Abstract: Density of moles is a strong predictor of malignant melanoma. Some dermatologists advocate periodic full-body scan for high-risk patients. In the current practice, the physician compares the images at different time instances to recognize changes. There is an important clinical need to follow changes in the number of moles and their appearance in images from two different times. To prepare an automatic tracking system, we propose the first human back template allowing an anatomically meaningful comparison between moles in the human back images. The template is constructed based on a predefined number of longitudes and latitudes passed through anatomically meaningful landmarks. After extracting normalized mole location coordinates, we propose using an automatic graph-based approach for finding corresponding moles. We evaluate our proposed method on 56 pairs of real dermatological images. The results show that: first, using our proposed anatomy based normalized coordinates for the matching algorithms, we substantially improve the mole matching accuracy. Second, our proposed matching algorithm compares favourably with the state-of-the-art.

Clinical Significance and Knowledge Translation: Visual inspection of moles is costly, time consuming, and may be error prone due to user fatigue. Therefore, preparing such an automatic mole tracking system has benefits especially for patients who are at a high risk of developing melanoma and, hence, require regular mole examinations.
Skin Mole Matching Incorporating Template Normalized Coordinates

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Overview

Introduction

Proposed Back Template

Mole Matching

Results
Introduction

Density of moles is a strong predictor of malignant melanoma.

Periodic full-body scan for high-risk patients.

Compare different times instances to recognize changes.

(a) 1993
(b) 1996

Figure: Sample of the images 1

\(^1\)Gallagher et al., JAMA, 2000.
Introduction

- Density of moles is a strong predictor of malignant melanoma.

\[1\text{Gallagher et al., JAMA, 2000.}\]
Introduction

- Density of moles is a strong predictor of malignant melanoma.
- Periodic full-body scan for high-risk patients.

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Introduction

- Density of moles is a strong predictor of malignant melanoma.
- Periodic full-body scan for high-risk patients.
- Compare different times instances to recognize changes.

Figure: Sample of the images.¹

¹Gallagher et al., JAMA, 2000.
Automatic tracking of the corresponding moles would have significant health benefits.
Proposed Back Template

- **Landmarks:**

- **Overlaid grid\(^2\):**
Proposed Back Template

- Overlaid grid\(^3\):

- Normalized space:

\(^3\)Corresponding latitudes and longitudes are shown with the same color.
Proposed Back Template

- corresponding cells with similar colors:
Mole Matching
Results

We evaluate our proposed method on 56 pairs of real dermatological images.

Some statistical results:
- Accuracy in correct matching: 299 out of 370 = 80%
- Accuracy in detecting appearing moles: 241 out of 253 = 95%
- Accuracy in detecting vanishing moles: 44 out of 73 = 60%
We evaluate our proposed method on 56 pairs of real dermatological images.

- Accuracy in correct matching: $\frac{299}{370} = 80\%$
- Accuracy in detecting appearing moles: $\frac{241}{253} = 95\%$
- Accuracy in detecting vanishing moles: $\frac{44}{73} = 60\%$
Results

- We evaluate our proposed method on 56 pairs of real dermatological images.
- Some statistical results:

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Implications to knowledge translation and clinical dermatology

- Our study is in the **Applied/functional experiments** stage.
- Visual inspection of moles is costly, time consuming, and error prone.
- Automatic mole tracking system has benefits especially for patients who require regular mole examinations.
Acknowledgement
Thanks :)
