Chapter 2
Pathological Tremor Management

A great deal of effort has been devoted in the past decades in the generic area of tremor management. Specific topics of modelling for objective classification of pathological tremor out of kinematics and physiological data, compensatory technologies and evaluation rating tools are just a few examples of application field. This chapter introduces a comprehensive review of research work in this generic field during the last decades. In particular special focus has been put on the systems approach and thus a specific section on modelling has been included. Aspects related to experimental protocol and tremor pattern identification are reviewed in detail with the aim of drawing a practical guideline when compensatory technology has to be developed. The current status on ambulatory and non-ambulatory tremor reduction technologies is given in the section devoted to tremor management. At the end, we finish our discussion with those aspects related to tremor evaluation.

2.1 Introduction

Tremor is a rhythmic, involuntary muscular contraction characterised by oscillations (to-and-from movements) of a part of the body, [7]. Although the most common types of tremor were subject to numerous studies, their mechanisms and origins are still unknown. The most common of all involuntary movements, tremor can affect various body parts such as the hands, head, facial structures, tongue, trunk, and legs; most tremors, however, occur in the hands. Tremor often accompanies neurological disorders associated with aging. Although the disorder is not life-threatening, it can be responsible for functional disability and social embarrassment, [33].

There are many types of tremor and several ways in which tremor is classified, [37]. The most common classification is by behavioural context or position, [33]. There are five categories of tremor within this classification: resting, postural, kinetic, task-specific, and hysterical. It is accepted that the majority of the affected patients have either Parkinson disease or Essential tremor and that the most incapacitating are essential tremor, tremor due to Parkinson disease and cerebellar tremor.
Resting or static tremor occurs when the muscle is at rest, for example when the hands are lying on the lap. This type of tremor is often seen in patients with Parkinson’s disease. Postural tremor occurs when a patient attempts to maintain posture, such as holding the hands outstretched. Postural tremors include physiological tremor, essential tremor, tremor with basal ganglia disease (also seen in patients with Parkinson’s disease), cerebellar postural tremor, tremor with peripheral neuropathy, post-traumatic tremor, and alcoholic tremor. Kinetic tremor occurs during purposeful movement, for example during finger-to-nose testing. Task-specific tremor appears when performing goal-oriented tasks such as handwriting, speaking, or standing. This group consists of primary writing tremor, vocal tremor, and orthostatic tremor.

Tremor is a disorder that is not life-threatening, but it can be responsible for functional disability and social embarrassment. More than 65% of the population with upper limb tremor present serious difficulties performing daily living activities, [46]. In many cases, tremor intensities are very large, causing total disability to the affected person.

The effect of tremor on the patient depends on the clinical manifestation. In general it can be said that the more goal-directed movements are distorted by tremor, the more severe the difficulty in performing daily activities. On the other hand, rest tremor is seen by the patients as a cause for social exclusion.

2.2 Tremor Manifestations

There are many types of tremor and several ways in which tremor is classified. The most common classification is by behavioural context or position, [37]. There are five categories of tremor within this classification: resting, postural, kinetic, task-specific, and hysterical. Resting or static tremor occurs when the muscle is at rest, for example when the hands are lying on the lap. This type of tremor is often seen in patients with Parkinson’s disease. Postural tremor occurs when a patient attempts to maintain posture, such as holding the hands outstretched. Postural tremors include physiological tremor, essential tremor, tremor with basal ganglia disease (also seen in patients with Parkinson’s disease), cerebellar postural tremor, tremor with peripheral neuropathy, post-traumatic tremor, and alcoholic tremor. Kinetic or intention (action) tremor occurs during purposeful movement, for example during finger-to-nose testing. Task-specific tremor appears when performing goal-oriented tasks such as handwriting, speaking, or standing. This group consists of primary writing tremor, vocal tremor, and orthostatic tremor. Hysterical tremor (also called psychogenic tremor) occurs in both older and younger patients. The key feature of this tremor is that it dramatically lessens or disappears when the patient is distracted.

The aetiology of tremor is diverse and different activation circumstances can be present, [33]. Table 2.1 summarises this situation.