Sayısal Ses İşleme

https://github.com/ihpar/ssi

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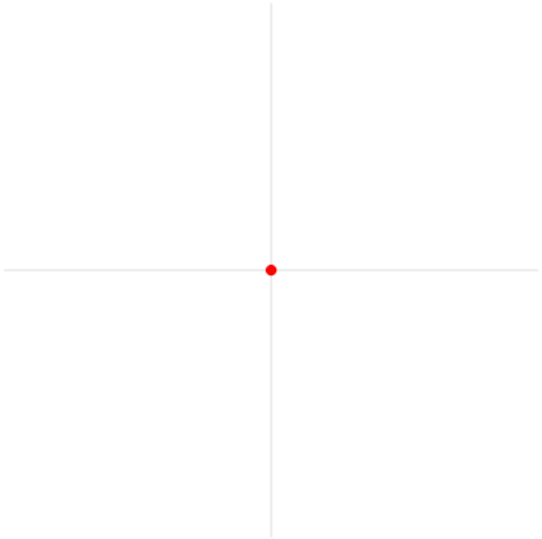
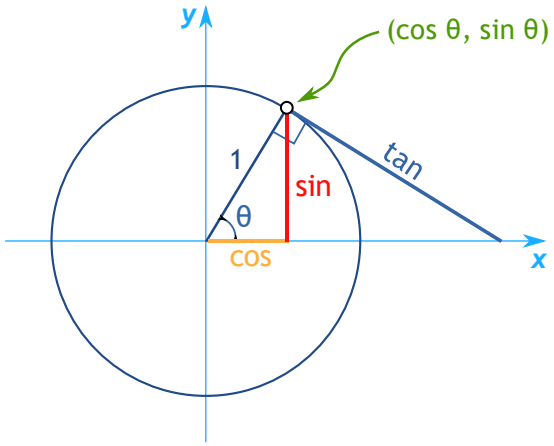
Sin Cos ve Açı Birimleri

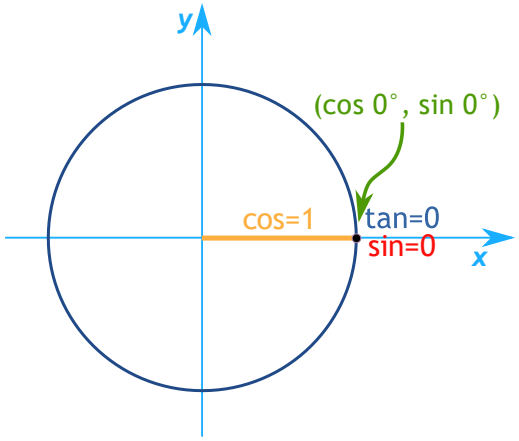
- Açı birimleri: radyan (rad), derece (°)
- 1 radyan 180/π ya da yaklaşık 57.2958 derecedir.
- π rad = 180°; 2π rad = 360°

