The major characteristics of UWB, i.e., extremely large bandwidth, low power, short-range high data rate communication, robustness against fading, immunity to multipath, multiple access capability, low cost transceivers and precise positioning, motivate several potential applications for this technology. Thus far the UWB technology has been mainly applied to military (especially radar) appliances [1]. In this chapter we study various commercial wireless applications of this technology. The applications have been broadly classified into 6 groups namely – Adhoc Networking, Wireless sensor networks, Radio Frequency Identification or RFID, Consumer Electronics, Locationing and Medical applications (Fig. 9.1). In the following sections we shall briefly explain these applications.

9.1 Wireless Ad hoc Networking

One of the promising applications of UWB technology is in wireless ad hoc networks. Wireless ad hoc networks are networks of nodes (hosts) which are mobile and have no permanent infrastructure. If a fixed or regular infrastructure is available the wireless network is considered as a mesh network. In wireless ad hoc networks multiple hops are used for routing, and the routing changes with time. The major advantages of wireless ad
hoc networks in comparison to traditional communication networks are [2]:

- Easy deployment as no infrastructure is needed,
- Better mobility and flexibility as wireless ad hoc networks can be established or torn down in a very short time,
- Less transmit power for the mobile node because of multi hop, and accordingly lower radio emissions,
- Higher frequency reuse enabling higher capacity coverage,
- Possibility of beyond line of sight (LOS) communication at high frequencies because of multi-hop support,
- More economical as they eliminate fixed infrastructure costs and reduce power consumption of mobile nodes.

For communication between the nodes different radio technologies can be used. For example for the Wireless Personal Area Networks (WPAN) with coverage of up to 20 m the Bluetooth or UWB technology is suggested. For the Wireless Local area Networks (WLAN) with the coverage area of about 100 m, the OFDM or CDMA have been proposed (802.11-a,g and b, respectively). And for Wireless Metropolitan area Networks (WMAN) with the coverage of several kilometers single carrier modulation, OFDM in combination of TDMA, and OFDM are proposed (IEEE 802.16e).

In wireless ad hoc networks each mobile can act as a terminal and as a router. This provides a higher level of autonomy compared to the traditional fixed communication infrastructure. However, the location of mobile, the constraint on power consumption of battery-powered mobile terminals and multipath interference are main concerns in wireless ad hoc networks [3]. UWB technology is an interesting and new application for the wireless ad hoc networks. It can