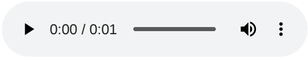
HW7

휴먼지능정보공학과 201910803 박채희

In [19]:
```
import numpy as np
import matplotlib.pyplot as plt

from thinkdsp import decorate
```

In [20]:
```
from thinkdsp import read_wave

wave = read_wave('28042__bcjordan__voicedownbew.wav')
wave.normalize()
wave.make_audio()
```

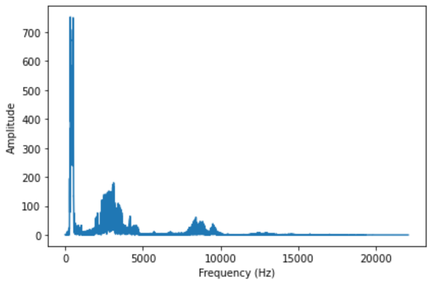
Out[20]:



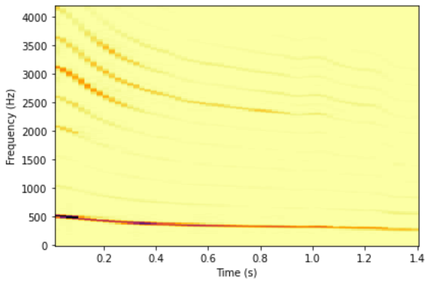
In [21]:
```
def autocorr(wave):
    """Computes and plots the autocorrelation function.

    wave: Wave
    """
    lags = np.arange(len(wave.ys)//2)
    corrs = [serial_corr(wave, lag) for lag in lags]
    return lags, corrs
```

In [22]:
```
def serial_corr(wave, lag=1):
    """Computes serial correlation with given lag.

    wave: Wave
    lag: integer, how much to shift the wave

    returns: float correlation coefficient
    """
    n = len(wave)
    y1 = wave.ys[lag:]
    y2 = wave.ys[:n-lag]
    corr_mat = np.corrcoef(y1, y2)
    return corr_mat[0, 1]
```

In [23]:
```
spectrum = wave.make_spectrum()
spectrum.plot()
decorate(xlabel='Frequency (Hz)', ylabel='Amplitude')
```



In [24]:
```
wave.make_spectrogram(2048).plot(high=4200)
decorate(xlabel='Time (s)',
         ylabel='Frequency (Hz)')
```



1) frequency return 해주는 함수 : 가장 큰 peak를 찾고 그 peak의 index를 시간으로 바꿔준 다음, 그 시간을 초단위단위로 바꿔준다.

In [32]:
```
def estimate_fundamental(segment, low=70, high=150):
    lags, corrs = autocorr(segment)
    lag = np.array(corrs[low:high]).argmax() + low
    period = lag / segment.framerate
    frequency = 1 / period
    return frequency
```

In [33]:
```
#실행결과 성공
duration = 0.01
segment = wave.segment(start=0.2, duration=duration)
freq = estimate_fundamental(segment)
freq
```

Out[33]:
```
436.63366336633663
```

2) start와 end를 정해 wave의 segment 각각의 중심 time을 ts list에 append하고 그에 따른 frequency도 freqs list에 append한다.

In [39]:
```
step = 0.05
starts = np.arange(0.0, 1.4, step)

ts = []
freqs = []

for start in starts:
    ts.append(start + step/2)
    segment = wave.segment(start=start, duration=duration)
    freq = estimate_fundamental(segment)
    freqs.append(freq)
```

In [40]:
```
wave.make_spectrogram(2048).plot(high=900)
plt.plot( ts,freqs, color='white')
decorate(xlabel='Time (s)',
                     ylabel='Frequency (Hz)')
```