3D computer vision system for face recognition

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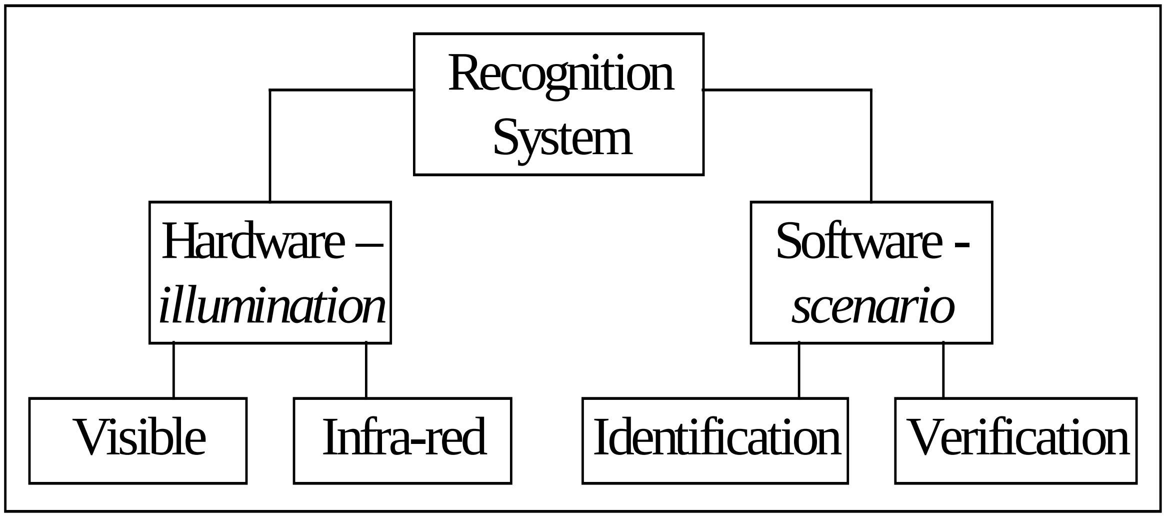

General structure of person recognition systems "Citadel"

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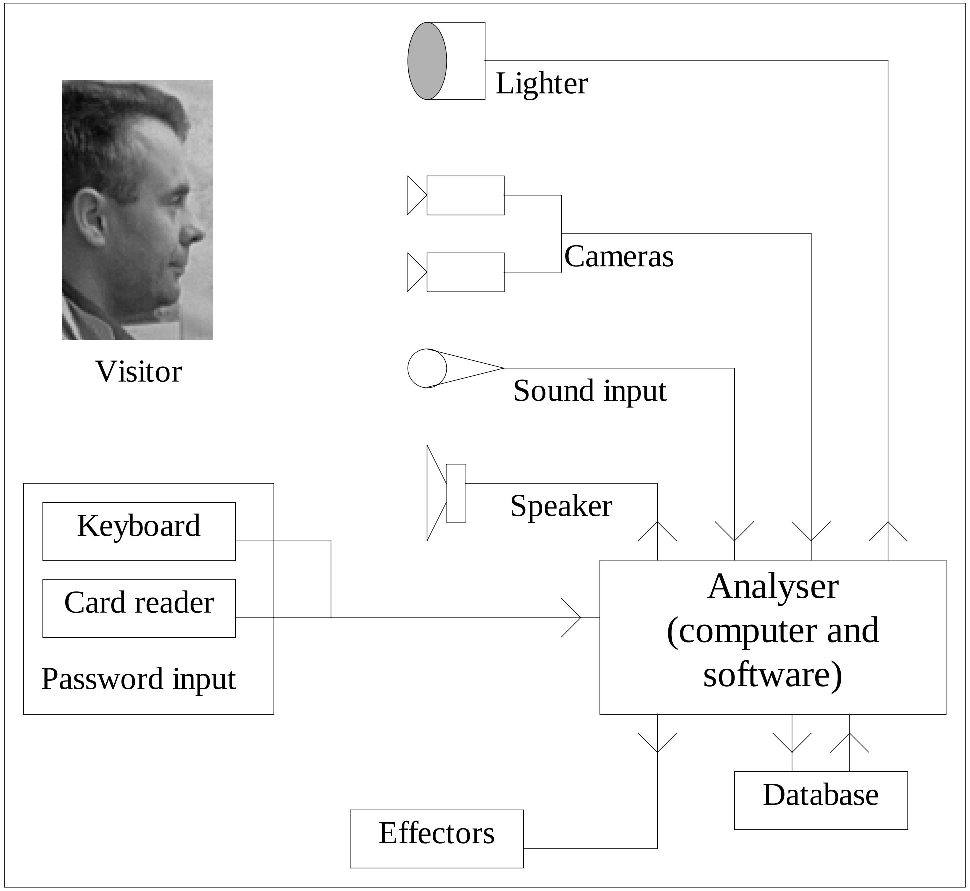

