Editorial

Free space optical communications

Early examples of 'optical' communications, using mirrors and smoke signals, can be found in the early days of the history of mankind! Free space optical communications predate fibre optics.

This area of study is currently undergoing a considerable resurgence of interest, in various telecommunications, consumer electronics and data communications applications. The success of the technology may be measured by the degree of penetration into products, and by the dependence of people on them. At home, it is gradually becoming difficult to imagine life without the TV remote control, and we all have experienced the discomfort of not being able to find it when we want to change a TV channel. Many of us remember the early infrared optical links on calculators, advanced versions of which are now common in palmtop computers. I mention these two products as indicators of free space optical links already in use in various forms in the home. This is a sign of a maturing technology. The advent of fibre optic technology has offered huge bandwidth distance product fibre optic links, which are cost effective; as well as components such as lasers, LEDs and photodetectors, now available at low cost and having excellent specification.

Interestingly, the need for portable and wireless computing and networking has taken off recently, and as the need for low cost wireless connections is in demand, wireless optical links are being considered in many products. Although wireless optical links have been studied for long distance intersatellite links, as well as TV outside broadcasting links, it is in indoors operation that they have been most successful.

As the technology matures, IR links offer high bandwidth at low cost, low power consumption, small size and low weight. This is a powerful portfolio of advantages in aid of large scale integration and volume production. Furthermore, the low bandwidth and regulatory problems in using RF indoors has recently tilted the balance for research and development of IR free space links into some products. The importance shown by industry in this technology is demonstrated by the formation of the Infrared Data Association, an industry standards forming body, for short range IR links.

The user models of specific products dictate the design of the links. Short range indoor links between computers may take the form of direct, short distance, (1m) 'point and beam' IR optical links, or cellular areas of coverage, or omnidirectional links relying on multiple reflections from walls and ceilings.

The variability of ambient noise is a major design challenge in IR links; historically, developments of indoor lighting have been independent of developments in IR links. Therefore lights cause noise and interference and are of great concern in the design of robust links. This is evident from the proportion of papers in this Special Issue concerned with counteracting this problem.

The difficulties of designing IR links are further complicated by issues of backward product compatibility, and by the protocol of operation. Recently, eye safety classification of IR transmitters has also been a concern, and poses further design constraints: a paper in this Special Issue on holograms for wireless LANs addresses eye safety.

A record breaking wireless IR link capability demonstration of 1Gbit/s is presented here by BT Labs, clearly setting the path for faster IR links for future applications. It is anticipated that multimedia applications and ATM will have a great deal of influence when designing future IR links, and it is expected that further research and developments in the use of IR links and networks for wireless multimedia applications will continue.

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IEE Proceedings online no. 19960879

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