

Microsoft®

INTERN FINAL REVIEW

Name	<u>Rogério Schmidt Feris</u>	Email	<u>t-rferis@microsoft.com</u>
Position	<u>Intern</u>	Group	<u>Telepresence</u>
Mentor	<u>Jim Gemmell</u>	Date	<u>04 September 2001</u>
Hiring Mgr	<u>Jim Gray</u>		
School	<u>University of Sao Paulo</u>	Expected Grad Date	<u>I finished my Master's in May 2001</u>

1. Intern fills out performance review and sends to mentor.
2. Mentor completes performance review.
3. Intern and mentor meet to discuss the review (with Hiring Manager present as applicable).
4. Intern, Mentor, and Hiring Manager should sign review.

EVALUATION OF GOALS AND OBJECTIVES

Evaluate performance of the goals and objectives.

GOAL/OBJECTIVE:

* Orientation; initial paperwork; set up computer system; get latest Gazemaster software compiling and running.

INTERN'S EVALUATION:

* I was able to get the latest GazeMaster and Kentaro's face tracking software compiling and running.

MENTOR'S EVALUATION:

* Rogério did a good job of studying Kentaro's code and getting it to run with minimal help.

GOAL/OBJECTIVE:

* Write a program that adds head pose estimation to facial feature files (based on Kentaro Toyama's head pose estimation code). Modify CFileSource in GazeMaster to use pose estimation in facial feature files. Test with facial features selected manually in the images, and use as input to GazeMaster.

INTERN'S EVALUATION:

* After studying Kentaro's head pose estimation algorithm as well as analyzing both GazeMaster and Kentaro's face tracking source code, I could write the program that adds head pose estimation to facial feature files. Tests on pose estimation were carried out with facial features selected manually in the images. I used the results obtained from the above program to rotate a 3D head model in the GazeMaster system. This step is required to align the model so that the face image texture can be projected onto it. I was able to create a demo showing the pose adjustments. Further, I obtained better head pose estimations by manually selecting the facial feature position in the images with more accuracy. This was done by capturing a video sequence where my face had small stickers showing the precise location of facial features. I had to adapt the 3D head model in GazeMaster to agree with the model used to estimate the head pose in Kentaro's code. Finally, I was able to compute directly the texture coordinates associated with each point in the head model by using the head pose information. As a result, a cool demo was created, completing this step with success.

MENTOR'S EVALUATION:

* Rogerio handled all the coding well in this objective. He was proactive in creating different video test sequences. Once again, he was able to dive into unfamiliar code and make it work.

GOAL/OBJECTIVE:

* Extend above program to use Kentaro's code to track facial features, given input of .bmp files, and (manually produced) facial points for the 1st image. Output tested as input to GazeMaster

INTERN'S EVALUATION:

* After studying Kentaro's algorithm for facial feature tracking and analyzing his code, I could successfully accomplish this objective. Considering a set of .bmp files as input, tracking is performed by template matching (using sum of absolute differences as distance measure) in various scales. I tested this tracking method in different video sequences and integrated the output with GazeMaster system, achieving good results.

MENTOR'S EVALUATION:

* Once again, Rogerio did a great job of porting unfamiliar code.

GOAL/OBJECTIVE:

* Improve accuracy of face-tracking: consider more facial points, track the selected points with subpixel accuracy, possibly try applying Rogerio's code.

INTERN'S EVALUATION:

* I could improve feature tracking with subpixel accuracy (also considering Kentaro's code), using parametric motion models. This method is also robust to rotation in-plane of the considered facial features. To obtain a better performance, I integrated this method with the above multiresolution template matching tracker. So, we have a system that first provides a fast locating of facial features with pixel accuracy. Then, the second method also runs fast (since it has good initializations), providing more accurate feature positions, which leads to better pose estimations. The output was successfully tested as input to GazeMaster.

MENTOR'S EVALUATION:

* Rogerio's strong vision background allowed him to treat this as a simple task, which he handled with no problems.

GOAL/OBJECTIVE:

* Write a program to automatically initialize the facial feature points in the first frame of the video sequence using Gabor wavelets.

INTERN'S EVALUATION:

* I implemented a method for facial feature detection, initially considering specific individuals (per-session initialization). Basically, the method can be divided in two steps: face matching, which is performed by affinely deforming a wavelet representation of the whole face, and feature matching, which considers small wavelet representations for each feature. The first step provides approximated feature locations which are then fine-tuned using the second step.

* I could improve the performance of this technique by using a coarse-to-fine approach. Considering that we have the wavelet representation (face + features) of a specific individual, facial feature detection runs very fast (less than one second), being robust to different facial expressions, homogeneous illumination changes and considerable affine deformations of the face image.

* In order to detect facial features in any individual, we proposed a new method that considers a database of wavelet representations for faces and facial features (per-user initialization). Given a target face image, we first select the "best wavelet face representation" in the database, which most closely matches the new face. The selection of the best representation can be performed efficiently, considering low resolution and/or a small number of wavelets. It's important to say that the best match is determined by means of a score

measure based on wavelet weights. Once this step is accomplished, we ensure that we have good approximations for the feature locations in the target image, which are then fine-tuned, considering the best match of all wavelet feature representations in the database.

* I used a GUI editor to select the face and the considered feature regions in the database images. Then, the wavelet representation for these regions are obtained and the face/feature matching are performed. Finally, I was able to create a set of scripts to provide an automatic way of running experiments and analyzing the results through charts. Such scripts can even be used for other purposes (e.g. face recognition).