Possible components of system

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Appearance of Visible range model

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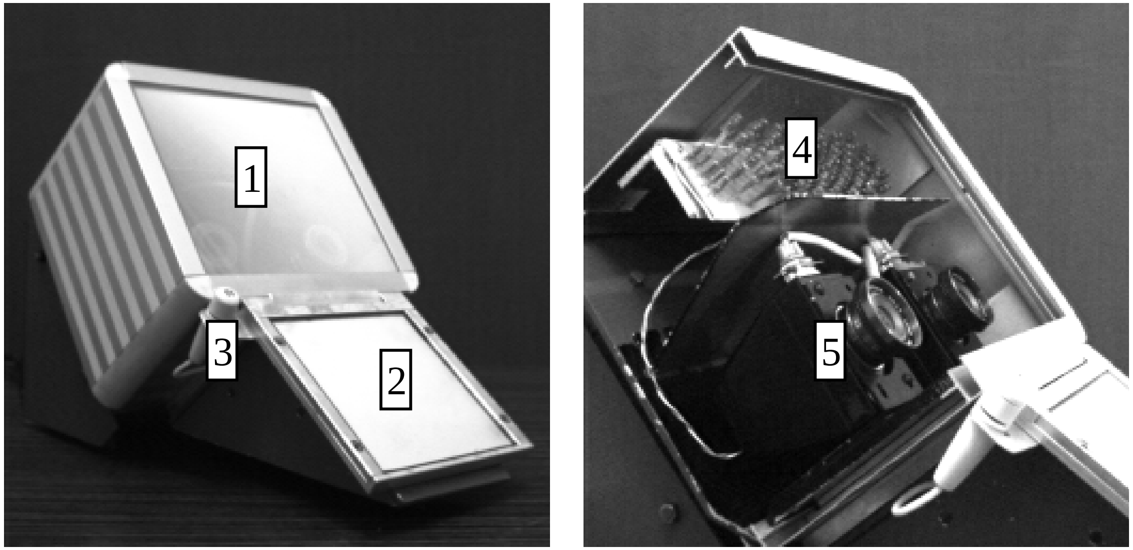

Infrared range model

1 *front panel mirror*, 2 *additional mirror*, 3 *microphone*, 4 *lighter*, 5 *camera*

