

## Research of Methods Search Key Points for 3D Modeling of Amber Samples

**Oksana Luhovykh**

Zhytomyr Polytechnic State University, Zhytomyr, Ukraine

### **Abstract:**

3D visualization and modeling of amber samples is important for assessing shape, inclusions, color, and volume. The results obtained allow for amber evaluation and calculation of optimal stone processing. To create a machine vision system, the following steps must be performed: camera calibration, amber image acquisition, keypoint extraction, point triangulation, and polygon mesh creation.

The Nikon D3100 kit camera was calibrated using a checkerboard image and the `cv2.calibrateCamera` function (OpenCV library). The reprojection error is 0.3153 pixels (px), which is a good value.

To detect the control points of the image of the amber sample, two methods were researched: SIFT and ORB. 16 images of the sample were researched and the number of key points on the surface of the object, the calculation time for finding the key points and the number of correct key points were determined. The SIFT method was chosen, which is resistant to the influence of adverse factors and has a larger number of correct points.

To determine the spatial position of the camera, the Perspective-n-Point method was used. The errors for the key points of the camera position and orientation are in the range from 0.43 to 50 px. This indicates certain inaccuracies in determining the triangulation parameters, due to objective factors.

After completing all the steps, we have a set of triangulated points for the amber sample. Based on this set, we can calculate the steps for further processing the amber sample.

### **Keywords:**

Computer vision, camera calibration, 3D visualization, point triangulation, object reconstruction.