

# 2016 ISARC Technical Workshop Instructions

As a hands-on workshop, all attendees are expected to use their laptops to follow each tutorial step by step. Although WIFI will be provided during the workshop, attendees are strongly encouraged to follow these instructions below to download and install software and sample data prior to the event, so that speakers can be informed early, in case of any software issues.

Several sessions require the use of **Matlab** or **Microsoft Visual Studio C++ Integrated Development Environment (IDE)**, and some basic programming skills of Matlab or C++. For those who do not have Matlab, the [30-day free trial version](#) is a good option. For those who do not have Visual Studio, the [free community version](#) is a good option. In general, attendees are expected to use a Windows operating system, where most of the presentation source codes and precompiled binaries are prepared and tested.

---

## Marker-based Real-time Pose Estimation

[Dr. Chen Feng](#)

[cforrest@umich.edu](mailto:cforrest@umich.edu), [cfeng@merl.com](mailto:cfeng@merl.com)

### 1 Hardware: webcam

It is recommended but not required, since you can use the sample data below to follow the presentation. However, a webcam will allow you to practice the real-time pose estimation in a toy example of Augmented Reality.

And yes, the integrated webcam on your laptop works. But a separate USB webcam that can to be freely moved is ideal.

### 2 Software: Matlab/Octave

Although you can run some of the precompiled binaries from command line, our Matlab scripts make such process easier, and allow you to have better experiments with simple visualizations.

[Octave](#) is a free and open source alternative for Matlab. It works for most of this tutorial except for the real-time demo.

### 3 Precompiled Binaries, Matlab Scripts, and Sample Data

Download the zip file and unzip everything to a folder (e.g., `C:\masfm_isarc2016workshop\`):

[https://bitbucket.org/simbaforrest/myscripts/downloads/masfm\\_isarc2016workshop.zip](https://bitbucket.org/simbaforrest/myscripts/downloads/masfm_isarc2016workshop.zip)

You can test if it works by the following Matlab commands:

```
cd C:\masfm_isarc2016workshop\  
install(true);
```

### 4 Source Code

This is NOT needed during the workshop. It is just for your information, in case you want to better integrate the marker-based real-time pose estimation and structure from motion functionalities into your own research projects.

Marker Assisted Structure from Motion: <https://github.com/simbaforrest/masfm>

### 5 Reference

Feng, C., Kamat, V. R., and Menassa, C. C. (2016). Marker-Assisted Structure from Motion for 3D Environment Modeling and Object Pose Estimation. Construction Research Congress, 2604-2613.

Olson, E. (2011). AprilTag: A robust and flexible visual fiducial system. IEEE International Conference on Robotics and Automation (ICRA), 3400-3407.

Feng, C., Xiao, Y., Willette, A., McGee, W., and Kamat, V. R. (2015). Vision guided autonomous robotic assembly and as-built scanning on unstructured construction sites. Automation in Construction, 59, 128-138.

---

## Image-based 3D reconstruction

[Dr. Mani Golparvar-Fard](#)  
[mgolpar@illinois.edu](mailto:mgolpar@illinois.edu)

Software and data will be hosted on the cloud. URL, user name and password will be provided during presentation.

---

## Automated 3D laser scan planning and change analysis

[Dr. Pingbo Tang](#), Mr. Cheng Zhang, Mr. Vamsi Sai Kalasapudi  
[tangpingbo@asu.edu](mailto:tangpingbo@asu.edu)

1 Software: Matlab

2 Code and Data

All related codes and data can be downloaded using the following link:

<https://www.dropbox.com/sh/gnjdk382sapsmri/AADNq9Xretl4JKgAop41zCKLa?dl=0>

---

## Point Cloud Processing: Registration, Segmentation and Clustering

[Dr. Yong Kwon Cho](#), Mr. Jingdao Chen  
[yong.cho@ce.gatech.edu](mailto:yong.cho@ce.gatech.edu)

The software, PowerPoint slides, and instructions can be downloaded online from:

<http://rical.ce.gatech.edu/research-A5.html>

---

## Vision-based Human Motion Capture and Analysis

Dr. JoonOh Seo, [Dr. SangHyun Lee](#)  
[joonoh.seo@polyu.edu.hk](mailto:joonoh.seo@polyu.edu.hk)

1 Hardware

- **Microsoft Kinect for Windows / Xbox 360**

Kinect is Microsoft's motion sensor add-on for the Xbox 360 gaming console. It contains a depth sensor and a color camera that capture RGB-D images on scenes. Sample data from the Kinect will be provided.

2 Software

- **Brekel Pro Body**

Brekel Pro Body is a Windows application that enables 3D animators to do body Motion Capture using a Microsoft Kinect sensor.

Please download a trial version at the following website:

<http://brekel.com/brekel-kinect-pro-body/>

- **iPi Recorder and iPi Mocap Studio**

iPi Recorder is a software program, recording RGB-D videos from depth sensors such as a Kinect sensor. iPi Mocap Studio is a software program that tracks an actor's motion by analyzing depth sensor video recordings.

Please download trial versions at the following website:

<http://ipisoft.com/download/>

- **3D Static Strength Prediction Program™ (3DSSPP)**

3D SSPP software can evaluate workers' physical demands from work. This program provides an approximate job simulation that includes posture data, force parameters and male/ female anthropometry.

Please download a trial version of this program at the following website:

<http://c4e.engin.umich.edu/tools-services/3dsspp-software/3dsspp-download/>

### 3 Sample Data

Sample data for this session is available at:

<https://drive.google.com/folderview?id=0B5jas7IXWOwCaUNHUKlPUGFzSEk&usp=sharing>

---

## Vision-Based Monitoring of Construction Equipment

[Dr. Ehsan Rezazadeh Azar](mailto:eazar@lakeheadu.ca)

[eazar@lakeheadu.ca](mailto:eazar@lakeheadu.ca)

### Software and Sample Data

- OpenCV

It is better to install a version later than 2.4.1 (download from <http://opencv.org/>).

Moreover, for attendees who have a laptop with CUDA-enabled NVIDIA GPU, please install OpenCV libraries with GPU-enabled option. OpenCV has a well-documented installation procedure (including how to enable GPU parallel computing) for different platforms here: <http://opencv.org/quickstart.html>

- Download source code and sample data from this link (google drive folder):

<https://drive.google.com/open?id=0B4vOglASEDbgcV9UTXdfSXBpMEU>

- It is better to make yourself familiar with the basics of OpenCV.