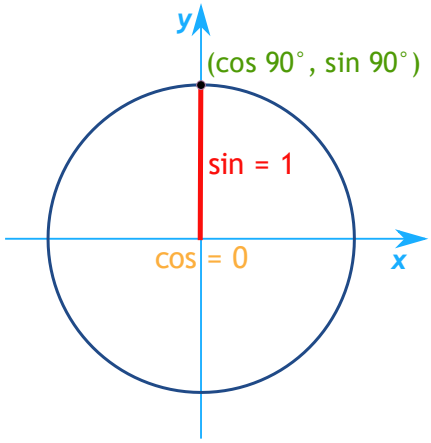


https://tr.wikipedia.org/wiki/Radyan

Sin Cos ve Açı Birimleri





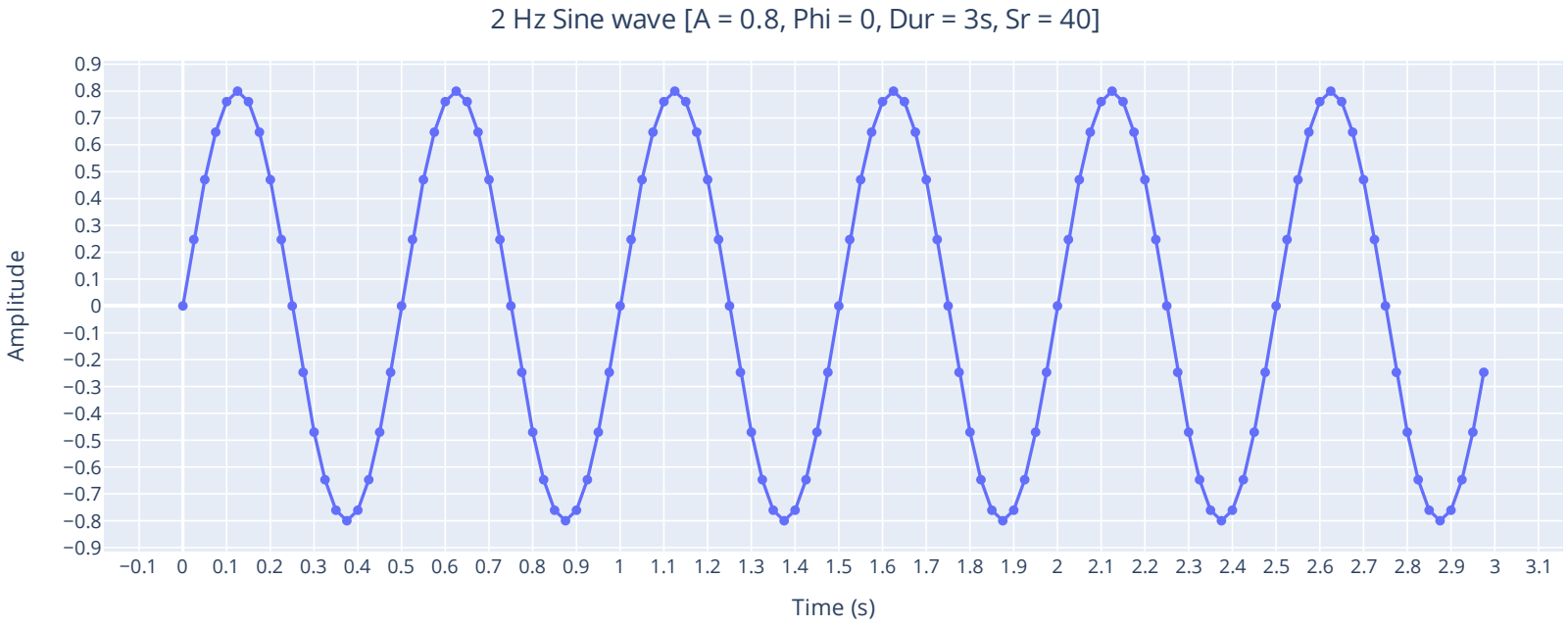


Derece	Radyan	Sin	Cos
0	0	0	1
30	π/6	1/2	√3/2
45	π/4	√2/2	√2/2
60	π/3	√3/2	1/2
90	π/2	1	0
180	π	0	-1
270	3π/2	-1	0

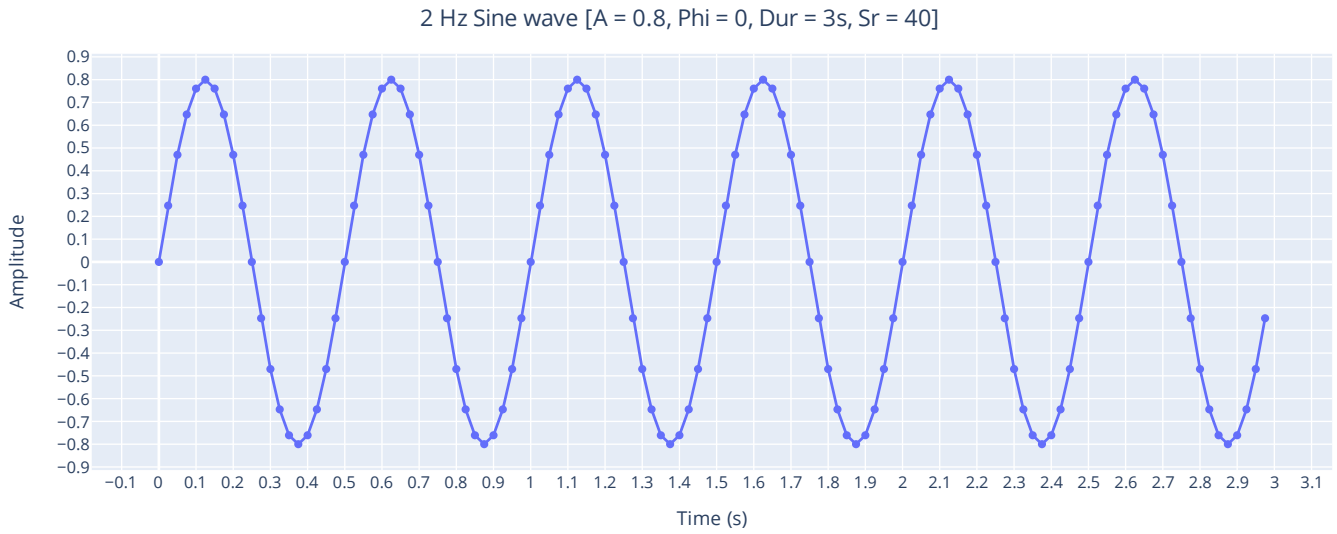
https://www.mathsisfun.com/geometry/unit-circle.html

