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Direct Research Studies in a Biomedical Engineering Program- Learning Biomedical Data Acquisition

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Abstract— **Biomedical Engineering (BME) is a branch of sciences that combines a wide range of scientific knowledge areas and engineering principles to apply and obtain engineering solutions in the field of medicine and biology. It requires students of bachelor and master programs to learn and explore distinct topics of sciences and engineering technologies that are associated with the field of biomedical engineering. Focusing on the main subjects of this wide range of fields can be sometimes overwhelming for students to gain specific knowledge in an area without the full understanding of the integrated processes in the field of biomedical engineering.[1]**

Keywords: Biomedical Engineering, Education, Data Acquisition in Biomedical Engineering Directed Research Studies

I. INTRODUCTION

Direct research studies can be an advanced and effective method of learning that allows students to choose a topic of their interest and to explore it in depth. Is their individual topic integrated into a larger group project they have the opportunity to be introduced to the further relevant knowledge areas. One of the challenges that can be observed in Biomedical Engineering study programs is having students with different technical and educational backgrounds and possible different learning targets according to their individual professional career goals which can be focus on specific fields of studies. In addition, the advancement of knowledge in the different areas of technology creates a recognized demand in many healthcare and medical sectors to utilize these technologies to improve the services provided in these sectors.[1]

II. METHODS

DRS (Direct Research Studies) is within the Biomedical Engineering program at the Anhalt University of Applied Sciences a project-orientated class, which has the goal to give students an opportunity to look into to them new aspects of Biomedical Engineering. The course provides the students the unique opportunity to discover new skills or fields during their master's. In the beginning, the main frame of DRS is established by the faculty who teaches the class to define the different tasks for every student in his chosen field. In this particular case, the semester topic was to develop an application to simulate the breathing of a human in a virtual and augmented reality environment. Therefore, the different students tasks are developed into different stages that focus on different engineering principles. In the presented example it is data acquisition of physiological signals. In particular the student had to find and use an appropriate airflow sensor for the project. Tthis matched the students interest in the field of physiological data acquisition. As part of the breathing simulation topic, the task was to record the data of the airflow sensor, store the data and provide it to the group responsible for the visualization in a VR enviroment. The recording of a biosignal requires a sensor that converts the biosignal into an analogue signal. In our case, we used a Honeywell AWM720P1. The power was provided by a HAMEG HMP2030 power supply with a voltage of 12V DC, a current of 6 mA and a Power of 72mW. The parameters were chosen according to the datasheet which shrank the supplied voltage on 15VDC. The first step was to get a signal on an oscilloscope to get an idea of the output signal of the airflow sensor. After these observations we're expecting an output signal of 5V with the mentioned settings. For the signal recording, we chose the USB based measurement and automation device LabJack U6 Pro that captures analogue inputs and generates a digital output signal via the USB connection. After the analogue-digital conversion through the LabJack, we used the LabJack software LJStreamUD to record approximately 30 seconds of breathing simulation with a resuscitator. The signal was recorded with a scan rate of 200Hz. Then the data is exported to an Excel sheet and uploaded to the graphical programming application. The signal is inserted with data input and passed through a serial port as an 8bit digital signal. Additionally, the process creates a plot of the recorded data. We used a symbol rate of 9600 Bd for the serial port to the VR Application.

III. RESULTS

As the educational results, we can say that the working process with the project team and working on your chosen topic guided by the faculty, bring a massive amount of knowledge in biomedical data acquisitions.

IV. DISCUSSION & CONCLUSION

This is a practical way to get in touch with new fields in BME.

REFERENCES

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