1.0 SUMMARY

The purpose of this data collection protocol is to develop a joint multi-biometric database to address research tasks in identification at a distance under non-ideal conditions to represent a range of iris and face quality images for varying sensors, distances, illumination, and quality. The experimental setup has been designed for acquiring images for the second phase of ‘DHS/NSF Dynamic Decisional Fusion Face/Iris Database’ grant.

The main factors which will be studied are the impact on quality and performance over five distances: baseline, 5’, 7’, 11’, 15’, 25’. Subject will enroll (baseline) and stand at each of these five distances. Additionally, subjects will be asked to walk through a ‘portal’ at 7’ and 15’ to introduce motion blur. To produce non-uniformity in the dataset, variability in the data will be introduced through six factors (resolution, ambient (or external) illumination, out-of-focus blur, multiple faces, gaze/pose angles, and motion blur). Additionally, an occlusion factor will be introduced for iris images. For each factor, our goal will be to achieve high, medium, and low quality iris and face images. Distances of 5’, 7’, 11’ produce variability in iris resolution specifically tuned to produce high/med/low resolution iris images. Distances of 5’, 15’, 25’ produce variability in face resolution to produce high/med/low face images.

1.1. Subject criteria
We will collect data from 150 subjects, at least two visits each. Criteria:

- Minimum of two weeks between visits
- At least 35 subjects over 30 years old.
- Tinted, mirrored, or polarized glasses are not allowed
- Textured or colored contacts not allowed

1.2. Subject Enrollment

Subjects will read and sign a consent form and be assigned a random subject ID number. The subject will then be entered into the database and be asked to provide the following information; gender, date of birth, ethnicity, eye glasses, contact lenses, hair color, hair length, facial hair, and eye color. The subject will then proceed to data collection area for iris/face biometric data collection.

1.3. Baseline Images

Baseline data shall be obtained using the MBARK system, with the following characteristics:

- MBARK is a general application that allows users to collect biometric data. Two biometric sensors are used in our application with the MBARK system, one for iris images and one for face images.
- Iris sensor: OKI IRISPASS EQ5016A iris camera. Images obtained from this sensor are 640x480 pixels, with ~200 pixels across the iris resolution.
  - Image quality control logic internal to the camera is active.
- Face sensor: Olympus C-5060 camera. Images obtained from this sensor are 2592x1944 pixels, with ~400 pixels between the eyes resolution.
  - Background for face capture is controlled with an 18% reflectance gray color

In a normal situation, the system takes 4 iris images (2 left and 2 right) and 10 face images. If the subject wears glasses, the system takes 4 iris images, and 10 face images without the glasses and 10 with the glasses on.

1.4. Face and Iris Overview

For the remainder of the experiment, under each distinct subject condition, a near-infrared (NIR) camera will be used to capture the iris video and a HD camcorder will be used to capture the face video. The two cameras will run simultaneously for video collections where both iris and face videos are needed. NIR lighting will used to allow for the iris image capture. A series of two different types of visible lighting (room overhead fluorescent and incandescent) will be used for the face image capture. The equipment list and settings are listed in Section 2.0.

Face and iris will be collected simultaneously in all cases where iris and face data are both needed. However, varying factors for face and iris may not be occurring simultaneously; e.g., face out of focus variation will not be performed at the same time as iris out-of-focus variation. A table (which follows at the end) will further describe the experiments to be performed.
For each quality factor, each section will discuss the methods to achieve varying quality, the metric to measure, and the targets values to achieve high/med/low. Each section will consider iris and face separately.

1.4. Resolution

Iris

- **Methods:** subject at varying distances with a set focal length. Collection at distances 5’, 7’ and 11’ generate the high/med/low resolution images respectively. We will also collect data at 15’ and 25’ during face resolution trial.
- **Metric:** Pixels across iris (measured horizontally at the maximum value)
- **Proposed Targets:**
  - High: 280 to 300 pixels across the iris (comparable higher quality UBIRIS datasets and high-end of ranges suggested by Daugman and high end range in drafts of the iris image interchange format)
  - Medium: 200 to 220 pixels (comparable to medium quality CASIA and Biosecure datasets and the center of the range suggested by 2)
  - Low: 100 to 120 pixels (similar to the 100 – 149 pixels requirements for “low quality” iris images according to ISO iris image standards (table below), comparable to low quality MBGC dataset–NIR face camera and below the minimum of 140 pixels suggested by Daugman)

Table from Iris Quality Standard under development

The spatial resolution of the iris imaging system should be at least 2 lp/mm at the object plane with 80% modulation. The digital image that is captured from the iris should have pixel resolution equal to at least 8.3 pixels per mm. Image suppliers may indicate higher levels of resolution by specifying in the CBEFF image header an image quality value corresponding to acceptable or good quality in accordance with Table A.1. Typical iris diameter values, corresponding pixel resolution in pixels per mm, and optical resolution specified for 80% modulation, are listed in Table A.1. Specific recommended values are defined in the following subclauses.

