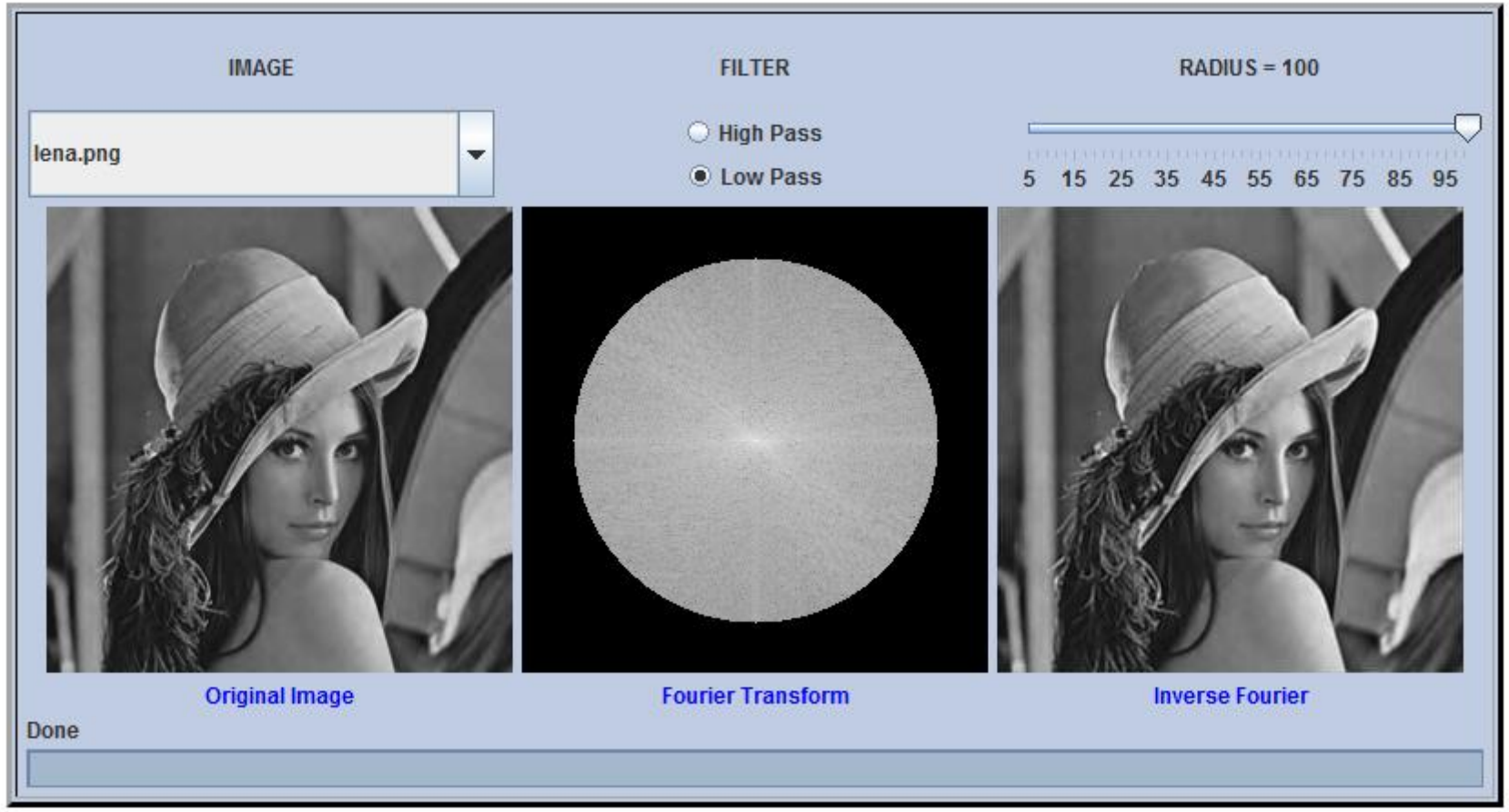
Lecture 2 Image Formation

COMP3204 & COMP6223 Computer Vision

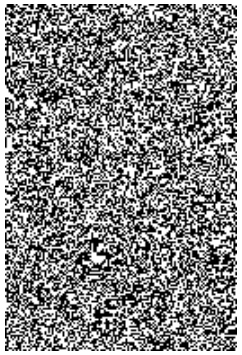
What is inside an image?

