Analiza merenog signala DFFT

DFFT teorijske osnove

Fourijeova transformacija

$$\hat{f}(\xi) = \int_{-\infty}^{\infty} f(x)\, e^{-2\pi i x \xi}\, dx,$$

Inverzna Fourijeova transformacija

$$f(x) = \int_{-\infty}^{\infty} \hat{f}(\xi)\ e^{2\pi i x \xi}\, d\xi,$$

Diskretna Fourijeova transformacija

$$X(k) = \sum_{j=1}^{N} x(j)\omega_N^{(j-1)(k-1)}$$

$$\omega_N = e^{(-2\pi i)/N}$$

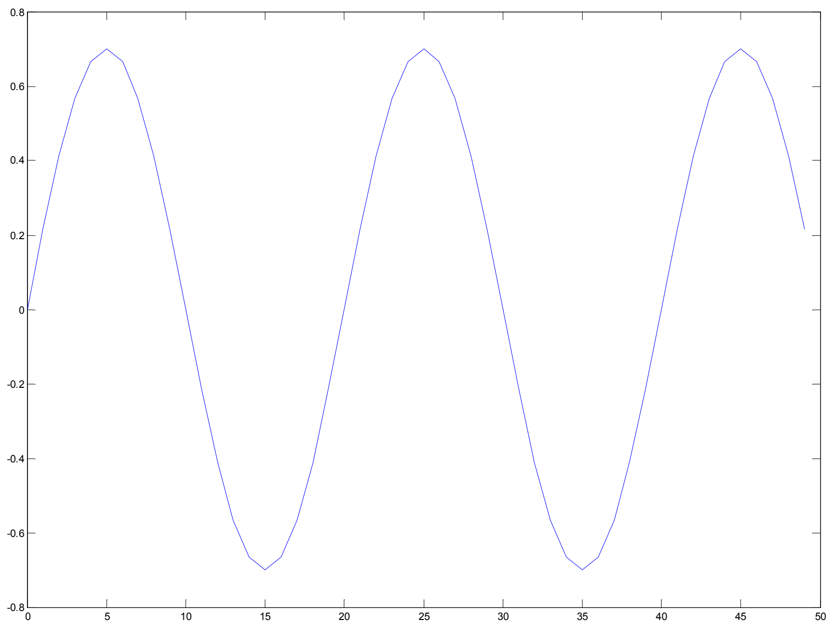
$$x(j) = (1/N) \sum_{k=1}^{N} X(k)\omega_N^{-(j-1)(k-1)}$$

