fsk-modulation-and-demodulation

March 29, 2024

[36]:
```
import numpy as np
import matplotlib.pyplot as plt
```

[75]:
```
x = np.random.randint(0, 2, 10)
x
```

[75]:
```
array([1, 0, 0, 0, 1, 1, 1, 1, 0, 1])
```

[76]:
```
bp = 0.000001
```

[77]:
```
bit = np.array([])
for n in range(len(x)):
    if x[n] == 1:
        se = np.ones(100)
    else:
        se = np.zeros(100)
    bit = np.concatenate((bit, se))
len(bit)
```

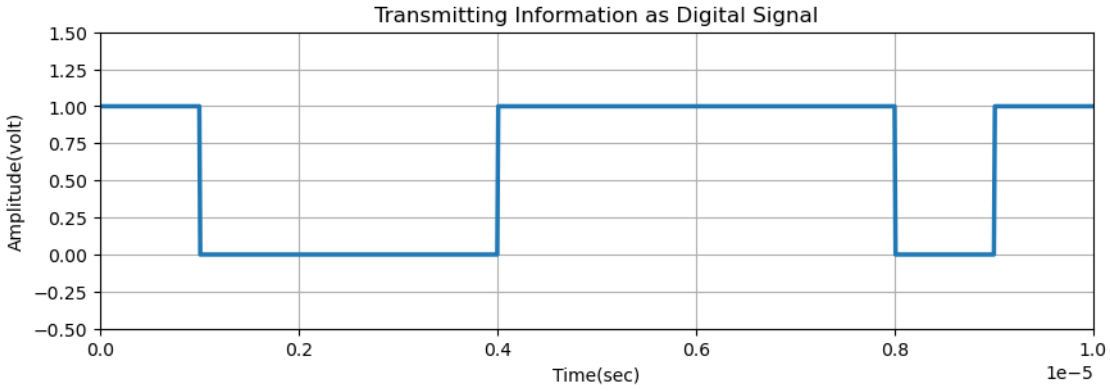
[77]:
```
1000
```

[78]:
```
t1 = np.arange(bp/100, 100*len(x)*(bp/100) + bp/100, bp/100)
t1 = t1[0:len(t1)-1]
len(t1)
```

[78]:
```
1000
```

[79]:
```
plt.figure(figsize=(10, 3))
plt.plot(t1, bit, linewidth=2.5)
plt.grid(True)
plt.axis([0, bp*len(x), -0.5, 1.5])
plt.ylabel('Amplitude(volt)')
plt.xlabel('Time(sec)')
plt.title('Transmitting Information as Digital Signal')
```

[79]:
```
Text(0.5, 1.0, 'Transmitting Information as Digital Signal')
```



binary FSK Modulation

[80]:
```
A = 5
br = 1/bp
f1 = br*10
f2 = br*1
```

[81]:
```
t2 = np.arange(bp/99, bp + bp/99, bp/99)
len(t2)
```

[81]: 99

[82]:
```
ss = len(t2)
```

[83]:
```
m = np.array([])
for i in range(len(x)):
    if x[i] == 1:
        y = A * np.cos(2*np.pi*f1*t2)
    else:
        y = A * np.cos(2*np.pi*f2*t2)
    m = np.concatenate((m, y))
len(m)
```

[83]: 990

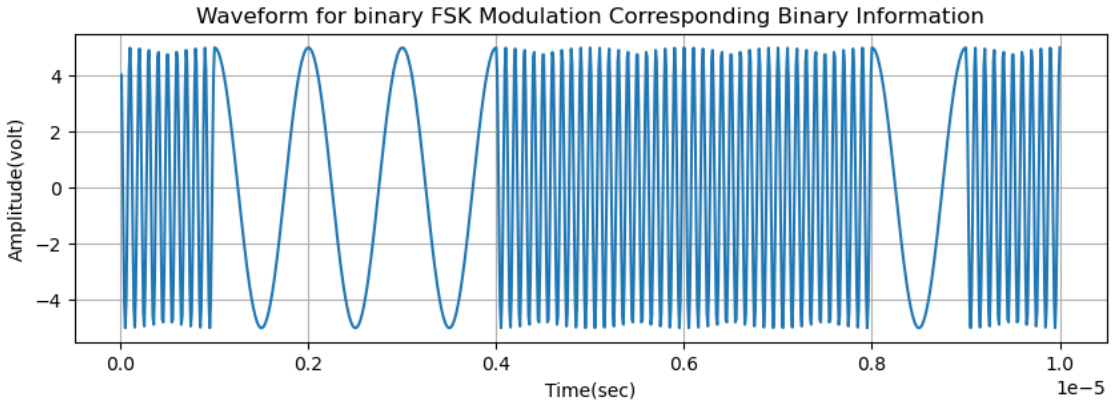
[84]:
```
t3 = np.arange(bp/99, bp*len(x) + bp/99, bp/99)
len(t3)
```