Department of Electronics and Computer Science
UNIVERSITY OF Southampton
School of Electronics and Computer Science

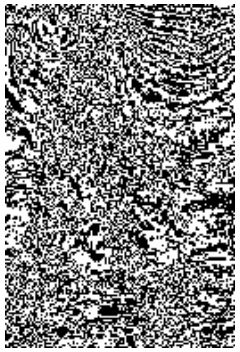
http://users.ecs.soton.ac.uk/msn/book/new_demo/fourier/



(a) original image



(b) bit 0 LSB



(c) bit 1

(d) bit 2

(e) bit 3

(f) bit 4

(g) bit 5

(h) bit 6

(i) bit 7 MSB

Decomposing an Image Into its Bits

(a) 64×64

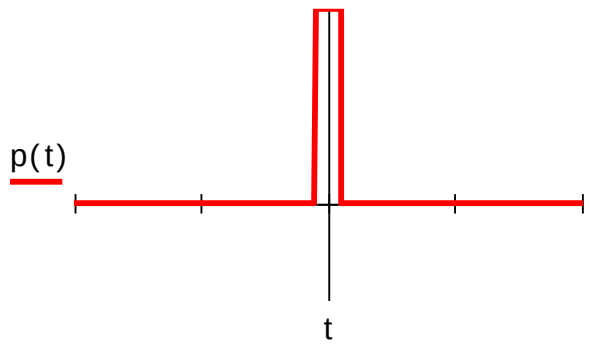
(b) 128×128

(c) 256×256

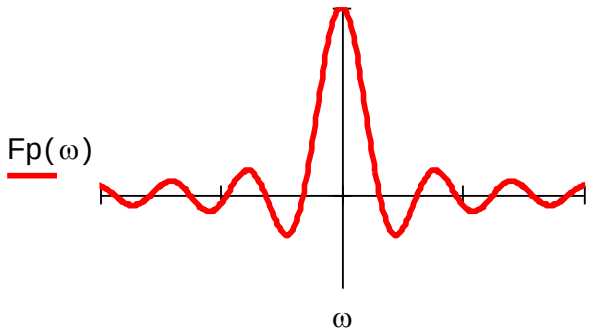
Effects of Differing Image Resolution

Jean Baptiste Joseph Fourier

- Any periodic function is the result of adding up sine and cosine waves of different frequencies
- Sceptical? Yeah, so were Lagrange and Laplace. Good company eh?
- “Fourier’s treatise is one of the very few scientific books that can never be rendered antiquated by the progress of science” James Clerk Maxwell 1878
- Fourier 10 Laplace 0 …