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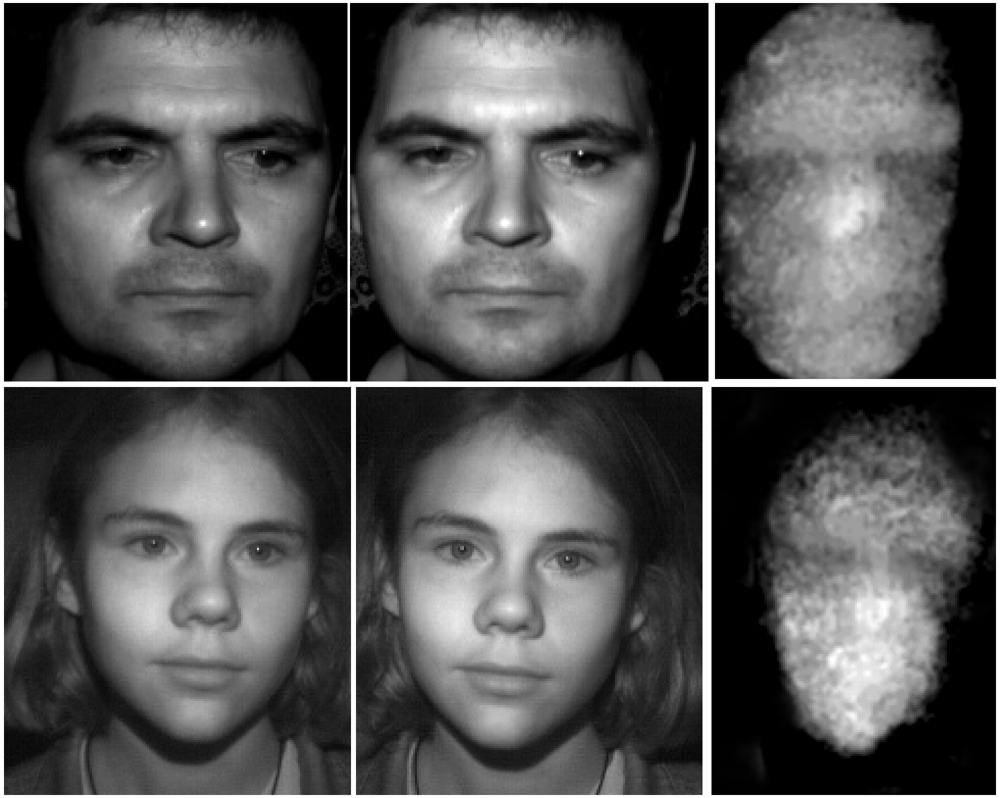

Source stereo-images and results of 3-D reconstruction algorithm

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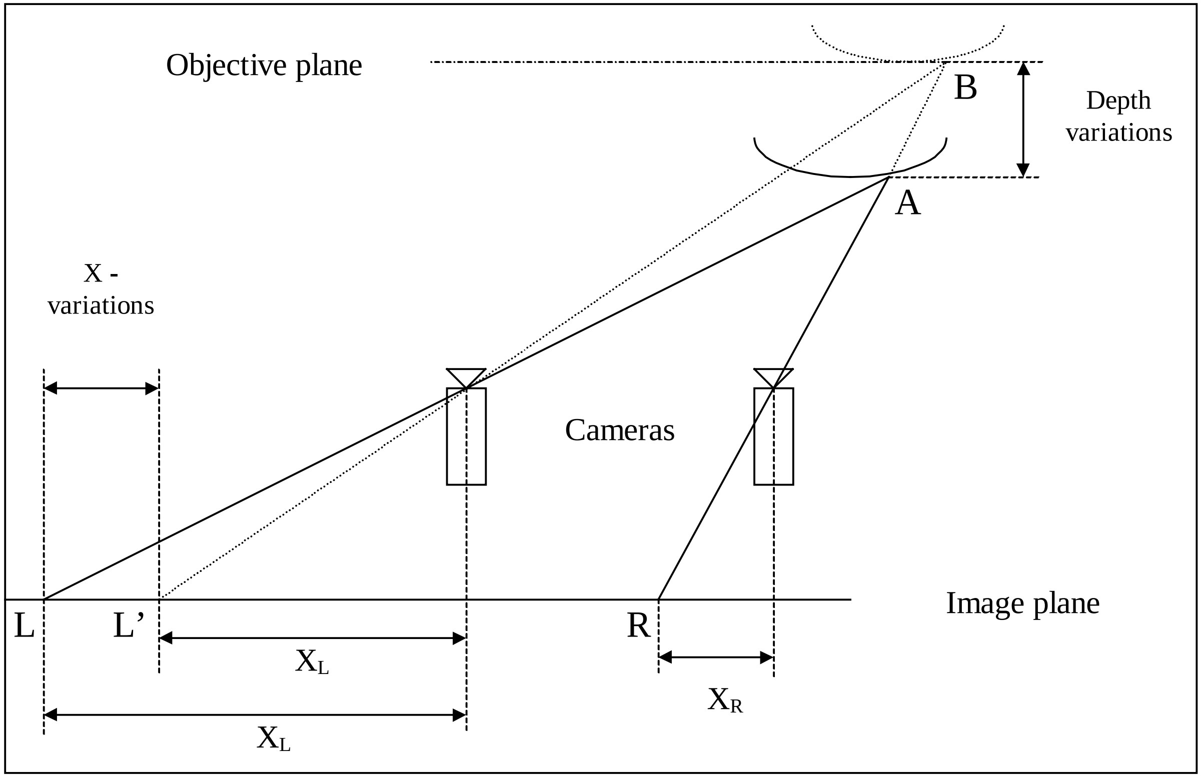

