Negentropic Planar Symmetry Detector Supplementary Material

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1 Details of a Loy and Eklundh's Method Assessment

In this section we present the details of Loy and Eklundh's method [1] assessment. The pseudocode is given in Algorithm 1. The input parameters are an image I and a scaling factor $sf \in (0, 1]$. In our experiments we have set *dist_max* as 1/64 of the original image resolution, this parameter is used to determine the most centred rotation in an image.

[2] utilizes the right-handed coordinate system, while in our method we use the left-handed one. Therefore in line 6 of the algorithm we transform the results to the left-handed system and take modulo 180 to keep angles between 0° and 180°.

2 Details of a Shen-Ip Symmetry Detector Assessment

Shen-Ip Symmetry Detector [3] is based on generalized complex (GC) moments given by

$$GC_{p,q} = \frac{1}{2\pi} \int_0^{2\pi} \int_0^{\infty} I(r,\theta) \left(r^{p+1} \exp(iq\theta) \right) \, dr \, d\theta.$$

In our implementation of Shen-Ip method we map an image I onto a unit disc so that $r \in [0, 1]$ and $\theta \in [0, 2\pi]$ and utilize a discrete estimator of a GC moment,

$$\widehat{GC}_{p,q} = \frac{1}{2\pi} \sum_0^{2\pi} \sum_0^{1} I(r,\theta) \, r^{p+1} \exp(iq\theta).$$

We have found, however, a certain problem with using GC moments. Moments with repetition q equal to a multiple of 4 reach significantly higher values than other moments. We have run our experiments including and excluding these moments, and the latter yielded higher detection rates.

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Algorithm 1 Execution of Loy and Eklundh's Algorithm

procedure LoyEklundh(I, sf)
  $loy\_refl \leftarrow$ [1] call for mirror symmetry detection in I scaled by sf
  $loy\_rot \leftarrow$ [1] call for rotational symmetry detection in I scaled by sf
  if NbOfRows(loy_refl) > 0 **then**
    $angle \leftarrow loy\_refl[1][2]$ ▷ the angle of a dominant symmetry
    $tilt\_angle \leftarrow (angle + 90) \mod 180$
    $order\_refl \leftarrow$ NbOfRows(loy_refl)
  else
    $tilt\_angle \leftarrow -1$
    $order\_refl \leftarrow 0$
  end if
  $rot\_idx \leftarrow$ an index of a row in loy_rot that contains rotational symmetry whose centre is the closest to the centre of an image and no further away than a predefined threshold $dist\_max$. If no such symmetry was found then 0.
  if $rot\_idx > 0$ **then**
    $order\_rot \leftarrow loy\_rot[rot\_idx][3]$
  else
    $order\_rot \leftarrow 1$
  end if
  return $order\_refl$, $angle$, $order\_rot$
end procedure

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References

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[2] [link].
URL `http://www.nada.kth.se/~gareth/homepage/local_site/code.htm`

[3] D. Shen, H. H. Ip, K. K. Cheung, E. K. Teoh, Symmetry detection by generalized complex (gc) moments: a close-form solution, IEEE Trans Pattern Anal Mach Intell 21 (5) (1999) 466–476.