Editor's Comment:

Report to the manuscript: **A Novel Comparison between the Performances of Several Invariant Moments for Printed Multi-Oriented, Multi-Scaled and Noisy Eastern Arabic Numerals Recognition**

Decision: **I recommend the manuscript for publication, after considering the corrections/suggestions bellow.**

The subject of the study is interesting, but the manuscript is too long and the written English should be improved. I have made a few comments and corrections/suggestions that I hope can be considered as a positive contribution to the manuscript.

Keywords

The maximum number of keywords is eight, as the authors can confirm in the available template of the journal. Note that, usually it is not recommended to use in the keywords "sentences" already used in the title of the manuscript. This way, I recommend you to remove the keyword/sentence: "multi-scaled and noisy printed Eastern Arabic numerals".

1. INTRODUCTION

The authors should insert a space between, for example, "… Legendre (LIM)" and the reference "[12], …". Please check this along the paragraph.

The spaces between paragraphs, should be equal along the manuscript.

I think that an important part of the last paragraph of Section 1 should be considered in the beginning of Section 2. In a manuscript with a considerably number of pages perhaps it is recommended to describe a little bit each section at the end of the Introduction (Section 1).

2. RECOGNITION SYSTEM

Before Fig. 1, at the end of the sentence, the authors should replace "(…) figure bellow (…)" by "(…) Fig. 1 (…)". I also recommend the authors to check this situation for all the figures and tables in order to maintain the coherence all over the manuscript.

In the title of Figure 1, replace "Fig .1." by "Fig. 1.". The authors should also consider this situation in Figure 2.

The authors should also remove the *italic* titles of the most tables and figures of the manuscript.

2. RECOGNITION SYSTEM

At the end of the paragraph, before Fig. 2, the authors should insert (Fig. 2), after "(…) threshold.".

4.1. The Hu invariant moments

The authors should consider, all over the manuscript, the letters that represent variables, functions, vectors/matrix in *italic* (but not the numbers, signals and brackets). For example, in the first paragraph of this section the authors should replace "(p+q)" for "($p + q$)", "f(x,y)" for "$f(x, y)$" and "NXM" for "$N \times M$".

All over the manuscript, the authors should consider a dot after the formulas, which are numbered, when the next line is the beginning of a new paragraph. Otherwise, the first letter of the first word should not be capital.

Replace the means " $\bar{x}$ and $\bar{y}$ " for "$\bar{x}$ and $\bar{y}$" in the equation (2) and also in the text.

The authors also should rewrite the equations in (3):

$$\bar{x} = \frac{m_{10}}{m_{00}} \quad , \quad \bar{y} = \frac{m_{01}}{m_{00}}$$

by

$$\bar{x} = \frac{M_{10}}{M_{00}} \quad \text{and} \quad \bar{y} = \frac{M_{01}}{M_{00}} .$$

These last equations are also considered in (13), but with capital *M*.

The authors should compare carefully the expressions of moments, especially in equations (7), (9) and (11) with the expressions available in http://en.wikipedia.org/wiki/Image_moment. Maybe some square is missed in (7) and some indexed number are not correct in (9) and (11). Please check especially the equation (11), maybe a part of the second term is not correct.

Please remove the unnecessary symbol * to represent the product in equations (9), (10) and (11).

4.2. The Legendre invariant moment

The authors should improve the quality of equations in (12) and (13).

The authors should define the letters *n* and *m* in (13), that appear for the first time in $\gamma = \frac{n+m}{2} + 1$.

In (15), the authors should replace "(…) is even And (…)" by "(…) is even and (…)". Please do not forget a dot after $|x| \leq 1$.

4.3. The pseudo-Zernike invariant moment

The authors used the letter *j* to represent the imaginary unit of complex numbers, but it is preferable to consider $i = \sqrt{-1}$ instead.

In equations (27) and (54) the authors should replace

$$\delta_{nm} = \begin{cases} 1 & if \quad n = m \\ 0 & else \end{cases}$$

by

$$\delta_{nm} = \begin{cases} 1 & \text{if} \quad n = m \\ 0 & \text{otherwise} \end{cases} .$$

The authors forgot the signal minus in *N* – 1 and *M* – 1, which are the superior extremes of sums in equation (28).

4.5. The invariant analytical Fourier-Mellin transform

In equation (34) I think the authors should replace

$$\forall (k, v) \in Zx\ \Re \quad , j = \sqrt{-1} \quad , s \succ 0$$

by

$$\forall (k,v) \in \square \times \square, \quad i = \sqrt{-1}, \quad s > 0.$$

6. EXPERIMENTS AND RESULTS

In the title of Fig. 4, I think the authors should consider:

Fig. 4. Eastern Arabic numerals rotated, translated and rescaled and noisy for different values of the parameter standard deviation of Gaussian noise.

The authors should centre some formulas and numbers in Tables 1 and 2.

6.1. Recognition thresholding and recognition interval

In this subsection the authors represent some intervals of numbers into different pages, for example [0 0.30]. But, I think they should represent this interval by [0; 0.30].
In the test after equations (42), (43) and before equation (44), the authors should improve the quality of

$$\forall i = \{ ٠,١,٢,٣,٤,٥,٦,٧,٨,٩ \}.$$

In equation (58), the quality of the sum extremes has also to be improve.

7. CONCLUSION

Maybe the authors should try to improve the second half of conclusions, especially the last paragraph.

REFERENCES

The numbers that identify the references should not be between brackets.

The references should be carefully formatted according to the journal template.

<u>Suggestions</u>:

The authors should really improve the quality of mathematical formulas and do not forget the *italic* to represent variables, functions, vectors/matrix and Greek letters in the test. The index letters should also be represented in *italic*.

The authors should check all the text, because some spaces between letters/numbers and commas or dots are missed. In other cases some spaces should be removed.

Some equation numbers are not align to the left. By the way, the authors numbered all the equations in the manuscript but they only cited equations (12) and (20) in the text.

If the authors are going to use the Microsoft Word program for writing the final manuscript, try to format the formulas and mathematical symbols using the application MathType (try MathType free for 30 days, available on http://www.dessci.com/en/products/mathtype/trial.asp), which improve the equation editor of Word processor. With this application the final result is similar to LaTeX.

<u>Editor's Details:</u>

Dr. Luís Miguel Lindinho da Cunha Mendes Grilo
Polytechnic Institute of Tomar (IPT), (ESTT), Departmental Unit of Mathematics and Physics, Portugal