<table>
<thead>
<tr>
<th>Image quality level</th>
<th>Image quality value</th>
<th>Expected iris diameter, pixels</th>
<th>Minimum pixel resolution, pixels per mm</th>
<th>Optical resolution at 60% modulation, lp/mm</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0 – 25</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Unacceptable quality</td>
</tr>
<tr>
<td>Low</td>
<td>26-50</td>
<td>100 - 149</td>
<td>8.3</td>
<td>2.0</td>
<td>Marginal quality</td>
</tr>
<tr>
<td>Medium</td>
<td>51 - 75</td>
<td>150 - 199</td>
<td>12.5</td>
<td>3.0</td>
<td>Acceptable quality</td>
</tr>
<tr>
<td>High</td>
<td>76 - 100</td>
<td>200 or more</td>
<td>16.7</td>
<td>4.0</td>
<td>Good quality</td>
</tr>
</tbody>
</table>

Face:

2. First Working Draft, Iris Image Interchange Format, Project 1576, Project Proposal M1/02-0181, Revision C
- **Methods:** Varying subject-camera distance while the focal length of the camera is fixed. We will set the focal length of the lens at 50 mm, with a target to achieve high resolution at 5’, med at 15’, and low at 25’.

- **Metric:** Pixels between the eye centers.

- **Proposed Target:**
  - High: 350 to 800 pixels between the eye centers (levels 50 and 51 in ANSI/NIST-ITL 1-2007 standard\(^3\), Annex I)
  - Medium: 120 to 300 pixels between the eye centers (level 40 in ANSI/NIST-ITL 1-2007 standard, Annex I)

1.5. Illumination:

**Iris**

- **Methods:** We seek to achieve varying levels of illumination through fixed illumination plus varying levels of lights (based on LED arrays) positioned 2 feet from subject.
  - Lighting
    - LED-based portal (830 nm with angle of 30°, 5 Watts each) positioned two feet from subject, a total of 8 LED-based lights which can be independently turned on/off.
    - High lighting/contrast: 8 LED-based (5’, 7’ 11’) and 10 LED-based (15’, 25’)
    - Medium lighting/contrast: 6 LED-based (5’, 7’ 11’) and 8 LED-based (15’, 25’)
    - Low lighting/contrast: 4 LED-based (5’, 7’ 11’) and 6 LED-based (15’, 25’)
  - **Metric:** Contrast measured as the difference in the gray level between that sclera-iris and iris-pupil levels. We will select a representative sample from the sclera, iris, and pupil to perform measurements.
  - **Proposed Target (number of gray levels):** The lower bound for the contrast suggested by the current ISO iris image standard requirements is a minimum of 70 gray levels between iris and sclera and a min of 50 gray levels between pupil and iris.

<table>
<thead>
<tr>
<th></th>
<th>Sclera-Iris</th>
<th>Iris-Pupil</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>Med</td>
<td>70</td>
<td>50</td>
</tr>
<tr>
<td>Low</td>
<td>50</td>
<td>30</td>
</tr>
</tbody>
</table>

Target contrasts provide average quantities to be achieved among irises of all colors

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\(^3\) ANSI/NIST-ITL 1-2007 Data Format for the Interchange of Fingerprint, Facial, & Other Biometric Information – Part 1, Annex I
• **Methods:** We seek to achieve varying levels of illumination through fixed overhead illumination (med) plus additional incandescent illumination (high) or strictly side illumination to produce shadow (low).