MENTOR'S EVALUATION:

* This is the area where Rogerio's talents were really allowed to shine. In a very short time (<8 weeks) he has developed this feature tracking system, consisting of an entire experimental suite of programs. To our knowledge, no feature detector currently exists inside Microsoft. The work is important enough that we have decided to submit a conference paper based on it. As short as internships are, developing something of this significance and scope is a real home run.

GOAL/OBJECTIVE:

* Integrate the above program with the GazeMaster System (in SampleVision).

INTERN'S EVALUATION:

* We have chosen to continue working on facial feature detection, instead of integrating the programs. Jim Gemmell is currently working on the head mesh model to provide better pose adjustments to a specific face.

MENTOR'S EVALUATION:

* I felt Rogerio's talents were best used on the wavelet feature detection mentioned above, and directed him to focus his efforts there. I have taken over this work item.

GOAL/OBJECTIVE:

* Write a technical report, focusing on the obtained results.

INTERN'S EVALUATION:

* We are currently writing a paper about feature detection to the International Conference on Automatic Face and Gesture Recognition (FG'2002). A more detailed version of this paper will be published as a Microsoft Technical Report. We also intend to write a report concerning the computer vision part of GazeMaster.

MENTOR'S EVALUATION:

* I directed Rogerio to continue with the feature detection and drop this item. We will make a technical report out of the conference paper. Rogerio will continue to work on the paper after returning to Brazil.

GENERAL COMMENTS AND PERFORMANCE STRENGTHS AND WEAKNESSES

INTERN'S COMMENTS: Feel free to comment on your work assignment, this review process, your experience working with your mentor, or the company as a whole. Please comment on your performance strengths and weaknesses as shown in the work you have done during the internship.

- § That was amazing to work as an intern at Microsoft BARC under the supervision of Jim Gemmell. I could learn a lot with him and get a sense of how is to be a researcher at Microsoft. In fact, I had a great time here! The GazeMaster project is very interesting and involves many knowledge areas. Jim Gemmel, Jim Gray and all people at MS BARC are very friendly and provided me the best atmosphere to work. Experiences such as the talk given in Redmond as well as the meeting with Bill Gates were really meaningful for me. I feel very motivated to continue my research in the computer vision area.
- § I think I worked hard during this internship and I was always persistent to get good results with a minimum of help. I had some problems with the language, but the objectives were clear all the time.

MENTOR'S COMMENTS: Note any additional comments regarding individual accomplishments or performance trends. Please note specific performance strengths and weaknesses shown by the intern during the internship.

- § Rogerio is an incredibly hard worker. He often worked evenings and weekends. He has volunteered to continue work on the face tracker after the internship is over.
- § Rogerio is upbeat and very pleasant to work with. He is eager to please, and enjoys a challenge.
- § Rogerio is a very competent programmer. I was expecting him to need some help with unfamiliar environments and code bases, but he asked for virtually none.
- § Rogerio is proactive and finds solutions well on his own. E.g., he came up with many different ways of testing as we went along.
- § Rogerio has a strong background in computer vision, and has made a real contribution to the field this summer. To have accomplished what he has during an internship is indicative of his strong intellectual capabilities. He shows all the signs of making an excellent researcher.
- § As he mentioned, Rogerio had some problems with English. His speaking of English was never a serious problem, mostly it was making sure he understood what is said. No doubt the time he spends in Santa Barbara doing his PhD will sort this out.

Mentor:

Please check the most appropriate box to rate your intern's performance description and fill out the interview eligibility information below.

PERFORMANCE RATINGS

X	Consistently exceeds all position requirements and expectations. Accomplishments are highly valued and may be well beyond the scope of the position. Demonstrates higher standards of performance excellence relative to individuals with comparable levels of responsibility.
	Consistently exceeds most position requirements and expectations. Accomplishments are often noteworthy. Overall performance is consistently above levels of quality and quantity relative to individuals with comparable levels of responsibility.
	Exceeds some position requirements and expectations. Successfully accomplishes all objectives. Overall performance consistently matches levels of quality and quantity relative to individuals with comparable levels of responsibility.
	Meets position requirements and expectations. Accomplishes most or all objectives. Some aspects of overall performance may require additional development or improvement to match levels of quality and quantity relative to individuals with comparable levels of responsibility.

	Falls below performance standards and expectations of the job. Demonstrates one or more performance deficiencies that hinder acceptable performance relative to individuals with comparable levels of responsibility.
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Intern has demonstrated the necessary competencies during his/her internship to be considered for a subsequent position with Microsoft (Fulltime or Intern).

Please provide reasons for your decision below:
 Rogerio is very bright, very involved in his research, and has been very productive at BARC this 13-week period. He is extremely hard-working and the ideas and algorithms he has developed show great promise. I believe he has a bright future as a researcher or in advanced development. His language skills are a bit weak (he is from Brazil), but he has a sunny disposition, seems to understand well, and seems quite able to work in a group.
 -Jim Gray

□ Intern has not demonstrated the necessary competencies during his/her internship to be considered for a subsequent position with Microsoft (Fulltime or Intern). *Note: Interns who receive this status should contact their school recruiter for additional information.*

Please provide reasons for your decision below:

Intern Rogerio Schmidt Feris _____ Date _____
Your signature does not confirm agreement but that this review has been discussed in detail between you and your reviewer.

Mentor Jim Gemmell _____ Date _____

Hiring Mgr. Jim Gray _____ Date _____

Note: Signed hardcopies are for Intern, Mentor, and Hiring Mgr. Reference. A typed full name should replace the written signature for softcopies. Please send softcopies to designated intern program contact and Intern's school recruiter.