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Talking About the Virtual Teaching Platform of Signal and System Course Based on LabVIEW

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ABSTRACT

"Signals and Systems" is a basic course for communications majors. This course has strong theory, numerous formulas, abstract content, and difficult to understand. It is proposed that based on LabVIEW simulation design, the LabVIEW implementation of signal analysis, signal sampling, LTI system characteristics and other teaching content is completed. The teaching system composed of these modules can visualize abstract theoretical knowledge and mobilize students' enthusiasm in a simple way. It can be used in signal and system teaching experiments of various electrical majors, which is conducive to students' understanding of knowledge. Through simulation, it can also increase students' learning interest and improve learning efficiency.

Keywords: *Teaching platform, LabVIEW, Signal and system, Signal analysis and processing.*

1. INTRODUCTION

"Signal and System" is a professional basic course for undergraduates majoring in automation, electronic information, and measurement and control. Its teaching content is closely related to theory and practice. After adjusting the teaching plan and setting the syllabus, the University of Shanghai for Science and Technology summarized and integrated "signals and systems" to scientifically construct a new curriculum system. At present, virtual experiments have been widely used in the teaching of telecommunications majors, providing a good teaching and research platform for teachers and students. At the same time, it can solve the experimental teaching of basic electronic information courses. Due to the large number of students and the large number of batches, traditional laboratories generally face greater difficulties and pressures in terms of funding, venues, and equipment. At the same time, traditional experimental teaching requires regulations Complete the specified experiment within time, design and modify the parameters by yourself, which greatly reduces the difficulty of the experiment for students.

2. CURRENT SITUATION FACING THE CURRICULUM

The "Signal Analysis and Processing" course is for undergraduate students from the School of Optoelectronics, University of Shanghai for Science and Technology. Most of the students are engineering and technical personnel in the field of automation, measurement and control and electronic communication in optoelectronic technology, and a small number of students will enter postgraduate studies. "Signal and System" is a very theoretical professional basic course. It has a wide range of content, abstract theories, complex mathematical formula calculations, and many function waveforms and curves. Only through a single classroom teaching method, students feel that the theory is too boring. Abstract, it is difficult to receive good teaching results within limited teaching hours. How to make full use of modern education methods according to the new curriculum system to make the organization of teaching

content more enlightening and improve teaching efficiency; how to flexibly use various advanced teaching experiment methods to stimulate students' learning potential and interest in learning; how to introduce The application background of signal analysis and broadening the amount of information that students can obtain in classroom learning are all problems that must be urgently solved in the reform of the teaching methods of the "Signal Analysis and Processing System" course.

3. REFORM OF EXPERIMENTAL TEACHING OF VIRTUAL INSTRUMENT

Virtual instrument technology is the concept of virtual instrument (Virtual Instrument, VI) proposed by National Instruments (NI) in the mid-1980s. It is the product of the combination of computer technology and instrument technology. In terms of composition, virtual instrument is the use of computer hardware, virtual instrument special software (such as LabVIEW), and hardware interface modules to form both the basic functions of ordinary instruments and general instruments. A new type of instrument with flexibility and openness. In terms of use, the virtual instrument uses the powerful graphical environment of the PC computer to establish a friendly interface virtual instrument panel. The operator controls the operation of the instrument through the friendly graphical interface and graphical programming language to complete the collection, analysis and judgment of the measured quantity , Display, storage and data generation. And pay attention to cultivating students to tolerate the views of others and express their opinions freely in classroom teaching. In the classroom teaching, the discussion content is very substantial. The professor focuses on stimulating students' new ideas, not to guide students to think, but to guide students how to think, how to listen to different voices without prejudice, and solve problems together, so as to cultivate students' cooperative ability. Stimulate students' motivation for innovation.

4. REALIZE SIGNAL GENERATION IN LABVIEW

Signal generation is the prerequisite for signal processing and analysis. We can design a multi-functional signal generator through the LabVIEW platform to meet the needs of teaching. The input form of the signal can be selected, and the signal that comes with the system can also be manually set. Generate the signal you need or directly generate the signal according to the formula. The program based on LabVIEW has two parts: front panel and background block diagram. Let's take Fig. 1 Gaussian modulated sine wave signal as an example in Figure 1.

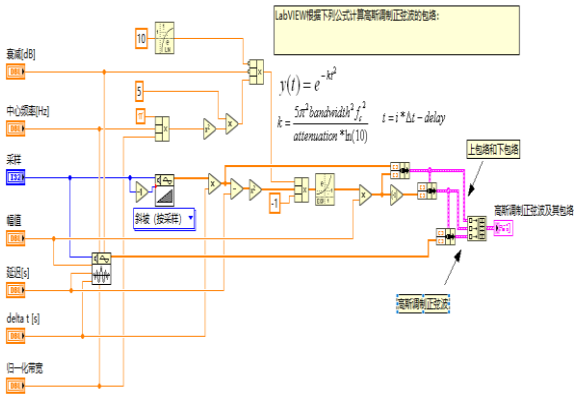

Figure 1 Block diagram of Gaussian modulated sine wave signal

Figure 2 mainly includes the parameter settings of the Gaussian modulated sine wave. From the block diagram, we can see that the demodulated signal we want can be obtained based on the parameters we set and the pre-compiled formula.

