INVESTIGATION ON THE USE OF BANDPASS SAMPLING TECHNIQUE TO EXTRACT INFORMATION FROM DOPPLER ULTRASOUND SIGNALS

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ABSTRACT

Doppler ultrasound technology has been widely used in medical field. This signal is use to get the information about heart movements to check the sign of abnormalities. Demodulation technique has to be performed to extract information of the DUS signal. There are a few type of demodulation and one of the types is bandpass sampling technique. In preparation for further investigation on the performances of bandpass sampling technique, a hardware set-up was arranged to send the data out from the PC. In order to create DUS signal that has the same characteristic as the real signal from patient, the signal from PC is mix with Megahertz signal using mixer. After the signal has downconverted using bandpass sampling technique, the signal is then analysed to confirm that the correct signal is obtained.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Doppler ultrasound technology has been widely used in the clinic. It is use to diagnose vascular diseases and check the fetus status. In application of fetal analysis, Doppler ultrasound can detect detects the heartbeat of the fetus and can be used to evaluate the pulsations in the fetal heart and bloods vessels for signs of abnormalities.

In practice, the Doppler Ultrasound signals from the transducer are in Megahertz frequency. It is impossible to detect any heart motion in very high range of frequency. Therefore, the Doppler Ultrasound signals must be downconverted to baseband frequency which is in Kilohertz frequency. Currently, conventional approach to downconvert the signal was using analog downconvertion technique but the output signal will contain much of noise. Therefore, a few digital demodulation techniques have been implemented to downconvert the DUS signals. If the downconversion process is done digitally, accurate result may be produced that will contain less of noise. One of the digital demodulation techniques is bandpass sampling technique. However, these techniques those are useful, for demodulating Doppler Ultrasound Signals (DUS) from the fetal heart have not been employed in the fetal monitor but have been studied [2].

The performance of this technique has been examined using computer simulation and it was demonstrated that these techniques can successfully extract important information from the fetal DUS [3]. Currently, there is no research has been done to implement this technique sing hardware set-up. Therefore, this study investigates the performance of bandpass sampling technique using hardware set-up.