Intelligent Helmet for Coal Miners with Voice over ZigBee and Environmental Monitoring

Abstract

In recent years, research is going on ZigBee based wireless sensor networks due to their remote environment monitoring capabilities. Such a network can easily collect sensor data and transmit them by radio. A cost effective ZigBee based wireless mine supervising system with voice over ZigBee (VoZ) is presented here. Here we design a smart new helmet, which enable the helmet as a mobile node of ZigBee wireless sensor networks, gathering parameters from underground timely and quickly. The helmet which is mobile sensor node will collect the temperature, humidity and illumination level of nearby environment and will alert the central management unit in case of abnormal condition. In this project, we also design a voice transmission system, one of telecommunication value-added services, based on the same low-rate ZigBee networks. So with environmental monitoring, the miners can communicate with control centers or with other miners through wireless speech communication. G.726 voice codec algorithm is used for compressing and decompressing the speech samples at transmitter and receiver sides respectively. Speech compression algorithm is used for reducing the bandwidth requirements during the time of transmission. The PIC24F 16bit microcontroller architecture used here is a powerful extension of Microchip’s existing RISC microcontroller portfolio. By giving users an even greater range of options for computational power and rich peripheral sets, it allows users to grow their applications. G.726 Speech compression algorithm uses the Adaptive Differential Pulse Code Modulation (ADPCM) methodology.