Development of Annotation Tool for Skin Patch Image Data

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Summary

Convolutional Neural Network (CNN) have obtained significant improvement in image classification. This kind of data-driven algorithm need a This paper introduces an annotation program specific for skin patch image data. This annotation tool be provided with patient info recorder, cell labelling, patch ROI annotating and cropping function which helps fastening up the process of annotation of skin patch image. Besides, our annotation tool is also expected to optimize the process of tagging every cell in the patch image by dermatologist in term of speed. The cell labelling and ROI cropping function are also expected to speed up the development of skin patch dataset.

Ⅰ. Introduction

Skin patch test is a type of skin allergy test which the skin will be exposed to substances which is suspected to trigger an allergy. A patch contains up to 15 cells maximally. Each cell contains different suspected substance will be contacting to patient's skin by attaching the whole patch onto the patient. After 24 hours, the patch will be detached and the skin parts which contacted directly to the cell will be observed at every time interval. The observations will be interpreted by dermatologist.

Dermatologist tags each cell by refer to the photo of skin contacted to the patch. Each single cell will be marked with a number in range between 0 to 4*. 0 indicates no allergy, the higher the value, the more severe the allergic reaction. This activity of distinguishing the cell images by the degree of allergy can be regarded as image classification. Convolutional Neural Network (CNN) had proved itself that it is an excellent algorithm to be applied in image classification [1][2]. These deep learning models be capable to automate the detection of skin allergy. Deep learning models usually require a massive amount of sample during learning. A dataset with large capacity will be helping develops a highly generalized model.

We introduce an annotation tool that helps dermatologist to read the cells while making annotation to the patch image at the same time. The crop and warp function crop only the part contacted with patch as a ROI (Region of Interest) can provide a good view for the dermatologist to determine the reaction. This will also implicitly remove the unwanted element in the image such as background, body part of patient outside the range of patch which result in prevent personal information leak. Our annotation program is expected to increase the efficiency of development of skin patch test dataset.

*The maximum number may be varied depends on the standard defined by organization.

Ⅱ. Functions and User Interface

Corner Marking and Perspective Transformation

Our annotation tool is developed to apply perspective transformation on the image. The four corners of the rectangular patch can be marked manually by the user. These four corners will be used to perform perspective transformation of the ROI (the area contacted with patch) by transform it into a bird's eye view image. This can help the dermatologist to get the aligned view of the ROI. Figure 1 illustrates the perspective transformation of the raw image.

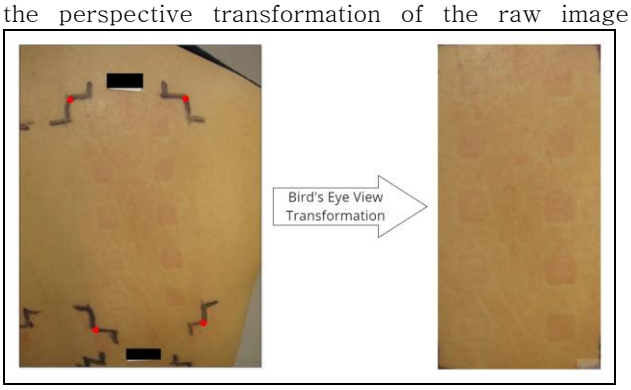

Figure 1.

The red points indicate four corners of the ROI. These points is pointed manually by the user. By using the four points, the ROI is cropped, and other information such as background and patient's other body part will be removed.

User Interface

Figure 2 shows the user interface of our annotation program. Each part is labelled with number and different colours.

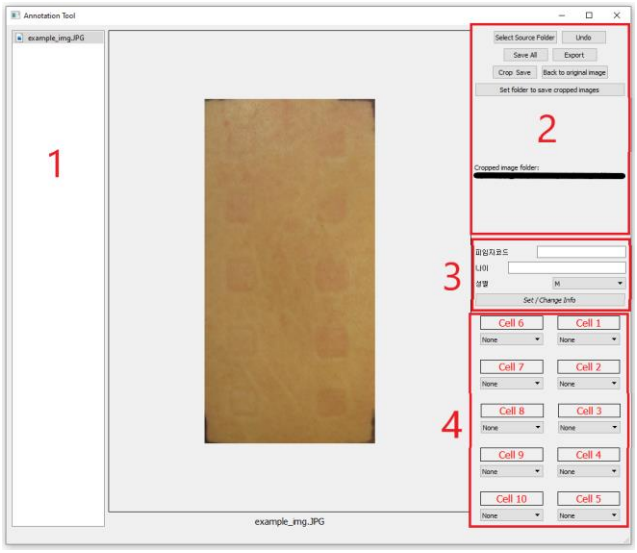

Figure 2

Section 1 is a window that the list of the images will be showed up. Section 2 is a control panel which the user can select the location of raw image and where the cropped images will be saved to. Functions such as undo of corner marking, view the original image, exporting the annotation into a csv file are also included in this section. The patient's information including patient code, age and gender can be recorded in Section 3. Section 4 is the cell annotation panel. Lastly, the image will be displayed at the center of the UI.

Annotation Workflow

First, the location of folder including the raw images and location to save the cropped images must be set in Section 2. All name of the image files will be listed in Section 1. After double-clicking one of the file names, the raw image will be display in the center of the window. An additional patient information can be added to Section 3. The corner marking can be implemented by clicking on the image displayed in the center. Once four corners are marked, the perspective transformation is ready to be applied to the image and transformed image will be saved. The cell annotation can be carried on in Section 4. The position of the input columns in Section 4 is corresponding to the position of cells in the transformed image. The "Save All" button is used to save the annotation temporary in a Pandas data frame. Lastly, the data frame filled with annotations of all images can be exported as csv file by clicking "Export" button.

Development Tools

In the development of our annotation tool, the user interface was built by using PyQt5. The temporary saving of annotation is achieved by Pandas. All image processing is done by using OpenCV[4].

Ⅲ. Conclusion

We proposed a data annotation tool for developing skin patch test image dataset which is expected to make the development more convenient. The current version is still depending on manual corner marking. In the future, we intended to introduce a more advance version equipped with auto corner detection algorithm.

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