



# ASSISTED GROUND TRUTH GENERATION USING INTERACTIVE SEGMENTATION ON A VISUALIZATION AND ANNOTATION TOOL

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## CONTRIBUTION: INTERACTIVE SEGMENTATION IN FIREFLY

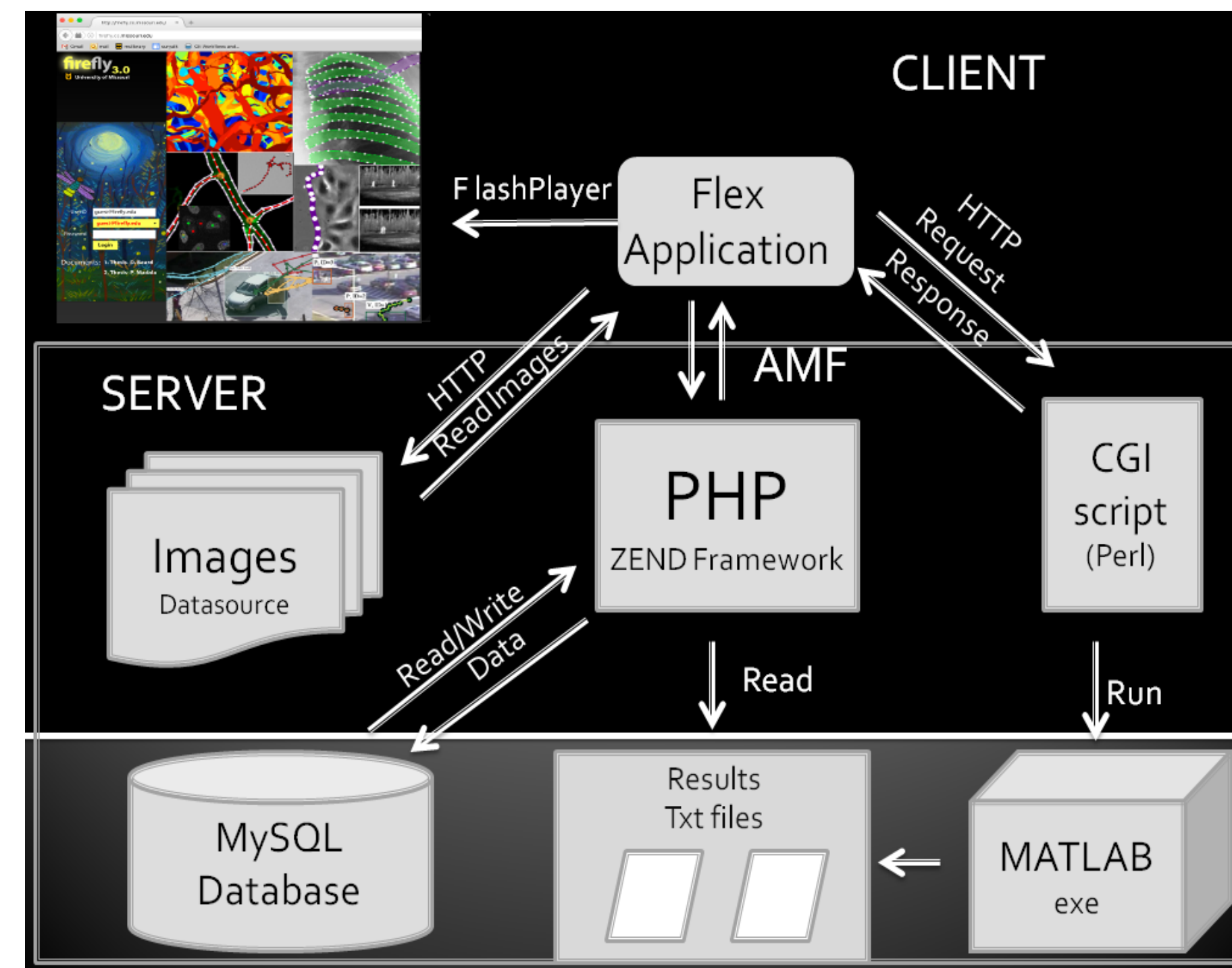


Figure 1: Architecture of Firefly.

