ABSTRACT
When ordinary people learn hand languages, it is critical to properly understand that the forms of the hand shapes and moves are different for speakers and listeners. To cope with the issue, we have equipped a PC camera with the visual interface of an edutainment system for Japanese hand alphabets. To investigate the visual interface, we have conducted experiments with/without the camera device to measure the eye movement when subjects use the interface. The experimental results have shown the effectiveness of the how-you-look-smart interface with a PC camera.

Categories and Subject Descriptors
H5.2 [User Interfaces]: Graphical User Interface, Interaction Styles

General Terms
Human Factors

Keywords
Visual Interface, PC Camera, Learning Hand Characters, Eye Tracking Device.

1. INTRODUCTION
A hand language and hand alphabets are major tools to communicate among hearing-impaired and ordinary people. Our research project aims at promoting basic expressions of Kana characters (AIUEO) of Japanese hand alphabets (YUBIMOJI) to children at elementary school age.

To learn hand alphabets, it is confusing that the forms of the hand shapes and moves are different for speakers and listeners: What you look like for a listener is not easy to understand for very beginners. To cope with the issues, this paper presents a visual interface with a PC camera for an edutainment system on Japanese hand alphabets. The system is an extended version of PYA (Practice! Yubimoji AIUEO) proposed by Namatame, et al. [1],[4]. The paper focuses on showing the effectiveness of PYA with a PC camera (PYA-Cam) through the experiments with/without the camera device in order to measure the eye movement when subjects use the interface.

2. BRIEF DESCRIPTION OF PYA-CAM
The problems we would like to address are summarized as the following three points: 1) How do we design a visual interface for children; 2) How do we entertain children by using the system; and 3) How do we avoid misunderstanding of children about hand shapes.

PYA-Cam is implemented in Flash/MX and Flash/FCS tool kits and Java language. The PC camera device equipped is a conventional one usually used as a Web-camera. PYA-Cam runs on a conventional stand-alone PC. If a PC has no camera device, PYA-Cam will work as an original PYA. For the experiments in the succeeding sections, we have implemented log recording functions for mouse clicking.

Figure 1 displays the system configuration. Left hand picture is the main entry of the system and the right hand photo is the system with a camera device.

3. EXPERIMENTS WITH AN EYE TRACKING DEVICE
To investigate the effects of the camera device, we have carried out experiments with an eye movement tracking device [3]. We have used Eye Movements Measuring System (EMR-HM8 of NAC Inc.) on the head mount cap with 60Hz sampling (left and right eyes with 30Hz) on videotape.

3.1 Experimental Setup
3.1.1 Objective of the Experiments
Investigate the relationship of the following four main objects of finger forms and the eye movements of the user.

Four Objects: 1) My Hand: Finger form of the user’s own hand, 2) PYA Speaker: The finger form of the corresponding character
displayed by PYA as the speaker side, 3) PYA Girl: The finger form of the corresponding character displayed by PYA as the listener side, and 4) Camera Monitor: The finger form displayed for the user’s hand from the listener side.

Figure 2. Snapshot of Experiments with Eye Tracking

3.1.2 Subjects of the Experiments
Two women with 20 years old, who have no experience on Japanese finger characters. We select the subjects instead of school children, because the experiments with children are considered to require physical and mental stresses to the subjects. Figure 2 shows a snapshot of the experiments.

3.1.3 Tasks of the Experiments
Express the character strings Ni-Shi-Ka-Wa-Yu-U-To (a typical Japanese name), which require the representation of (1) Both side forms (Wa-Yu and U-To), (2) Use of two fingers (Ni, U, and To), (3) Use of three fingers (Shi, Ka, Wa, and Yu), and (4) Similar and difficult forms (Shi and Ka).

3.2 Results and Discussion
The results are summarized in Figure 3. The left hand side (resp. right hand side) sub-figures are corresponding to the ones without (resp. with) a PC camera. The first row show sample screens of the interface. The lines in the second row shows the eye movements. In the third row, we give explanations about which the subjects have given focuses.

When using PYA without a PC camera, the subjects have paid attention only to My Hand and PYA Speaker, and have not noticed on PYA Girl (the second and the third of the left sub-figures). On the other hand, when using PYA-Cam, they have paid attention to PYA Girl and Camera Monitor (the second and the third of the right sub-figures).

This results have suggested that the subjects understand the importance of what you look like to remember hand characters. This means that the functions of PYA-Cam reduce the cognitive barriers between reading and speaking of finger characters.

4. CONCLUDING REMARKS
This poster paper has described PYA-Cam: an edutainment system for Japanese hand alphabet learning for school children. We have demonstrated the effectiveness of the visual interface with/without a PC camera device, which enables very beginners of hand language systems to learn what they look like from the listeners’ points of view. As some class room experiments have been carried out so far, the results will be reported elsewhere. The future work related with the research is to enhance the system to collaborative learning with smaller number of PCs [2].

5. REFERENCES