  ▪ **Lighting**
    - Overhead fluorescent
    - Two incandescent 500 Watts studio lamps, arranged in a Two-point balance lightning, each at 30°-45°, diffused with umbrellas, positioned at 5 feet from the subject.
    - Single direct incandescent studio lamp 500 watts studio lamp, diffused with umbrella, positioned with subject at 90°

  ▪ **Face lighting setup**
    - High: overhead fluorescent plus two-point lightning
    - Medium: overhead fluorescent
    - Low: single incandescent lighting at 90° to form a shadow on one side of the face, overhead lights off to increase shadow effect

  ▪ **Metric:** dynamic range measured as the number of gray levels (based on 8-bit, 256 gray level range).
    - ISO/IEC 19794-5:2005(E) Information technology — Biometric data interchange formats —Part 5: Face image data Standard requires the following: “The dynamic range of the image should have at least 7 bits of intensity variation (span a range of at least 128 unique values) in the facial region of the image.” They also state that the image should be free from shadows; hence the ‘low’ images will include shadows.

  ▪ **Proposed Target:**
    - High: width of histogram above 128 gray levels
    - Med: width of histogram below 128 gray levels
    - Low: Shadowing on one side of face.

1.6. Out of Focus Blur

**Iris**

• **Methods:** A 6 sec. video sequence of a subject will be taken with gradual change of the focus by changing the focus ring on the camera. This will ensure that the true in-focus image and the images with different amount of blur are captured. For each setup, the camera will be focused and turned until it is (just) completely out of focus. Once the camera is recording, the collector will change focus until the image is in focus and then go beyond focus point to completely out of focus again.

• **Metric:** Normalized LoGscore measured on a scale of [0,1], expressed as a percentage. The exact amount of blur will be controlled/measured by the sharpness measure obtained via computer processing of an iris image as the convolution result of the Lagrangian of Gaussian operator (LoGscore of an iris image). The LoGscore (normalized on the scale of [0,1]) of an iris image almost exactly matches the relative modulation transfer function (MTF) computed from the ISO 12233 test chart[^1]. Use of the chart is not

[^1]: Downloaded from [http://www.graphics.cornell.edu/~westin/misc/res-chart.html](http://www.graphics.cornell.edu/~westin/misc/res-chart.html).
feasible on a large scale, as the features of interest on the iris are quite small and therefore it is difficult to align and to maintain alignment of the chart with the iris. Thus, the use of the LoGscore will be used to select frames of varying focus instead of the more involved chart utilization and MTF computation.

- **Proposed Targets:**
  To obtain the three levels (high, medium and low) of out-of-focus blur, frames with the following ranges of normalized logscore will be selected: It should be noted that more than three frames can be selected to create multiple samples at varying levels of blur (limited by the rate of change of blur compared to the frame rate.

<table>
<thead>
<tr>
<th>Blur category</th>
<th>Metric: Norm. LoGscore</th>
<th>Examples of out-of-focus iris images</th>
</tr>
</thead>
<tbody>
<tr>
<td>High blur</td>
<td>40-50%</td>
<td><img src="image1" alt="High blur example" /></td>
</tr>
<tr>
<td>Med blur</td>
<td>60-70%</td>
<td><img src="image2" alt="Med blur example" /></td>
</tr>
<tr>
<td>Low blur</td>
<td>100% (sharp)</td>
<td><img src="image3" alt="Low blur example" /></td>
</tr>
</tbody>
</table>

**Face**

- **Methods:** A 5 sec. video sequence of a subject will be taken with gradual change of the focus by manually changing the focus on the camera. This will ensure that the true in-focus image and the images with different amount of blur are captured. A sharpness chart will be placed on a stand beside the face.

  **Metric:** Relative MTF at chart level 2, expressed as a percentage. The exact amount of blur will be controlled/measured by relative modulation transfer function (MTF) from ISO 12233 test chart magnified to 400% zoom. Due to the nature of blur in face images (that is visible only in large features), chart level 2 was computed for the lowest resolution (25 ft) and then used for calculation at all distances/resolutions (at 5ft, 15ft and 25ft):

  ![Chart level 2 example](image4)

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5 Downloaded from [http://www.graphics.cornell.edu/~westin/misc/res-chart.html](http://www.graphics.cornell.edu/~westin/misc/res-chart.html).
• **Proposed Targets:**
  To obtain the three levels (high, medium and low) of out-of-focus blur, frames with the following ranges of relative MTF will be selected:

<table>
<thead>
<tr>
<th>Blur category</th>
<th>Metric:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relative MTF at chart level 2</td>
</tr>
<tr>
<td>High blur</td>
<td>20-30%</td>
</tr>
<tr>
<td>Med blur</td>
<td>50-60%</td>
</tr>
<tr>
<td>Low blur</td>
<td>100%</td>
</tr>
</tbody>
</table>

1.7. Multiple faces

Iris

- Not Applicable, no iris recording for this experiment.