- Firefly: Rich interactive web-based tool for annotation and ground truth generation.
- Uses Model View Controller Design pattern. Abode flex in the front end. PHP on Apache server for controller logic. MySQL for saving the annotations, authentication and authorization details [1].
- Integrated interactive segmentation algorithm [2] with Firefly for assisted ground truth generation.
- Automatically generates contour for the segmented result using line fitting algorithm [3].

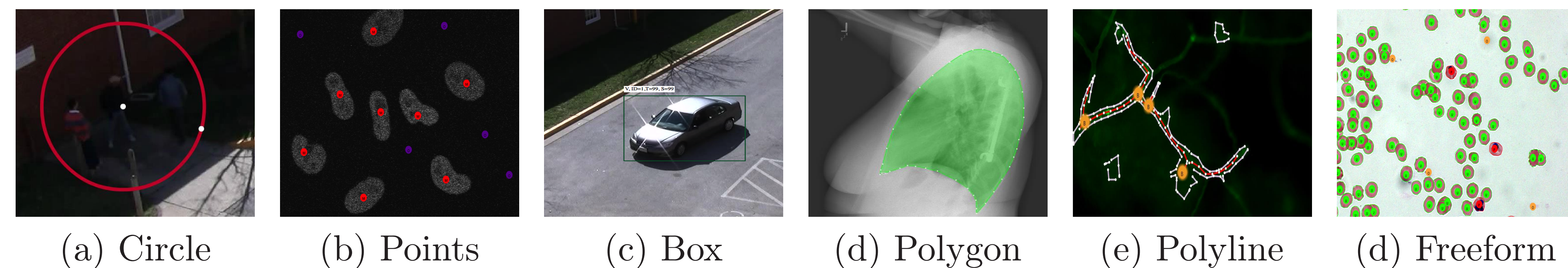


Figure 2: Various annotation tools are available in Firefly.

