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Non-Cooperative Facial Recognition Video Dataset Collection Plan

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August 2013

Pacific Northwest
NATIONAL LABORATORY

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Science and Technology Directorate,
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Pacific Northwest National Laboratory
Richland, Washington 99354

Revision Log and Approvals

Non-Cooperative Facial Recognition Video Dataset Collection Plan

Rev. No.	Date	Describe Changes	Pages Changed
0			

Name and Title	Approvals	Date
Nick Lombardo PNNL Project Manager		
Patty Wolfhope DHS Program Manager		

Acronyms and Abbreviations

DHS	Department of Homeland Security
GT	Ground Truth
NIST	National Institute of Standards and Technology
OS	Operational Setting
PNNL	Pacific Northwest National Laboratory
TC	Toyota Center

Definitions

Aggregate Data Package:	The completed PNNL deliverable to DHS that includes video, photographic images of role players (candid and mugshot style), and ground truth spreadsheet.
Data Preparation Workstation	The designated workstation where all photographs and video collected will be copied to for preliminary analysis and packaging. The workstation will be in a secure facility on the PNNL campus, be password-protected, and accessible only to PNNL staff involved in the video collection program.
Dataset	The collection of self-contained video clips to be used in facial recognition research, training and evaluation. The dataset is intended to be a set of videos depicting people inside a venue hosting a large public event in which specific parameters are changed while others are controlled. The dataset will contain numerous videos from multiple cameras located throughout the venue.
Clip	A self-contained video segment from one of the deployed cameras.
Crowd Density	A qualitative description of the number of individuals in the viewing volume of the camera. Crowd density is not controlled so ranges are only approximate and expected to be time variant. 1 = low = 0-10 individuals present 2 = moderate = 5-25 individuals present 3 = high = 20 or more individuals present
Field of View (FOV)	The entire volume seen by a particular camera. Some portion of the FOV may not be in focus (too near or too far), some far field may have unusable inter-ocular distance.
Ground Truth	The documented image data related to each role player each time the role player enters a camera field of view (includes the time, location, and role player alias).
Ground Truth Mark	A term specific to the video collection event. It is the boundary where a RP comes into the FOV of a specific camera in each operational scenario. During post-processing, PNNL will use the information to determine and report each time (hh:mm:ss) the RP enters the FOV of individual cameras.
Inter-Ocular Distance (IOD)	Distance between the center of the eyes. To be useful for face recognition, this should be above 20 pixels for the most tolerant FR software, or above 40 for most FR algorithms.
Non-cooperative Subject	The public and/or role player that is not posing for the camera.
Occlusion	A physical obstruction that blocks a subject's face from the camera view. Occlusions may be partial or full.
Operational Setting	One way crowd flow, bi-directional crowd flow, and queues. Synonymous with scene.
Patron	Synonymous with public

Definitions

Presentation/Presence	A Role Player is present in the camera's FOV or the scene's viewing volume (may or may not be visible to the camera, may or may not be frontal)
Primary Ground Truth Data	Time and alias of role player who reaches a ground truth mark. Primary ground truth data is collected in real-time.
Public	The population that attends the public event and that does not sign an image release form.
Role Player	A PNNL staff member who will supply biometric data and be captured in the video data set. Role players will sign a consent form and willingly provide still photographs (for gallery enrollment). Two classes: Unpaid and Paid.
Scene	Unidirectional, Bidirectional or Queue. Synonymous with operational setting.
Scripted Scenario	Pre-defined walking patterns that are executed by role players.
Secondary Ground Truth Data	Additional data collected about the role player captured on video, e.g., time the role player exited the camera field of view, times when the role player face is fully visible (from profile to frontal), not back of head, not occluded, etc. Secondary ground truth data generated from analysis of the captured video.
Viewing Volume	That portion of the FOV which is overlapping for all cameras for that scene.

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1.0 Introduction

Through a Contract with the Department of Homeland Security (DHS), the Pacific Northwest National Laboratory (PNNL) will produce a non-cooperative facial recognition video data set to evaluate and enhance facial recognition systems technology. The aggregate data set consists of 1) videos capturing role players and the public in three key operational settings, 2) photographs of the role players (for enrolling in facial recognition system evaluation database), and 3) ground truth data (documenting when the role player is within various camera fields of view). PNNL will deliver the aggregate data set to DHS who may then choose to make it available to other government agencies interested in evaluating and enhancing facial recognition systems. The three operational settings that will be the focus of the video collection effort include: 1) unidirectional crowd flow 2) bi-directional crowd flow, and 3) linear and/or serpentine queues.

The video will be collected at the Toyota Center (TC) in Kennewick, Washington during up to eight live events. The TC is a multipurpose venue with a seating capacity of 6,000 people and conducts approximately 100 events a year. It is owned by the city of Kennewick and operated by VenuWorks. Events will be selected to provide a wide variety of crowd densities, queue lengths, and variability in walking speed. Patrons (i.e. the "public") attending the Toyota Center event will be provided PNNL-approved "opt-outs" for each set of deployed cameras. PNNL has conducted standoff explosives screening and standoff biometric testing at the TC in support of DHS S&T programs with and without live crowds, respectively.

Cameras will be positioned at three different locations inside the TC to capture video representative of each operational setting. The locations include one of the main entrances, a beverage queue, and a hallway. At each location, cameras will be placed at different elevations and/or at different offset angles to the direction of crowd flow/queues. Role players may be asked to execute scripted scenarios, e.g., enter the venue and/or queues at certain times, walk at certain speeds, walk with other role players, etc. The time that role players enter pre-defined locations in strategic camera views will be noted along with a role player alias (primary ground truth data). Secondary ground truth data (e.g., when a role player leaves a camera field of view) may be obtained by analysis of the video data.

All photographs and video collected will be copied to a single workstation for preliminary analysis and packaging. The workstation will be in a secure facility on the PNNL campus, be password-protected, and accessible only to PNNL staff involved in the collection program. Videos collected on the camera's storage device or copied to a workstation in the field will be deleted from those devices promptly upon successful data transfer to the Data Preparation Workstation.

Collectively, the different role players, camera views, crowd densities, walking speed, and queue lengths will allow researchers such as the National Institute of Standards and Technology (NIST) to evaluate face recognition systems under a range of conditions. The role-players will be enrolled into a facial recognition database and the ability of the facial recognition algorithms to correctly identify the role-player in the video data set assessed. Multiple camera views also provide a data set for overlapping video stream capability analysis.

This document outlines the aggregate data set collection objectives and requirements and provides an overview of the data collection approach and activities.

