Chapter 2
Communication through Many Senses

ABSTRACT

Sensory messages are examined as electromagnetic waves clearly identified by our senses, consisting of interacting electric and magnetic currents or fields and having distinctive wavelengths, energy, and frequency. Further text discusses modes of gathering information and communication that include sensory responses to electromagnetic waves, visible vibrations exemplified by cymatics, the pitch response, the senses of vision, smell, touch, and taste, all of them further expanded by the developments in current technologies. The sense of numbers is examined next, involving numerical and verbal cognition and communication with the use of numerals. Sensitivity, spatial abilities, and the threshold of sensory information make a part of the issues about biology-inspired computational solutions for enhancing our particular or synesthetic abilities, and the role of imagination in biology-inspired research and technology, learning, and teaching. The role of the sensory input in art, which pertains in some extent to individual curiosity and sensibility, concludes the chapter.

INTRODUCTION

It may be useful to keep in mind that communication with others, as well as exchange of knowledge, insight, and information can be done both in verbal and non-verbal way. Many agree that a written text alone may not be the most effective way to communicate ideas and information, even if it goes in a language shared by both parts. Moreover, our communication with the world and people, conscious and unaware of, goes through our senses in much more ways than only by sight, hearing, touch and haptic experience, smell, or taste. For these reasons, the issues discussed in this chapter

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will return repeatedly in the chapters that follow, assuming diverse frames of reference, from physiological, physical, technological, to aesthetical.

Other faculties that are usually described as senses include many internal and external senses: a sense of temperature, kinesthetic sense that gives us balance, a sense of motion, a sense of acceleration and velocity changes (e.g., pressure caused by the wind), proprioception that allows sensing the relative position and movement of parts of the body, a feel of direction, responsiveness to pheromones, and sensitivity to pain. We may sense someone's feelings or mood through the tone of their voice, body language, even from the look in their eyes; it may happen also in one's communication with animals. We are constantly processing sensory information coming from our external and internal receptors that respond to and transmit signals about our body. Our own feelings, for example a feeling of being tired and exhausted, hungry, or just thirsty and dehydrated after a vigorous physical exercise or after a long discussion, can add or subtract the intensity of the sensory input.

Animal senses are seen analogous, and comparable to human ones but they often act differently, as it for instance happens with worms, butterflies, or birds. Some animals have more acute sense of smell, some have better balance, and other have the wider or more narrow ranges of frequencies used for vision and hearing; some may receive ultrasound signals. Many kinds of animals have also other kinds of senses, such as echolocation and different kinds of receptors such as electrically sensitive electroreceptors found in sharks, electric eels, catfish, and other fish (Wueringer, Squire, Kajiura, Hart, & Collin, 2012), and thus different ways of sensing and interpreting data from the environment. Every now and then scientists give a new account of animal facilities for searching through their environment. Some aquatic animals generate the bioelectric dipole fields created by the opposite electromagnetic charges separated by a small distance. Sharks and rays can detect such fields and attack their prey. Wueringer et al. (2012) analyzed the predatory behavior of sawfish. In a saw of a sawfish (all species of sawfish are critically endangered), an elongated cranial cartilage with teeth is covered in a dense array of electroreceptors. The sawfish's saw is unique in its use for both detecting and manipulating prey.

In general terms, senses provide input to an organism due to their physiological capacities. We examine these capacities and use this information for theoretical, practical, and computational solutions within the domains of physiology, neuroscience, cognitive science, cognitive psychology, sociology, anthropology, medicine, computer science, but also human perception, philosophy, and art. One may say that art media of the 21st century, including music, theater, new media art, and design, is the art inspired by the input from our senses, and incorporating the viewer's senses. It is often aimed to visualize the unseen and give the viewer the phenomenal, immediate experience.

Our sensory receptors receive signals from our surroundings or our internal environment, such as temperature, velocity changes (for instance, caused by air changes in the pressure – wind), touch, haptic experiences, and proprioception. Sometimes our senses are below par with the animal senses, for example we cannot sense from a distance the body heat of people or animals, and cannot perceive the signals related to the degree of water pressure or water current. Signals become stimuli that cause physical or physiological reflex responses, which may be performed without our consciousness or as intentional reactions; they also cause psychological reactions. Some hold that humans, and maybe some animals are experts (without training) of picking up emotional expression in faces (Loizides, 2012). The answers depend on the sensitivity of our senses or our organism. However we lack senses or not have enough sensitivity to detect many physical or chemical qualities. We seem to lack the sense of ultrasounds, we are unsure (in variable degree) about our circadian rhythms (biological processes recurring on a 24 hour cycle and influenced by the