DOPPLER SCAN

Demo

ABSTRACT

- Doppler Ultrasound is a non-invasive procedure to image tissue and obtain information about blood flow.
- A Handheld Doppler is used to analyse the blood flow and identify the healthiest perforator. The healthiest perforator from the volumetric flow to have the largest diameter.
- The Handheld Doppler only gives spectral information with no depth.
- We try to estimate the healthiest perforator by studying the spectral information to obtain velocity of blood flow and energy of the signal.

CWAND PW DOPPLERS

- PW Dopplers are used in imaging and revealing the depth and diameter of vessels.
- By studying PW dopplers we gained insight on how the depth and diameter is calculated and the differences in hardware of the CW and PW equipment's.
- CW Dopplers lack any resolution about depth and hence cannot be used to obtain accurate information about diameter of the vessel.
- We try to find the velocity from the CW data and use the signal information to find a relation to the diameter.

FINDING VELOCITY

- The audio signals obtained from the Doppler are noisy. The spectral information is extracted after removing some noise using the Wiener Filter.
- The spectrogram from the filtered audio signal is observed.
- The signal is windowed with 20ms frames and 10ms overlaps and autocorrelated to find the period of each window.
- We use Hilbert Transforms to obtain the instantaneous amplitudes to set a dynamic threshold for each frame to ignore amplitudes that don't correspond to the Systolic beat.



We plot the frequency for each frame to observe the systolic peaks for each window frame.

VELOCITY FROM THE FREQUENCY

- Using the period of each frame a fundamental frequency is derived.
- The relation from the Doppler effect is used to obtain the velocity from the frequencies of the signal.

$$v = \frac{f_{\mathcal{D}} \cdot c}{2f_0 \cdot \cos(\alpha)}$$