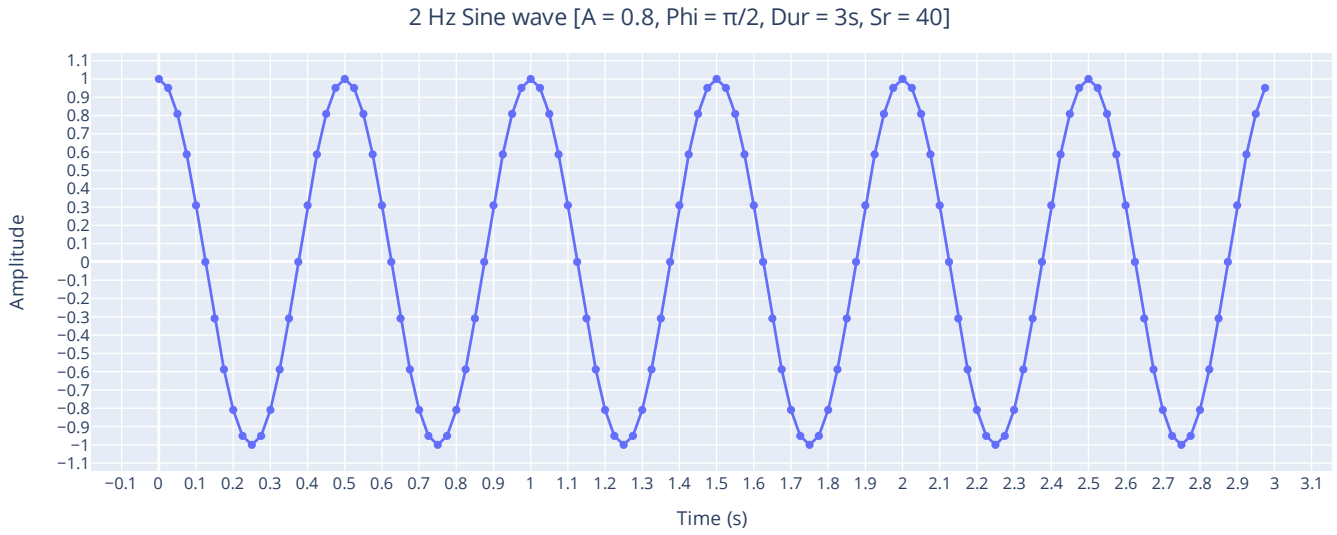
Sinüs Dalgası

- $y = A \times \sin(2\pi f t + \phi)$
- A → amplitude (genlik)
- f → frekans (Hz)
- t → zaman
- ϕ → faz açısı