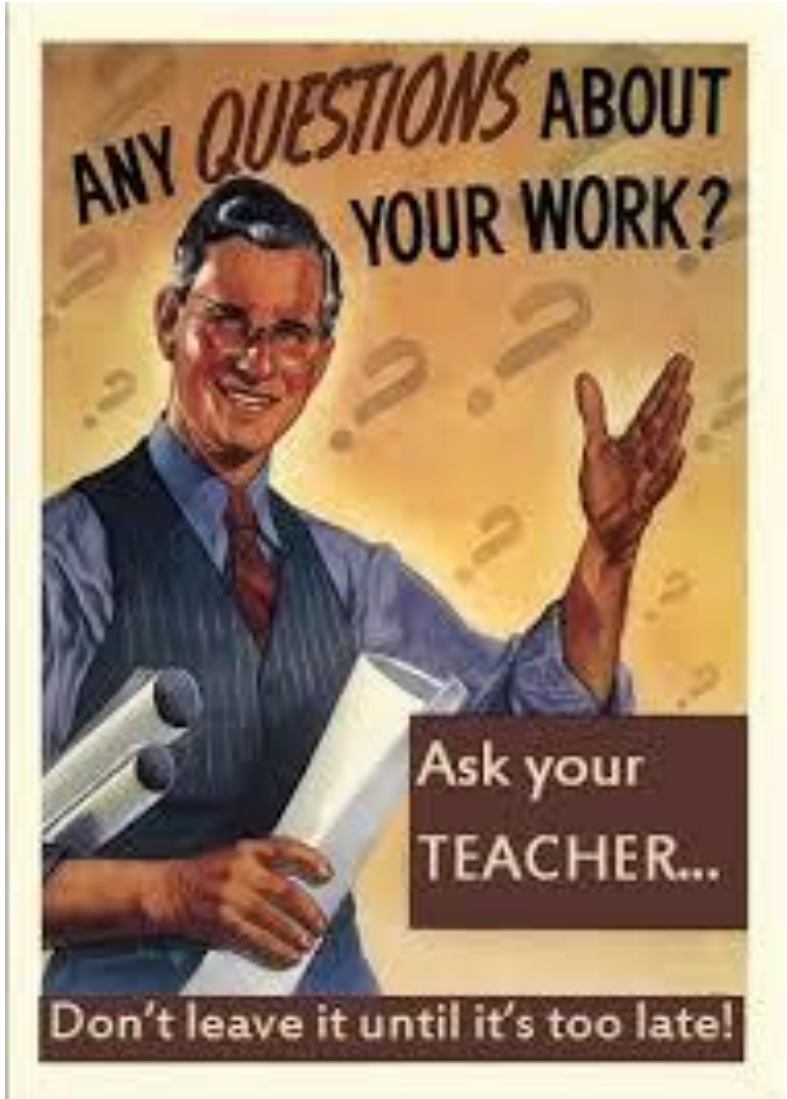
(a) pulse of amplitude $A = 1$

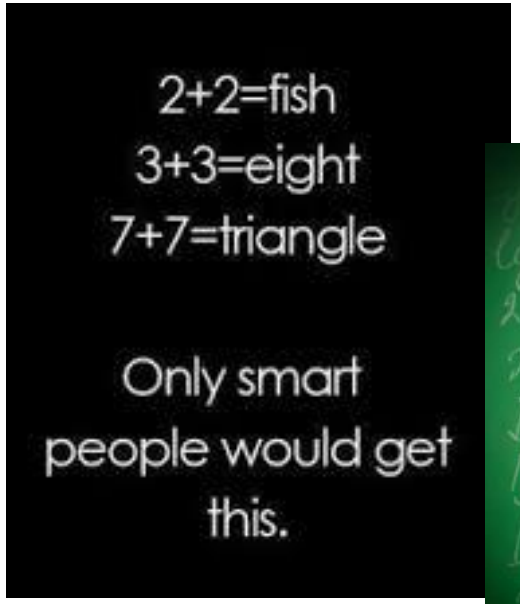


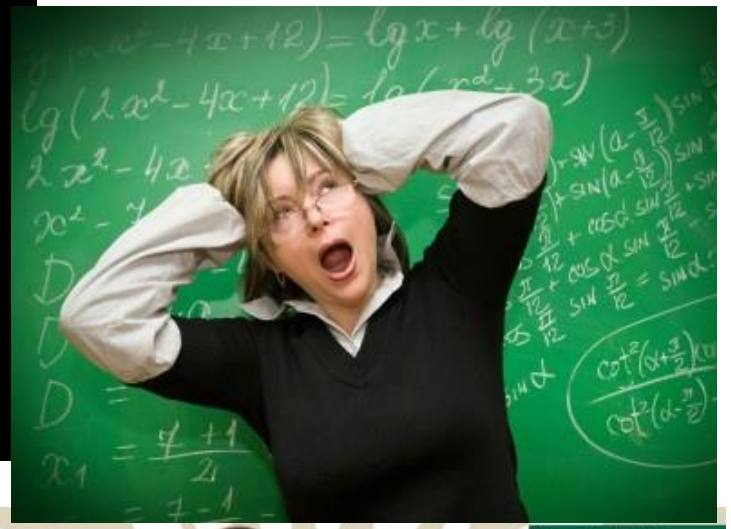
(b) Fourier transform

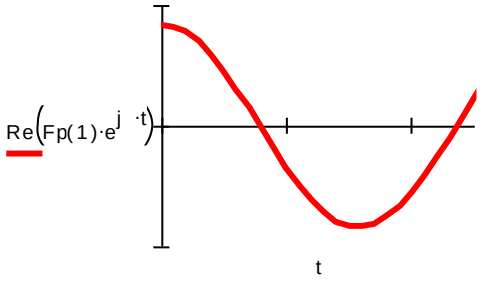
A Pulse and its Fourier Transform

Google “are you frightened of maths”

