**深 圳 大 学 实 验 报 告**

**课程名称： 现代通信原理**

**实验项目名称： 实验四**

**学院： 电子与信息工程学院**

**专业： 电子信息工程**

**指导教师： 陈真**

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**实验时间： 2023.03.23-2023.03.30**

**实验报告提交时间： 2023年3月30日**

**教务部制**

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| **实验目的与要求：**  微信截图_20230329234806 |
| **内容和步骤：**   1. **Read the PCM code and write the explanatory note for the code (the note rate should not be less than 50%)**   The notices are shown in the following figure.  微信截图_20230330004415  微信截图_20230330004429  微信截图_20230330004438   1. **Use the PCM code to encode an audio signal (only need to process the first channel). Plot the encoded result of the first and the last 100 samples in 2 figures.**   The main codes are shown in the following figure. We first extract the first channel of the audio sound. It is worth to say that we should perform PCM for all the audio signal then we cut the first 100\*8 encoded results and the last 100\*8 encoded results when we perform PCM for the first 100 samples and the last 100 samples. Since in the PCM, we should find the maximum of the audio signal, we can’t obtain the encoded results by PCM(signal(1:100)) and PCM(signal(end-99:end)). That we will not get the maximum value of the original audio signal, instead we get the maximum value of the first and the last 100 values of the audio sound. The red rectangle marks the corresponding process.  微信截图_20230330005605  The following figures shows the encoded result of the first and the last 100 samples.  微信截图_20230330015523  微信截图_20230330015536   1. **Write a function of 7/11 transformation based on the PCM. (Give the 11-bit encoded results of the first 10 samples)**   The following figure shows the 7/11 transformation function called transformation7to11 with output 11-bits called seq. The input of the function is a 1×7 vector representing the 7-bit encoded result. The principle of my own function is first determine the highest effective bit. In other word, we should determine the segment for the 7-bit encoded result. For example, when it is 3rd segment, B6=1. And the B5B4B3B2 is its 4-bit inner segment. All the notices have been made in the program.  微信截图_20230330015642  微信截图_20230330015652  In order to primarily test my own 7/11 transformation, I input a special case 7-bit encoded result which is 1000110. The example also presents in the slides shown in the following figure. The theoretical 11-bit encoded result is 00010110000.  微信截图_20230330020621  The following figure shows the practical 11-bit encoded result which is 00010110000. That is consistent with the theoretical 11-bit encoded result indicating that my own 7/11 transformation function is correct. Then we generate the 11-bit encoded results of the first 10 samples.  微信截图_20230330020525  The following figure shows the main codes of this task. Finally, we output the 11-bit encoded result matrix for the first 10 samples in convenience to observe.  微信截图_20230330020323  The 11-bit encoded result matrix for the first 10 samples is shown in the following figure. Each row represents a 11-bit encoded result for one sample.  微信截图_20230330020539 |
| **实验结论：**  The PCM process includes :   1. **Sampling:** The analog signal is sampled at regular intervals, typically using an analog-to-digital converter (ADC). The sampling rate determines the number of samples taken per second, and the accuracy of the resulting digital representation of the analog signal. 2. **Quantization:** Each sample is quantized to a discrete value, typically using a uniform quantizer. The number of quantization levels determines the resolution of the digital representation of the analog signal. PCM adopts A-law 13 broken line quantization method. 3. **Encoding:** The quantized samples are encoded into 8-bit binary format. And we could use the 7/11 transformation or 11/12 transformation for the encoded result in the following process. |
| **指导教师批阅意见：**    **成绩评定：**  **指导教师签字：**  **年 月 日** |
| **备注：** |

注：1、报告内的项目或内容设置，可根据实际情况加以调整和补充。

2、教师批改学生实验报告时间应在学生提交实验报告时间后10日内。