Interactive Image Segmentation

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Outline

• Introduction

• Motivation & Objective

• Related Works

• Research Gap

• Current Progress

• Future Plan
What’s Image Segmentation

- the process of *partitioning* a digital *image* into *multiple meaningful segments*

- It is often used to locate objects and boundaries in images

- Have wide applications—*Multimedia Indexing & Retrieval, 3D Reconstruction, Video surveillance* ....
What’s Image Segmentation

We can classify the existing methods into two rough classes based on whether they rely on user interaction or not:

• **Automatic Image Segmentation**– K-Means, Watershed, Mean-shift……..

• **Interactive Image Segmentation**– Magic wander, Magnetic Lasso…….
Why need interactive factors?

*Here is an example for illustration:*

Why automatic methods produce so poor result?

*It lacks higher level semantic information to guide its search for desirable solution*
Why need interactive factors?

Here is an example for illustration:
Research Objective

Find new method which

• Produces better result than the automatic ones with the help of user input.

• Has a clearly defined user interface which can reflect user’s original intention

• Provides quick feedback which allow user to justify the segmentation result and make further refinement
Related Works

Active Contour Model (Snake) – M. Kass, A. Witkin, D. Terzopoluos (IJV 1988)

• User is asked to input a set of initial contour near the desire boundary, then the contour will iteratively evolve to the object boundary

• May get trapped in some local minimum
Related Works

Intelligent Scissors—E.N. Mortensen, W.A. Barrett (SIGGRAPH ‘95)

- Require user to point the mouse in proximity to the object edge, then “live-wire” will snap to the object boundary
- In case of highly textured area, large number of user input is needed which is laborious
Related Works

Random Walk — L. Grady (TPAMI 2006)

- Include Foreground/background strokes to help incorporate regional (GMM) and boundary information

- But is sensitive to seeds number and positions due to lack of global color information
Potential Research Gap

- Most methods rely on local information such as color, texture to make segmentation decision—will frequently find a lot of trivial, non-semantic regions.

- Moreover, many algorithms are concerned with dual-label problem, multi-label problem are seldom studied.

Thus we attempt to solve multi-label problem with the help of user input and features which can provide global information.
Current Progress

In the past 6 months, we’ve made the following progress

• Made intensive research into the existing algorithms & developed a broad idea about the strengthens & weaknesses of the current methodologies

• Implement continuous max-flow multi-label segmentation model

• Experiment on the expressive power of existing features, such as GMM, curvature…..
Future Plans

• Try adding user input as the constraints in continuous max-flow model

• Make further research to find features which can provide global information
Thank You!