2.0 Objectives

The objective of this data collection activity is to provide a collection of video, photographs, and ground truth data that can be used to evaluate and enhance single and multi-camera facial recognition systems:

- For 3 key operational settings
- Under multiple look-down and offset angles
- Under different crowd densities
- Under different walking speeds

3.0 Requirements and Assumptions

3.1 Data Collection Requirements

The requirements for this data collection effort are as follows:

3.1.1 Venue and Operational Setting Requirements

- Video data sets shall be captured in an indoor environment
- Data shall be collected for each operational setting
- For each operational setting, a minimum of 3 cameras shall be deployed to capture different look-down and/or offset angles
- One camera in each operational setting shall capture a "front-on" view, e.g., zero degree offset relative to the setting (e.g. hallway, queue) as TC infrastructure permits

3.1.2 Video Camera Requirements

- There shall be continuous recording for the event duration (3-4 hours per event)
- The video data shall be in MP4 H.264 format at 24 fps
- Camera resolution shall be 1920 X 1080
- The video captured from each camera shall be time synched with reference clock.
- Post-collection reporting of specifics on cameras used (placement, model information, settings, bit rate) All pertinent information needed to reproduce the data will be recorded.
- The final video shall have no sound
- The video, photographic, and ground truth data shall be password protected

3.1.3 Role Player Images for Database

- All privacy and human subjects testing issues shall be resolved prior to testing
- PNNL acquired "mug shots"
    - Minimum: set of 9 images, minimum 6 megapixel camera with a good lens; all zero pitch, Yaw = 0 and +/- 22, 45, 67 and 90 degrees. Recommended at 0 yaw: 5 pitch (2 negative and 3 positive)
    - Highly Desirable: Video recording of each mug shot capture session using two cameras, one at eye-level, and one with 22.5 degree look-down angle.
- Still and video cameras are all set with accurate date/time settings
- Day-of-event: Highly desirable: full body images, front and back (if RP is wearing outerwear, repeat photo with outerwear removed)
- Recommended Role Player provided images
    - driver's license photo (photo only)
    - passport (if available, photo only)
    - scanner requirements – color, high resolution 600PPI

- Recommended RP provided digital images (candid). Variety of poses and expressions are acceptable
  - At least 10 (inclusive of older candids)
  - All should have both eyes visible
  - Age at time of photo annotated (at least 18 years of age)
  - Prefer that photos span a significant range of past years

3.1.4 Ground Truth Requirements

- Manually and/or electronically record the RP-identifier(s) and time associated with entry into a scene-specific viewing volume.
- Time synchronization across cameras and with GT recorder will be achieved with accuracy estimated +/- 2 seconds.
- A qualitative assessment of crowd density using a scale of 1, 2, 3 will be recorded as crowd density conditions change. Crowd density is not controlled (other than event status like "intermission") so ranges are only approximate and expected to be time variant.
- Determining the duration of presence in the viewing volume is not expected from PNNL.

3.2 Assumptions

The scope of non-cooperative dataset collection assumes the following:

- PNNL purchases standalone cameras as approved by DHS
- More than one event will be necessary to capture the targeted number of presentations/data set diversity
- Camera locations will remain fixed over the course of any single event with the exception of unidirectional flow in which the cameras may be moved during the event to capture exiting crowds.
- Ambient lighting may change over the course of the events
- Crowd densities will change during the course of an event and will vary between events
- Video will be captured ~ 30 minutes before event start time until at least 10 minutes after the event ends
- Cameras capture multiple presentations of each role player during an event
- TC infrastructure can support planned deployment
- No hardware/software development is needed
- Adequate PNNL role players will be available
- Primary ground truth data will be collected at the event; secondary ground truth data will be developed from analysis of the video

4.0 Venue Environment

The venue has 3 primary entrances and multiple concession stands in the interior. The corridor accommodates two-way traffic. Queues associated with food concessions protrude into the traffic flow and can interfere with traffic flow.

PNNL has consulted with VenuWorks to identify events that would present a variety of crowd densities, queue lengths, and walking speeds. The preferred event type is a hockey game. They occur with relative frequency during the months of September through March and can have attendance on the order of 5500 people. Other events do not draw as well or do not provide suitable opportunities for queue operational settings.

Hockey games typically start at 7:05 PM and last approximately 2-1/2 hours. Persons attending the event may come as early as 6:30; a significant portion of the crowd arrives between 6:50 and 7:10. Sunset is 7:04 PM on September 18, 6:07 PM on October 18th, and 4:22 PM on November 18th. Occasionally, game times are 5:05 but they are very infrequent and typically occur later in the year. Based on the hockey season and the normal game start time, the ambient light afforded by the many windows will be little or none. Thus, lighting conditions will not appreciably change unless supplemental lighting is supplied.

Before the game and during the intermission between periods (20 minutes between the first and second and second and third periods), there is significant foot traffic in the hallways and the beverage queue lines can be up to 20 persons deep. At well attended games, walking speed is somewhat reduced by crowd density. During play, the hallways are relatively empty, walking speed is unaffected, and the queues are very short, if at all.

The targeted queue for video collection runs parallel to an exterior wall. The queue can extend to 20 or more individuals depending on the event. VenuWorks has agreed to set up a serpentine queue at this concession stand if requested. Because of adjacent hallway traffic, the width of the serpentine queue is limited to no more than 3-4 people per “bend.”

5.0 Roles

The following roles pertain to PNNL employees involved in the data collection exercise. Persons assigned to each role will be recorded prior to testing. Persons may fulfill more than one role.

Test Director: The PNNL representative who oversees dataset collection at the TC and maintains records of all data collected during the event. All activities during dataset collection are under his/her direction. The Test Director also provides input to the Test Engineer indicating that a scripted scenario contains all design attributes.

Test Engineer: Provides instruction to role players and assists Test Director. The Test Engineer coordinates with the Video Hardware Specialist and Ground Truth Specialist, and reports to the Test Director.

Video Hardware Specialist: Responsible for setup, configuration, and operation of camera systems. The Video Hardware Specialist receives instructions from and reports to the Test Engineer.

Ground Truth Specialist: Responsible for collecting ground truth data, e.g., identifying when role players reach predefined ground truth mark. The Ground Truth Specialist receives instructions from and reports to the Test Engineer.

Role player: PNNL staff that will be the subject of biometric system evaluation. The role player will submit photographs of themselves and have photographs taken of them for the purpose of enrolling them in a biometric gallery. The role players will come into multiple camera views creating a presentation multiple times during an event and may be paid or unpaid. The unpaid role players consist of PNNL employees that plan to attend the event and agree to participate on a limited basis. The paid role players will participate in scripted scenarios as directed throughout the event.