DFFT primer

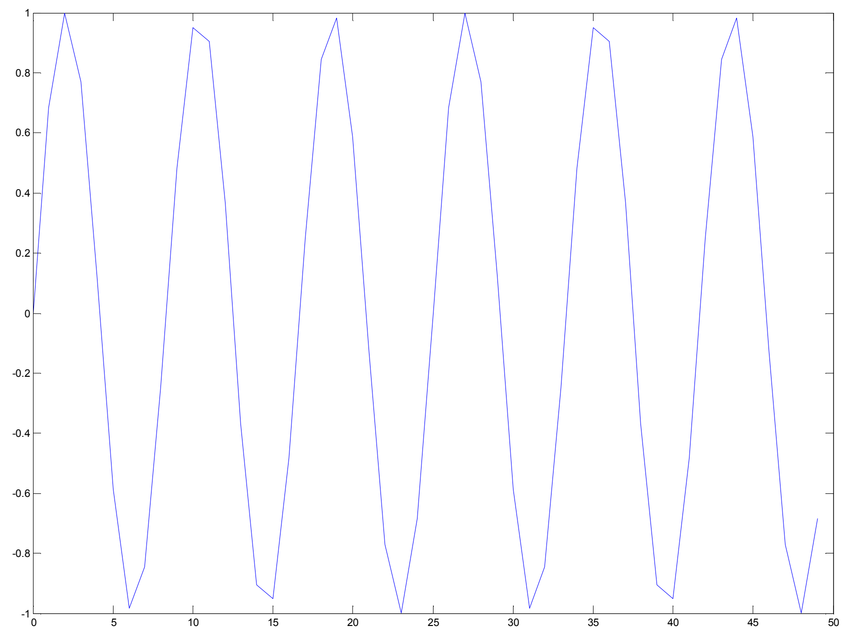
Frekvencija uzorkovanja F=1 kHz

Dužina signala L=1000

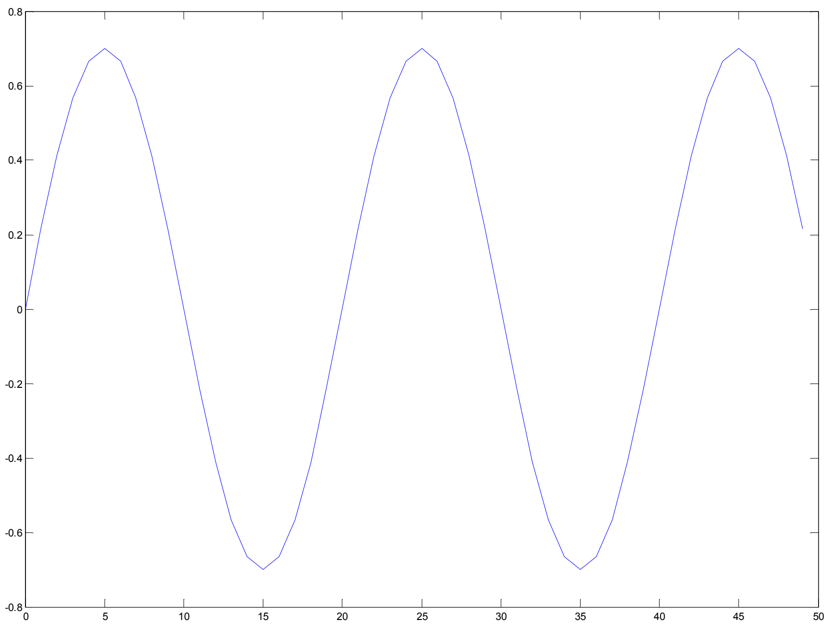
Sinusna funkcija od 50 Hz amplitude 0.7



Sinusna funkcija od 120 Hz amplitude 1



Dva sisnusna signala



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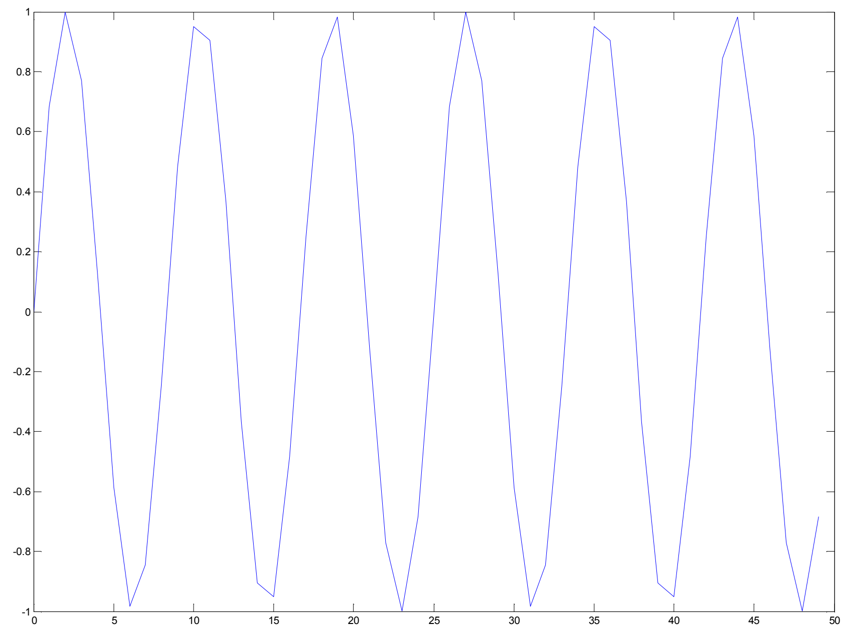

