

osnovno_delo_s_signali

July 31, 2024

```
[2]: import sounddevice as sd
from scipy.io.wavfile import write
import soundfile as sf
import matplotlib.pyplot as plt
import numpy as np
```

```
[17]: fs = 44100 #vzorčna frekvenca
seconds = 3
cutoff_time = 0.25 #odrežan čas od originalnega posnetka
scaling_time = [1.5, 1.52] #interval za prikaz manj period signala
time = np.linspace(0, seconds, num=(seconds * fs))
```

```
[18]: def record(filename):
    recording = sd.rec(int(seconds * fs), samplerate=fs, channels=1)
    sd.wait() #čakaj, dokler se snemanje ne konča
    write(filename, fs, recording)
```

```
[19]: def graph_signal(data, title):

    temp_time = time.copy()

    #odreži začetek signala
    for i in range(0, len(temp_time)):
        if temp_time[i] >= cutoff_time:
            temp_time = temp_time[i:]
            data = data[i:]
            break

    plt.figure(1)

    #os x naj prikaže četrтинke sekund
    ticks = [i * cutoff_time for i in range(int(seconds / cutoff_time) + 1)]
    plt.xticks(ticks)

    plt.title(title)
    plt.xlabel("Čas(s)")
    plt.ylabel("Amplituda")
```

```

plt.plot(temp_time, data)

plt.show()

#poišči start in end index za prikaz samo 3-4 period signala
start_index = 0
end_index = 0

for i in range(0, len(temp_time)):
    if temp_time[i] >= scaling_time[0] and start_index == 0:
        start_index = i
    elif temp_time[i] >= scaling_time[1]:
        end_index = i
        break

temp_time = temp_time[start_index:end_index]
data = data[start_index:end_index]

plt.figure(2)

plt.title(title + " (povečan)")
plt.xlabel("Čas(s)")
plt.ylabel("Amplituda")

plt.plot(temp_time, data)

plt.show()