Face

**Methods** Two additional subjects will be positioned behind the subject of interest where faces will overlap in the HD video camera field of view. The first additional subject will stand one foot behind subject, one step to the right. The second additional subject will stand two feet behind the subject, one step to the left. When the video camera begins to record, the two collectors will
take eight different positions around the subject, holding momentarily at each position. The positions will be; two additional subjects behind subject on either side with no face overlap, the two additional subjects take a half step in to produce half face overlap on either side, the two additional subjects cross for half face overlap on the other side, the two additional subject take another half step out to produce no face overlap on opposite sides, additional subject on left side walks around the subject on the left side to stand directly in front of the subject without face overlap, both subjects take a half step towards the middle to produce half face overlap, two additional subjects switch sides to produce half face overlap on opposite sides, and both additional subjects take another half step out so that no faces are overlapping.

- Multiple Face Metric - Not Applicable.
- Multiple Face Targets - Not Applicable.

1.8. Off-Angle:

Iris

- Gaze angles will be achieved through markings on a movable stand.
- **Methods:** Different gaze positions, head fixed straight forward.
  - Five positions for 30 degrees gaze variation (approximate drop off point for performance in commercial systems based on Iris06 from Authenti-Corp report)
    - First position is neutral gaze (straight ahead).
    - XY plane (parallel with the floor at eye level) – 30 degree (right), and 30 degrees (left).
    - YZ plane (slice body symmetrically) – 30 degree (up), 30 degree (down).
- **Metric:** Gaze angle (intended) in degrees and direction
- **Proposed Targets:** not applicable.

Face

- **Methods:** Different head positions, eyes fixed straight relative to head
  - Five positions for 30/70 degrees (3/4 face)
    - First position is neutral gaze (straight ahead).
    - XY plane (parallel with the floor) – 70 degree (left), 70 degree (right)
    - YZ plane (slice body symmetrically) – 30 degree (up), 30 degree (down)
- **Metric:** Head pose angle (intended) in degrees and direction
- **Proposed Targets:** not applicable.

1.9. Motion blur

Iris

- **Methods:** The subject will be asked to walk straight towards the camera from 5 feet above to 5 feet below the set distance to produce motion blur.

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6 Iris Recognition Study 2006 (Iris06) Aka Standards-Based Performance And User Cooperation Studies Of Commercial Iris Recognition Products, 1 September 2007, Version 1.0, Authenti-Corp
Speed of walking controlled by a metronome. We measure stride and set metronome to achieve fast and slow walking speeds

- The focal length will be set to get high quality images at 7 and 15 feet (each).
- Lighting portal will be placed 2 feet from target distance (7 or 15 feet), all 10 LED-based lights will be illuminated, as well as UF500 at 5 ft from focal plane.
- Camera settings: ET: 5,000 μs, 25 frames/sec, 230mm at 7 feet, and 630 mm at 15 feet.

- **Metric**: Blur metric not defined or computed. Frame selection based on maximum sharpness (computed using XYZ method) to maximize the focus (isolate the motion blur).
- **Proposed Targets**: Fast and slow walking speeds of ~1.5 miles/hour (65 beats per minute) and ~2.75 miles/hour (120 bmp), respectively.

### Face

- **Methods**: Same method as iris motion blur (capture both face and iris simultaneously)
- **Metric**: Speed of walking controlled by a metronome. We measure stride and set metronome to achieve fast and slow walking speeds.
- **Proposed Targets**: Fast and slow walking speeds of ~1.5 miles/hour (65 beats per minute) and ~2.75 miles/hour (120 bmp), respectively.

#### 1.10. Occlusion: Iris

- **Methods**: Occlusion due to blinking of the eye will be captured to obtain a partial image of the iris. The subject will be asked to blink repeatedly every second during a 6 second recording.
- **Metric**: not applicable.
- **Proposed Targets**: not applicable.

### Face

- Not Applicable, no face recording for this experiment.