## INTERACTIVE SEGMENTATION WORK FLOW IN FIREFLY

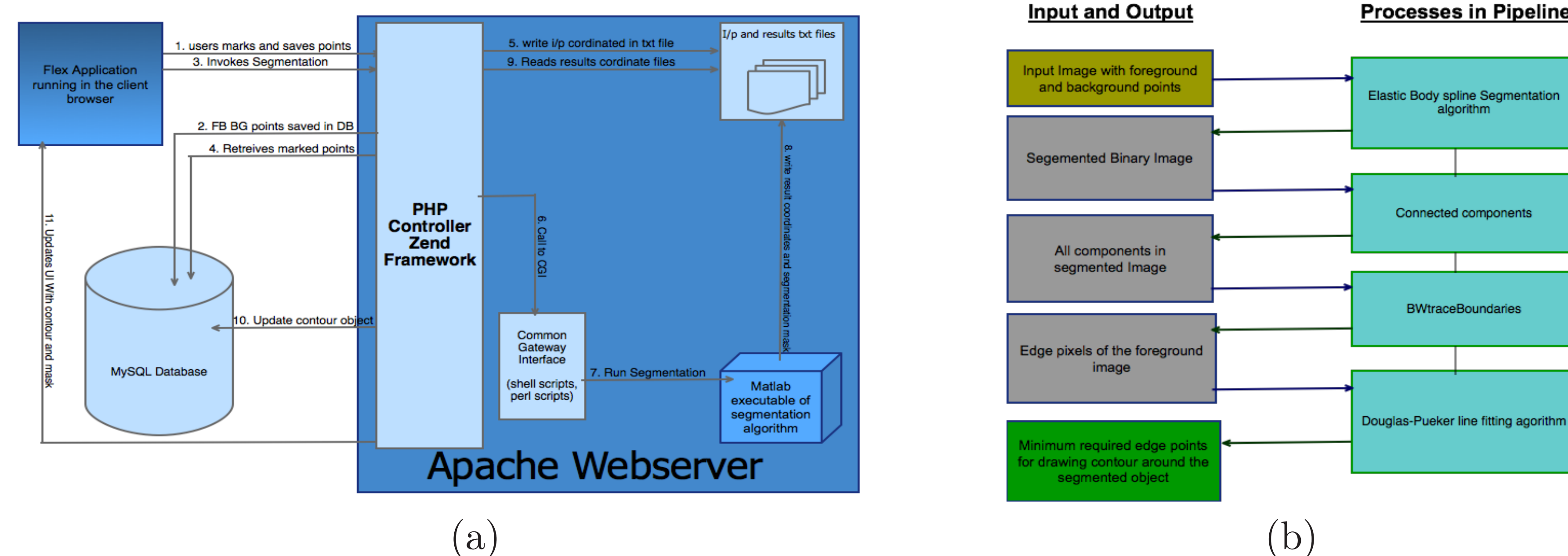


Figure 3: (a) Interactive segmentation framework in Firefly. (b) Process flow pipeline of the interactive segmentation framework.

## WEBSITES AND MORE INFORMATION



- Firefly: <http://firefly.cs.missouri.edu>
- CIVA Lab: <http://cell.missouri.edu>
- Download the poster @ figshare: <https://dx.doi.org/10.6084/m9.figshare.4036245.v1>

## INTERFACING FIREFLY WITH INTERACTIVE SEGMENTATION

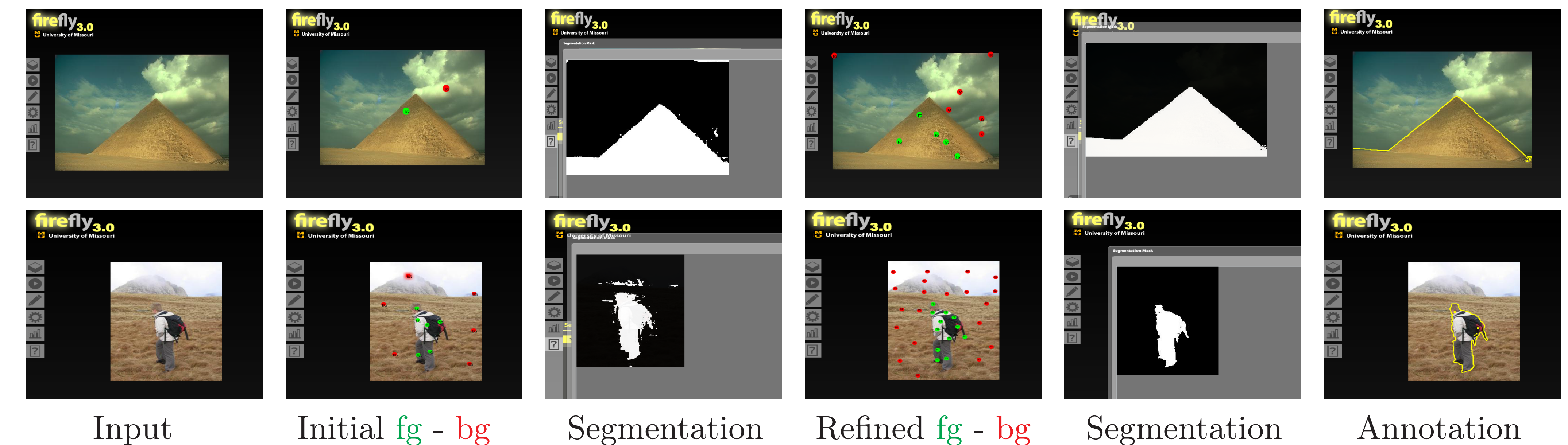


Figure 4: User interaction with Firefly to generate segmentations and annotations.

