

qpsk-modulation

March 29, 2024

```
[1]: import numpy as np
import matplotlib.pyplot as plt
```

```
[23]: x = np.random.randint(0, 2, 10)
x
```

```
[23]: array([0, 0, 1, 1, 1, 0, 1, 1, 0, 1])
```

```
[24]: p = np.where(x == 0, -1, 1)
p
```

```
[24]: array([-1, -1,  1,  1,  1, -1,  1,  1, -1,  1])
```

```
[25]: even_seq = p[::2]
odd_seq = p[1::2]
print(even_seq)
print(odd_seq)
```

```
[-1  1  1  1 -1]
[-1  1 -1  1  1]
```

```
[26]: t = np.arange(0, len(x), 0.01)
len(t)
```

```
[26]: 1000
```

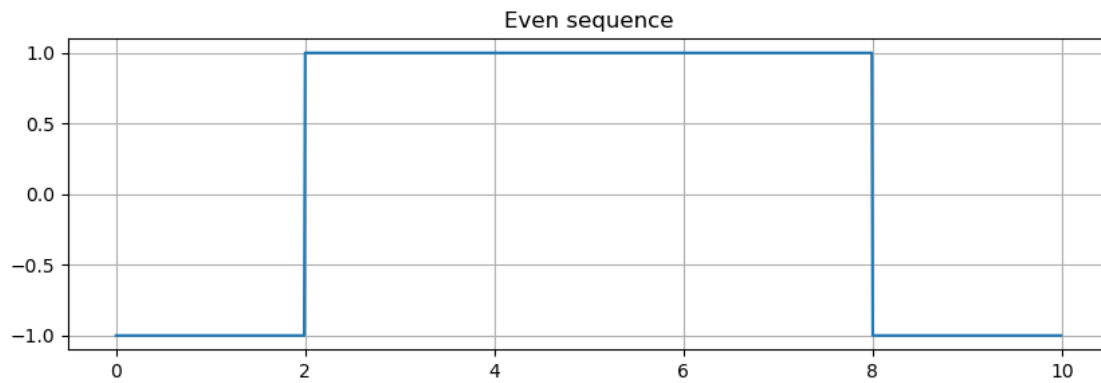
```
[27]: even_ps = np.repeat(even_seq, int(len(t) / len(even_seq)))
odd_ps = np.repeat(odd_seq, int(len(t) / len(odd_seq)))
```

```
[28]: c1 = np.cos(2 * np.pi * 1 * t)
c2 = np.sin(2 * np.pi * 1 * t)
```

```
[29]: r1 = even_ps * c1
r2 = odd_ps * c2
qpsk_sig = r1 - r2
```

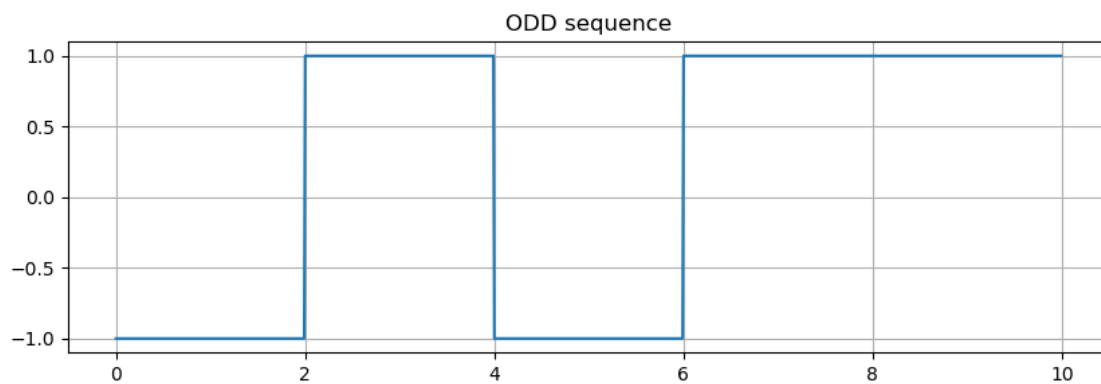
```
[30]: plt.figure(figsize=(10, 3))  
plt.plot(t, even_ps)  
plt.grid(True)  
plt.title("Even sequence")
```

```
[30]: Text(0.5, 1.0, 'Even sequence')
```

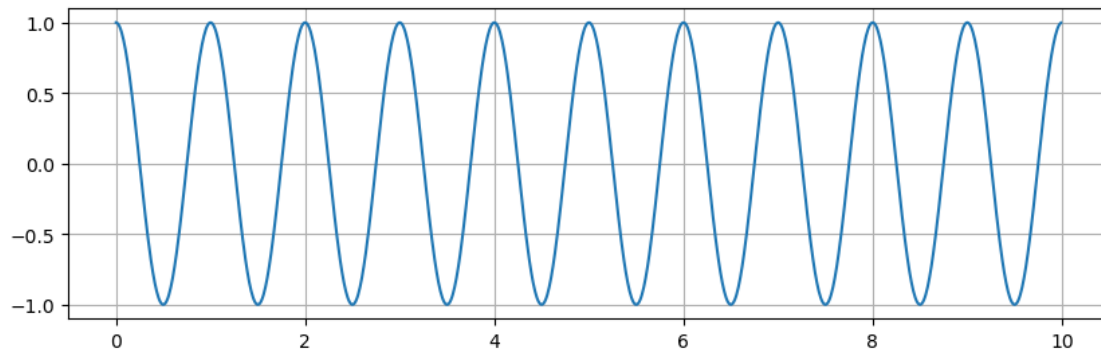


```
[31]: plt.figure(figsize=(10, 3))  
plt.plot(t, odd_ps)  
plt.grid(True)  
plt.title("ODD sequence")
```