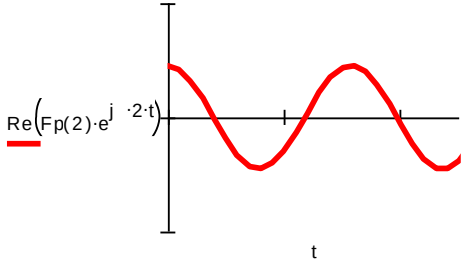




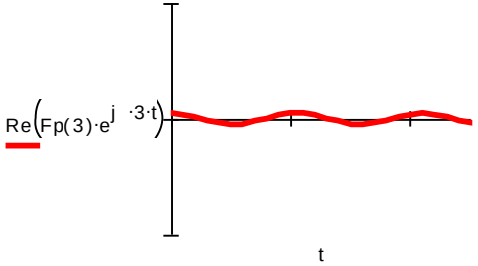




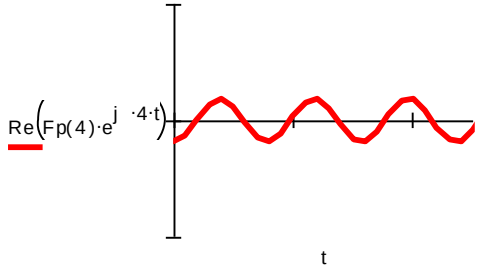
(**a**) contribution for ω = 1



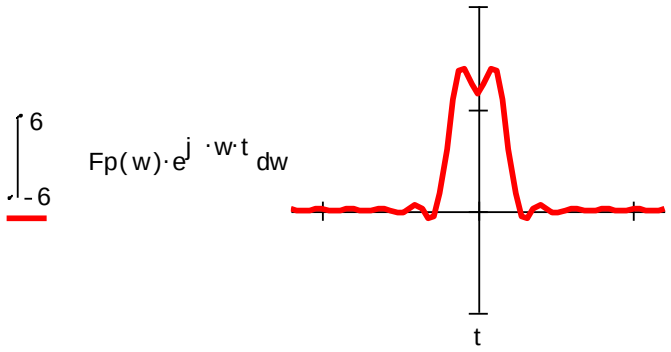
(**b**) contribution for ω = 2



(**c**) contribution for ω = 3

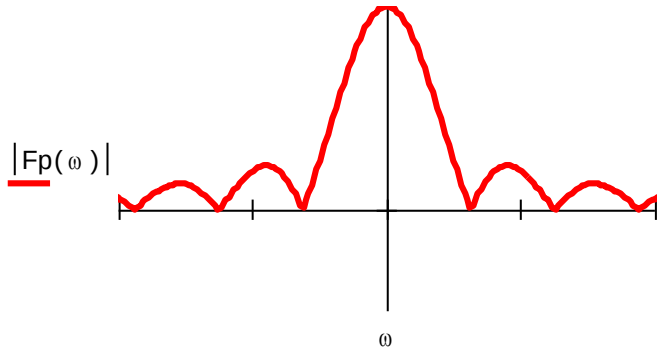


(**d**) contribution for ω = 4

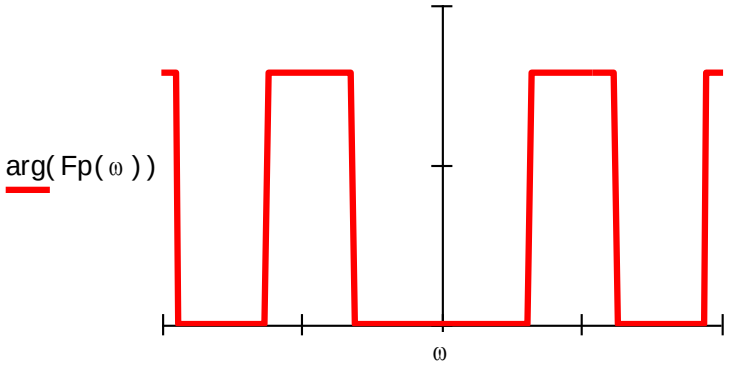


(**e**) reconstruction by integration

Reconstructing a Signal from its Transform



(a) magnitude



(b) phase

Magnitude and Phase of Fourier Transform of Pulse

Using Gait as a Biometric, via Phase-Weighted Magnitude Spectra

David Cunado, Mark S. Nixon and John N. Carter

Department of Electronics and Computer Science, University of Southampton,
Highfield, Southampton SO17 1BJ, England.
Email: dc95r@ecs.soton.ac.uk and msn@ecs.soton.ac.uk