## SEGMENTATION RESULTS ON BIOMEDICAL IMAGES

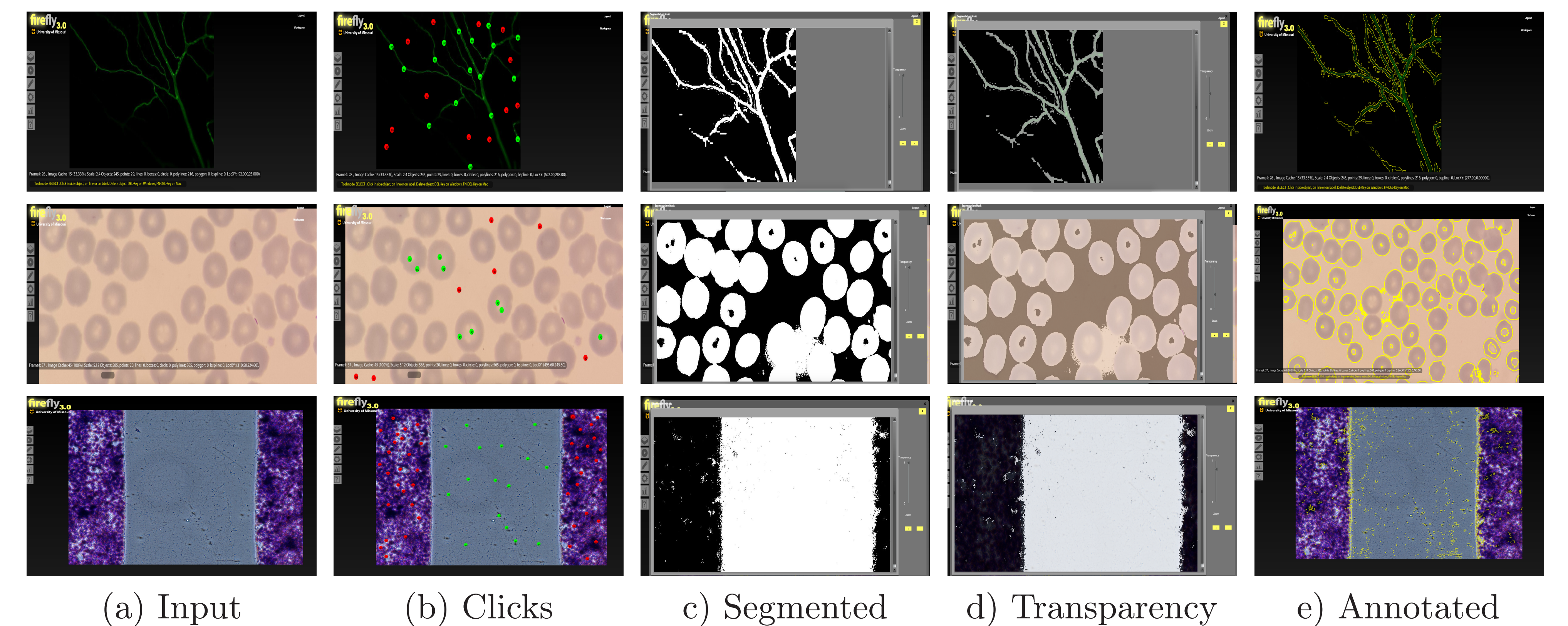


Figure 5: Interactive segmentation and ground truth generation on biomedical imagery [4, 5, 6].

## REFERENCES

- [1] R. Singh. Web-based interactive editing and analytics for supervised segmentation of biomedical images. MS. dissertation, University of Missouri-Columbia, USA, 2014.
- [2] S. Meena et al. Elastic body spline based image segmentation. *IEEE ICIP*, 2014.
- [3] D. H. Douglas, T. K. Peucker. Algorithms for the reduction of the number of points required to represent a digitized line or its caricature. *Reflections on Influential Articles from Cartographica*, John Wiley & Sons, Chichester, UK, 2011.
- [4] S. Meena et al. User driven sparse point based image segmentation. *IEEE ICIP*, 2016.
- [5] S. Meena et al. Multiquadric spline-based interactive segmentation of vascular networks. *IEEE EMBS*, 2016.
- [6] V. B. S. Prasath et al. Computerized microvasculature dura mater structure extraction and analysis of fluorescence microscopy imagery. In: *Missouri Informatics Symposium*, April 2016, University of Missouri-Columbia, USA. Available at figshare: <http://dx.doi.org/10.6084/m9.figshare.3146269.v1>