AREA–BASED MATCHING ALGORITHM ASSESSMENT FROM SATELLITE IMAGES
(transparencies)
(see references for the full text)

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CONTENT

MATCHING ALGORITHMS

(1/2)

A matching algorithm is used to find,
among a set of images $\{g_1, ..., g_n\}$
the one which is the “closest” to a reference image *f*.

A matching algorithm may be based upon
the minimization of a *distance d* or
the maximization of a *similarity measure s*.

There exist pairs (*d*, *s*) such that the minimization based on *d* is **equivalent** to the maximization based on *s*.

Examples:
(Euclidean distance, correlation coefficient)
(City Block distance, morphological correlation).

MATCHING ALGORITHMS
(2/2)

In this work, we consider the following matching algorithms.

Correlation coefficient
(Euclidean distance)

Barnea and Silverman, 1972; Maragos 1988
(City Block distance)

Brunelli and Messelodi, 1995
(estimation of the correlation coefficient)

Khosravi and Shafer, 1996
(morphological approach)

Fernàndez, 1997
(Chessboard distance)

Banon and Faria, 1997
(morphological approach)

MATCHING PRECISION MEASURE

(1/2)

The images in $\{g_1, ..., g_n\}$ are extracted from a bigger image g.

The *Matching Region* is the set of pixel positions which have the greatest similarity.

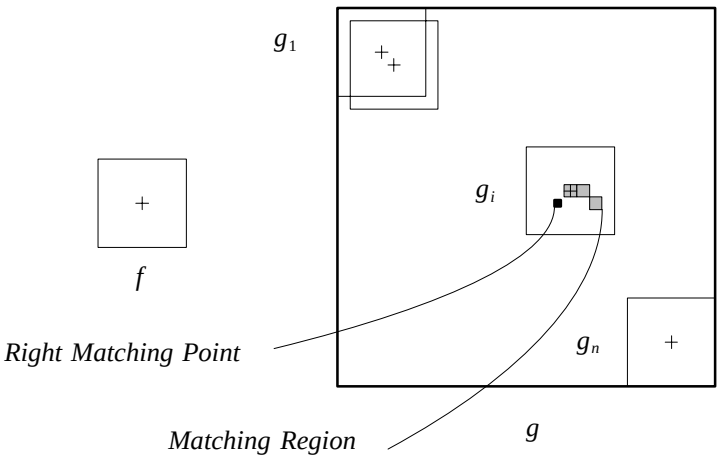

Fig. 1 – Matching Region and Right Matching Point.

MATCHING PRECISION MEASURE

(2/2)

The matching degree between a Matching Region A and a Right Matching Point x is given by

$$\beta(A,x) = \alpha_1(A)\,\alpha_2(A,x)\,\alpha_3(A,x)$$

where

$\alpha_1(A)$ depends on the area of A
$\alpha_2(A,x)$ depends on the minimum distance between A and x
$\alpha_3(A,x)$ depends on the maximum distance between A and x.

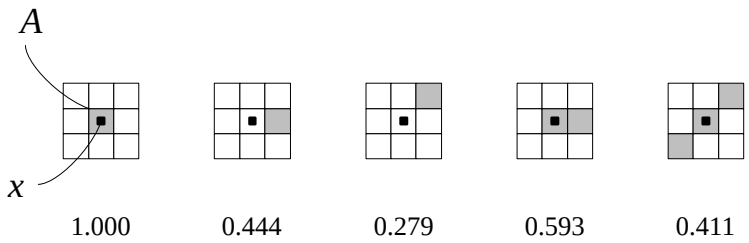

Fig. 2 – Some degrees of matching between a point and a subset.

EXPERIMENTAL ASSESSMENT

(1/2)

Five pairs of images were used.

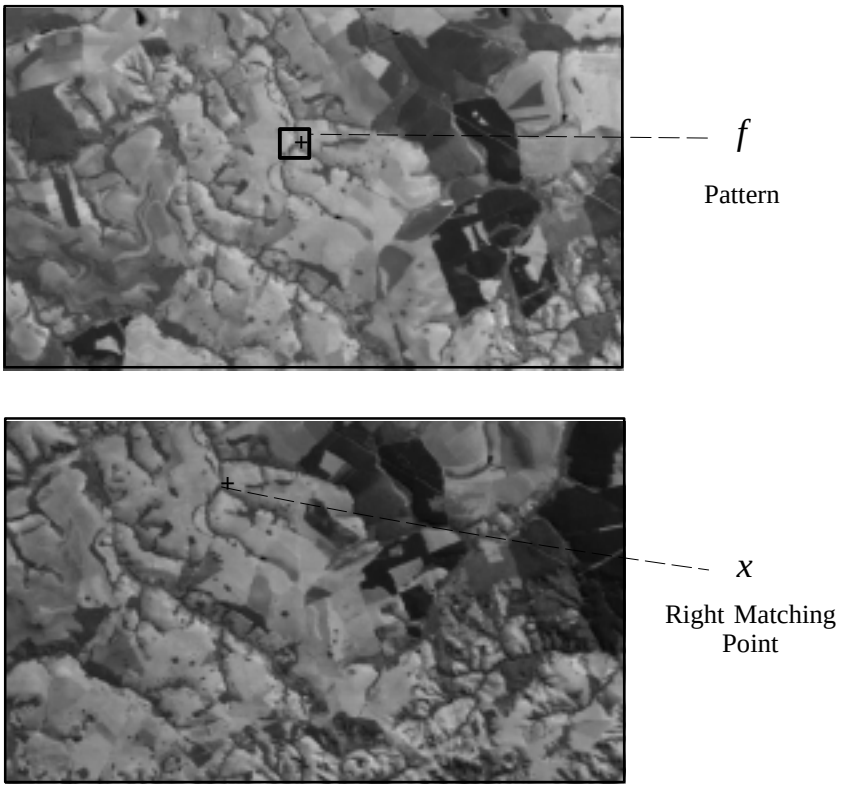

Fig. 3 – Example of an image pair.

EXPERIMENTAL ASSESSMENT
(2/2)

Ten 23×23 patterns for each image pair were used.

Ranking of the matching algorithms.

Matching algorithm	Degree of matching
Correlation coefficient	0.958
Brunelli and Messelodi, 1995	0.912
Barnea and Silverman, 1972; Maragos 1988	0.882
Banon and Faria, 1997	0.678
Fernàndez, 1997	0.166
Khosravi and Schafer, 1996	0.154

Similarity measures in the literature are alternatives to the correlation coefficient.
However, none behaves better than the correlation coefficient.

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