Chapter 4

The Brain as a Distributed Processing System

Neuroscience is a branch of science that has its origins in the work of Paul Broca (Price, 2012) reporting that lesion of the left inferior frontal area (Brodmann areas 44 and 45 in Figure 4.1) impaired speech in his patient nicknamed Ton-Ton, because this was the only sound he was able to produce. This initial observation was followed by the report made by Carl Wernicke that lesion of the left temporal lobe (Brodmann area 22 near areas 39 and 40 in Figure 4.1) impaired human capacity to understand spoken languages. These initial observations provided background for a reductionist view of brain function that tries to assign complex cognitive functions to specific and unique areas of the brain.

In contrast to this theoretical approach, Gestalt theory (Humphrey, 1924) proposed that mind forms a global whole of self-organizing tendencies, and no specific complex cognitive function can be assigned to specific brain areas.

As discussed in Chapter 3, the theory of distributed intelligent processing system (DIPS) was first developed in the field of artificial intelligence to formalize those systems comprised by multiple agents that individually have some sort of expertize in solving defined problems, and working together they may solve tasks of higher complexity (Rocha *et al.*, 2004). In this theoretical approach, complex cognitive functions are tasks to be handled by widely distributed set of neurons that are in charge of handling specific subsets of problems. This is the theoretical approach used in this book.