6.0 Data Collection Overview

Discussed below is the approach to collect role player presentations based on the proposed camera placements. The proposed video collection and ground truth approaches are also discussed along with the anticipated data set composition.

6.1 Camera Placement

Standalone cameras that have a capability to record video to an internal storage device will be used to collect video data. There are 11 camera views proposed for this dataset, with a final count to be determined by specific infrastructure and camera limitations.

In collaboration with VenuWorks, PNNL has identified 3 locations inside the TC that will address the 3 operational settings discussed above. The three locations are depicted by blue stars in Figure 1 and include a hallway with bidirectional travel, a beverage line where individuals queue for several minutes at a time, and an entry/exit location with unidirectional travel. Cameras for each location will be placed to provide head-on footage of individuals (0 yaw, 0 pitch), as well as various yaw and pitch locations as provided by the building infrastructure. Detailed camera information will be recorded in Appendix A and the final camera positions will be recorded in Appendix B.

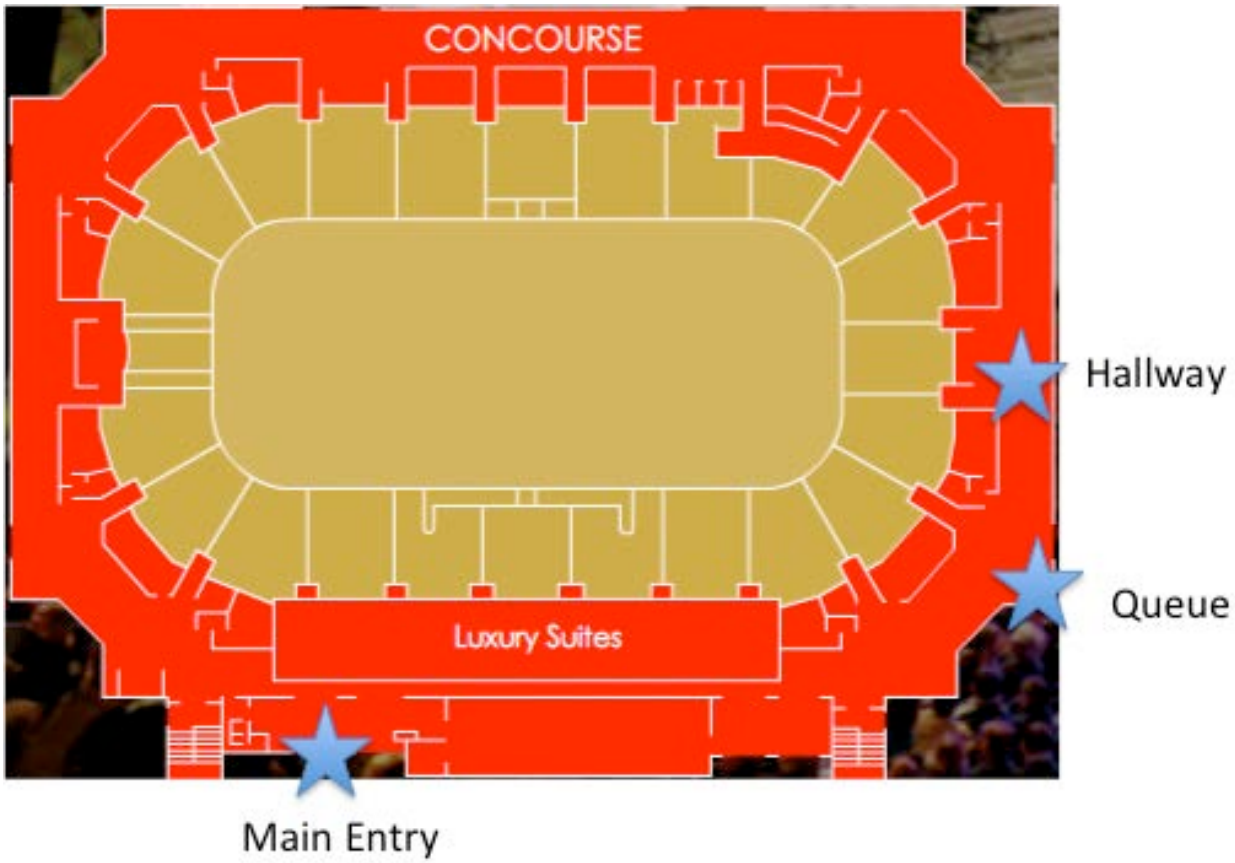

Figure 1. Toyota Center Proposed Dataset Collection Locations

Role players will be viewed multiple times on each camera to allow thorough testing of algorithms with various challenges isolated. While the general layout for each scene is given in Table 1, exact placement

of the cameras will be determined based on camera type, mounting requirements, and by Toyota Center infrastructure. Camera FOVs will be selected in cooperation with DHS and their government partners.

Table 1. Planned Camera Views by Operational Setting

Setting	Views (Yaw, Pitch, Roll)		Description
Queue	4	Head on (0,0,0) Look down Center (0,10,0) Left (-10, 0, 0) Look Down Left (-10,-10,0)	Four camera views will target the queue line, as shown in Figure 2 (red star) and Figure 3. Cameras will be placed directly in front of the queue and to the left (camera's left) of the queue as infrastructure allows. This will yield 4 different perspectives of each individual in the queue. A serpentine queue is planned.
Bidirectional Travel	4	Right (15,0, 0) Left (-15,0,0) Look down Right (15,-15,0) Look down Left (-15,-15,0)	Four camera views installed in the hallway between Sections S and W will target the hallway as close to head on as layout allows. All cameras will face one direction similar to what is shown in Figure 2 (yellow star) and Figure 4. Cameras may be installed at the opposite end of the hall due to general crowd flow direction.
Unidirectional Travel	3	Look down Center (0,10,0) Look down Right (30, 10, 0) Look down Left (-30,10,0)	Three camera will be located above the doors and to each side of the doors at Main Entrance 1 as shown in Figure 5, Figure 6 and Figure 7.