## 2.0 EQUIPMENT LIST

### Iris

- Dalsa 4M30 infrared camera, Dalsa Corporation
- Tamron AF 70-300mm 1:4.5-5.6 LD DI lens
  - B+W 62mm 092 IR filter (removes 680 nm and below)
  - Set at 230 mm / f4.5 for 5/7/11 feet
- Sigma APO 300-800mm F5.6 EX DG HSM lens, Sigma Corporation of America
  - B+W 46mm 092 IR filter (removes 680 nm and below)
  - Kenko Extension tubes (12mm+20mm+36mm)
  - Set at 630 mm / f5.6 for 15/25 feet
- **Exposure time**: 7500 μs for 5/7/11 feet, 30000 μs for 15/25 feet, motion blur: 5000 μs
Face:
• Canon VIXIA HFS100, HD camcorder
  MXP (24 Mbps), 1920 x 1080 Full HD Recording, 30p Progressive

Lighting:
• 10 light spots, LED-based (830 nm, angle of 30°, Power 5 Watts each)
• 3 incandescent 500 Watts studio lamps, with 43” umbrellas
• For medium light settings, umbrella (off) is placed on left side of subject to reduce uneven illumination from fluorescent lights in the room.
• 1 UF500-030-830 (830 nm, angle of 30°, Power average 77 Watts)

3.0. GENERAL DESCRIPTION OF PROCEDURE
This procedure outlines the steps necessary to collect IRIS and FACE images simultaneously at multiple distances. The data collection consists of 5 distinct subject conditions under which video will be captured. The five subject conditions include:

1. Single subject, baseline reference images with MBARK system (iris/face)
2. Single Subject, five FIXED distances (5’, 7’, 11’ represent variable resolution for iris; 5’, 15’, 25’ represent variable resolution for face).
   At each distance:
   a. Variable lighting for both face/iris (low, medium, high).
   b. Variable focus manually controlled for iris camera and fixed focus for face camera.
   c. Variable angles of eye, head fixed (5’, 7’, 11’; up, down, left, right--30 degrees).
   d. Variable position of eye lid (5’, 7’, 11’).
   e. Variable angles of face, eyes fixed (5’, 15’, 25’; up/down 30 degrees, left/right 70 degrees).
3. Single Subject walking through a 7 ft FOCAL PLANE
   a. Variable speed (slow, fast)
4. Single Subject walking through a 15 ft FOCAL PLANE
   a. Variable speed (slow, fast)
5. Subject with additional faces, multiple FIXED distances (5’, 15’, 25’)

In condition 2 the subject will stand at five distances (5’, 7’, 11’, 15’, 25’). The lights will be positioned relative to the subject.

For each distance, three distinct lighting setups (high/med/low) will be used for both iris and face. Lighting will be set at high for face and iris simultaneously, medium simultaneously for face/iris, and low simultaneously for face/iris. This will be performed at the start of each distance.

At each distance, variable focus will be achieved by manually turning the focus ring of the iris camera. The face focus will be set into auto focus mode.
At each distance (5’, 7’, 11’), the subject will be asked to vary their eye gaze direction (up, down, left, right 30 degrees) during the data collection period. Lighting will be held at the high setting.

At each distance (5’, 7’, 11’), the subject will be asked to repeatedly blink every second.

At each distance (5’ ,15’ ,25’ ), the subject will be asked to vary their head position (up, down, 30 degrees; left, right 70 degrees) during the data collection period.

For condition 3, at distances (5’, 15’, 25’), additional faces will be added overlapping behind the subject. Lighting will be held at the high setting.

In condition 4 and 5, the focal length will be set to get high quality images at 7’ and 15’, and the subject will be asked to walk straight towards the camera from 5’ above to 5’ below the set distance.
### 4.0 DATA COLLECTION OVERVIEW TABLE

