

Braille Pad Project: Proposal of a Braille Education Support System using a Tablet Device

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Abstract

In this study, as teaching materials of early Braille education for visually-impaired children, we propose a Braille learning support system, which they play touching Braille by using tablet devices. The proposed system provides auditory and tactile feedback in conjunction with finger movement touching Braille, relying on placing conventional Braille teaching materials on the touchscreen surface of a tablet device. In doing so, the system is effective in point of making user to touch and trace Braille actively and accurately, linking own finger movement with sound. Also, we entertain that the system can be used as motivational teaching material in early stage of Braille education. In addition, because that consists of the system is simplified based on product on products for sale generally and widely distributed in Braille education, the system is estimated using widely. In this paper, we describe about the process of development, system, and consideration through exhibition of the system.

Keywords: Braille education, accessible, tablet device

1 Introduction

Visually-impaired children use Braille habitually as a way of learning. Therefore, in education for visually-impaired children, it is important to nourish the ability to read and write Braille effectively. In Braille education, it is hard to learn how to read and write Braille. Hence, it is necessary to use support devices to make learning Braille more efficient. Previously, refreshable Braille displays, which can create tactile outputs by connecting personal computers, Braille keyboards, which can enter text, and Braille typewriters, which can print Braille documents; were all commonly used. In recent years, information technology has made it possible to read and write Braille easily, meaning there is ample research and development [1][2][3][4]. However, these works focus on supporting to distinguish Braille characters on the monitor using vibration or audio feedback, and do not give much thought to experience of touching Braille physically. Especially, in the early stage of Braille education, it is important to touch Braille physically. Through this physical experience, visually-impaired children, who have underdeveloped tactile sense, can become familiar with Braille, improve their awareness of tactile sense, and practice how to touch Braille to read it in an efficient way. For such occasions, we consider teaching materials necessary to make visually-impaired children actively and physically touch Braille.

On the other hand, tablet devices, such as the Apple iPad have become common in recent years. Tablet devices are expected to be widely used for supporting education, for the reason that

they have high functionality yet low cost compared with personal computers, and are portable [5]. Tablet devices make it possible to detect several fingers' location and movement simultaneously on a touchscreen within a high degree of accuracy. In addition, these devices provide visual and auditory feedback in response to users' touch actions instantaneously. For these distinctions, tablet devices have the induction of touching action. Thus, we assert applying tablet devices to early Braille education by incorporating the physical experience of touching Braille with touch interaction provided by the tablet's touchscreen.

In this study, we propose a Braille learning system, which provides effective support to visually-impaired children in the early stage of Braille education by using a tablet device and tangible Braille objects [Figure 1]. The system consists of a tablet device affixed to a custom wooden case that allows for sheets of Braille to be placed over the tablet's touchscreen. The movement of the finger tracing the Braille is detected via the touchscreen. The user, while tracing the Braille sheet, receives auditory feedback. The system can make the user touch Braille actively, and use it as motivational teaching material in the early stage of Braille education. In addition, the user links their own finger movements with sound, meaning they can focus on movements, improving sharpness and awareness of their tactile sense. We set out to implement this system in an education setting, and become widely-used in Braille education. For this reason, the constitution of the system is based on products that are widely available. Also, in the process of developing the system, we added audio functionality for teachers in special needs school which