Sinüs Dalgası

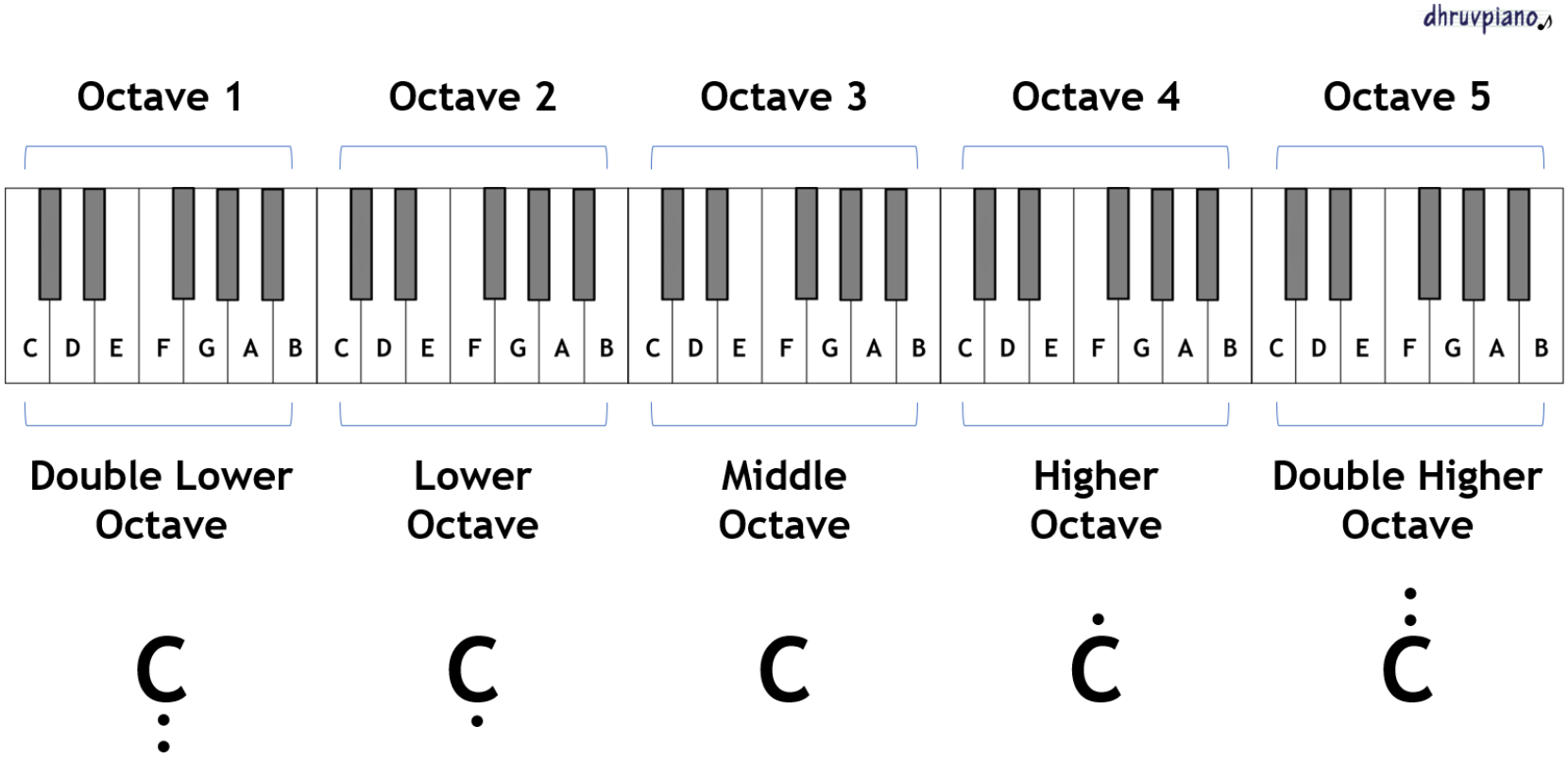




Frekans Perde İlişkisi

- Perde (pitch, nota adı): Do, Re, Mi, …
- İngilizce nota adları: A (La), B (Si), C (Do), D (Re), E (Mi), F (Fa), G (Sol).
- 4. Oktavdaki La (A4), 440 Hz olarak referans alınır.
- Her bir oktavda frekans 2 kat artar veya azalır.
  - A0 → 27.5 Hz, A1 → 55 Hz, A2 → 110 Hz, A3 → 220 Hz, A4 → 440 Hz, A5 → 880 Hz, A0 → 1760 Hz

Frekans Perde İlişkisi



https://music.dhruvpiano.com/theory/basics/octaves/

Frekans Perde İlişkisi

- Batı müziğinde 1 oktavda 12 perde bulunur.
- C, C#, D, D#, E, F, F#, G, G#, A, A#, B, C, C#, ...
- C-D, D-E, F-G, G-A, A-B aralıkları tam aralık olarak adlandırılır.
- E-F, B-C aralıkları yarım aralıktır.
- 12 perde yukarı çıkılınca bir oktav (8li) tamamlanır.

https://music.dhruvpiano.com/theory/basics/octaves/

Frekans Perde İlişkisi

- Bir perdenin frekansı (Örn: A4) 1 oktav tizleştiğinde (A5) 2'ye katlanır.
- Bir oktavdaki 12 perdenin frekans aralıkları lineer değil logaritmik oranlıdır.
- $f(p_{i+1}) = \sqrt[12]{2} \times f(p_i)$
- $f(p_{i+n}) = (\sqrt[12]{2})^n \times f(p_i)$