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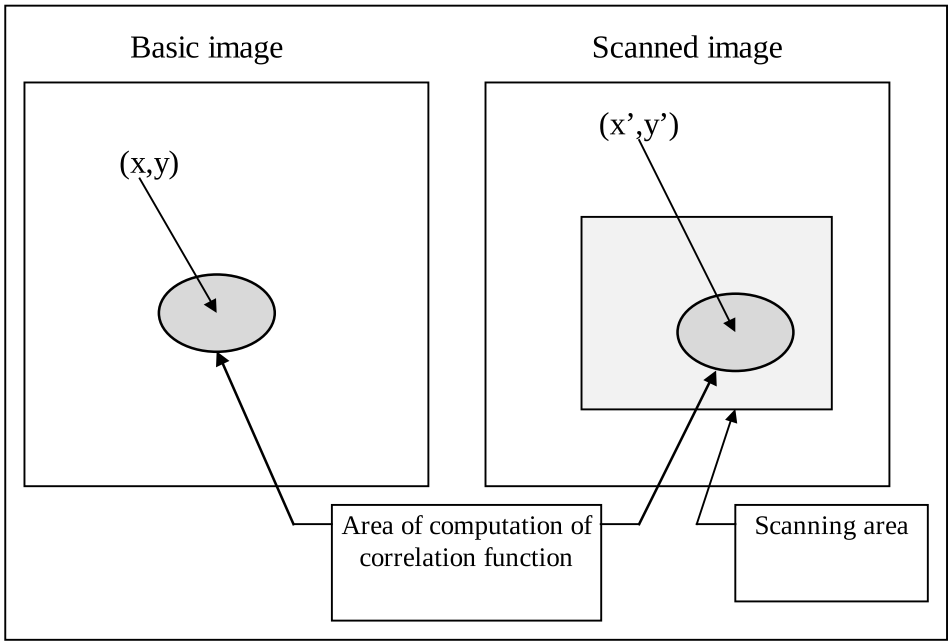

Correlation functions:

$$\Re_1(f,g)=\sum_{x_i\in\Omega_1,\,y_i\in\Omega_2} f(x_i)*g(y_i)$$

$$\Re_2 = \sum_{x_i\in\Omega_1,\,y_i\in\Omega_2} \left|(f(x_i)-M_f)-(g(y_i)-M_g)\right|$$

$$\Re_3 = \sum_{x_i\in\Omega_1,\,y_i\in\Omega_2} \left|(f(x_i)-M_f)-(g(y_i)-M_g)\right|$$

