

## 2019年度 羽ばたけ! TUT 海外研修応援キャンペーン報告書

1 系 ( B ・ M ) 3 年 氏名 Aiman Faruq

参加プログラム	CUNY 研修
研修期間	2019年 9月 5日 ~ 2019年 9月 31日
渡航国・都市	米国 ニューヨーク
研修先機関名またはプログラム名	City University of New York, City College

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I worked in Biomechatronics and Intelligent Robotics (BIRO) Lab lead by Dr Hao Su. They gave me a project to set motion capture system on the lab with Qualisys Track Manager and 8 Miquis cameras. Besides that, I attended seminars, helping other lab members work on their researches and event.

My project aim is to set the motion capture system on one of the lab's room. In this room, we use the Qualisys Track Manager software and 8 Miquis camera. Motion capture is the process of recording the movement of objects or people. It is used in military, entertainment, sports, medical applications, and for validation of computer vision and robotics. In this lab, it will help measure and analyse human motion to help student members' research, such as soft exoskeleton for human augmentation and restoration. Qualisys system help to evaluate the eco or algorithm.

I attended two seminars. There was a seminar by Prof. Minghui Zheng from Buffalo University about A Learning-Based Control Strategy for Robotic Systems. The other is a seminar by Prof. Kyu-jin Cho from Seoul National University about Soft Robotics.

Besides that, I helped lab members to prepare groove of engineering anniversary's event. Moreover, I helped their research as a model for gait detection. They use a wearable sensor to estimate the human gait cycle and mount IMUs in my body to measure kinematics for gait detection.

Most of the lab's members are PhD students, and I learned a lot of thing from them about their research, how they do it, and much advice to me as an undergraduate student. The lab does not have attendance, and they do not need to come every day. However, the lab has a weekly meeting, they review last week's target and discuss target for the next week with Dr Hao.

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### 研修内容

#### 1.参加の目的や動機

I am interested in Dr Hao Su Biomechatronics and Intelligent Robotics Lab because Biomechatronic helps humans in medical care, medical treatment and save more human lives, and the demand for Biomechatronic devices are high. In the future, I want to work towards designing new biomechatronic innovations that contribute to the treatment of patients and make their lives easier. I have Mechanical Engineering background in National Institute of Technology, Gunma College with graduation research on a control method of 2 DOF leg mechanism of Rescue Robot.

In this opportunity to study in CUNY, I would like to experience how to research in English and in a Western way, to learn differences in studying and working style between Western and Asian way. I think lab culture in Japan and America are different, so I can learn the differences and can compare between them. I hope I can use this experience to improve my research skills and I hope I can help to improve the TUT lab to be better after I go back to Japan.

#### 2. 研修内容

The Biomechatronics and Intelligent Robotics (BIRO) Lab have two rooms, and my project aim is to set the motion capture system on one of the lab's room. In this lab, we use Qualisys Track Manager software and 8 Miquis camera from a Swedish company called Qualisys. Motion capture is the process of recording the movement of objects or people. It is used in military, entertainment, sports, medical applications, and for validation of computer vision and robotics. In this lab, it will help measure and analyze human motion to help student members' research such as soft exoskeleton for human augmentation and restoration. Qualisys system help to evaluate the eco or algorithm.

# Hardware Structure

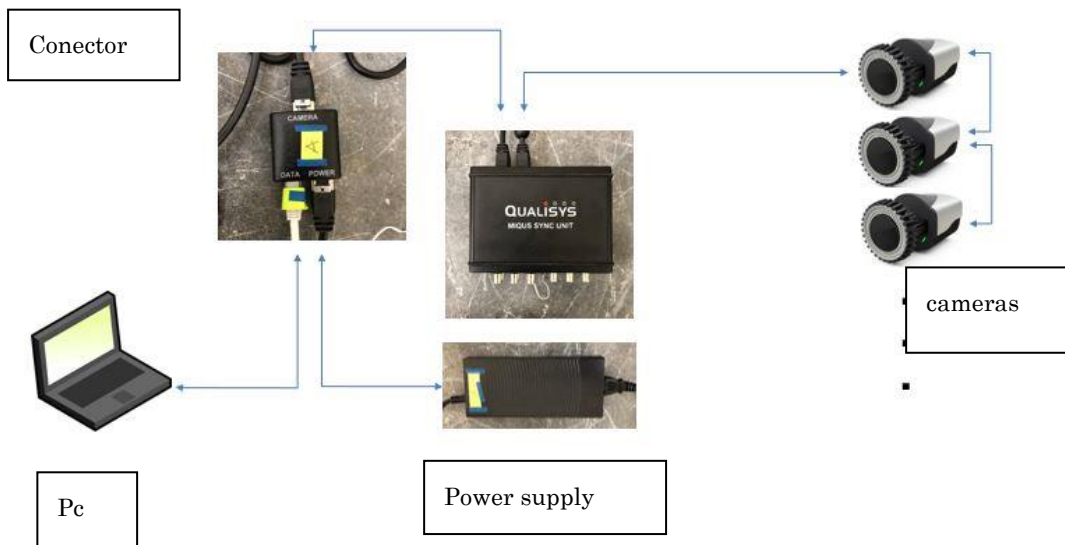


Fig 1 hardware structure of motion capture system

After setting the hardware, we install the QTM software and get in touch with Qualisys to acquire the license.

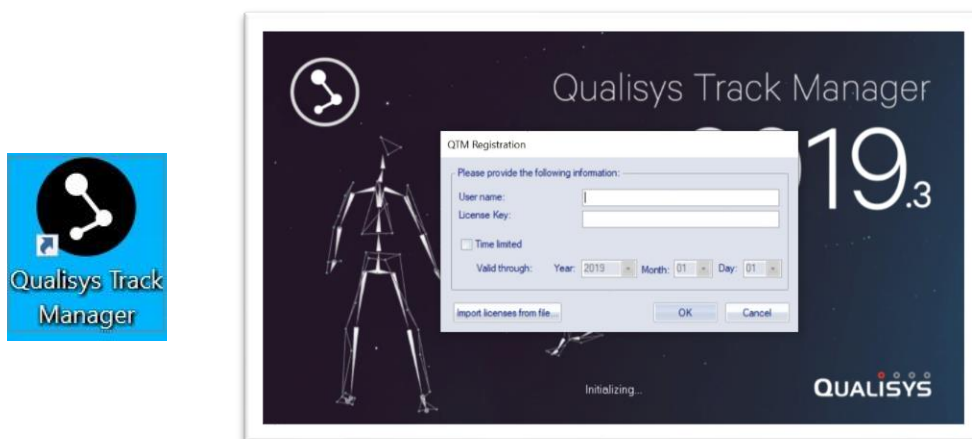


Fig 2 QTM software on PC

After setting the hardware, installing the software, and log in with the license, we Determine and prepare the Volume of interest. The volume of interest (Vol) is the space that our motion capture system will be viewing and recording. Here we use blue tape to make the border of our Volume of interest and determine the middle of it to make zero points. Later we put the L calibration kit to these zero points.

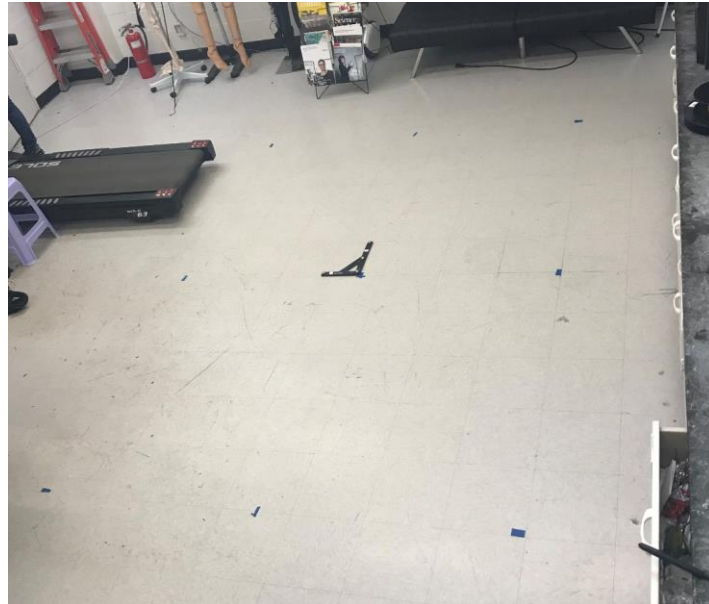
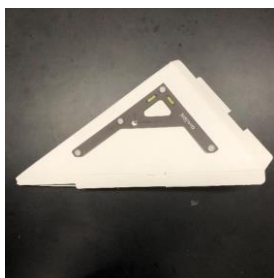
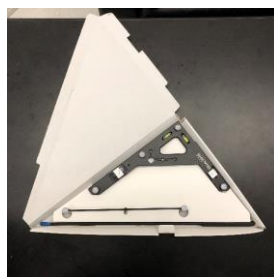


Fig 3 Volume of interest

Next step is calibration. We have three calibration kit.



Calibration Kit Box



L frame kit  
and Calibration Wand



Put the L wand kit on the zero points of Vol.  
The long side will be the X axis.

Fig 4.1 Calibration Kit

## Preparing Calibration Wand:



connecting the wand



Wand kit  
measurement value



How we grab the  
wand kit for  
calibration

Fig 4.2 Calibration Kit

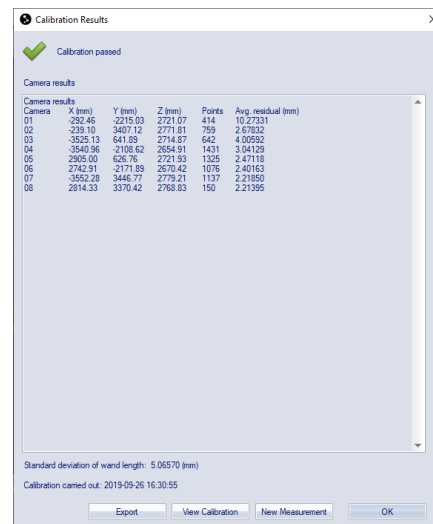
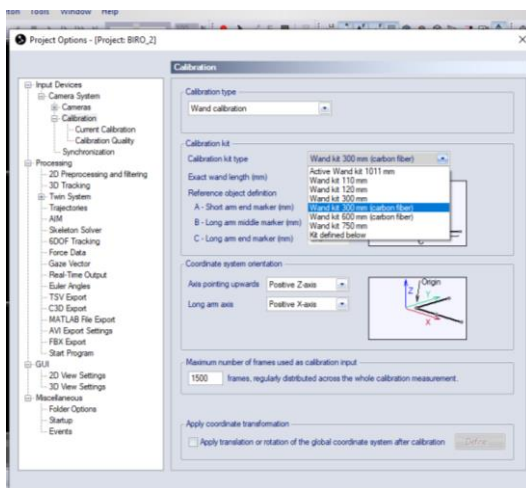


Fig 5. Calibration Setting

After the preparation finished, we did the calibration. QTM will automatically process the calibration and open results window. Now we can start the motion capture. Shotaro helps me to be a model and analyse it. I put sensor markers around his body.

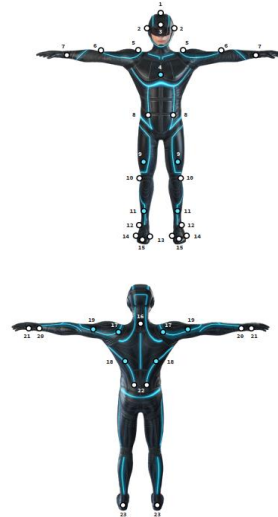
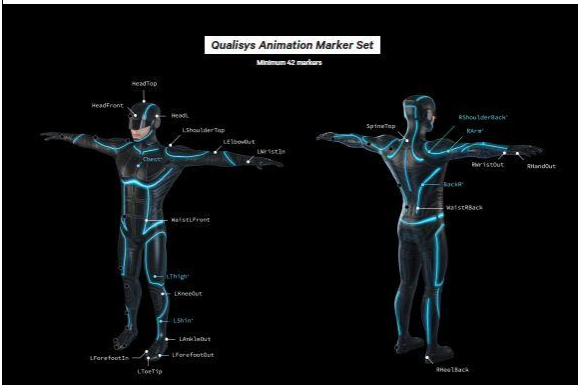


Fig 5. Setting The censor markers

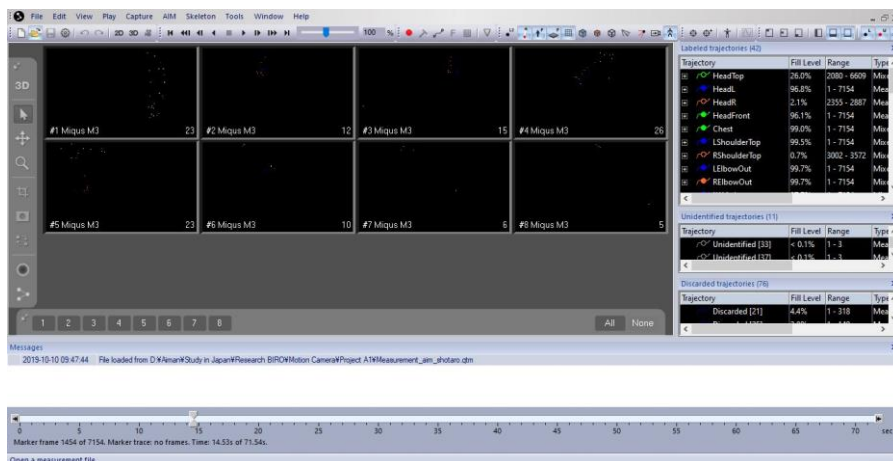


Fig 6.1 Analyze the motion capture in 2 dimensions from each camera

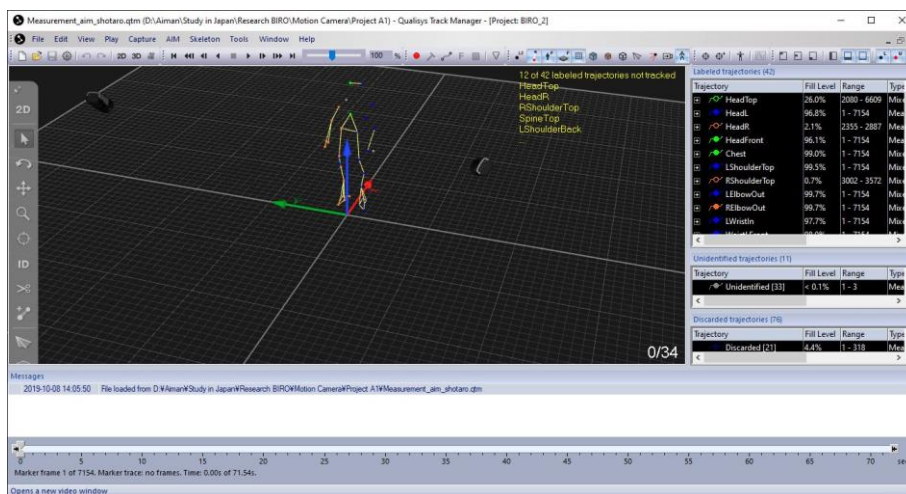


Fig 6.2 Analyze the motion capture in 3 dimensions and make the stick figure



A useful feature of the Qualisys software is the option to set up an Automatic Identification of Markers (AIM) model that will automatically label markers. This result will help the researcher to evaluate and analyse motion.

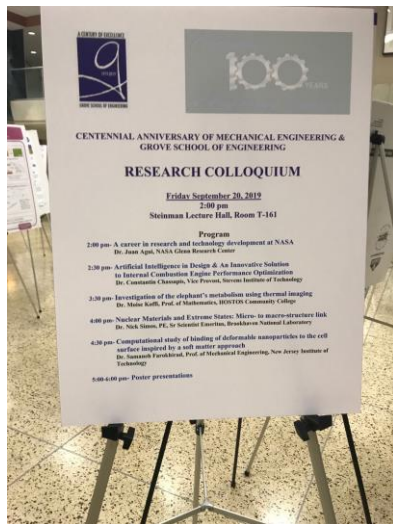


Fig 7. Mechanical Engineering Anniversary event

### 3. 研修の成果、研修で獲得したもの、当初設定した行動目標の達成度、問題点

研究室のメンバーがほとんど Phd の方で研究に関して多くのことを学びました。アメリカと日本の研究室では、ルールや雰囲気などに違いがありました。アメリカでは出席を取ることはなく、先生も毎日研究室に来てません。しかし、毎週研究室のミーティングがあり、そこで研究のターゲットを先生と話し合いで決めていました。さらに、決定したターゲットに対して毎週レポートで報告をしていました。一ヶ月では時間をかけて研究が出来なかったため、プロジェクトを渡されました。次回は研究に参加したいです。

### 4. 今後の目標、課題、当初設定した「帰国後に実践する行動目標」の見直し

アメリカ式の研究室の雰囲気やゼミなどを自分の研究室のメンバーに伝えたいと思います。大学の学生及び国際交流サークルの海外に興味のある学生にアメリカでの得た経験と知見を伝え、アメリカや西洋の文化と日本文化の違いを教えたいです。大学で英語を活用することによって、学内のグローバル環境に貢献したいと考えています。

### 5. その他感想など

ニューヨークでは多文化都市で日本の都市と違ってたくさん的人类がいます。日本は均質社会ですのでおおきな違いが感じました。Dr. Hao Su 研究室の研究にとっても興味がありました。

travel visa で visa 申請をしたところ、却下されてしまいました。次回ビザが必要な学生は travel visa で十分だと言われても、観光目的ではないので student visa を大学にお願いした方が良いと思います。