Steganography is the process of hiding data within other data, such that the hidden data is only visible to the party that added the hidden data, and other persons whom they wish to be able to see it. One modern application of this field is the process of adding nonvisible digital watermarks to various types of media, such as audio, video, and image files. There are several methods for accomplishing this, such as spread-spectrum watermarking, low-bit, and quantitization index modulation, which is related to the application of dither (Chen et al. 2001). The field of digital watermarking first began togrow significantly in the late 1990s to early 2000s, during which time many methods of embedding were developed, many of which did not have strong theoretical evidence of their performance in areas such as performance and reliability (Perez-Gonzalez, 2003).

The process of quantization index modulation is essentially to take an existing analog or digital signal, quantize it for a given step size (in the case of a digital signal, converting it to a lower resolution than before). Instead of applying dither noise to the signal as usual, some function of the message m, d(m) can be applied, which may be pseudo random (Chen et al. 2001)(Chen 2001). An important factor when choosing a method for embedding is whether the host signal is known, in which case obtaining the embedded signal is made much easier. With or without knowledge of the host signal, statistical methods can be used to determine the nature of the pseudo-noise d(m) relative to what the signal would look like with true random noise (Perez-Gonzalez, 2003)(Perez-Gonzalez, 2005).  
  
The two main competitors to QIM, both of which appear to have been developed earlier than the dither based method, are Spread Spectrum watermarking, and Low Bit(s) Modulation (Chen et al. 2001). Spread Spectrum watermarking relies on drawing values from a gaussian (Normal(0,1)) distribution, and applying them as noise across specific frequency bands or channels in the host signal. The channels chosen are based on their significance, with the most significant sections used for application of the watermark, and as a function of the message, a function a(m), given the message m. This is to ensure that any attempt to remove or “erase” the watermark from the file will have a high probability of damaging the fidelity of the ‘scrubbed’ file to the old one (Chen et al. 2001)(Cox et al. 1997). Low Bit(s) modulation works by assesing which sections in the signal are least significant (ie the Least Significant Bit) and modulating that bit by a function of the message m, d(m).

The key goals in applying a hidden signal of this type to a original signal is to embed as much information as possible and to have the signal be as robust as possible (minimize the likelihood that the embedded information will be corrupted beyond usefulness when retrieved, and make the embedded signal difficult to erase without destroying the host signal)(Chen et al. 2001). For some applications, the strength of the method against ‘erasing’ attacks does not matter. These methods might include the embedding of a digital signal for transmission inside of an analogue one, such as an analogue radio signal which can be played by older analogue-only devices, but which also “piggybacks” a digital signal inside of it, which can be read and played by digital devices (Chen et al. 2001). However, many important uses of digital watermarking require that detection, and most importantly, removal, of the embedded signal be as close to impossible as can be. Applications in this category include watermarking of DRM-protected media such as a digital copy of a movie purchased from a digital store, and watermarking copies of sensitive military documents distributed to a group of people. In both of those cases, each copy of the file distributed to an individual is signed with a unique watermark, indicating who the file was distributed to. If a leak or unauthorized sharing of the document occurs, the watermark can be used to trace the origin of the file back to the responsible parties (presumably with discipline following) (Chen et al. 2001). Along with the most obvious application areas of audio, video, and static images, printed documents can be invisibly watermarked by adjusting the line spacing of a given printed or scanned copy (Su et al, 1999).

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