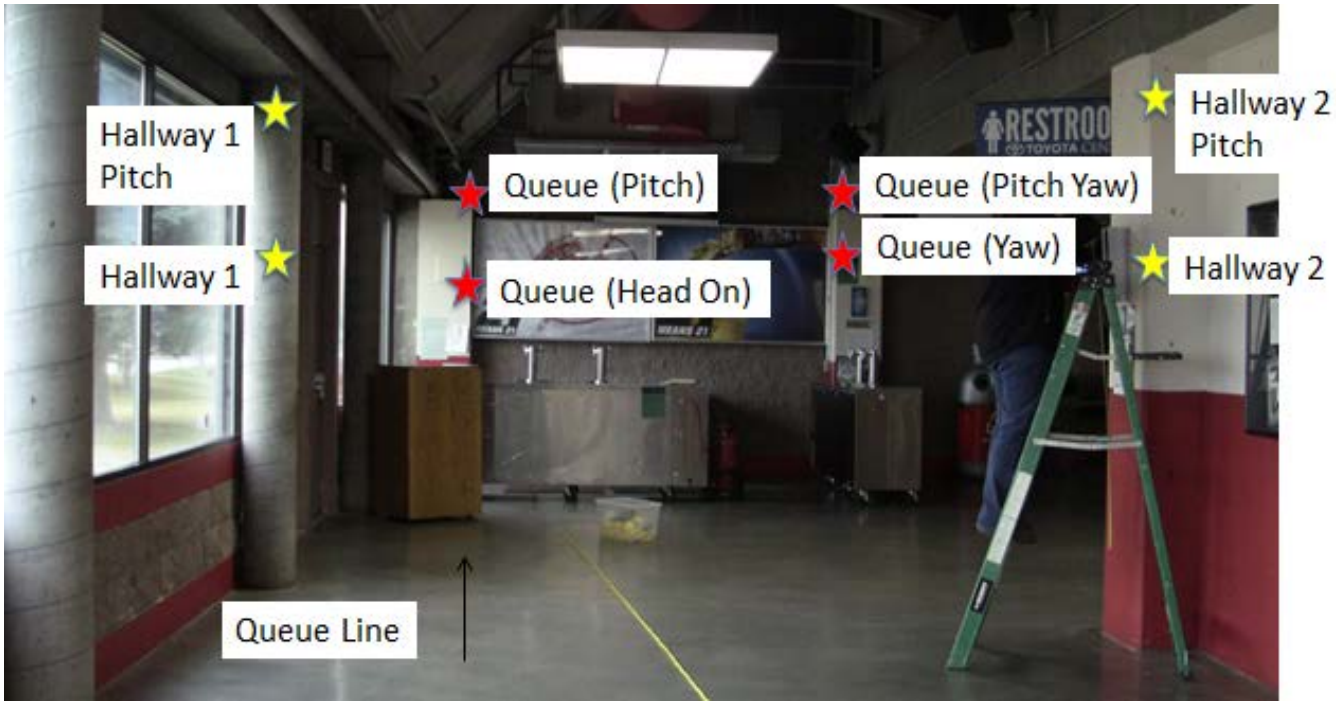

Figure 2. Proposed Camera Locations for Queue and Bidirectional Flow

Figure 3. Example Camera Views for Queue Operational Setting

Figure 4. Example Camera Views for Bi-Directional Flow in Hallway at 5 Meters (left) and 15 Meters (right)

For unidirectional flow, cameras will be installed above the double doors in the foyer at Main Entrance 1 (Figure 5), as indicated by red stars in Figure 6.