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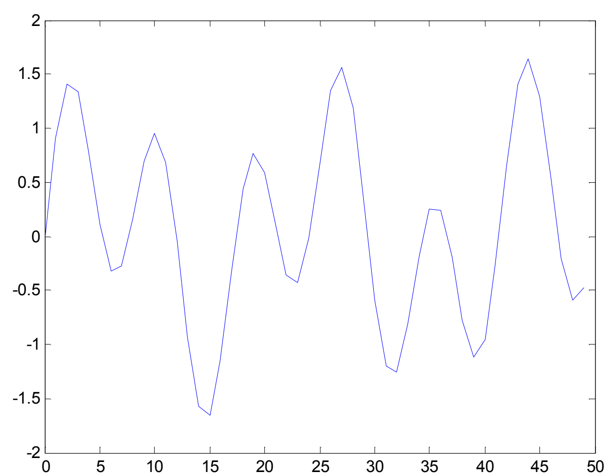
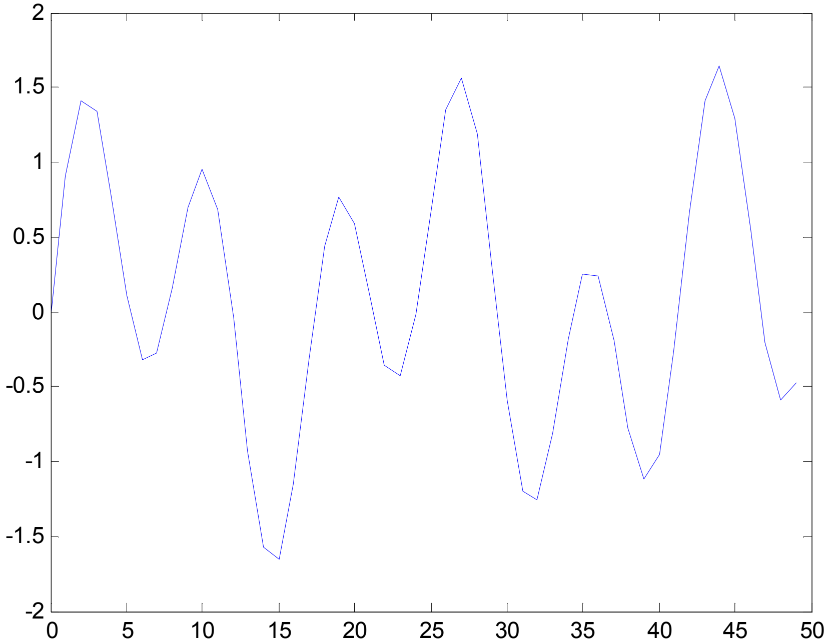


Sinusni signali i šum



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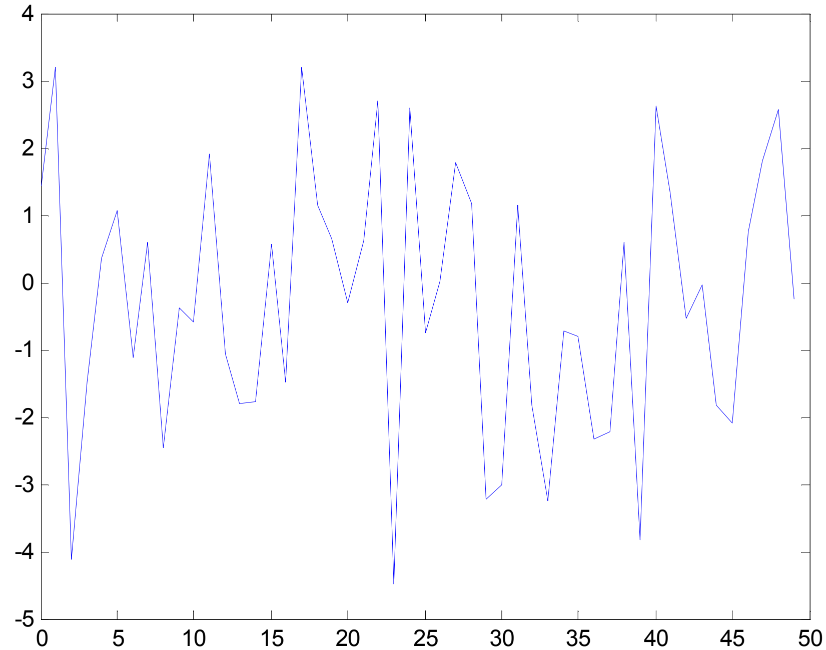
Šum



