Abstract: Digital dermatoscopy techniques for diagnosing malignant melanoma are adapted to consumer-grade mobile devices with macro photography lenses and a prototype application for Android devices is presented.

Malignant Melanoma
- Melanoma is the most deadly variety of skin cancer, accounting for the majority of skin cancer related deaths globally
- Self-examination is proven to be effective for decreasing mortality rates, but there is a large inconsistency in the interpretation of risk factors
- The ABCDE method for skin self-examination is the most established:
  - Asymmetry
  - Border
  - Color
  - Diameter
  - Evolving
  - Ever changing

Dermatoscopy vs. Macro Photography
- Digital dermatoscopy techniques for diagnosing malignant melanoma are adapted to consumer-grade mobile devices with macro photography lenses and a prototype application for Android devices is presented.
- Dermatoscope® by Fotofinder Digital Dermatoscope:
  - Physician centered: Designed for expert users
  - Polarized filters
  - Sub-dermal imaging
  - Existing body of technical literature for automated image processing
- Photojojo Macro Lens Adapter for Mobile Devices:
  - Patient centered: requires no prior knowledge
  - Inexpensive, consumer grade
  - Magnification only
  - Barrel and pincushion distortion
  - Variable imaging conditions

Feature Detection and Description
- Preprocessing:
  - Otsu Binarization
  - Small Region Removal
- Segmentation:
  - Largest Component
  - Max Size Filter
- Descriptors:
  - Symmetry
  - Border
  - Color

Results
- Asymmetry:
  - Region color and texture are variable
  - Use percentage of pixels whose mirrors are included within a region instead
  - Computing a full symmetry map is computationally expensive
  - Calculate symmetry about 0, 45, and 90 degree axes only

Future Work
- Testing against large datasets
- Image segmentation refinement
- Region matching for change detection over time
- Lesion location mapping for automatic generation of mole maps

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Feature Validation
- Mobile Implementation
- Printed Phantom
- Asymmetry Phantom
- Color Phantom
- Printing test images does not work – pixilation due to printing process
- Use “melanoma phantoms” to test individual descriptors
- Required locally adaptive thresholding due to device shadow in image

Flow Diagram
- Asymmetry
- Border Strength
- Color Variation
- Printed Phantom
- Asymmetry Phantom
- Color Phantom
- Printing test images does not work – pixilation due to printing process
- Use “melanoma phantoms” to test individual descriptors
- Required locally adaptive thresholding due to device shadow in image