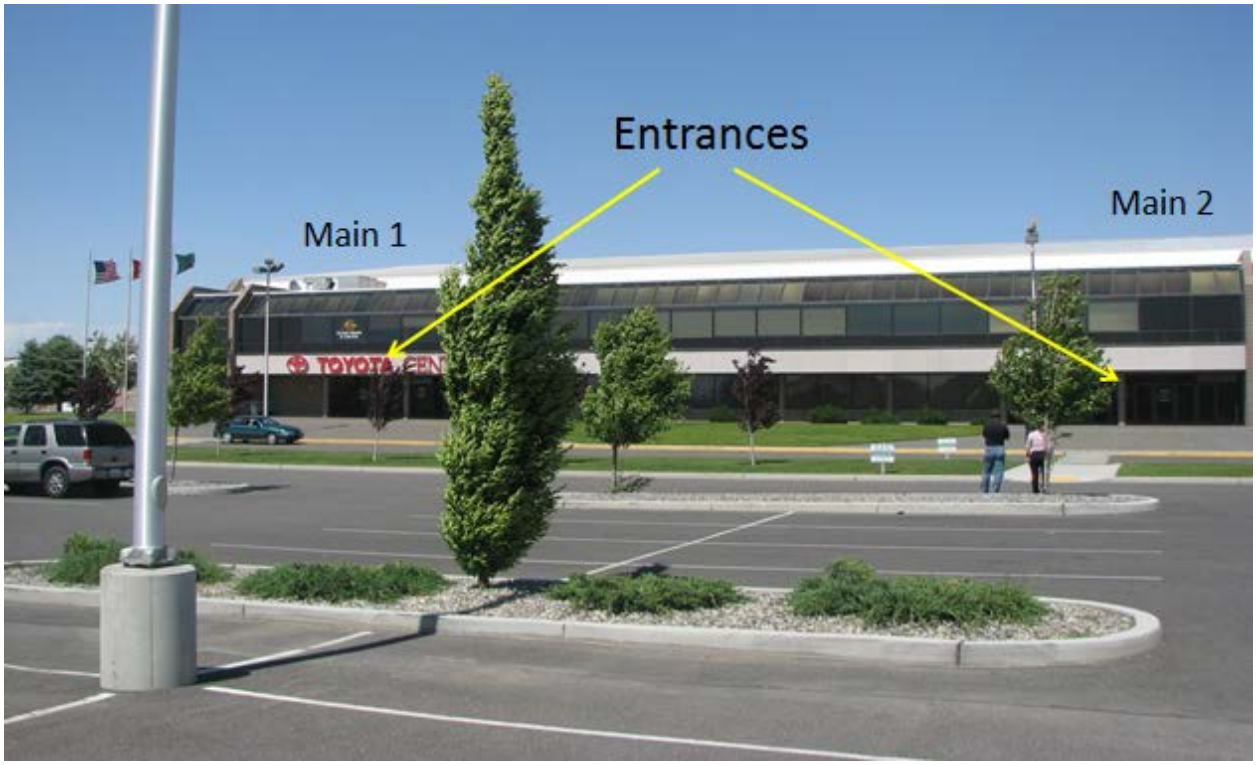

Figure 5. Main Entrances 1 and 2 of the Toyota Center

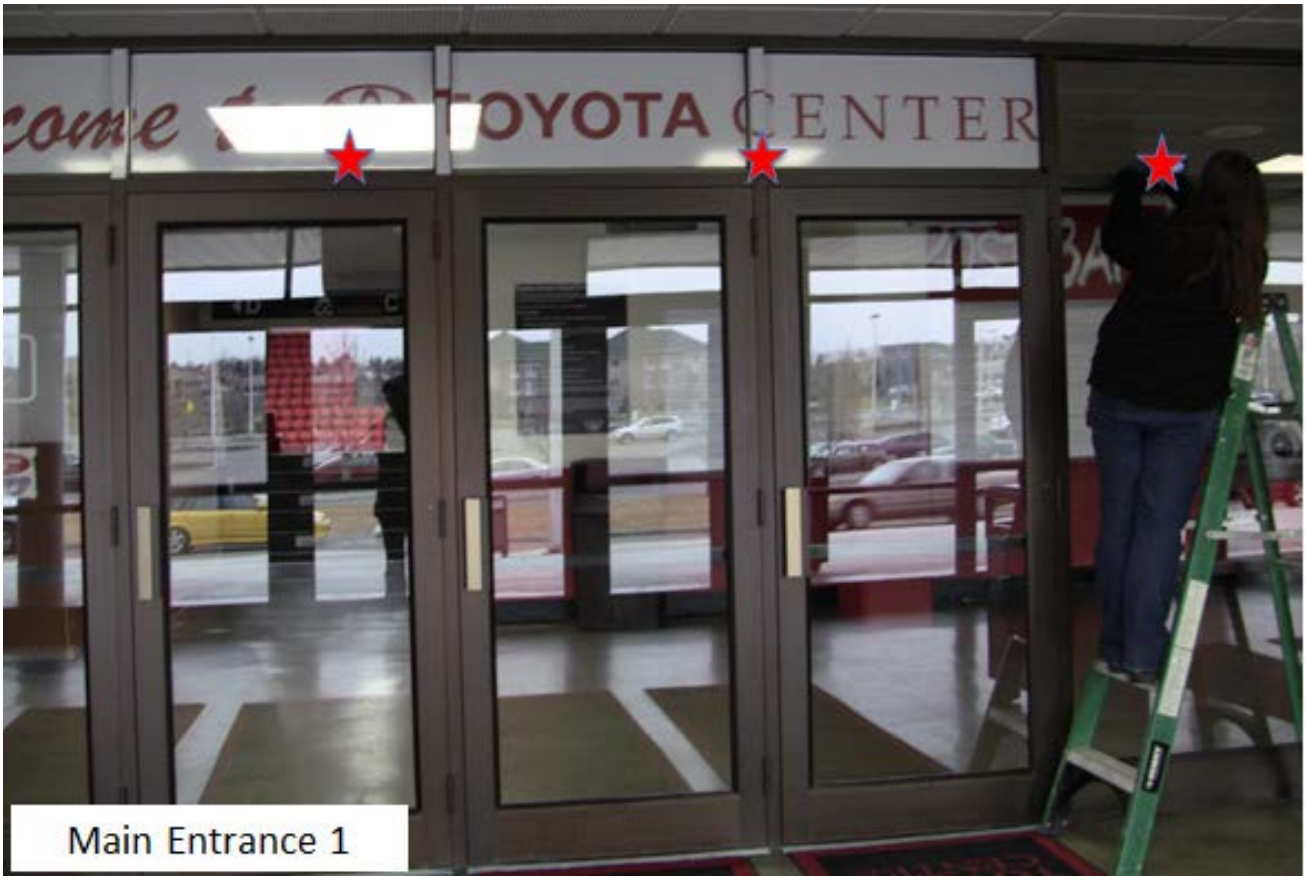

Figure 6. Proposed Camera Locations for Unidirectional Flow

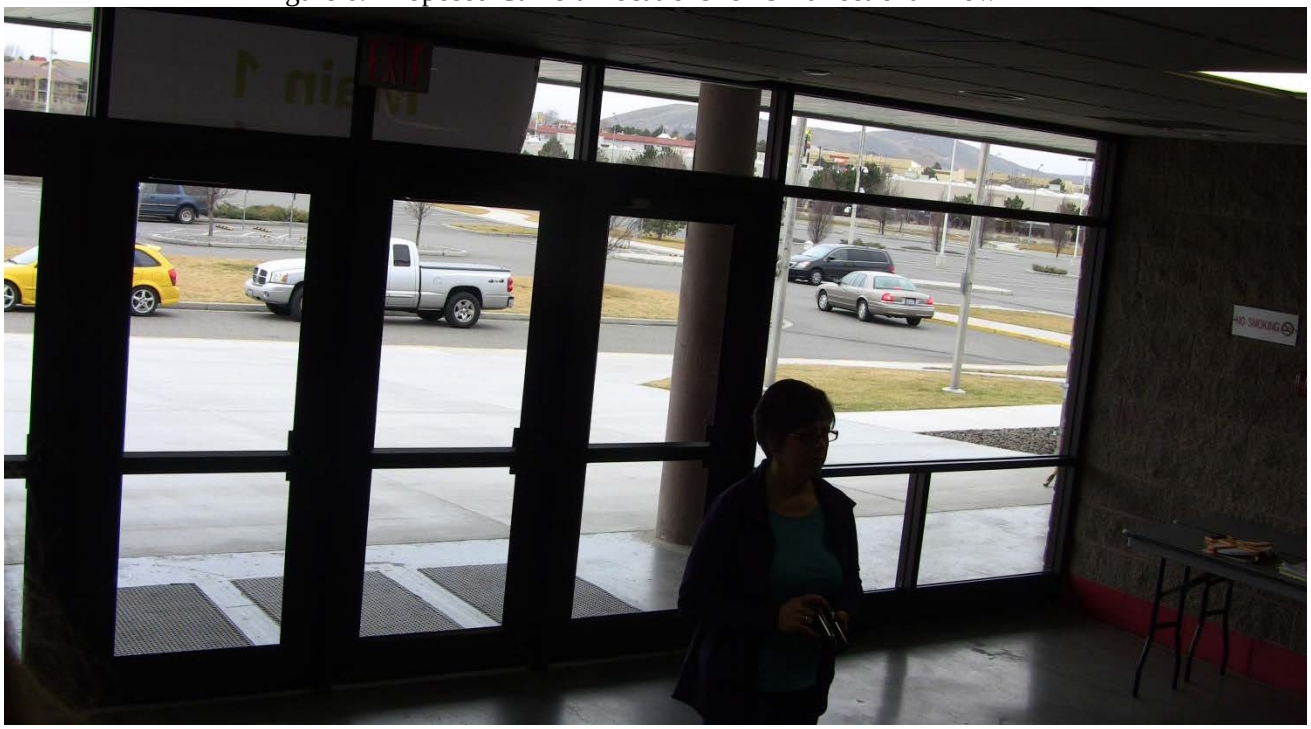

Figure 7. Example Camera View of Unidirectional Flow at Main Entrance 1

6.2 Time Synchronization and Calibration

Clocks on cameras will all be set to the same time before recording each event. Once filming begins a frame sync test will be performed by placing a reference clock in the FOV of each camera, and this may be periodically performed during testing to check the clock timing across all devices as a function of time as well as at the end of the test. Once the videos are reviewed each camera can be determined to be a specific set of frames off from the chosen reference camera.

