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Introduction

Key words: morphological cell morphology, cell morphology, circular statistics

The present study is concerned with the morphological analysis of digital images, specifically focusing on the morphological characteristics of cells in microscopic images. The aim is to develop a method for quantitatively analyzing the shape and size of cells, which can be crucial in various fields such as biology, medicine, and material science.

Methods:

1. Digital Image Processing:
   - Image Acquisition: Using a high-resolution microscope, the images of the samples are captured.
   - Image Segmentation: The images are segmented to separate the cells from the background.
   - Morphological Operations:
     - Erosion and Dilation:
       - Erosion: A morphological operation that shrinks the boundaries of objects.
       - Dilation: A morphological operation that expands the boundaries of objects.

Results:

- The results show a significant difference in the morphological characteristics of cells from different samples.
- The circularity analysis indicates that the cells from sample A are more circular compared to sample B.

Conclusion:

A method for measuring the circularity of cell morphology has been developed and validated. This method can be useful in various applications including biological research, medical diagnostics, and material science.
Results and conclusions

Figure 3: Angle calculation

Figure 2: Image transformation

(a) Original image
(b) Dilated image
(c) Eroded image
(d) Thresholded image
(e) Converted image

Figure 1: Graphical illustration

The mean $\mu$ and standard deviation $\sigma$ of a measurement $x$ can be calculated as

$$ \mu = \frac{1}{n} \sum_{i=1}^{n} x_i $$

$$ \sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (x_i - \mu)^2} $$

The distribution and expression of the data can be shown by fitting a normal curve. This is useful for locating and analyzing the data. The distribution with the mean $\mu$ and standard deviation $\sigma$ is given by

$$ f(x) = \frac{1}{\sigma \sqrt{2\pi}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right) $$

2. Angle measurement

The application of the measurement is extended to other areas. The specific angle measurements are implemented on the hardware interface to facilitate the measurement process.

The mean and standard deviation of the measurement are calculated as

$$ \mu = \frac{1}{n} \sum_{i=1}^{n} x_i $$

$$ \sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (x_i - \mu)^2} $$

The distribution with the mean $\mu$ and standard deviation $\sigma$ is given by

$$ f(x) = \frac{1}{\sigma \sqrt{2\pi}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right) $$

In conclusion, the measurement process is validated and the accuracy of the measurements is assessed through various experiments. The results show a high level of precision and reliability in the measurement process.
References


Figure 5: Von Mises distributions with $\kappa = 1.5$ and $\mu = 7.5$. For a regular cell configuration and a more irregular cell configuration.

Figure 4: (a) A regular cell configuration, (b) A more irregular cell configuration.

Illustration of the different cell shape arrangements observed in the endothelial cell mosaic. This arrangement was found to closely resemble the defect of irregular
more irregular endothelial cell mosaic. This arrangement was found to closely resemble the defect of irregular.
Author Index

References

to be added in course of post-processing. A list of template names could be of assistance in a situation where a template is not available or is not recognized. The list should include common and uncommon names, as well as those that are specifically relevant to the current application.

The format of the reference list should follow the IEEE-APS style guide. The list should include:

- Authors' names and affiliations
- Title of the paper
- Journal name and volume
- Page numbers
- Year of publication

The reference list should be double-spaced.

4 Conclusions

The conclusions section should summarize the main findings of the paper and highlight the implications of the research. It should also suggest areas for future research.

The conclusion should be concise and to the point, avoiding unnecessary details or repetition.

4.1 Future Work

The future work section should outline the next steps for the research. This could include:

- Further experimentation and testing
- Validation on larger datasets
- Comparison with other methods
- Application to real-world scenarios

The future work section should be well-organized and clearly outlined.

4.2 Limitations

The limitations section should identify the limitations of the research and the factors that could affect the generalizability of the results.

The limitations section should be short and to the point, avoiding excessive repetition.

4.3 Contributions

The contributions section should highlight the novel aspects of the research and how they advance the field.

The contributions section should be concise and to the point, avoiding unnecessary details or repetition.

4.4 Acknowledgments

The acknowledgments section should thank any individuals or organizations that contributed to the research.

The acknowledgments section should be short and to the point, avoiding excessive repetition.

4.5 References

The references section should include all the sources cited in the paper.

The references section should be double-spaced and formatted according to the IEEE-APS style guide.

4.6 Appendix

The appendix section should include any additional information that is relevant to the research but is not included in the main text.

The appendix section should be well-organized and clearly labeled.

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E

Appendix F

Appendix G

Appendix H
Barcelona, a 15 de Enero de 1997

M.E. Díaz, V. Arnau, M.I. Maldonado
Inst. de Robótica, Univ. de Valencia, c/ Hugo de Moncada 4

Estimado colega,

es un placer informarle de que - después de una cuidada revisión por los miembros del comité de programa - su artículo, número 110, titulado

A method to measure endothelial cell regularity based on morphological operators

ha sido aceptado para el VII SNRFAI para presentación Oral.

Cada artículo ha sido revisado de forma anónima por dos miembros del comité de programa. Para su información, le enviamos las copias de las revisiones de su artículo.

También se incluyen los detalles para formatear y enviar la versión final de su artículo. Por favor, considere que necesitamos recibir su versión definitiva antes del día 21 de Febrero de 1997. Los artículos que lleguen fuera de plazo no serán publicados en los proceedings que se entregarán en el simposium.

Gracias por enviar su artículo al SNRFAI. Espero verle en Barcelona en Abril. Si tiene alguna pregunta no dude en contactar con el secretariado del simposium.

Atentamente,

[Signature]

Jordi Vitrà
Responsable de la Organización