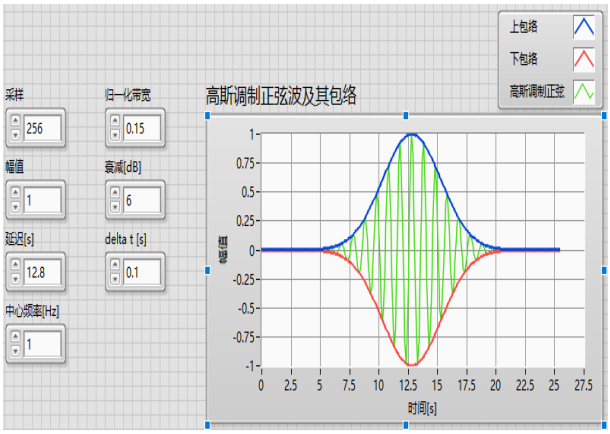

Figure 2 Gaussian modulated sine wave signal front panel

On this basis, we can use the powerful signal processing capabilities of LabVIEW to integrate some basic waveforms such as triangle waves, sine waves, square waves, sawtooth waves and other basic waveforms into the LabVIEW interface. Students can easily follow the tasks assigned by the teacher during the signal processing class. And efficiently complete the experimental tasks assigned by the teacher. As shown in Figure 3 and Figure 4.

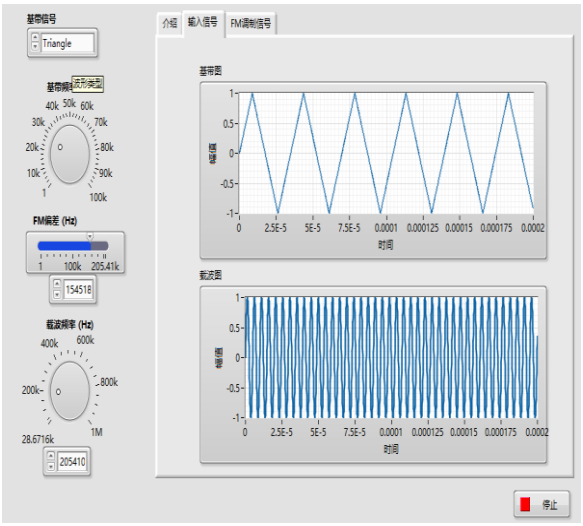

Figure 3 Front panel of triangle waveform diagram

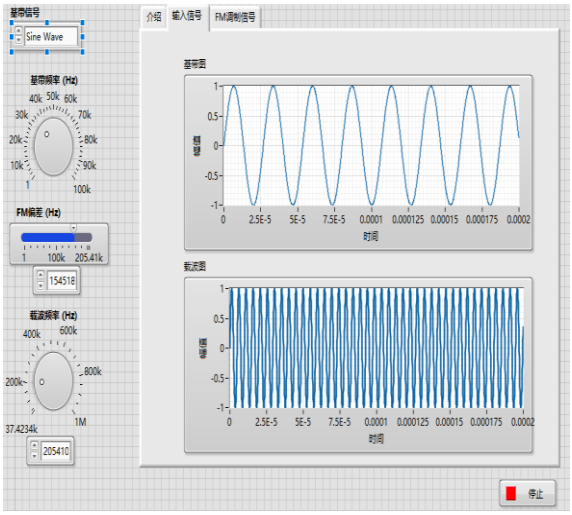

Figure 4 Front panel of sine wave pattern

For simple filtering and noise processing, it is also common in signal processing. The interface is shown in Figure 4.

We can select the waveform generator according to the baseband signal diagram on the front panel to meet different experimental requirements.

4. CONCLUSION

LabVIEW's powerful signal processing functions and graphical programming functions can effectively analyze and solve many problems in the number and system, and can display the results to learners in intuitive forms such as graphs and charts. With the aid of this auxiliary teaching tool, teachers can directly dynamically demonstrate abstract concepts and theorems, thus combining abstract formulas with intuitive graphics to deepen students' understanding of learning content. Under the ideological guidance of "strengthening practical teaching management and improving the quality of talent training", we have formed our own school-running characteristics in professional construction, laboratory construction, and talent training. The teaching level and scientific research ability of teachers have been greatly improved. The graduates trained are also well received by employers. In short, how to adapt to the development of the industry, deepen educational reforms, build specialties, and how to cultivate professional talents who can meet the needs of economic development and have innovative capabilities are the ultimate goals of our university teaching.

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