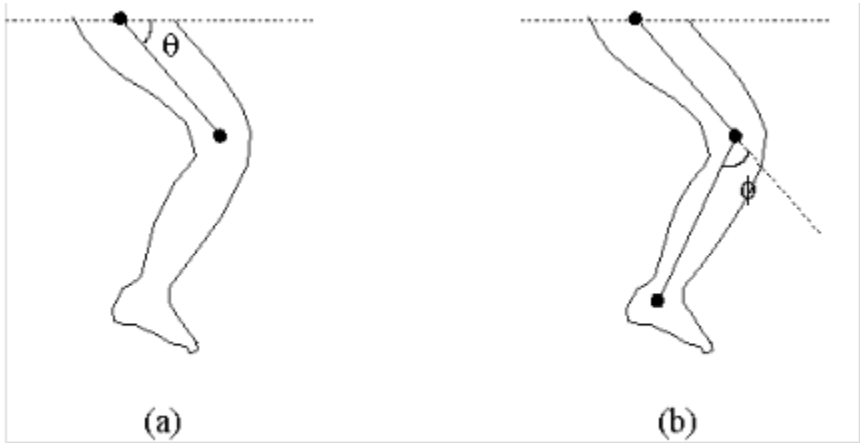


Fig. 1. (a) Hip and (b) Knee rotation angles.

http://eprints.soton.ac.uk/250040/1/cunado_avbpa.pdf

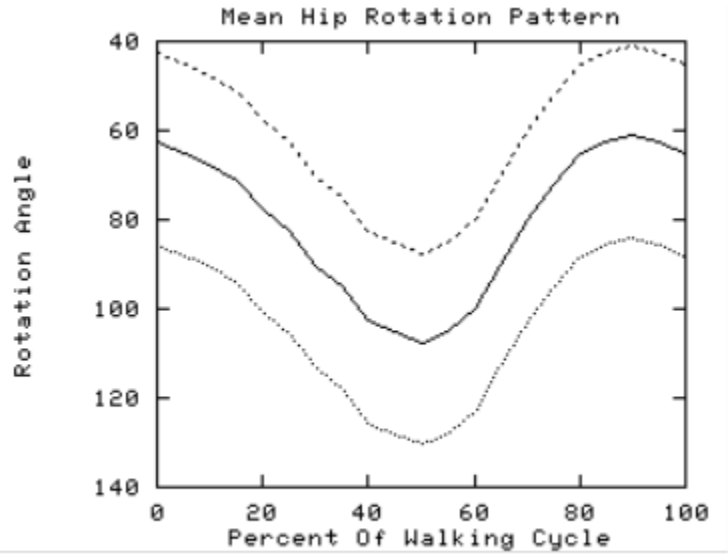
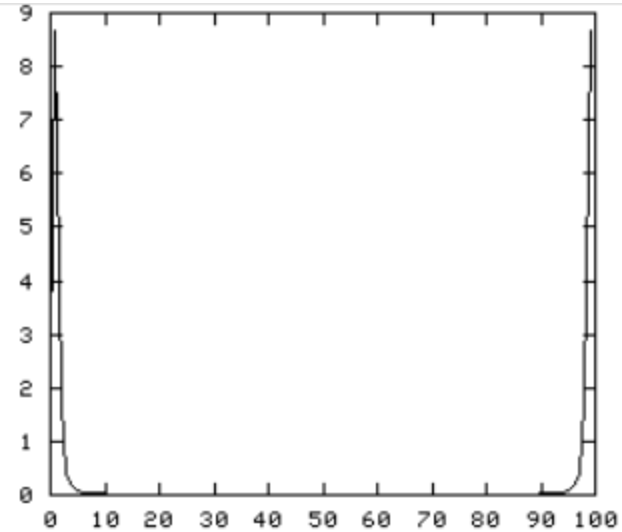
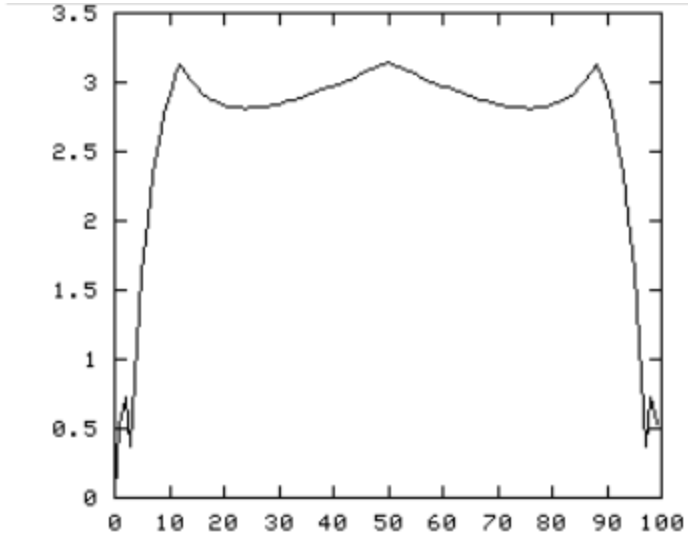


