Research on the Reform of Medical Signal Processing Course to Promote the Integration of Medical and Engineering Knowledge

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Abstract: Biomedical signal processing is an important course for biomedical engineering combining the basic principles of signal processing with biomedical applications, which provides the possibility to build a bridge between signal processing courses and biomedical courses. The combination of traditional science and technology and modern biomedical signal through course reform is of great practical significance for stimulating students' interest in learning and cultivating high-quality interdisciplinary talents in biomedical engineering. Based on an analysis of the current situation of Biomedical Engineering Teaching in China, this paper analyzes its main problems, and puts forward some suggestions for the teaching reform of biomedical signal processing, which can promote the integration of medical and engineering knowledge.

1. Introduction

Biomedical engineering is an interdisciplinary subject combining traditional engineering technology with biomedical science [1]. How to combine engineering knowledge with biomedical application is a great challenge for cultivating professional talents of biomedical engineering. At the same time, the information and network technology provide a new way for students to learn professional knowledge, but the non-professional network information leads to knowledge fragmentation, which is difficult to meet the needs of cultivating talents with systematic knowledge of Biomedical Engineering and need combine the medical health knowledge and engineering technology.

Biomedical signal processing is the combination of basic principles of signal processing and biomedical applications. It is the application of signal processing method in biomedicine. It mainly uses signal processing method to extract useful biomedical information, which provides effective basis for the analysis and diagnosis of physiological information [2]. The purpose is to extract, analyze and diagnose biomedical signals by using signal processing technology and methods. Therefore, biomedical signal processing provides the possibility for the intersection of engineering technology and biomedicine.

In addition, biomedical engineering undergraduates have a good foundation of digital signal processing, have a preliminary understanding of the methods used in digital signal processing, and have mastered the ability of using various time-domain and frequency-domain methods to analyze and solve medical signals. The course"digital signal processing"in the basic education of Biomedical Engineering enables the junior students of biomedical engineering major to learn and master the basic digital signal processing methods. However, in this process, they just master the signal methods and models which are unrelated to biomedicine. Teaching processing and teaching content cannot achieve the docking with biomedicine.

In fact, biomedical engineering is the biomedical application of mathematics, signal and system, digital signal processing. Therefore, it is an effective way to introduce of biomedical phenomena

and processes from the perspective of engineering to integrate the knowledge of biomedicine, engineering technology and mathematical science. Relying on biomedical signal processing, we can not only express various human electrophysiological signals, but also extract useful signals for analysis by various signal processing methods, in order to realize the close-combination of engineering methods and biomedical applications.

2. The Main Problems of Biomedical Signal Processing

Biomedical signal processing is the core course of Biomedical Engineering. The course includes theoretical learning in class and experimental learning. students start to learn in the fifth semester of our college, the aim of the course is to guide students to extract or analyze the biomedical signal after finishing their basic engineering courses. The problems of this course are as follows:

2.1 The Teaching Resources Based on University Textbooks Are Lack of Vividness.

Biomedical signal processing is based on signal processing to explain biomedical processes or phenomena. Abstract teaching is difficult to stimulate students' interest in learning, and needs digital course resources support.

2.2 The Teaching Content of a Single Course Cannot Realize the Combination of Medical Engineering.

The traditional teaching content emphasizes the principle and method of signal processing while neglects the connection with the characteristics of biomedical signals. It needs to be connected with biomedical courses such as biomedical sensing technology and physiology.

2.3 It is Difficult to Realize the Intersection of Medical Application with Teaching Single Signal Processing Course.

On the basis of signal processing, this course needs to highlight the medical application of signal processing and introduce the big healthy industry, for example the engineering method of health information monitoring and so on, in order to promote the application of signal processing in medical engineering.

2.4 The Traditional Teaching Methods Cannot Meet the Needs of Talent Training.

The methods and principles of the existing teaching mode cannot meet the problem-oriented teaching method. Therefore, the combination of preparing cases and classroom discussion can realize case teaching mode, flipped class model and research-oriented teaching mode.

2.5 Experimental Teaching and Classroom Teaching Are Not Closely Linked.

Most of the existing experiments are basic experimental projects, which are related to the theoretical teaching content but have not strong expansibility. The effective way is to combine the experimental project with the case teaching method, in order to deepen the knowledge and the application of the method [3,4].

3. The Teaching Reform for Promoting the Integration of Medical and Industrial Knowledge

Biomedical signal processing, as the core course of Biomedical Engineering, plays a bridge role in the combination of engineering and medicine. According to the needs of Biomedical engineering training requirements, the course content of biomedical signal processing should organically combine with not only the basic courses but also the professional courses, in order to promote the integration of engineering principle and medical application, as shown in Figure 1.
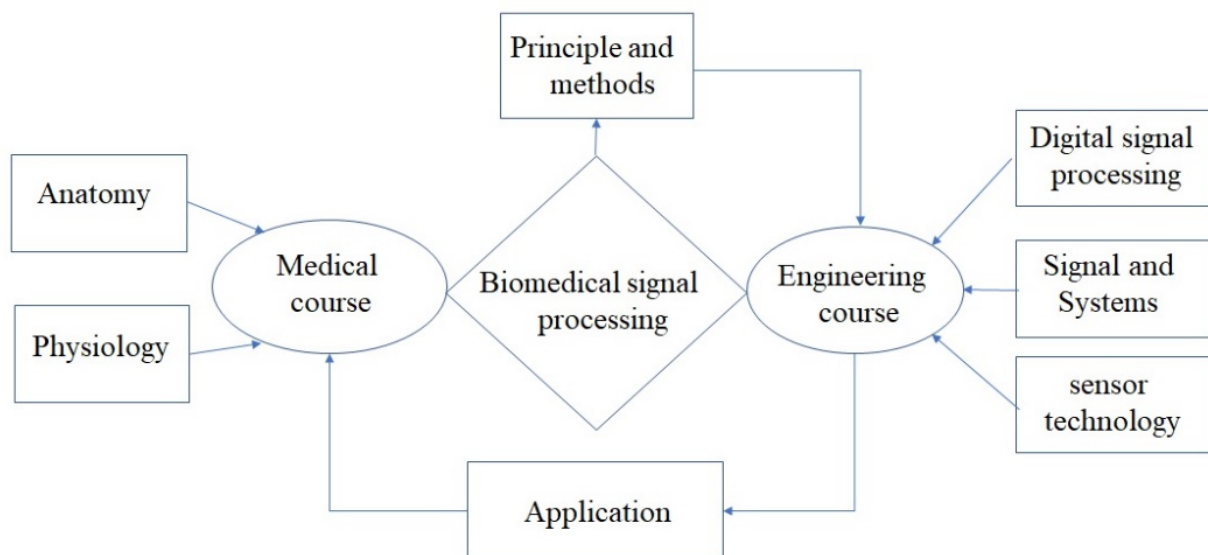
Figure 1. The integration of engineering principle and medical application

In the teaching procedure of biomedical signal processing, signal processing is the basis, medical health application is the goal, and engineering realization is the method. Relevant knowledge is integrated into each chapter to realize the medical engineering integration with biomedical signal processing as the bridge.

4. Conclusion

The teaching reform proposed in this paper is conducive to promoting the integration of medical engineering knowledge, meeting the needs of biomedical engineering to cultivate talents with systematic specialty and knowledge, and fitting the current undergraduate training program of Biomedical Engineering of our college. A project-oriented research group has been preliminarily established among the students, and relevant contents have been implemented step by step.

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