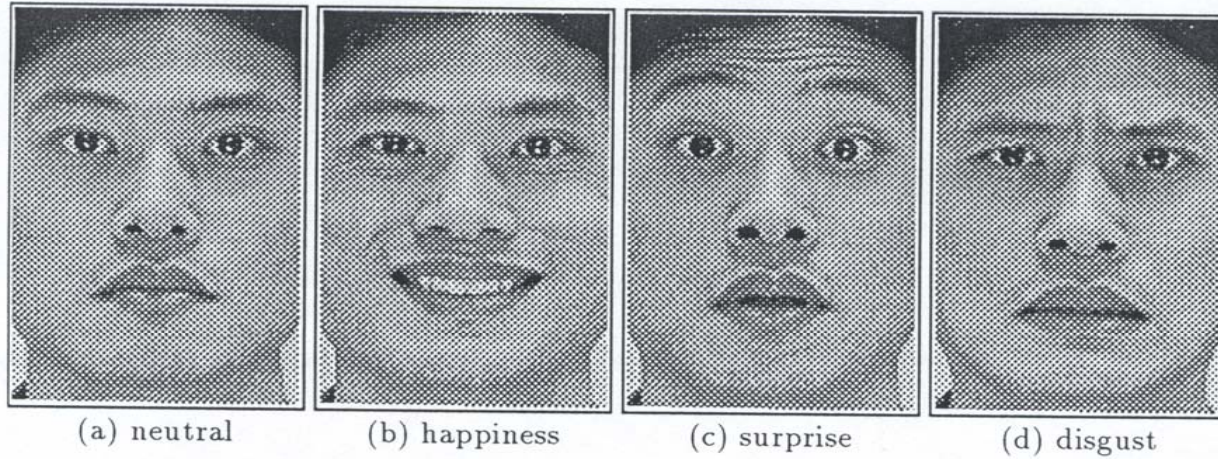


Fig. 8. Example of facial expressions

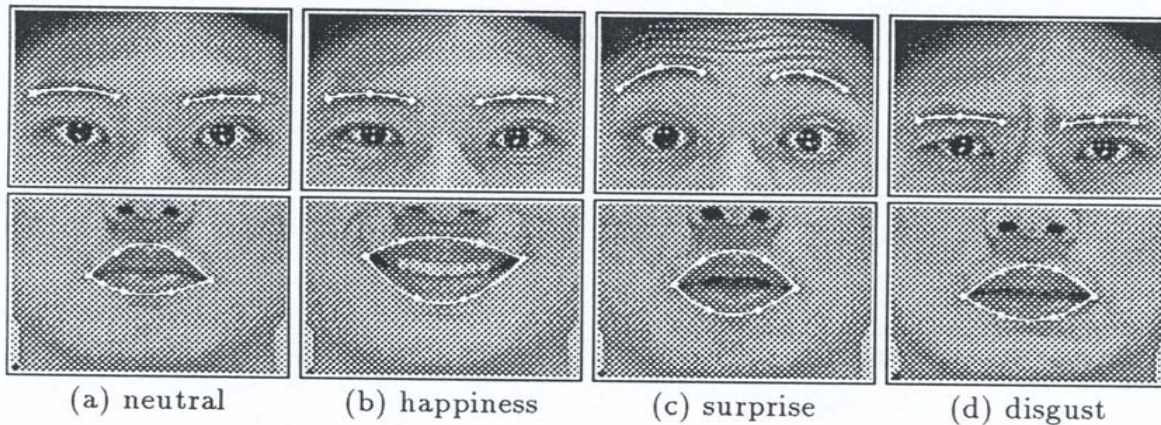
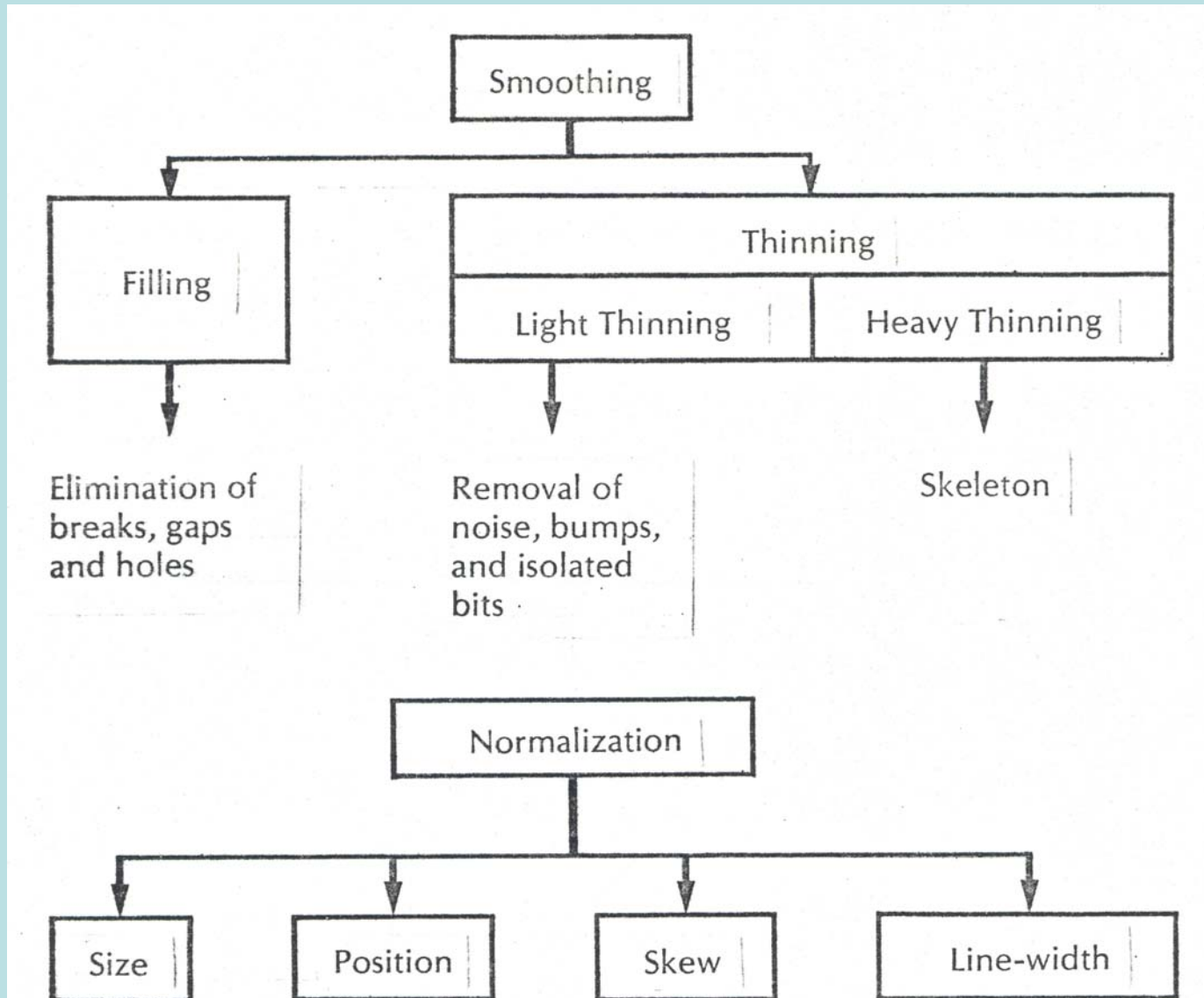


Fig. 9. Results of tracking the eyebrows and mouth

Preprocessing of Handwriting Images



Thinning of Handwritten Characters

Table 2. Comparison.

Characteristics	Algorithm				
	CPM	DT	SPTA	MSM	MCM
Connectivity	P-8	P-8	P-8	I-8	I-8
Skeleton symmetry	Fair	Good	Good	Fair	Fair
Thickness of the skeleton	Unit width	Unit width	Unit width	Multiple pixels	
Presence of end-point erosion	Yes	No	No	Yes	Yes
Presence of noisy branches	No	No	No	No	No
Sensitive to orientation of the pattern	No	No	No	Yes	Yes
Visual quality	Good	Good	Good	Fair	Fair

