sperm patches become narrower so that the number of nonsperm patches was lower.

After sperm and nonsperm patches were generated, patches were divided into 3 types of dataset: training, validation, and testing. One can determine the proportion of each type. Generally, training dataset has the most proportion compared to others.

For implementation purpose using Caffe, the image patches were listed in a text file and labeled accordingly. Sperm patches were labeled as 1 while nonsperm ones were labeled as 0. Fig. 10 illustrated how the text file looked like.

```
patch18x18\motilitas_90_-2.avi_(8)20.jpg 1
patch18x18\motilitas_90_-2.avi_(8)200.jpg 1
patch18x18\motilitas_90_-2.avi_(8)201.jpg 1
patch18x18\motilitas_90_-2.avi_(8)202.jpg 1
patch18x18\motilitas_90_-2.avi_(8)203.jpg 1
patch18x18\motilitas_90_-2.avi_(8)204.jpg 1
patch18x18\motilitas_90_-2.avi_(8)205.jpg 1
patch18x18\motilitas_90_-2.avi_(8)206.jpg 1
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)64.jpg 0
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)65.jpg 0
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)66.jpg 0
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)67.jpg 0
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)68.jpg 0
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)69.jpg 0
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)7.jpg 0
patch18x18\nonSperm\motilitas_90_-2.avi_NonSperm(50)70.jpg 0
```

Fig. 10. Example of training text file

The sampling results were given to the veterinarian for validation which method was detailed in G. The sperm patches resulting from the system were considered to be valid images that representing sperms as well as the nonsperm patches. The plot of the sperm coordinates was also accurate.

Based on the result of this research and comparing to currently available works, we have developed a novel system to generate a Convolutional Neural Network dataset from a video/image sample.

V. CONCLUSION

In this paper we have developed a semiautomatic system to generate a dataset with these features: manual sperm marking and validation, automatically slice image frames into sperm and nonsperm patches with different patch sizes. This system simplify the task of veterinarian and researcher in generating dataset for Convolutional Neural Network.

This is an initial work for developing a robust system to detect sperm cells using CNN. In the present time, we are working to make the system fully automatic by implementing a sperm detection system developed by Hidayatullah and Zuhdi[12] with additional features to delete wrongly marked sperms and mark the unmarked sperm. In this paper, we use bull sperm detection as the case study. Nevertheless, we believe that this system is also able to be utilized for other convolutional neural network cases. In the future, we want to do dataset generator for human sperm detection, cell detection, and any other.

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