Corresponding points:

$$(x©,y©)=\arg\max_{(x©,y©)\in\Omega}\tilde{\Re}(\omega_L,\omega_R(x©,y©))$$

Depth computation:

$$Z=(L*W)/(B*N)$$

Computation of elevation maps

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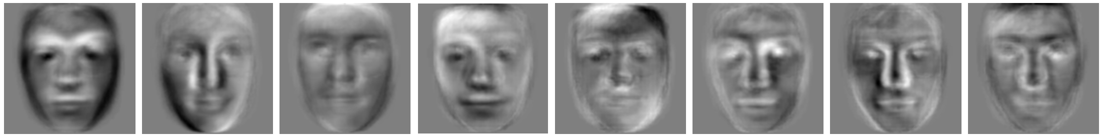
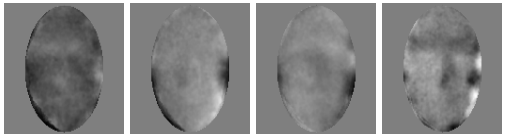
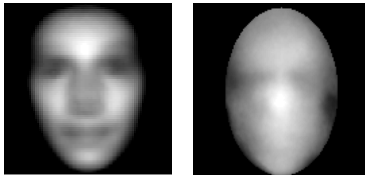


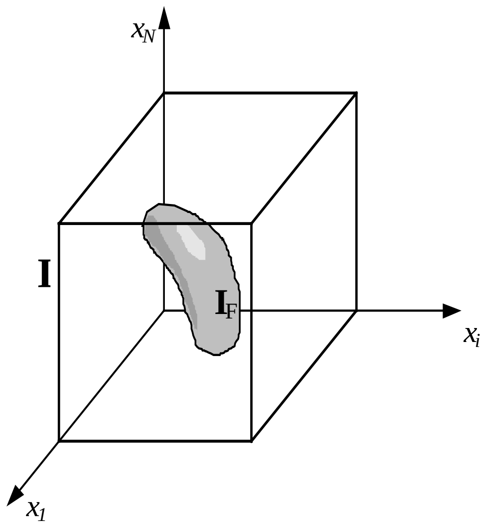
First eigenvectors of photo-images – principal components.



First eigenvectors of elevation maps – principal components



Mean vectors of training sets of photo-images and elevation maps respectively



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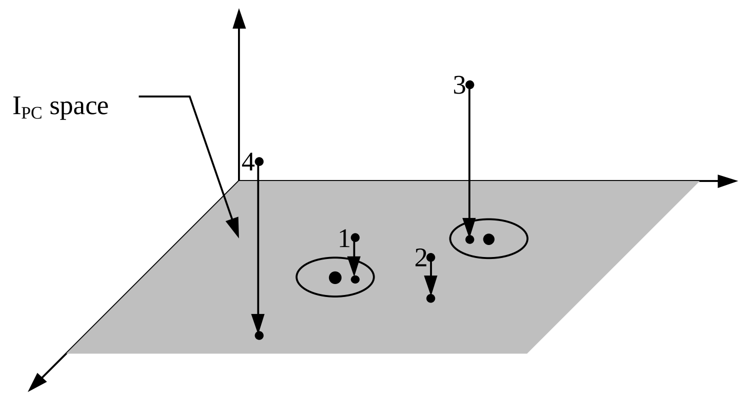
	PC Space I_{PC}	Known images	Decision
1	near	Near	Is a known object
2	near	Far	Is an unknown object
3	far	Near	Is not an object of given variety
4		Far	

Combined measure:

$$\frac{1}{R^2(c,k)} = \sum_i W_i \frac{1}{\min\limits_{j_k}\left[R_i^2(c_i, v_i^{j_k})\right]} \qquad W_i = D_i \frac{D_i}{D_i^c}$$

C - compound image, R -Euclidean distance,

D - dispersion, v^k *- training set*



Decision rule:

$$N = \arg\min\left\{R(c,v^1),\ldots,R(c,v^K),T\right\}$$

Possible situations for vector in image space

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Conclusion

System was tested on the database of about 600 stereo-images of 200 persons

Recognition accuracy achieved was about 95%

This is about two times more reliable than using simple photo-images