P-8: Perfect-8 connectedness

I-8: Imperfect-8 connectedness

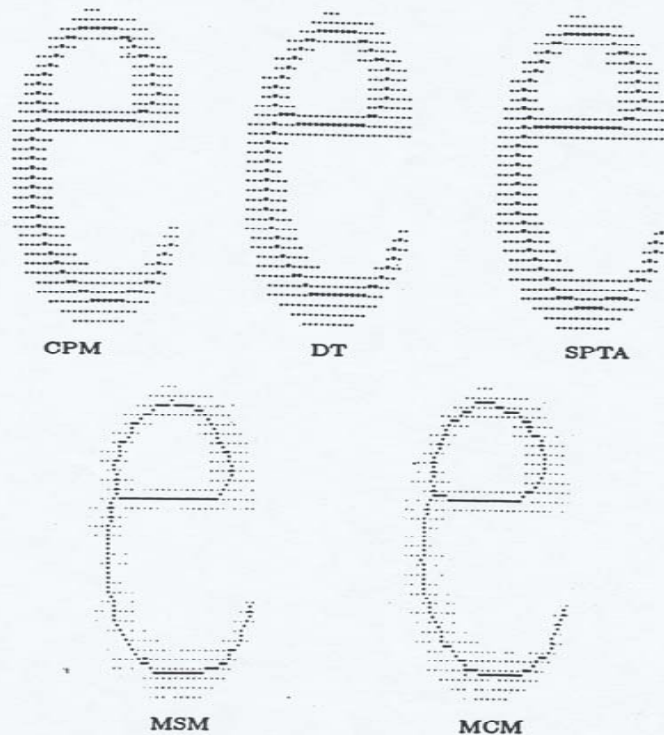
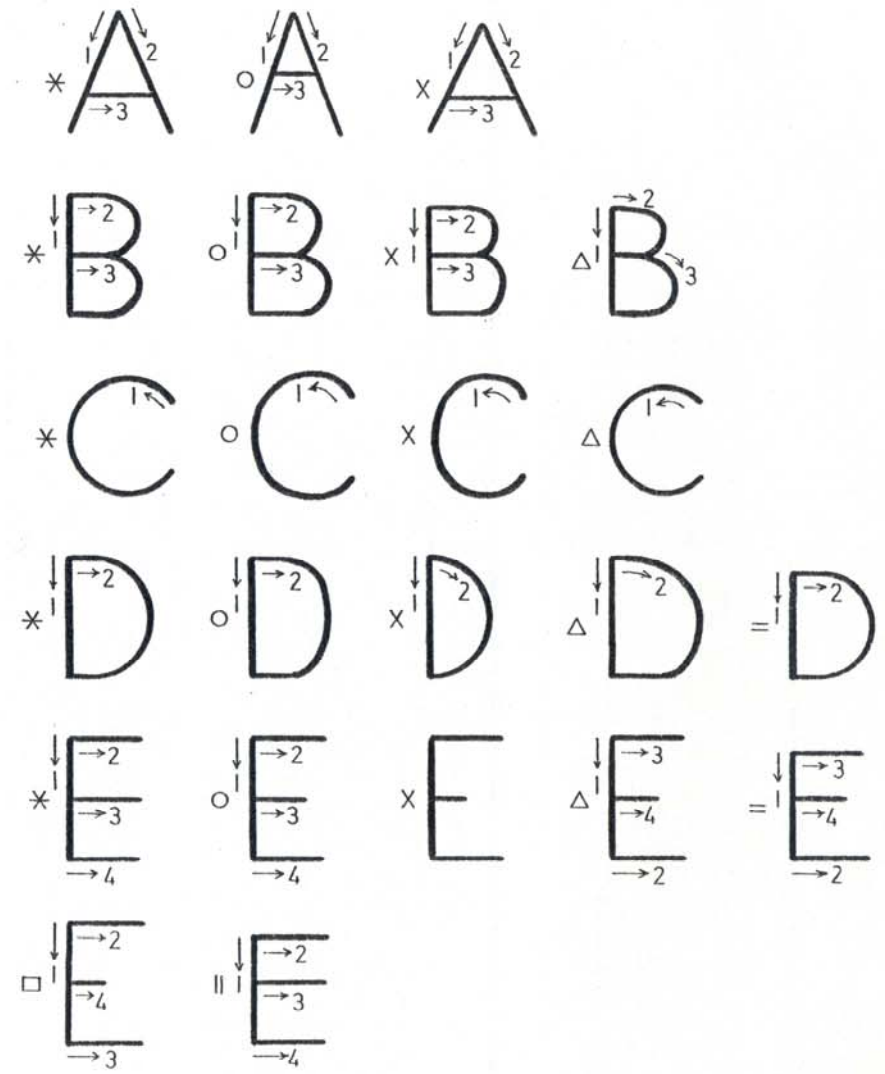


Fig. 7. Effect at junctions of lines with uneven thickness.