[84]: 990

[85]:
```
plt.figure(figsize=(10,3))
plt.plot(t3, m)
plt.grid(True)
```

```
plt.xlabel('Time(sec)')
plt.ylabel('Amplitude(volt)')
plt.title('Waveform for binary FSK Modulation Corresponding Binary Information')
```

[85]:
```
Text(0.5, 1.0, 'Waveform for binary FSK Modulation Corresponding Binary
Information')
```



Binary FSK Demodulation

[ ]:
```
```

[110]:
```
mn = np.array([])
for n in range(ss-1, len(m), ss):
    t = np.arange(bp/99, bp + bp/99, bp/99)
    y1 = np.cos(2*np.pi*f1*t)
    y2 = np.cos(2*np.pi*f2*t)
    segment = m[n-ss+1:n+1]
    mm = y1 * segment
    mmm = y2 * segment
    z1 = np.trapz(mm, t)
    z2 = np.trapz(mmm, t)
    zz1 = round((2*z1/bp))
    zz2 = round((2*z2/bp))
    if zz1 > A/2:
        a = 1
    elif zz2 > A/2:
        a = 0
    mn = np.append(mn, a)
```

[111]:
```
len(mn)
```

[111]:
```
10
```

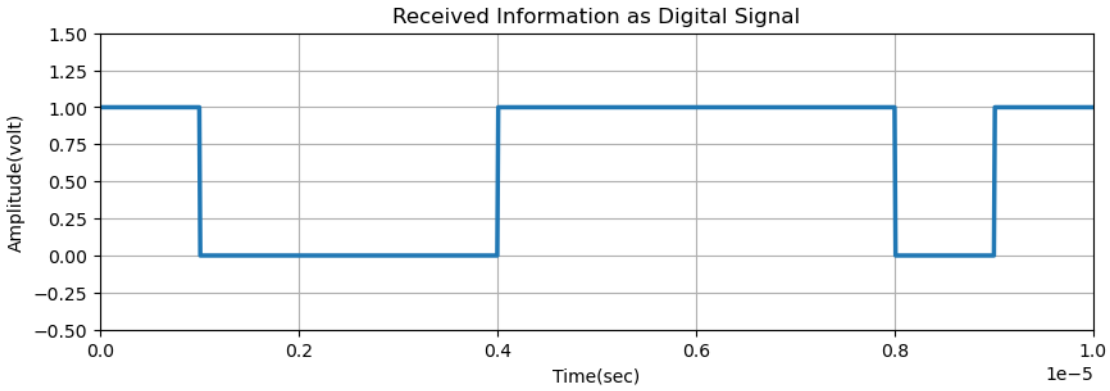
[112]:
```
bit = np.array([])
for n in range(len(mn)):
    if mn[n] == 1:
        se = np.ones(100)
    else:
        se = np.zeros(100)
    bit = np.concatenate((bit, se))
```

[117]:
```
t4 = np.arange(bp/100, 100*len(mn)*(bp/100) + bp/100, bp/100)
t4 = t4[:len(bit)]
len(t4)
```

[117]: 1000

[118]:
```
plt.figure(figsize=(10,3))
plt.plot(t4, bit, linewidth=2.5)
plt.grid(True)
plt.axis([0, bp*len(mn), -0.5, 1.5])
plt.ylabel('Amplitude(volt)')
plt.xlabel('Time(sec)')
plt.title('Received Information as Digital Signal')
```

[118]: Text(0.5, 1.0, 'Received Information as Digital Signal')



[ ]: