The 1st WG memo (record by Kameda)

Date/Time: 2009/07/29, 15:00-18:30

Place: Ritsumeikan University Suzaku Campus

Member: Tamura, Shibata, Kato, Kameda, Kiyokawa, Kurata, Sato [Tenmoku and Ichikari]

1. Discussion for having more Japanese members

2. Setting the goal and achievement of this working group

It might be to measure accuracy of geometric calibration, or to evaluate tracking performance.

We also need to reveal our goals of the second stage (to show our direction to go).

3. Evaluation methodology

Stereo vision will be out of our scope at our first stage.

We try to evaluate system performance, not for algorithmic evaluation of methods proposed in papers.

We should cover both methods that needs initialization step and the ones which do not.

Evaluation list should include only the items that could be measured physically / numerically such as accuracy, speed, detection ratio, etc.

Chronological result (along time line) should be covered and visualized.

As for the first stage, evaluation should be done by our group by ourselves for fair evaluation.

It is a good idea to call famous (major) researchers in this research field so that they provide programs to be evaluated to our group.

4. Collaboration with other research groups

There are some sites/groups that are also working similar matters (experiment video/image data + measured 3D points/structures).

We should have major/active researchers to our working group and promote deeper discussion.

We firstly focus on vision based methodologies only because it should be very tough work if we cover sensor-fusion data/results.

5. Accuracy measurement

Two major approaches: A projection matrix based approach and re-projection residual

based approach.

Reprojection residual is easy to handle. It could be measured by giving 3D position and 2D point of a certain point in a scene. The bad point is that it is not so easy to perceptually understand the amount of error.

As for speed: Latency and throughput.

Video sequences should be classified into several groups based on the difficulty.

We also need to think about preparing various kinds of artificial markers that are commonly used in our research literature.

--

Minutes of The 2nd　TrakMark WG MTG (English Ver.)

●About the events related to VRSJ SIG-MR
　・Survey paper for Transactions of VRSJ
　・SIG-MR on Jan. 2010 at Ritsumeikan Univ. hosted by Prof. Tamura
　・The special session for TrakMark at ISMAR2009
　　The length of the talk: 30 min.
　　The flow of the talk:
　　　1. Greeting by Prof. Tamura
　　　2. Introduction of the concept of TrakMark by Prof. Kato
　　　3. Detailed explanation by Dr. Shibata
　　　4. Examples of the bench mark by Dr. Sato

●Discussions about the video sequence
　・How do we deal with detailed information about the sequence such as zoom, focal
　　length of cameras, size of the image plane.
　・How can we obtain the ground truth of the camera path.
　・CG-based video sequence is possible to obtain its ground truth of the camera-path,
　　we can simulate lens blur for reducing deference between the CG movie and live
　　action movie.
　・Each group should prepare the sequence related to each group

●Collecting video sequence
　・Yokoya lab. prepare a sequence of outdoor navigation in NAIST.
　・Video sequence should be offered by the group who has a technique for obtaining
　　ground truth or reference value of the camera path.
　・Announcing call for the sequence at ISMAR.

●Next plans (ToDo)
　・launching a website of TrakMark
　・Job allocation for preparing the sample video sequence
　　・Outdoor navigation: Dr. Sato(NAIST)
　　・Indoor Navigation: Dr. Kurata(AIST), Dr. Kameda(U. of Tsukuba), Tamura
　　　lab.(Ritsumeikan U.)
　　・Desktop: Tamura lab.(Ritsumeikan U.)
　　・Car navigation: Dr. Kitahara(U. of Tsukuba), Dr.Sato(NAIST)

●Date of the next WG meeting
　　・On Nov. 10th , Start at 1PM.

Minute of the 3rd TrakMark WG meeting

Date: 13:00-, Nov.10(Tue), 2009

Place: Ritsumeikan Univ., Suzaku Campus

Participants: Tamura, Kato, Sato, Kiyokawa, Kurata, Kitahara, and Shibata

Observers: Tenmoku and Ichikari

● Report on ISMAR 2009 TrakMark Special Session
- ISMAR2009 TrakMark Session was generally favored
  ➢ "it should work with the tracking competition", "what was the evaluation criteria ?", "miniature sets could be distributed", "physical sensors could be considered", etc.
- We should collaborate with the tracking competition for ISMAR2010 (via Kitahara)
- We should make a guideline to clarify a standing position of the TrakMark
  ➢ e.g. physical sensors can be used but only for reference

● About Image Sequence
- Make a table considering variations and collect actual image sequences
- Learning sequence will not be provided separately as part of the provided data can be used
- Base coordinates will be provided as key frames

● About Evaluation Criteria
- 2D error: Distances to objects impact on the re-projection errors. Overall error of many points should be used ?
- 3D error: 3D errors such as position estimation errors are independent from target distances.
- Legitimacy of evaluation criteria depends on application scenarios. Reasonable scenarios / data should be provided.

● About Data Format
- Still image sets (JPEG files with a sequential ID?) would be good for handiness.
- For the drafting stage we will not restrict data formats

● Publicity
- Set up mailing lists
- Up history, schedule, activity on HP

· Up meeting minutes (Japanese) on HP. Translated versions would be difficult to prepare.
· Mainly Kiyokawa's job

● Schedule
· Next meeting: Dec.15, 2009
  ➢ Bring example image sequences (digital cameras are ok, any format).
  ➢ Pick up target tracking algorithms
· Jan. 2010
  ➢ Call for international contribution, call for tracking algorithms
· Mar. 2010
  ➢ Make 1st image sequence set

● Miscellaneous
· AIST databank can be a data repository. For maintenance purposes after TM activity ?
· Something like "pseudo camera class" will be needed for real benchmarkig ?
  ➢ Rendering is necessary. DirectShow ? QuickTime ? ffmpeg ? OpenCV ?
  ➢ Benchmarking software itself may damage tracking performance.
  ➢ Guarantee 30 fps ? Compare algorithms based on overall time required ?
· Get feedback from users of the image sequences and build up experience.

EOM

The 4th TrakMark WG Summary

Date / Time：Dec., 15th, 2009

Place：Ritsumeikan University Suzaku Campus

● Scenarios for AR/MR application
・ WG members discussed application scenarios to be prepared by bringing videos that assume the use of AR/MR technology.

● Policy for selecting image sequences (scenarios)
・ We gave priority to image sequences whose ground truth could be easily acquired, for example the CG model based video made by AIST.
・ These image sequences could be categorized based on the degree of difficulty.
・ We also game priority to image sequences whose scenario was clear.

● Classification of image sequences
・ Document type (2D object type)：Relationship between object coordinate system and camera coordinate system
・ Navigation type：Relationship between world coordinate system and camera coordinate system
・ 3D object type：Relationship between object coordinate system and camera coordinate system

● Guideline for making image sequences
・ We will use consecutive JPEG images. We will NOT adopt videos which use information of the preceding or the following frames, such as MPEG.
・ We will not intentionally make the image quality worse.
・ The length of the image sequence is about 1 minute. We will divide the sequence when it is over 1 minute.
・ Frame rate should be set as high as possible.
・ Shutter speed should be set as fast as possible.

● Target algorithms
・ There are two alternatives.
   1. We will get a target algorithm and execute it using out computer resources.
   2. We will only provide image sequences and a developer of a target algorithm will execute it using his/her own computer resources.

- First, we will call for contributors by e-mail. Then, we will get a feel for contribution.

● To do
- Make an e-mail of call for contribution.
- Release test videos which we brought in parallel with call for contribution.
- Put AIST, Ritsumeikan University, and NAIST Yokoya Lab in charge of making image sequences.

5th meeting memo

*How to release image sequences to the public?
**Categorize them into profiles of camera, target objects, etc.
**It might be good to make some package including several variations with the same materials.
**Need some web systems for DB input and search/browsing.

*Search/Browsing system and tag
**It would be good that profiles of image sequences are tagged and sorted/retrieved.
***Like a retrieval system for image packages
***It would be better to indicate the scenario or intension that the image-sequence provider has in mind when taking it.
**Tag would be just a reference, so we don't need to adhere to Tag?
***Too many tags for registration might make correct registration into DB rather difficult???
**The organizers can do tagging or validate the correctness when confirming the detail of registered image sequences.
***checking for issue of copyright and right of portrait

*Package: unit, content, ID
**A package contains data on the same camera, same intrinsic parameters, and same target objects.
**Or a data set in which we can use the same attribute data and appendix data would be called package?
**Image sequences for learning/constructing the targets are also in the package.
**Length of a sequence? Around 30 seconds (1000 frames)
**Format: JPEG or Motion JPEG

*Version control
**Version identification by the combination of package name + sequence #
***Identifying the version by name is easier to understand?
***Name like "CalTech 101 Airplain" is easy to cite in a paper.
**Basically anything once released never withdraw.
**The users like not to do version upgrade?
***Depend on how to use…
**We can't throw away the older data on the ground truth, reference data, and camera parameters.
**It might be better to control the version of image sequences and the appendixes separately?

*Minimum unit and Registration/Management system
**Adding data into some package would bother us.
**How about thinking about Playlist?
***Links in a playlist always indicate the original data that are never updated.
** TrakMark ver.1 should be much simpler and primitive thing.
***Realize Playlist by TrakMark ver.2.

*Goal of TrakMark1.0
**First, we release sample packages, then gather them from users.
**Categorize gathered packages manually, and put tags, zipped.

**It is Ok if we keep doing such tagging manually as long as we can.

*Future works
**Definition of tags that describe the profile of image sequences well
**Guideline to make image sequences and packages
**Compatibility with Open CV
**Difficult to unify 3D model including shape and texture?

6th meeting memo

Mar 9, 2010

- We provide a compressed movie of image sequence to enable users to check the sequence briefly. If the users want to use the sequence, they download all uncompress images in a zip file.

- We estimate camera parameters beforehand to provide them.

- A file name is composed of string, time stamp with millisecond accuracy and extension. When the name is a frame number and the frame rate of each image sequence is various, users may get confused.

- We also need to test a tracking method with a learning process.

- The sequence provided by NAIST focuses on outdoor camera tracking. The ground truth may be camera positions of key frames estimated by a laser system.

- The sequence provided by AIST is generated from the space of computer graphics, which is composed of simple 3D models with real textures.

- The sequence provided by Ritsumei Univ. will include new images captured from an actual camera motion for a movie.

The 7-th TrakMark WG Meeting

Recorder : Ichikari Ryosuke
Reviser: Shibata Tomonori
Editor: Ikeda Sei

Date/Time : 2010/5/21 14:30-17:00
Place : Ritsumeikan University Suzaku Campus 3F

English versions of web pages

- Prof. Shibata reported about the English versions of web pages.
  - Ritsumeikan's and NAIST's contents have been uploaded and accessible.
  - AIST's page is redirected to Japanese version.
- There were opinions we are …
  - Required to unify the format and add intention of each sequences.
  - Better to add thumbnail pictures of each sequence at the top page.

Problems of each sequence

Sequences by AIST

- There are discussions about the movement of the virtual camera.
  - The moving back of the camera at the beginning of the sequence seems artificial.
  - This artificial movement was intended to make initialization of SLAM easier.
  - The movement of the camera was generated by interpolating key-frame camera poses given manually.
- AIST team reported about their plans.
  - They will add environmental 3-D models following COLLADA format.
  - They can add camera movements simulating walker's view and moving objects such as walking people.

Sequences by Ritsumeikan

Prof. Shibata addressed about problems of their sequences.

- There is lack of frame due to their low power machine in the current sequences. They will capture the same sequences with a new PC.
- They have to make their sequences with a camerawork for taking virtual actors in filmmaking.

Sequences by NAIST

- There were comments about problems of the current data set.
  - The number of sequences is few. The reference data is insufficient.
  - NAIST team cannot add new reference data to the current data set because the target environment has changed.
- There were discussions about the second version.
  - NAIST team has to acquire similar sequences and reference data again.
  - The current version should be published early for receiving other researchers' comments even though it is insufficient.
  - The complete data set should be acquired in making the second version.

➢ Prof. Kato requested them to prepare the second version which many researchers can use.

Evaluation Method

● We discussed how to decide a concrete evaluation method.

➢ There is a suggestion that we try to evaluate some existing methods using the current sequences and reference data.
➢ We decided Tsukuba and Keio as evaluation teams will try to evaluate existing methods or their own method using the current data.
➢ There are suggestions evaluate PTAM, which does not require any additional reference data, and the multi-object tracking method developed by Keio Univ.
➢ Dr. Kurata will ask Winyu Chinthammit (UTAS) and Walterio Mayol-Cuevas (U of Bristol) to try to evaluate their methods.

● There were various discussions about evaluation. But, we have not arrived at some concrete conclusion.

➢ Is it possible the method using a depth camera developed by Keio Univ. is used to make ground truth?
➢ Is it possible to send students of Ritsumeikan Univ. abroad for three months and to make them evaluate various methods?
➢ Which error on images or in 3-D space should we evaluate?
➢ Evaluation method should be decided depending on sequences, taking into account to superimpose meaningful size of CG objects at meaningful positions.

Publication Method

We discussed about publication, format and use of the web page, and arrived at the following conclusions.

➢ The first version will open as an alpha version in order to get feedback from evaluation teams of Tsukuba and Keio and other international collaborators. But it is not completed.
➢ English check will be done by students of Osaka Univ.
➢ In order to unify format, Ritsumeikan team will make a model format and NAIST and AIST will follow it.
➢ It is the best to prepare both text and binary format of camera parameter files in order to avoid difference of effective digit,
➢ "Ground truth" will not be used. We will unify such term as "Reference Data".

The 8th WG memo (written by Kitahara)
Date/Time: 2010/6/24 14:30-18:00
Place: Ritsumeikan University Suzaku Campus

[TrakMark Workshop]
There were discussions about "date and place", "workshop style (mini-conference or real-workshop)", "type of attendees (open or invited-only)", "discussing topics (constructing the dataset/algorithm or authorizing WG's proposal)", and "expense". The tentative decisions are
- Date: just before the ISMAR2010
- Place: somewhere in Japan (Tokyo or Kyoto)
- Style: mainly real-workshop
- Attendees: only invited active foreign researchers or their colleagues (The TrakMark Web-pages are translated in English).
- Topics: TBD (due to the time-limitation, authorizing way has more possibility)
- Expense: TBD

[Evaluation dataset]
The data management such as adding update-log is discussed. Prof. Kato suggests that the dataset has to increase the scene-variation and the utility software.

[Trial-use reports]
As the result of Univ-Tsukuba trials to apply PTAM to the dataset, the naming rule for the dataset files, the setting rule of intrinsic parameters (such as the lens distortion) and initializing task should be improved.
Keio-univ team reports the trials to apply their own tracking algorithm to a part of the dataset (Ritsumeikan sequence). The result shows that the intrinsic parameters setting process and the initializing calibration should be improved.

TrakMark meeting #9

1300-1800, Aug. 9th, 2010, at Tokyo Campus of Ritsumeikan University

1. Preparation of TrakMark workshop

We decided to organize one day workshop before ISMAR2010. The detailed plan is as follows:

Date: 12 October, 2010

Place: Seoul

- We need to ask some Korea professors to reserve some room for the workshop
- We will send invitation letters to some important researches in the area of tracking.
- We should convince invited participants that our TrakMark activities will contribute to research area of augmented reality/mixed reality.
- We need to have the next meeting for final discussion on the preparation of Tramark Workshop at VRSJ in Kanazawa on September 16th.

2. Plan of the special session of TrakMark in ISMAR2010
- 30-40 min. oral presentation
- Proceedings paper will discuss about the trial of benchmarking using our preliminary datasets.

3. Data collection in the tracking contest of ISMRA2010

In the tracking contest, we can expect that the organizers of the contest will prepare a scene with some calibrating markers. Taking video sequence of the scene is very good oportunity for collecting dataset for the purpose of TrakMark. We will collect various video sequences of the scene with various kinds of cameras. The following possibilities:

- AIST algorithm can be applied to the captured sequence for reconstructing 3D structure of the scene.
- We would like to see the videos that are captured by the teams participating to the contest. Is it possible to ask the organizer of the tracking contest to make the captured videos open for the public?

4. Discussion for the future video sequences provided by the TrakMark.
- NAIST sequence will be extended.
- Ritsumeikan sequence will also be extended.
- Variation of capturing settings should also be increased:

* Resolution, Focal Length, Shutter Speed, FOV, Speed of Motion, Degree of Blur, ...etc.

* AIST full CG sequence is good for increasing such variation in easy manner.

- Variety of the captured scene is also important.　For example, we should take a sequence for the desktop application.

- Data from contributors:

Metaio: Credit should be presented, then we can include those data.

Gudrun's paper model, video sequence, model 3D data

5.　Discussion for support tools

- Time code, frame number conversion tools.

- We should define groups for each task: utility development and data preparation.

- We should encourage our database and tools to be used in the papers presented in ISMAR2011.

6. Discussions on ground truth

- Recent papers do not often mention about quantitative accuracy.　Even in the paper of PTAM, they only demonstrate their performance by showing the video sequences without any evaluation of quantitative accuracy.　This means that TrakMark should contribute by providing ground truth with the sequence data.

7. Conclusion of future plan for preparing data sequence

- Increase the variety of the scenario of the video sequence.　Desktop sequence will be the most important.

- Utility for supporting the usage of the sequence should also be developed.

8. Utility for supporting,　What to do

- Unified definition of camera parameter：Rotation should be represented by 3x3 matrix form rather than three angles.

- Definition of origin of camera coordinate should be the center of the lens.

Minutes of the 10th TrakMark WG MTG (English Ver.)

・Date: Sep. 16th, 2010. 14:15~17:00
・Participants: Prof. Tamura, Prof. Kato, Prof. Saito, Dr. Kurata, Dr. Kameda. Dr. Kitahara, Dr. Kiyokawa, Dr. Ikeda, Dr. Uchiyama, Dr. Ichikari. Dr. Shibata.
・Place: Kanazawa Institute of Technology

●Result of application of budget for TrakMark WS
　・We can use ¥50,000 for TrakMarkWS
●Utility software
　・There are other groups who started to evaluate camera tracking method
　　→Metaio, INRIA(Dr. Uchiyama stays now)
　・Utility for assisting to use reference data
　　→Dr. Uchiyama developed the utility for reading images with sequential number.
●Principles for preparing utility software
　・For reading image files, we use the software code written by Dr Uchiyama.
　・Cameras should be calibrated by the person in charge of preparing sequence.
　・Adopting OpenCV camera calibration method
　　→GML (Developed by Russian researcher) is useful for this purpose.
　・The data of relationship between 3D positions and 2D points in the image will be prepared when we remake the sample sequence.
　　(AIST prepare this for the first sequence, as an exception)
●About Workshop
・Place: rental meeting room near to COEX (TOZ Business Center)
・ToDo:
　　・Confirming address
　　・Preparing map.
　　・Announcing how to go to the place from COEX
　　・Arranging Lunch, Dinner
・Program of the workshop (Moderator: Dr. Kiyokawa)
　　・Opening (Prof. Tamura)
　　・Overview of TrakMark (Dr. Shibata)
・Purpose of this workshop
　　・Authorizing the activity of Trakmark
　　・Discussion and hearing opinions

●Special Session at ISMAR2010
　・Introducing the opinion of participants of the workshop in the session
　・role:
　　　・Overview of the TrakMark: Dr. Shibata
　　　・Overview of the workshop: Dr. Kiyokawa

●Proofreading of the HP, translation of the minutes
　・Proofreading of the HP: Foreign students in Takemura lab.(Osaka U.)
　・Before translating the minutes, we should shorten the length of the minutes.
　・For confirming the flow of the meeting.
　・The short minutes in English can be used as handout at the workshop.