https://en.wikipedia.org/wiki/Piano_key_frequencies

$y = A \times \sin(2\pi f t + \phi)$

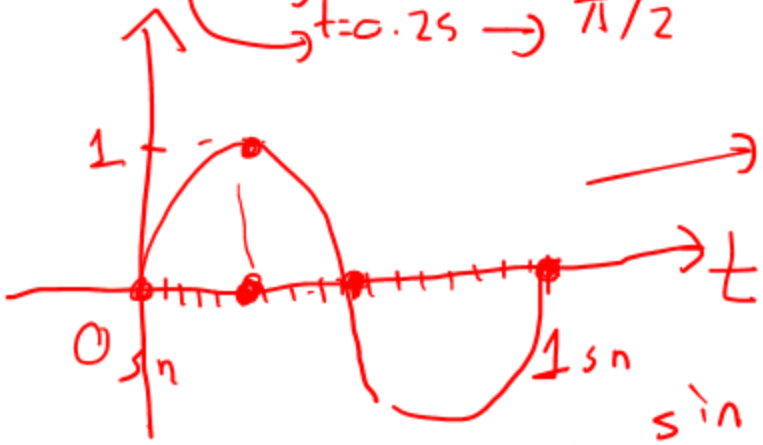
$\sin(2\pi 2t)$

$\sin(2\pi 1t) \xrightarrow{t=1} 2\pi$

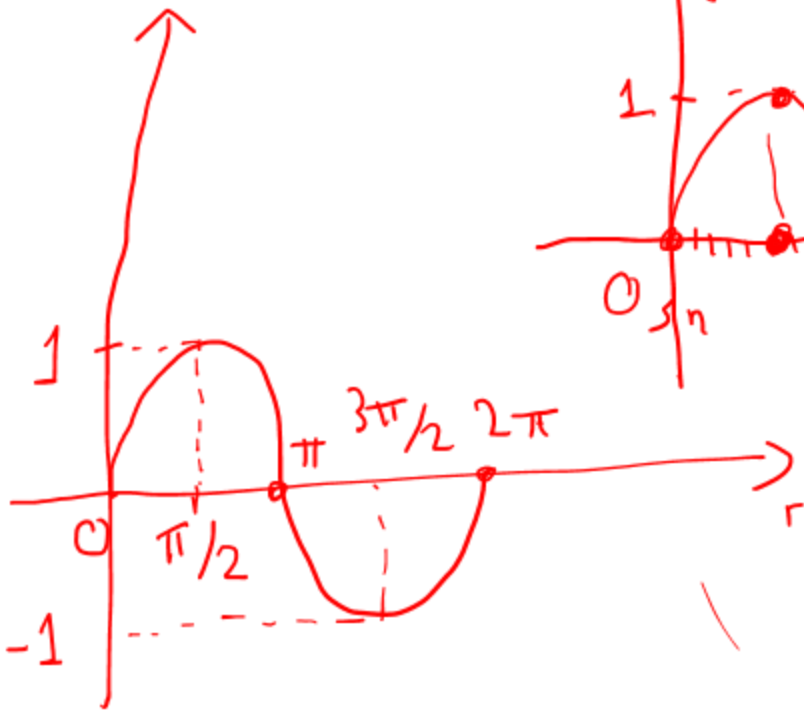
$t=0$ 0

$t=0.5$ π

$t=0.25 \rightarrow \pi/2$



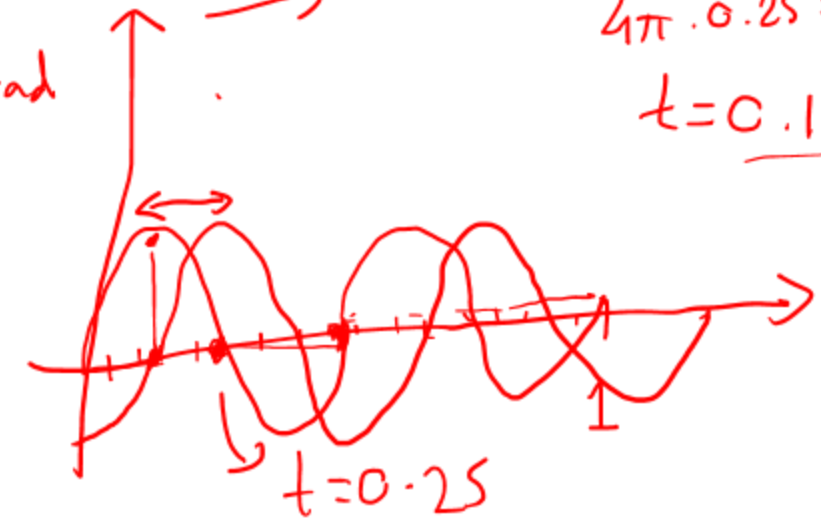
$\sin(2\pi 1t)$



$\sin(2\pi 2t)$

$4\pi \cdot 0.25 = 1\pi$

$t = 0.125 \text{ sn } \frac{\pi}{2}$



44100 Hz

2205oHz

f=1

F → min 2f