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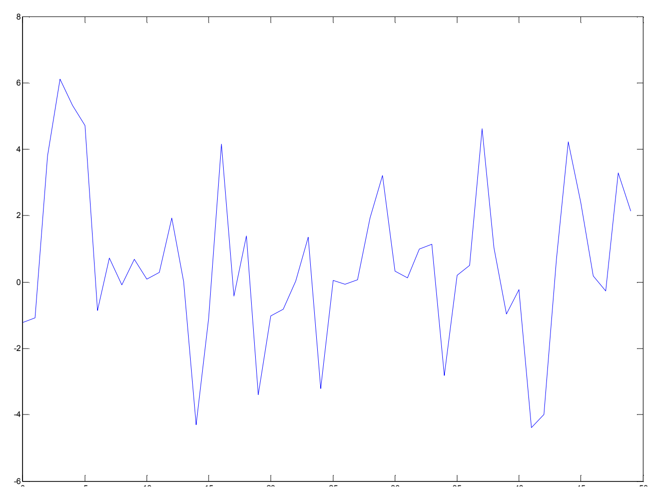
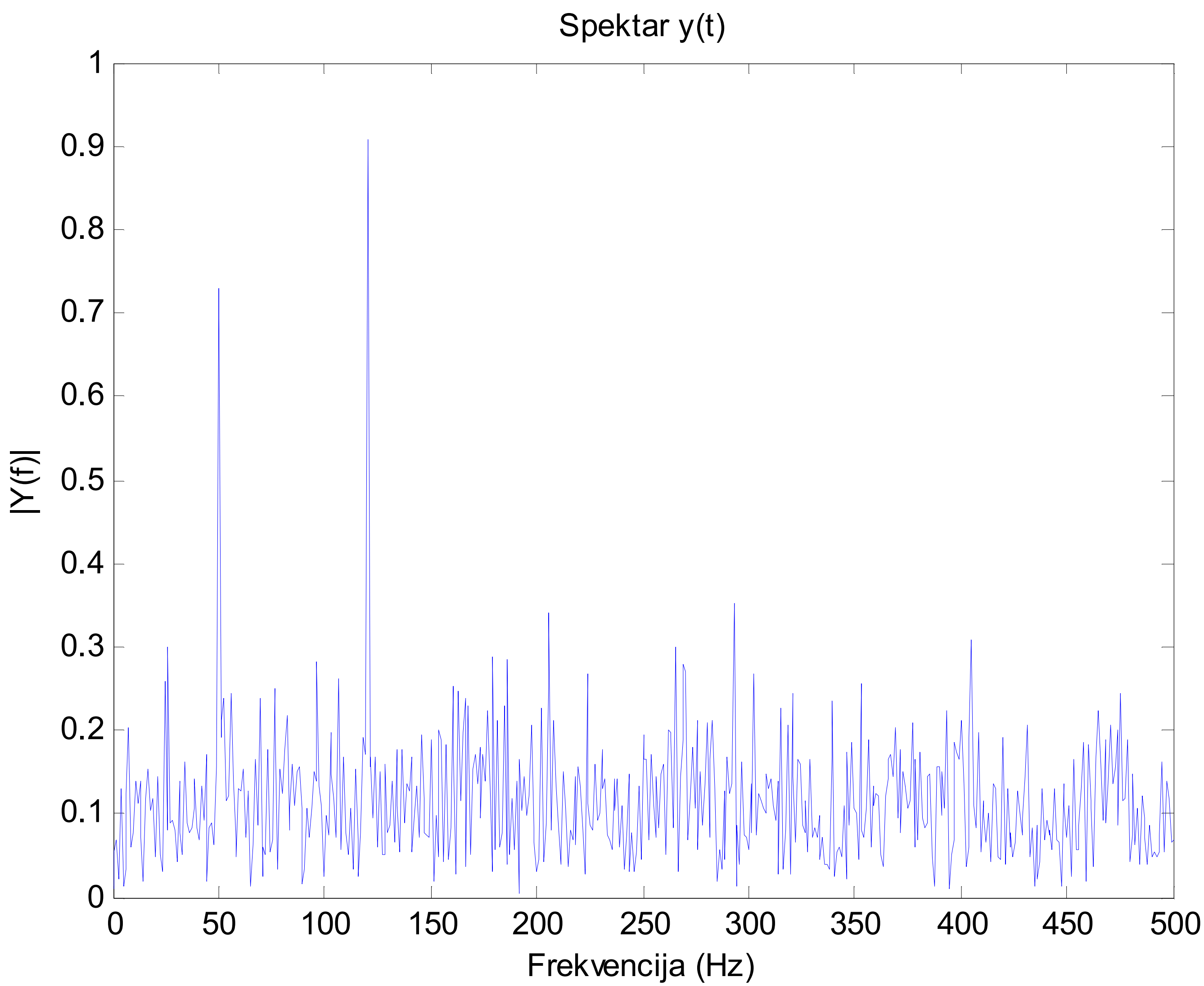
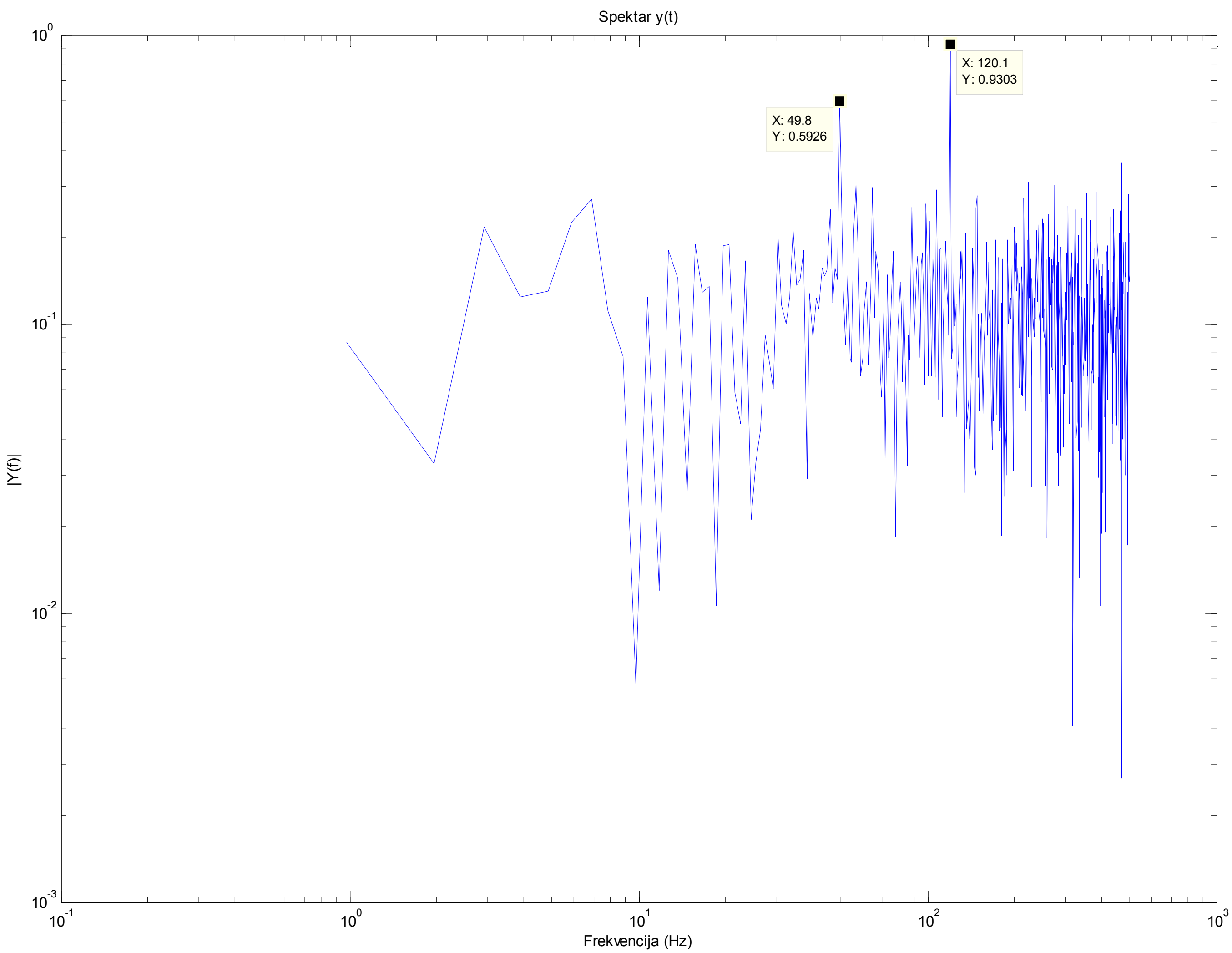


Spektar dobijen pomoću DFFT



Logaritamska raspodela spektra



Zaključci

- Furijeovom transformacijom se mogu odrediti spektralne karakteristike signala
- Diskretna furijeova transformacija zahteva 2n uzoraka (ukoliko to nije ispunjeno MatLab dodaje određeni broj uzoraka što kvari analizu)
- Najmanja frekvencija koja se može otkriti limitirana je frekvencijom uzorkovanja

(ukoliko je najviša frekvencija signala x(t) jednaka B, on se može potpuno opisati ako se uzorkuje sa intervalom (1/2B) sekundi)