The PNNL Video Hardware Specialist will ensure that ground truth RFID system clocks as well at the Ground Truth Specialists have their clocks synched within 2 seconds of the cameras. Time stamp verification will occur in post-data collection ground truthing with any deviations noted.

6.3 Scripted Scenarios

Role players will be given the minimum instruction necessary to complete the requirements of the dataset collection. The required instructions will be presented to each paid role player at the start of the event and will be documented for inclusion in the aggregate data package.

Scripted scenario concepts are summarized below.

1) Unidirectional Crowd Flow: Role players will be interspersed with patrons as they enter prior to the event. Unpaid role players will arrive without special instructions. Paid role players will enter interspersed with 2-10 members of the public.
2) Bi-directional Crowd Flow: Role players will be instructed to walk toward the cameras interspersed with groups of the public. Heaviest traffic is anticipated during pregame and intermissions. Minimal to moderate flow scenes may be scripted using the paid role players and conducted during the periods when patrons are watching the event. Unpaid role players will participate on a limited basis during pregame and intermission for at least one period.
3) Queue: Individuals wait for up to several minutes at a time at the designated beverage queue.

6.4 PNNL Role players

Approximately 20 PNNL role players will be recruited for each event where data collection is occurring. As many different role players as possible over the course of events is desirable. Each role player will sign a document permitting the use of their image for this data collection and evaluation, subsequent biometric system and component testing, and training and proficiency test purposes. The document has been developed in collaboration with PNNL's human subjects testing subject matter expert and provided to DHS S&T. This approach was recently employed on the standoff biometrics program. Because of various challenges associated with the use of commercially hired role players, PNNL staff will be the first choice when recruiting role players.

6.4.1.1 Role Player Job Description

Role players will be recruited in two groups: one unpaid and one paid. The unpaid role players consist of PNNL employees that plan to attend the event and agree to participate on a limited basis as described in Section 6.3. The paid role players will be provided access to the event at no cost to themselves but will participate in scripted scenarios as directed throughout the event. All role players will be expected to walk around the interior of the Toyota Center, and at specific locations to check in with a ground truth specialist that will record time, location, and unique alias (or alternative equivalent GT method). They will also stand in lines at the beverage stand and will be compensated for the purchase of concessions. Role players will arrive prior to the event and attend for the entire event, although unpaid role players will

not be held to time restrictions. There will be no attempt to control the appearance of role players (such as hats, glasses) during data collection unless accessories significantly occlude the face.

6.4.1.2 Recruitment Strategy

A tiered approach to recruitment will be employed. First, PNNL employees that have previously expressed interest in participating as a role player in similar data collection events will be made aware of this effort and invited to participate. There is a fairly large pool of PNNL employees that have worked on related projects in the past and have expressed interest in participating in future project activities. An IRB approved email (Appendix C) will be sent to this group first. Depending on interest, the PNNL project team may run an advertisement on the internal web publication "Inside PNNL" using the same language as the approved email. No undue influence or coercion will be placed on any PNNL employee who does not wish to participate in the event.

6.4.1.3 Photographs of Role Players

Prior to the event, PNNL plans to collect at least nine digital mugshot-style photographs[1] of each role player. In addition, each role player will be requested to provide photographs that include candid as well as "immigration style" shots such as a scan of a driver's license or passport photograph (photo only). Each role player will be assigned a folder with a unique alias where the photographs will be stored. On the day of the event full body image photographs will be collected to aid in ground truthing efforts. No personal information will be associated with the photographs and all photographs and videos will be deleted from PNNL computers upon delivery of the aggregate data set to DHS. Collectively, this information will make up the "gallery."

6.4.1.4 Role Player Presentations

During an event, role players will perform according to a scripted scenario as described in Section 6.3. For example; they will enter the building at Main Entrance 1, walk around the interior of the venue, and enter the beverage queue. Cameras will collect video of the role players along with the general public.

[1] "Best Practice Recommendation for the Capture of Mugshots," Version 2.0. National Institute of Standards and Technology. September 23, 1997.

Table 2 and Table 3 project the number of presentations per role player for unpaid and paid role players, respectively. More detailed scenario information may be found in Appendix D.

Prior to the event, the PNNL unpaid role players will agree to participate in the bidirectional and queue operational settings during one of the two intermissions. The actual level of participation at the event, the grouping of unpaid role players (i.e. whether they stand in the queue in a group our alone, etc.), and timing will not be controlled during the event.

Table 2. Number of Presentations per Unpaid PNNL Role Player per Event

Operational Setting	No. of Presentations	Crowd Density	Notes
Unidirectional			
Pregame	1	2	Cameras will be placed to capture entrance into venue
Exit	1	3	Cameras in entry are repositioned to capture exit
Bidirectional			
Pregame	2	2	Assumes arrival 20 minutes prior to taking seat for start of game.
During Periods	0	N/A	The unpaid RP will not be expected or requested to participate during the periods
Intermissions	1	3	Role player enters hallway during intermission
Queue			
Pregame and Intermissions	2	2 - 3	Role player enters beverage queue before the game and at least one time throughout the event
Estimated Total	7		

Table 3 takes into account the following general scripting strategy for paid role players:

- a single RP presentation in each OS two-thirds of the time
- multiple RPs in each OS one-third of the time

Table 3. Number of Presentations per Paid Role player Per Event

Paid Role Players			
Operational Setting	**No. of Presentations**	**Crowd Density**	**Notes**
Unidirectional			
Pregame	1	2	RP arrives 40-60 min prior to game. Cameras will be placed to capture entrance into venue. RP will enter at crowd density ~2.
Exit	1	3	
Bidirectional			
Pregame	2	2	RP traverses corridors heading in the direction facing cameras (expect clockwise).
During Periods	6	1 to 2	RP contributes to bidirectional and queue scripted scenarios during period.
Intermissions	4	3	RP circles stadium as directed during the 20-min intermission.
Queue			
Pregame	2	2	RP enters beverage queue as directed prior to start of event
During Periods	12	1 to 2	RP contributes to scripted scenarios as directed during each period.
Intermissions	2	3	RP enters beverage queue as directed during intermission.
Estimated Total	30		

Based on a target number of 10 unpaid role players and 10 paid role players, approximately 370 presentations of the role players in the event data set are expected. Of the 370 presentations, the crowd densities are anticipated to be approximately 17% Level 3, 43% Level 2, and 40% Level 1. Additional presentations may be obtained by increasing the number of role players and/or increasing the number of events. Care must be exercised in increasing the total number of role players so that ground truthing is not impacted.

