transmitter operational parameters must be preceded by a warning message to the receivers, so that the receivers will expect the change and stay coordinated with the transmitter at all times.

One benefit of the inherent channel-identifying properties of IR encoding is that multiple communication links can coexist in the same environment without risk of inter-channel interference. This aspect of IR, coupled with the relatively low power requirements for IR transmitters, the frequency domain characteristics of IR transmissions, the noise immunity of IR systems, and the potential for relatively long-range of communication links, suggests that IR is particularly advantageous in the context of medical device systems. For example, it is contemplated that IR communication systems in accordance with the present invention can facilitate ambulatory monitoring of implanted device patients (due to the long range potential), as well as monitoring from outside a surgical field (again due to the long range potential), transtelephonic monitoring (due in part to the ability of the system in accordance with the present invention to automatically adapt its transmitting operational parameters—data rate, etc.—to accommodate a telephonic link), and communication with multiple devices in the same environment (for example, monitoring multiple patients in a hospital ward from a centralized monitoring station).

Since minimization of power consumption is of particular concern in the context of battery-powered body-implantable device systems, a variation upon the above-described impulse radio scheme is contemplated which takes advantage of the fact that the correlation between the received signal and the expected pseudo-random signal is less when one data state is transmitted (e.g., a transmitted "1") than when the other data state is transmitted (e.g., a transmitted "0"). In accordance with this alternative embodiment, a pseudo-random baseband code is used as described above. However, during the modulation of the pseudo-random baseband code for the purposes of introducing information content therein, pulses whose position in the pseudo-random baseband pulse stream would normally be perturbed are not transmitted at all. That is, whereas the position of a pulse would normally be perturbed in order to modulate a binary "1" into the pulse stream (in order to reduce the correlation between the received signal and the expected signal) in this alternative embodiment, that pulse is simply not transmitted. By not transmitting the pulse, the correlation, in the receiver, between the received signal and the expected signal is even less than if the pulse's position had merely been perturbed during data modulation. Pulses whose position in the pseudo-random baseband stream would not be perturbed (e.g., to modulate a binary "0" into the pulse stream) are transmitted as usual, leading to a high correlation between the received signal and the expected signal for those data bits. By not transmitting pulses corresponding to one data state, a significant reduction in power consumption can be realized.

From the foregoing detailed description of a specific embodiment of the invention, it should be apparent that a method and apparatus for implementing adaptive, optimizing communication systems, particularly well-suited, but not limited to the area of implantable medical devices, has been disclosed.

Although a specific embodiment of the invention has been described herein in some detail, this has been done solely for illustrating various aspects of the invention, and is not intended to be limiting with respect to the scope of the invention, as defined in the claims. It is contemplated that various substitutions, alterations, and/or modifications, including but not limited to those design and implementation options specifically discussed herein, may be made to the disclosed embodiment of the invention without departing from the spirit and scope of the invention, as defined by the appended claims, which follow.

What is claimed is:

1. A system comprising an implantable medical device and an associated device, each provided with a transmitter/receiver, wherein the system is further provided with means for optimizing communication between said implanted device and said associated device, said optimizing means comprising:

means associated with said transmitter/receivers for defining a plurality of telemetry transmission types and for defining in conjunction with each of said telemetry types a prioritized set of a plurality of performance goals which vary depending upon telemetry transmission type;

means associated with said transmitter/receivers for controllably altering a plurality of operational parameters of said transmitter/receivers;

means associated with said transmitter/receivers for determining whether a transmission between said transmitter/receivers meets said performance goals; and

means associated with said transmitter/receivers for selecting among said operational parameters and adjusting said selected operational parameters based upon said prioritized set of performance goals to achieve said performance goals in order of their priority.

2. A system in accordance with claim **1**, wherein said adjustable operational parameters include a plurality of transmission speed, number of repetitions of data transmitted, transmission power, transmission frequency and receiver bandwidth.

3. A system in accordance with claim **1**, wherein said set of performance goals include a plurality of transmission speed, transmission power, error rate, noise level and transmission range.

4. A communication system in accordance with claim **1**, wherein at least one of said transmitter/receivers comprises an impulse radio transmitter and wherein the other of said transmitter/receivers comprises an impulse radio receiver.

5. A communication system in accordance with claim **4**, wherein said impulse radio transmitter comprises means for modulating a pseudo-random baseband pulse stream with data to be transmitted, such that for one data state, at least one pulse's position in said pseudo-random baseband pulse stream is perturbed, and for another data state, at least one pulse's position in said pseudo-random baseband pulse stream is not perturbed.

6. A communication system in accordance with claim **4**, wherein said impulse radio transmitter comprises means for modulating a pseudo-random baseband pulse stream with data to be transmitted, such that for one data state, at least one pulse in said pseudo-random baseband pulse stream is not transmitted.

7. A system comprising an implantable medical device and an associated device, at least one of which is provided with a transmitter, the other of which is provided with a receiver wherein the system is further provided with means for optimizing communication between said implanted device and said associated device, said optimizing means comprising:

means associated with said transmitter and said receiver for defining a plurality of telemetry transmission types