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Automated morphological analysis of human sperms cells according to WHO standards using computer graphics and computer vision algorithms

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Currently, we have minimum one million hospitals all over the world but none of them have an application catering to sperm morphology. Microscopic evaluation of human sperm quality is a basic requirement of any diagnostic fertility service, assisted conception (IVF) centre or pathology laboratory. Human Sperm is evaluated in terms of three key features, namely concentration (sperm count), motility (sperm speed) and morphology (individual sperm shape). Conventional manual microscopic analysis of sperm samples is time consuming (1-2 hours) and lacks accuracy and reproducibility in many IVF centres. Motility and concentration are handled with variable degrees of efficiency but morphological or individual sperm health and abnormality detection is still missing from the automated software tools. The manual testing for morphology in labs according to World Health Organization (WHO) standards is labelled flawed by the andrology and fertility researchers due to the following problems:

- A dye has to be injected in the immobilized sample so the microscope can pick the sperms heads well at 1000x magnifications using oil immersion. The dye may transform the natural morphological characteristics of the original cells.

- Too much time has to be consumed as 1000x magnification means looking at only a couple of sperms per slide. And if we follow WHO standards at least 200 sperms have to be analysed, so a lot of images form the microscope have to be taken and processed.

We propose a sophisticated solution which analyses the immobilized sperms at 200x magnification without injecting a dye in. This work is highly appreciated and recommended by many hospitals in UK and we have 2 recommendation letters from 2 major hospitals from the United Kingdom. The physical analysis of the sperm involves the study of:

- Head
- Mid Portion
- Tail characteristics.

Objectives: The following are the objectives of the present study:

- To analyse sperms samples at lower magnifications to get more sperms in the image and save time.

- To write image processing and computer graphics algorithms to detect sperms without the injection of chemical dye which messes with their natural morphology.

- Automatically divide the sperm in 3 major parts namely head, mid-piece and tail.

- Find the head abnormalities using machine learning techniques.

- Find the neck and tail defects using tracking algorithms and some structural analysis techniques mentioned in a Bioinformatics paper.

Biography

Waqas Hussain has completed his Bachelor's degree from Air University, Islamabad. His research paper managed to attain 3ʳᵈ position in the The International Conference on Energy Systems and Policies (ICESP-2014). He developed 3D-Model for World Wide Fund an UK based organization. He presented his research papers in different international research based conferences (Turkey, Dubai and Pakistan). Currently, we have minimum one million hospitals all over the world but none of them have an application catering to sperm morphology. So, now, he is working on this idea using Computer Graphics and Computer Vision algorithms.

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