Chapter 6

Stimulation Devices for Human Haptic Perception and Their Applications in Cranial Nerve Diseases

Jian Zhang
Beijing Institute of Technology, China

Liancun Zhang
Beijing Institute of Technology, China

Jinglong Wu
Beijing Institute of Technology, China

ABSTRACT

Tactile perception is a class of complicated sensations that can be divided into categories including concrete pressure, shape, and temperature perception. In different parts of the human body, the distribution of tactile sensitivity clearly differs. Various stimulatory devices are becoming increasingly widely used in studies of human haptic perception. New methods and devices that can be used to explore tactile stimulation are also being developed and have yielded many important results. This paper introduces such tactile stimulation devices, which can be divided into many categories according to qualities, including their geometric properties, temperature, force, and vibration. This article also introduces some devices that can be used to guide clinical diagnosis and treatment. These devices can be used to examine a patient’s haptic perception to help the patient’s doctors diagnose their illness.

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INTRODUCTION

This chapter focuses on human haptic perception. It is intended to introduce the rapidly evolving field of stimulation devices.

In the first part, we describe the basics of human haptic perception and provide a simple introduction to the essentials of tactile stimulation devices.

In the second part, we begin with a review of the different types of stimulation devices. Because a variety of tactile displays and body parts exist, different academic research projects have different requirements for tactile stimulation devices, and this has led to the development of a wide variety of methods and devices that can be used for tactile stimulation.

Finally, the applications of devices used to stimulate human haptic perception have been extended into medical fields. Many studies have indicated that there is a correlation between tactile perception and some diseases. Because of the advantages of their simple structure, low cost, and non-intrusive nature, these devices will be useful for a wide variety of prospective applications in the medical field. In recent years, research into the development of equipment that can monitor Alzheimer’s disease and be used in therapeutic approaches for treating and diagnosing it have been at the forefront of such medical studies.

BACKGROUND

In everyday life, we attach great value to vision and hearing because of the roles they play in making us aware of our surroundings. Touch is also important to cognition (James, Kim & Fisher, 2007). The blind rely heavily on the sense of touch in their normal activities, and even deaf-blind individuals come to know much about the world around them and to function well within it (Gazzaniga, Ivry & Mangun, 2013). Touch is a method that is used to identify objects according to tactile sensation, which is a class of complicated sensations that can be divided into categories including concrete pressure, shape, and temperature perception.

Different parts of the human body are associated with clearly different distributions of brain activity (as shown in Figure 1) (Penfield & Rasmussen, 1950). Moreover, because of the inhomogeneity in the skin tissue structures that lie beneath different sites of measurement, the distribution of tactile sensitivity is also clearly different. For the purpose of studies into human haptic perception, various stimulation devices are becoming increasingly widely used. New methods and devices used to explore tactile stimulation are also being developed and have yielded many important results, especially in the medical field.
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