Fig. 2. Variation in Hip Rotation.

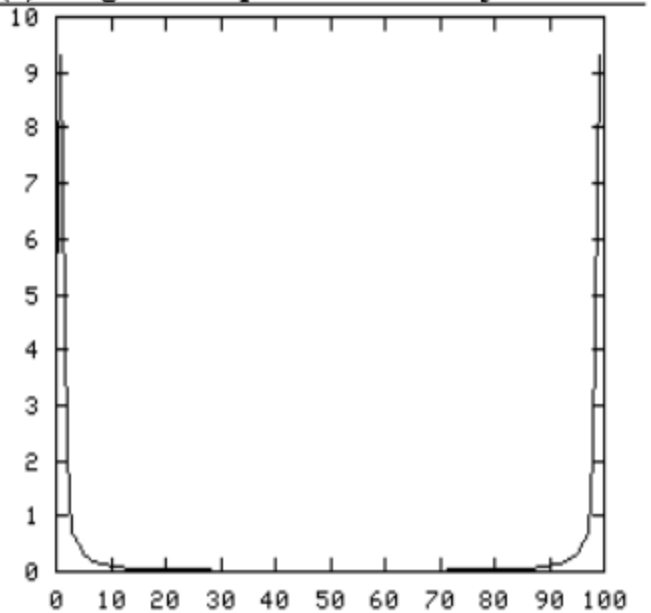
Fig. 3. Example Image of Walking Subject.



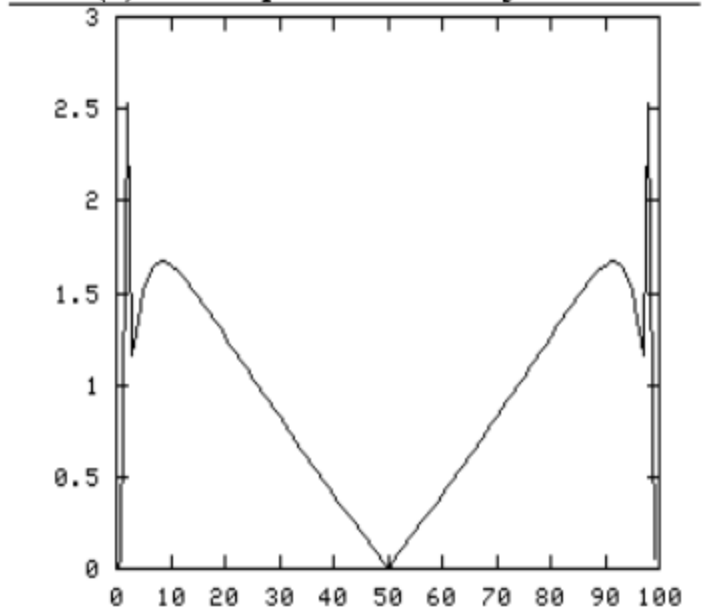
(a) Magnitude spectrum for subject 2.



(b) Phase spectrum for subject 2.



(c) Magnitude spectrum for subject 5.



(d) Phase spectrum for subject 5.

Fig. 6. Phase and Magnitude Gait Spectra.