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Abstract
The telephone line in the signal transmission, the noise can affect the quality of the transmission very easily. Therefore, using the property of the Dual-Tone Multifrequency signals to confer, analyze, and implement the ideal and noise environment in this dissertation respectively.

Software, using the MATLAB to process Discrete Fourier Transform and Matrix operation. To confer the property of the DTMF signals decode, use Signal Processing Toolbox, input voice parameter from external MIC in the Simulink working development, analyze the property of the digital filter, and design the digital filter met International Telecommunication Union Recommendations. Using GUI window to complete item of the experiment data and result analysis. To provide the friendly user’s interface, let users can use mouse to choose the analysis result and experiment data.

Hardware, using the ALTERA FLEX-EPF 10K50EQC240-1 chip to implement the system function in the ALTERA MAX+PLUXII. The functions have the shift register, RAM, Log-to-Linear Decompressor, ROM, digital filter algorithm, and the TI DSP-TMS320C50PQC to implement the multi-channel DTMF Decoder. The main projects process the Discrete Fourier Transform algorithm, and Time Division Multiplexing to implement the system of the real time and multiplexing.

Keywords：DTMF signals, Noise Analysis, DTMF decode, filter design
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