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Resolution</th>
<th>5 feet Iris: High</th>
<th>7 feet Iris: Med</th>
<th>11 feet Iris: Low</th>
<th>15 feet Iris: LD High</th>
<th>25 feet Iris: LD Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Face: Hi/Med</td>
<td>Face: Hi/Med</td>
<td>Face: Hi/Med</td>
<td>Face: Med</td>
<td>Face: Low</td>
</tr>
<tr>
<td><strong>Illumination</strong></td>
<td>High Medium Low</td>
<td>High Medium Low</td>
<td>High Medium Low</td>
<td>High Medium Low</td>
<td>High Medium Low</td>
<td>High Medium Low</td>
</tr>
<tr>
<td><strong>Face</strong></td>
<td></td>
<td>High Medium Low</td>
<td>High Medium Low</td>
<td>High Medium Low</td>
<td>High Medium Low</td>
<td>High Medium Low</td>
</tr>
<tr>
<td><strong>Out of Focus</strong></td>
<td>Face</td>
<td>Variable Focus</td>
<td>-</td>
<td>-</td>
<td>Variable Focus</td>
<td>Variable Focus</td>
</tr>
<tr>
<td><strong>Multiple Faces</strong></td>
<td>Face</td>
<td>Multiple faces</td>
<td>-</td>
<td>-</td>
<td>Multiple faces</td>
<td>Multiple faces</td>
</tr>
<tr>
<td><strong>Angles</strong></td>
<td>Iris</td>
<td>30° Up/Down/Left/Right</td>
<td>30° Up/Down/Left/Right</td>
<td>30° Up/Down/Left/Right</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Face</td>
<td>30° Up/Down/70° Left/Right</td>
<td>-</td>
<td>-</td>
<td>30° Up/Down/70° Left/Right</td>
<td>30° Up/Down/70° Left/Right</td>
</tr>
<tr>
<td><strong>Occlusion</strong></td>
<td>Iris</td>
<td>Variable occlusion</td>
<td>Variable occlusion</td>
<td>Variable occlusion</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Motion Blur</strong></td>
<td>Iris</td>
<td>-</td>
<td>Slow Fast</td>
<td>-</td>
<td>Slow Fast</td>
<td>-</td>
</tr>
<tr>
<td>Experiment</td>
<td>Distance Collected</td>
<td>Expected Number of Frames/Videos</td>
<td>Useful Frames Extracted (per subject/visit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------</td>
<td>----------------------------------</td>
<td>---------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illumination – Iris</td>
<td>5’, 7’, 11’, 15’, 25’</td>
<td>150 frames per video</td>
<td>3 frames at each distance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 videos per subject/visit</td>
<td>(H/M/L illumination)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Best focus per video)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3x5= 15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illumination – Face</td>
<td>5’, 7’, 11’, 15’, 25’</td>
<td>~180 per video</td>
<td>3 frames at each distance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 videos per subject/visit</td>
<td>(H/M/L illumination)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Best focus per video)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3x5= 15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of Focus – Iris (part of Illumination experiment)</td>
<td>5’, 7’, 11’</td>
<td>150 per video</td>
<td>At least 5 frames per video</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(L/M/H/M/L focus--For each of H/M/L illumination at each distance)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5x3= 15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of Focus – Face</td>
<td>5’, 15’, 25’</td>
<td>~180 per video</td>
<td>At least 5 frames per video</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 videos per subject/visit</td>
<td>(L/M/H/M/L focus--For each of H/M/L illumination at each distance)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5x3= 15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple Faces</td>
<td>5’, 15’, 25’</td>
<td>~500 per video</td>
<td>6 frames representing varying positions of non-</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SUBJECT REGISTRATION

#### 2.1 Informed Consent
All subjects MUST complete an informed consent form. The data collector is to obtain the appropriate blank consent form from the file in the lab and have the subject read, sign and date the form. The completed form must be placed in the secure, locked file drawer in the laboratory by the data collector.

#### 2.2 Disbursement Order
The data collector is to obtain a blank Clarkson University Disbursement Order. Complete the following sections: Date, Pay To, Account No., Amount, and Explanation. Place the completed form in the appropriate file on the Data Administrators desk for processing.

#### 2.3 Database Entry

<table>
<thead>
<tr>
<th></th>
<th>Angles – Iris</th>
<th>Angles – Face</th>
<th>Occlusion - Iris</th>
<th>Motion Blur – Iris</th>
<th>Motion Blur – Face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>3x5 = 15</td>
<td>3x5 = 15</td>
<td>3x3 = 9</td>
<td>1x4 = 4</td>
<td>1x4 = 4</td>
</tr>
<tr>
<td>Description</td>
<td>5 per video (neutral gaze, 30º up/down/left/right)</td>
<td>5 per video (neutral gaze, 30º up/down, 70º left/right)</td>
<td>At least 1 frame with significant occlusion</td>
<td>1 frame per video (best focus)</td>
<td>1 frame per video (best focus)</td>
</tr>
</tbody>
</table>
The data collector must insure that the subjects’ data is entered into the database. Please follow standard operating procedure for database entry to ensure this is done appropriately.

3.0 EQUIPMENT SETUP

The following set up is used for iris and resolution, iris and face off-angles, out-of-focus blur, and iris occlusion acquisition processes. The use of different lights is described in section 1.5.

This set up is used for the Motion blur acquisition process described in section 1.9.
The next set up is used for the multiple faces acquisition process described in section 1.7.
Two point balance studio lamps at 5' from subject of interest with umbrellas

Hardware set up

Database

Canon Vixia HD

Dalsa 4M30

Subject of interest

Additional faces

Distance of interest