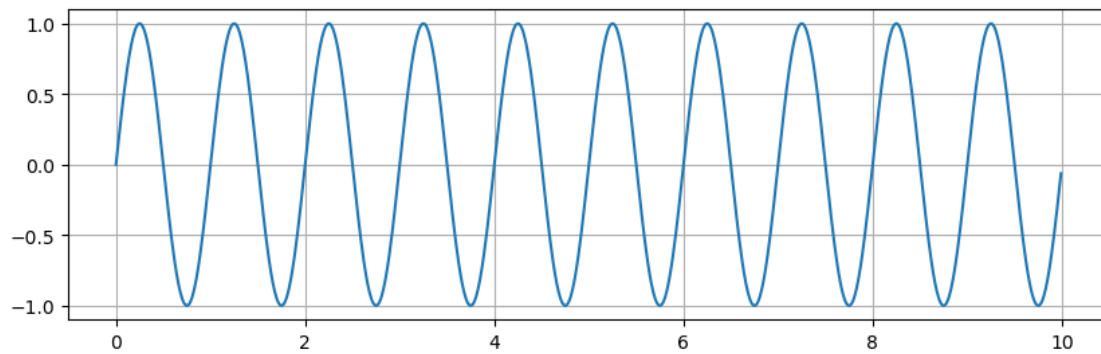
```
[31]: Text(0.5, 1.0, 'ODD sequence')
```



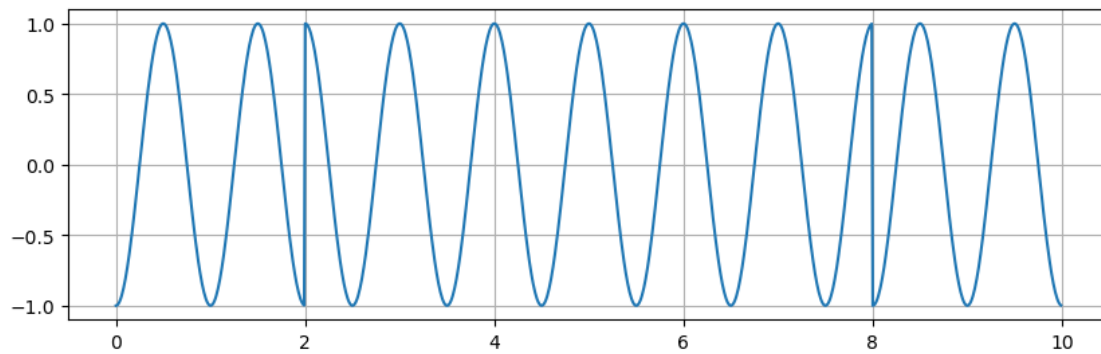
```
[33]: plt.figure(figsize=(10, 3))  
plt.plot(t, c1)  
plt.grid(True)
```



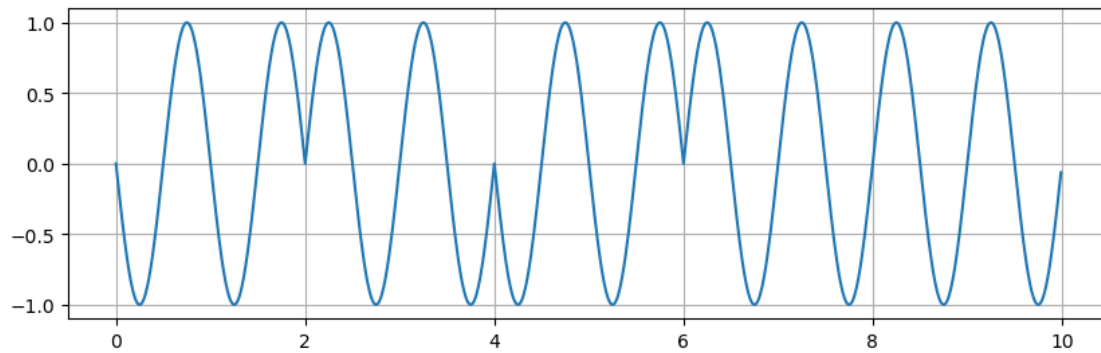
```
[35]: plt.figure(figsize=(10, 3))  
plt.plot(t, c2)  
plt.grid(True)
```



```
[40]: plt.figure(figsize=(10,3))  
plt.plot(t, r1)  
plt.grid(True)
```



```
[41]: plt.figure(figsize=(10, 3))  
plt.plot(t, r2)  
plt.grid(True)
```



```
[42]: plt.figure(figsize=(10, 3))  
plt.plot(t, qpsk_sig)  
plt.grid(True)
```