```

```

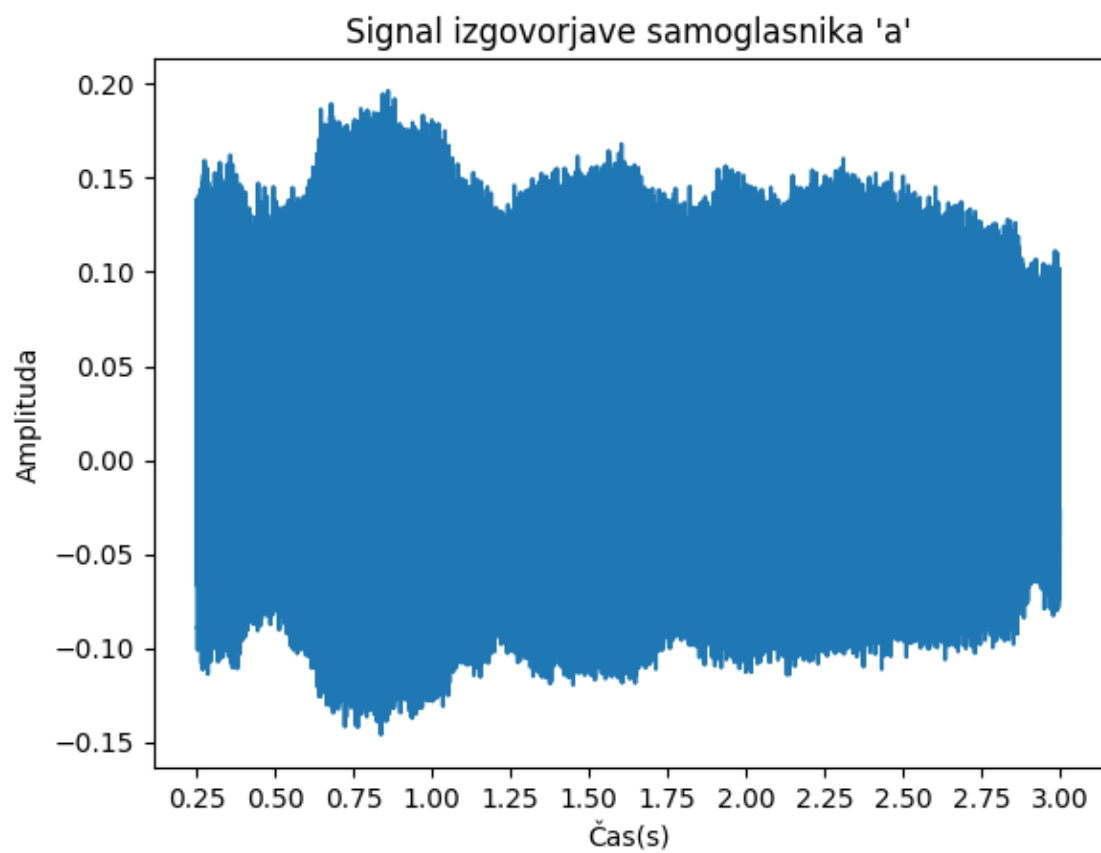
[26]: #snemi
      # record("a.wav")

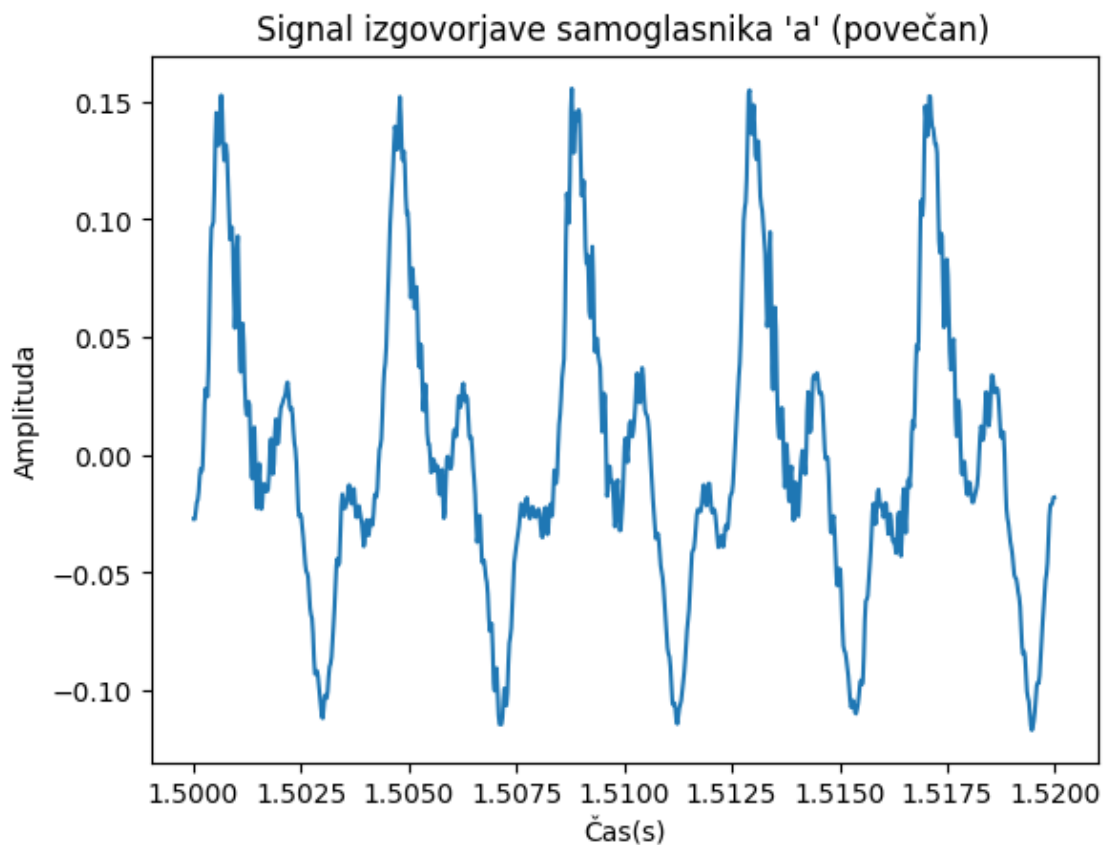
      #preberi iz datoteke
      data, _ = sf.read("a.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'a'")