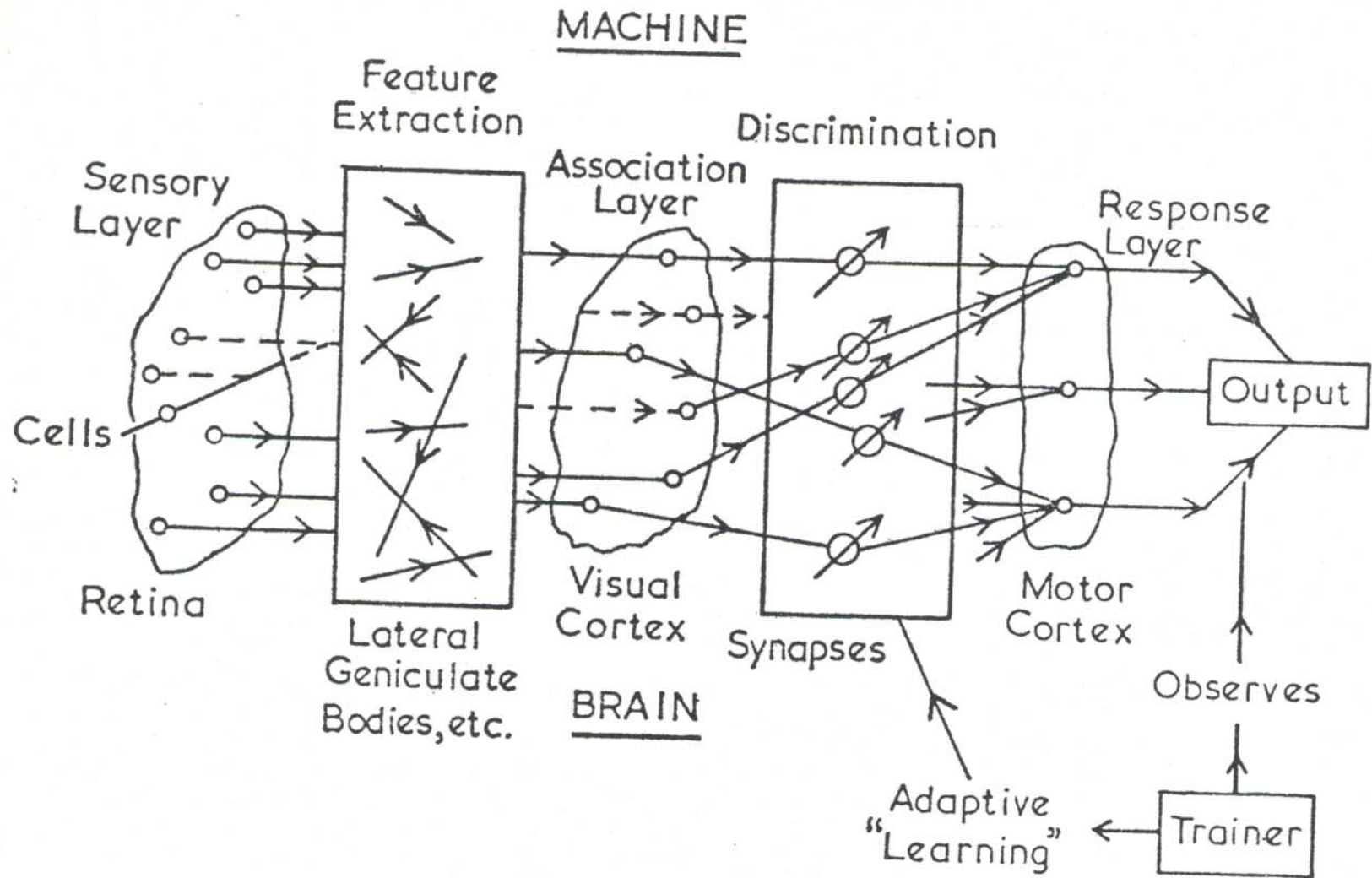
Handwriting Models

A	A	A	A	A	A	A	A	A	A
17.07	16.8	15.73	13.07	11.73	9.87	5.07	4.8	3.2	2.67
B	B	B	B	B	B	B	B	B	B
29.09	17.45	15.51	8.03	7.48	6.09	5.82	5.26	5.26	
C	C	C	C	C	C				
24.42	20.31	16.71	15.94	15.42	7.2				
D	D	D	D	D	D	D	D		
19.85	17.27	15.98	15.72	13.66	7.73	7.47	2.32		
E	E	E	E	E	E	E	E	E	E
18.27	13.2	12.18	11.17	10.93	10.66	8.88	8.38	6.35	
F	F	F	F	F	F	F	F		
37.25	20.1	15.2	8.82	8.33	6.86	3.43			