6.5 Public Opt Out Provision

Signage will alert the public to the video face collection and give an easy opt out solution prior to entering the Toyota Center. Patrons wishing to avoid the cameras located at Main 1 can enter via Main 2. Patrons can avoid the hallway between Sections T and U by approaching their seats through adjacent sections, and all other beverage queues will be open for use. Details on opt out are provided in Figure 8 and in Appendix C.

Figure 8. Opt Out for Seating in Sections T, U and V

6.6 Ground Truthing

RFID tags such as those used to time marathons will be used as the primary ground truth generator. The general operational constraints of this system include:

- Chip transponder on ankle strap shall contain a unique identifier for up to 30 participants. Chip shall be able to be worn under clothing (e.g., long pants) and be able to record timing information as the participant crosses over the "loop antenna" taped to the floor for at each ground truth mark.

- Accuracy of timing (association of a person with a fixed position) shall be within 1 second on the system clock.
- Reporting of each participant location and time shall be from at least three discrete recording locations within the Toyota Center. Distance between recording locations shall be a minimum of 5 feet.
- The system will record an excel file that contains time and location for each unique PNNL participant each time they pass the recording stations during an event.

PNNL will station "Ground Truth Specialists" at the entrance to each operational setting (out of the collective camera's fields of view) to manually record data as listed in the Ground Truth Log in Appendix E.

Following the event, a comprehensive table of ground truth data will be developed. The data will be able to be sorted by camera, by role player, and by time. Time stamps will be verified during post-processing.

6.7 Aggregate Data Set Composition

The aggregate data set will contain all images collected of the role players as defined in Section 3.1.3. For each event, approximately three hours of video will be provided for each camera. The estimated dataset size is approximately 64 GB per camera per event. The data will be transferred to DHS on an external hard drive that is password protected.

Each event will be accompanied with a ground truth file (Excel) indicating at what time a walker entered the field of view for that particular camera. All walker identities will be aliases such as Walker A, Walker B etc., and will correspond to the aliases for the reference images provided for each individual. With input from NIST, a file naming convention (e.g., event, camera, role player, etc.) will be developed both for the photos and videos.

7.0 Data Collection Activity Summary

Activities that will be completed prior to video data collection are listed in Table 4. A role player checklist is included in Appendix F to verify that all required data for all RPs has been collected.

Table 4. Activities Prior to Video Data Collection

Activity	**Lead Role**	**Days before Event**
Opt-out signage produced		
Opt-out seats purchased from TC		
Beverage Queue plan approved by TC		
Cameras installed/positioned/calibrated per test design		
Camera information and locations documented in Appendix B and Appendix A		
Role players recruited		
Role players sign release forms		
Opt-out signage strategically positioned		
Cameras charged and time synced		
Ground truth marks defined and documented		
“Calibrate” IOD pixels as a function of distance for each camera location		
Photographs of role players acquired and stored on a secure device		
Scripted scenarios developed for paid role players		
Paid role players briefed on scripted scenarios		
Unpaid role players briefed on targeted data		

Activities that are conducted during/after video data collection are listed in Table 5.

Table 5. Activities Conducted During/After Video Data Collection

Activity	**Lead Role**	**Time Before/After Video Data Collection**
Cameras turned on		Before
Ground Truth Specialists (GTS) deployed with clocks time-synched with camera time.		Before
Ground truth equipment set up and verified. Verify cross-reference of timing bracelet number to Role Player ID.		Before
Paid role players check in for photo collection prior to entering event.		Before
Role players and the general public arrive at the event.		Before
Paid and unpaid role players check in for full body photo prior to start of event		Before
Cameras record the images of role players in the operational scenes		During
Move foyer cameras mid-game to capture exiting crowds		During
Cameras turned off and removed from premises		After
Signage removed and stored if necessary		After

Activities conducted to compile non-cooperative facial recognition data set are listed in Table 6.

Table 6. Activities to Generate Aggregate Data Set

Activity	**Lead Role**
File naming convention established	
Camera data copied to Data Preparation Workstation	
GTS data compiled	
Ground truth data verified	
Video, role player photographs, ground truth data, and camera location/mark data packaged for transmittal	
Aggregate data package transferred to DHS	
Role player photographs deleted from Data Preparation Workstation	

APPENDIX

Appendix A Camera Information

	Manufacturer	Model	Serial No.	Video Resolution	Other
Camera 1	Canon	Vixia HFR400	682644319553	1920x1080	See metadata
Camera 2	Canon	Vixia HFR400	682644319540	1920x1080	See metadata
Camera 3	Canon	Vixia HFR400	682644318565	1920x1080	See metadata
Camera 4	Canon	Vixia HFR400	682644319545	1920x1080	See metadata
Camera 5	Canon	Vixia HFR400	682644310222	1920x1080	See metadata
Camera 6	Canon	Vixia HFR400	682644318469	1920x1080	See metadata
Camera 7	Canon	Vixia HFR400	682644319469	1920x1080	See metadata
Camera 8	Canon	Vixia HFR400	682644319547	1920x1080	See metadata
Camera 9	Canon	Vixia HFR400	682644318490	1920x1080	See metadata
Camera 10	Canon	Vixia HFR400	682644319455	1920x1080	See metadata
Camera 11	Canon	Vixia HFR400	682644318625	1920x1080	See metadata
Camera 12	Canon	Vixia HFR400	682644318856	1920x1080	See metadata
Photo Camera	Canon	Powershot SX500 IS	672062004002		

Appendix B Camera Positioning

NOTE: One page per operational setting

Digital Images Taken of Test Setup: _____ (initial)

Location (circle one): Main Entrance Queue Hallway

Camera	Height	Zoom	Comments
1			
2			
3			
4			
5			
6			

Appendix C PNNL IRB Approved Opt Out Signage, Recruitment Email, Consent Form

Approved forms in pdf format are available upon request from Marcia Kimura at marcia.kimura@pnnl.gov.

TEXT OF SIGNAGE FOR EVENT ATTENDEES TO OPT-OUT OF BEING CAPTURED ON VIDEO
SIGN BOARD AT FRONT ENTRANCE

"The VenuWorks and the City of Kennewick are cooperating with Pacific Northwest National Laboratory to videotape select areas of the Toyota Center for research purposes. If you do not wish to be videotaped, please use the Main 2 entrance and avoid the hallway between Sections (fill in the blank)."

