**Lab 6：Digital Baseband Transmission**

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| **Introduction**  In Lab 6, we have done digital baseband transmission by using labview. For the digital signals which is transferred, the first step is to map the bits. Then, upsample the mapped signal(0 to 1 and 1 to -1). After upsampling, the upsampled signal is pluse shaping by Raised-Cosine Function or Sinc Function. The pluse shaping signal is transmitted through the channel with noise. At the receiving end, the received signal is first filtered by matching. The detector extracts signals synchronously and periodically to make a decision. Finally, recover the signal by inverse map.  The following picture is the principle flow chart.    **Lab results & Analysis**：  The following pictures are the program chart.      **Analysis:**  When the value of upsampling factor is less than or equal to 5, the recovered bits are different from the original bits, which means the transfer fails. When the value of sampling factor is greater than 5, the recovered bits is the same with the original bits, which means the transfer succeeds. What’s more, inter-symbol interference is gradually reducing with the value of upsampling factor increasing.    ***upsampling factor is 4***      ***upsampling factor is 100***  The value of Sinc samples will affect the time domain delay of the waveform.    ***Sinc samples is 51***    ***Sinc samples is 72***  The following analysis concerns the raised-cosine function.  What can be known is that the trailing attenuation of raised-cosine roll - down filter in time domain is faster with the value of roll down factor increasing, which is beneficial to reduce inter-symbol interference and bit timing error and improve frequency band utilization rate. However, this comes at the expense of its signal bandwidth. The transmission performance of the system is improved with the roll down factor increasing.      ***the bandwidth with different afa***    ***afa is 0***    ***afa is 0.75*** | |
| **Experience:**  In the time domain of pulse forming in communication, the condition of no inter-code crosstalk should be satisfied. What can be thought firstly is the Sinc function, whose frequency domain is an ideal lowpass filter. However, the ideal low-pass filter is physically impossible and can only be "rolled down" at the edge, not "steep down" in practical application scenarios. Besides, Sinc signal decays slowly and has a large trailing amplitude, which requires high timing synchronization. So, a raised-cosine roll down filter is used in practical systems, the trailing decay of which is faster in the time domain relative to Sinc. | |
| **Score** | 100 |