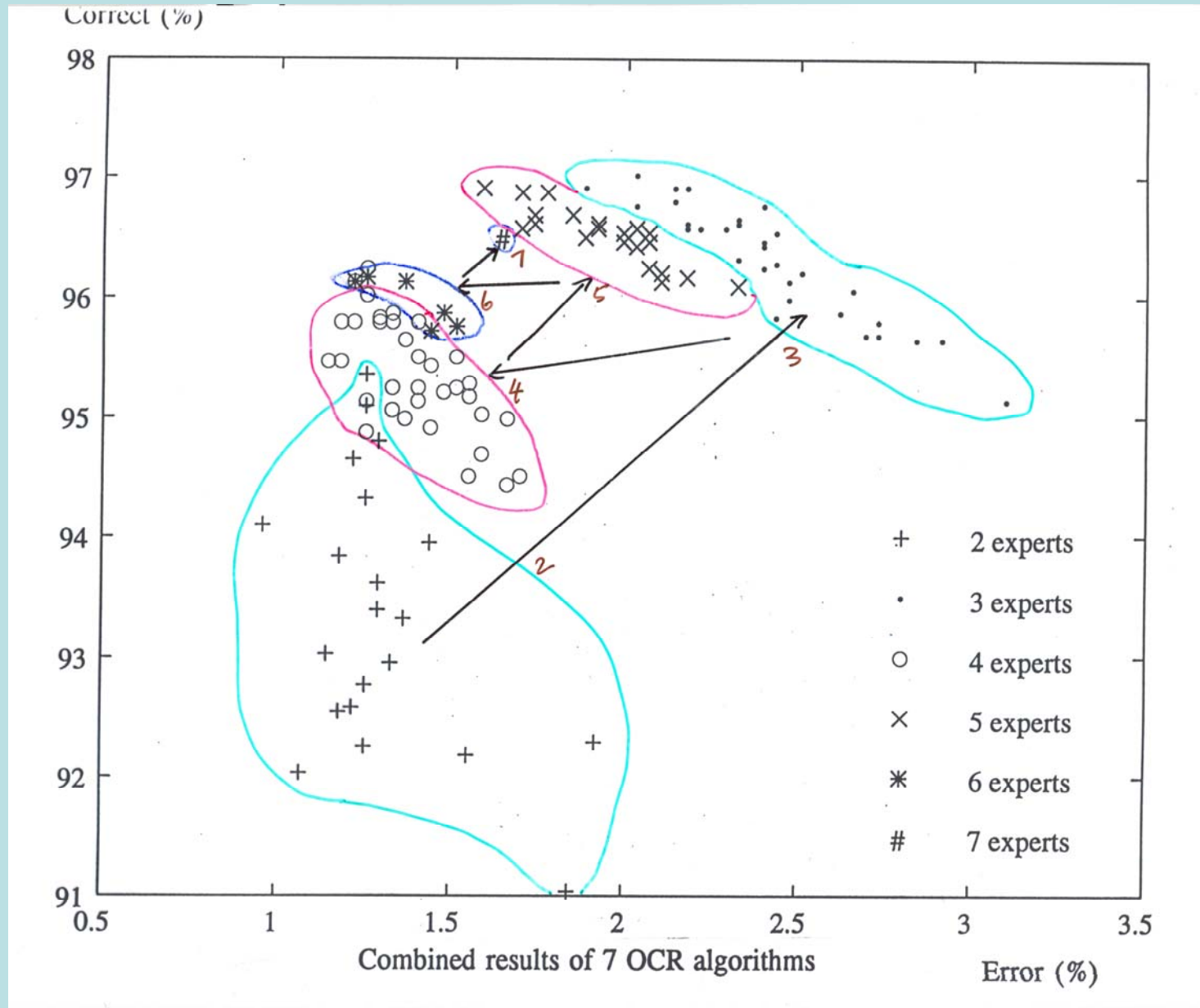
Table 3 (cont'd)



Comparing Human Thinking with Computing Power



Recognition Results of Multiple Classifiers



Presented by:

Dr. Ching Y. Suen

November 20, 2008 at Johns Hopkins University

Please visit my home page:

<http://www.cenparmi.concordia.ca/CENPARMI/Suen/>