RECRUITMENT for internal "Inside PNNL" web publication

"We are looking for participants in a research project about developing better facial recognition technology. We need volunteers during a public event at the Toyota Center (probably hockey). Volunteers will be asked to walk in specified areas, stand in lines, and walk in different patterns and directions. We will be collecting video data during the event and your image will appear on the video. It won't cost you anything to participate. If you are interested, please email Marcia Kimura."

RECRUITMENT EMAIL:

Two types of PNNL participants are needed for a research project about developing better facial recognition technology. To make our research meaningful we are collecting video of real crowds, with PNNL participants inserted strategically.

1. *Volunteer* Tri City Americans Season Ticket holders to contribute on a limited basis before the game and during intermission
2. PNNL junior staff to *work throughout* the entire hockey game at the Toyota Center. While you will not be able to watch the game, it won't cost you anything to participate and a work package will be provided.

Actions you would be asked to do include:

Prior to the game: PNNL will obtain photographs of you and you will also be asked to provide multiple personal photographs of yourself in a natural setting from the past several years (including approximate year photo taken). No personal information will be associated with the photographs.

During the hockey game: Behave like the general public (i.e. walk in specified areas and stand in lines). We will be collecting video data during the event and your image will appear on the video.

If you are interested, please email Marcia Kimura.

This study has been approved by the PNNL Institutional Review Board, IRB. No. 2013-13

Pacific Northwest National Laboratory (PNNL) Consent Form
Non-Cooperative Facial Recognition Testing

You are invited to participate in a research project. This research aims to develop better facial recognition technology. To make our research meaningful we are collecting video of real crowds, with test subjects inserted strategically.

PNNL is doing this research in cooperation with agencies of the U.S. Government.

Who are the researchers?

The PNNL research team is led by Nicholas Lombardo (509-375-3644) at PNNL. The PNNL Field Supervisor for this event is Marcia Kimura (509-947-0423).

Who can participate?

You may participate in this study if you are over 18 years of age and a PNNL employee.

What will I be asked to do?

You will be asked to walk in certain patterns and directions and occasionally stand in a line. Your participation will last up to 8 hours. You will be allowed to take short breaks if needed.

What information will you collect about me?

PNNL will be collecting video data during the event and your image will appear on the video. PNNL will obtain photographs of you and you will also be asked to provide multiple personal photographs of yourself in a natural setting from the past several years (including approximate year photo taken). Your facial image is the only personal information that is being used in this study. Your actual name will not be linked to the facial images you provide. PNNL will not keep your name or other identifying information in the research files, other than on this consent form.

How will the information be used, and how will you protect my privacy?

PNNL will send the video to another government agency for research purposes. No personal information, such as your name, will be supplied with this video data, nor will you be identified in any way. PNNL has no control over uses of this video data once it has been delivered to the client, although, the client has its own privacy protection policies.

What are the risks of this research?

We do not know of any risks to you from participating in this research.

What are the benefits of this research?

There are no direct benefits to you from participating in this research, beyond your normal wages.

Do I have to be in this research?

Your participation in this research is entirely voluntary. If you decide to participate, you may stop participating at any time without any penalty. If you decide to stop participating, please tell the PNNL supervisor.

What if I have questions?

The PNNL supervisor will talk with all participants before the research begins. You may ask any questions you wish then, or at any time while you are participating. If you have any questions after the research is over, you may call the researchers.

If you have questions about your rights as a research participant, please contact Kathy Ertell at the PNNL Institutional Review Board (IRB), 509-375-3610. The IRB is a committee that approves research with people to make sure their rights and their health are protected.

Participant Consent

I have read the information in this consent form. The research has been explained to me. My questions have been answered. I agree to participate in this research project.

_____ _____
Signature of Participant Date

_____
Name of Participant (PRINTED)

_____
PNNL Field Supervisor Signature

Appendix D Scripted Scenarios

Operational Scenario	Crowd Density[1]	Single/ Multiple RP in FOV[2]	PNNL PAID ROLE PLAYERS										PNNL UNPAID ROLE PLAYERS											
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	Presentations	
PREGAME																							Total/ Segment	Total/ Event
Unidirectional	2	S	1	1	1	1	1	1	1	1	1	1											10	10
	2	E											1	1	1	1	1	1	1	1	1	1	10	10
Bidirectional	1	S	1	1	1	1	1	1	1	1	1	1											10	10
	2	S	1	1	1	1	1	1	1	1	1	1											10	10
													2	2	2	2	2	2	2	2	2	2	20	20
Queue	1	S	1	1	1	1	1	1	1	1	1	1											10	10
	2	S	1	1	1	1	1	1	1	1	1	1											10	10
	2	E											1	1	1	1	1	1	1	1	1	1	10	10
PERIOD (3 Total)																								
Bidirectional	1	S	1	1	1	1	1	1	1	1	1	1											10	30
	2	M	1	1	1	1	1	1	1	1	1	1											10	30
Queue	1	S	1	1	1	1	1	1	1	1	1	1											10	30
	1	S	1	1	1	1	1	1	1	1	1	1											10	30
	1	S	1	1	1	1	1	1	1	1	1	1											10	30
	2	M	1	1	1	1	1	1	1	1	1	1											10	30
INTERMISSION (2 Total)																								
Bidirectional	3	S	1	1	1	1	1	1	1	1	1	1											10	20
	2	E	1	1	1	1	1	1	1	1	1	1											10	20
	3	E											0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	10
Queue	2	M	1	1	1	1	1	1	1	1	1	1											10	20
	3	E											0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	10
POST GAME EXIT																								
Unidirectional	3	E	1	1	1	1	1	1	1	1	1	1											10	10
	3	E											1	1	1	1	1	1	1	1	1	1	10	10
																							Total:	370

Key:	
1. Crowd density:	Not controlled. Ranges are only approximate and expected to be time variant.
	1 = Low = 0-10 in viewing volume
	2 = Moderate = 5-25 in viewing volume
	3 = High = 20 or more in viewing volume
2. RP in FOV:	S = Single
	M = Multiple (2 or more persons in viewing volume)
	E = Either (M or S)

Appendix E Ground Truth Log

Initials: _____ Date: _____

Operational Setting (circle): **Unidirectional** **Bidirectional** **Queue**

Event Segment Key: Enter information into table at the start of each new event segment Pre = Pregame P# = Period (include #) I# = Intermission (include #) E = Exit
Crowd Density: 1 = low = 0-10 individuals 2 = moderate - 5-25 individuals 3 = high = 20 or more individuals

Event Segment	Role Player ID	Time (hh:mm:ss)	Crowd Density	Notes

Appendix F Role Player Checklist

Role Player ID	Signed Consent (✓)	Mugshots Captured (✓)	Photos Collected (✓)	Front/Back Photo (✓)	Timing Bracelet ID	Notes