LIVENESS DETECTION IMPLEMENTATION NOTE

BACKGROUND KNOWLEDGE

Given two images, BioID Liveness Detection analyzes whether these were captured live from a genuine user. It is geared at preventing fraud through replay or presentation attacks such as videos, print-outs or masks.

In addition to leveraging deep learning, the proprietary optical flow algorithm analyses the user's motion. Therefore, BioID Liveness Detection requires two live images in between which the person has moved slightly. To use our API effectively, **the capturing of these two images is essential.**

Step 1:
Client-side image capture using BioID Motion Detection

Step 2:
Server-side Liveness Detection analysis

CLIENT-SIDE MOTION DETECTION

To facilitate your implementation, BioID provides a simple algorithm called "Motion Detection" for you to capture both images based on natural head movement. The client-side Motion Detection automatically triggers the image capture, as soon as enough movement was detected.

Images with lack of motion or too much motion will be rejected by the Liveness Detection API. For ensuring best performance of the API operation, BioID Motion Detection is strongly recommended, so your application is capturing and uploading suitable images to the BioID Web Service.

All information about the BioID Motion Detection, including source code for HTML5 & Javascript, iOS and Android can be found here:

https://developer.bioid.com/app-developer-guide/bioid-motion-detection

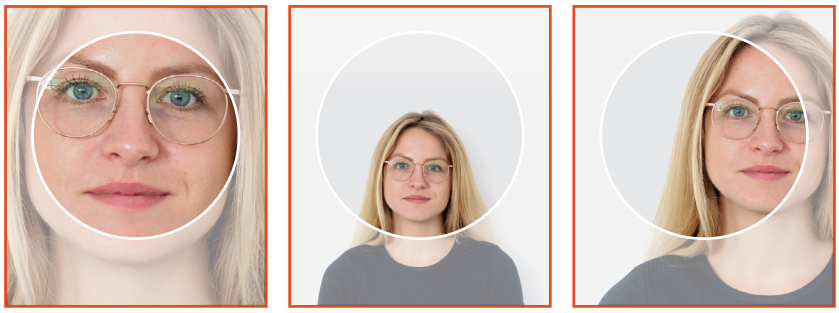
REQUIREMENTS OF THE TWO IMAGES

Desired Input Images	Example	Technical specification
"liveimage1": - face centered & fully visible - frontal image looking at camera		- Min 640 x 480 - PNG format - No compression - Full colour
"liveimage2": - an image triggered by using BioID Motion Detection e.g. slight nodding.		

REASONS FOR LIVENESS DETECTION FAILURE

1. Too much movement

2. Wrong placement



Have a look at our video example: https://youtu.be/w8OJrdCBblU

FAILURE PREVENTION

Always analyze the error information returned by the API upon a failure and provide useful user guidance based on the analysis

Most common reasons for failure	The problem	BWS Error Messages	Technical indication	Indication for User Interface
Movement too strong	Second image is blurry or turned sideways too much, (e.g. one eye not visible with face in profile) so that the two images can't be compared.	E.g. no face found / Image too blurry	Implement motion trigger if not done so	• Prompt user to nod instead of turning sideways • Ask user to move only slightly (about five degrees of movement is enough!)
			Modify motion trigger threshold (might be too high = too insensitive)	
Face not centered / not fully visible	Face only partially visible; most commonly chin or forehead are not in the picture	E.g. no face found	Optional: Use client-side face finder to determine the position of the face in the center of the display and in desired size (not provided by BioID)	• Prompt user to position in the center of the display • Ask user to fully capture their face • Display circle in the center of the display for the user to position in
User too far away or too close to the camera	If face is too small/ large compared to the whole image, the extracted portrait can have bad quality and movement can't be analyzed properly	Check eye coordinates returned by API	Optional: Use client-side face finder to determine the position of the face in the center of the display and in desired size (not provided by BioID)	• Display a circle in the middle of the capturing area • Prompt user to come closer / position their face in the circle
Lighting comes from the back	Face features and movement not analyzable due to strong difference in brightness between background and face	Check API message: e.g. "The image is under-exposed, i.e. it has too many very dark pixels."		• Ask user to provide good frontal lighting conditions • Ask user to come closer (lighting effect reduces if face fills the captured image)

WORKFLOW AND USER INTERFACE

1. Prompt the user to look straight. Make sure the user positions his/her face in the center of the image, ¼ from each side. This works best if you display a frame or circle in which the user should position.

   NOTE:
   A centered face is important as only the center of the image is used for motion analysis.

2. Capture the first image ("liveimage1").

3. Prompt the user to nod slightly and slowly. During this movement, the BioID Motion Detection will compare "liveimage1" with subsequent frames in the frame buffer until the difference reaches the preset threshold. Then use this frame as the second image ("liveimage2");

   NOTE:
   For mobile applications, the threshold may need to be adjusted.
   In particular, the threshold may need to be higher to avoid inadvertent image triggering due to device movement. It is important that the head movement triggers the image capturing, NOT the device movement.

4. Call LiveDetection API using the two images captured, i.e. "liveimage1" and "liveimage2".

BEST PRACTICE APPLICATION TIPS

- Ensure a secure application and never support virtual cameras
- Allow only a limited number of attempts (e.g. 3 - 5)
- Provide helpful feedback right away after repetitive failed attempts, e.g. providing examples of good and bad images, a simple animation guiding the user, a tutorial, etc.

NOTE:
BioID GUI materials are available upon request.

You can find our video tutorial here:

https://youtu.be/fBbVBIub50I