```



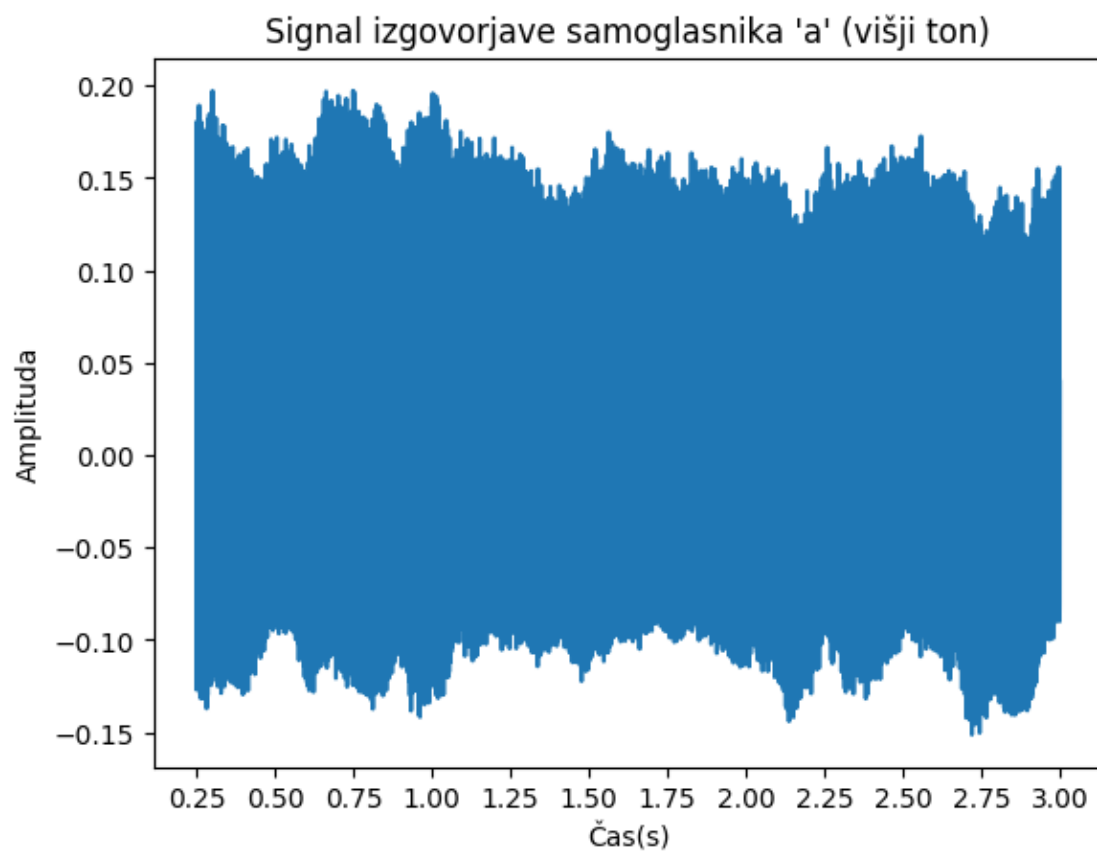


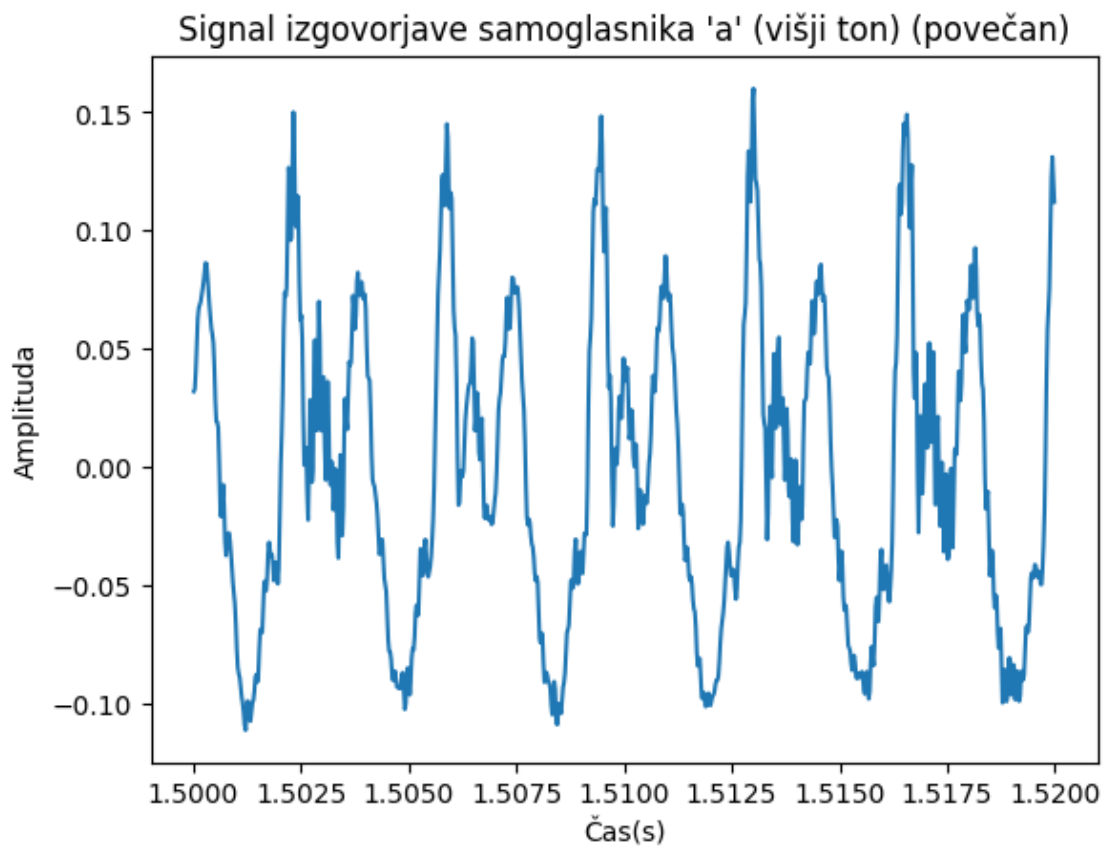
```
[27]: #snemi
      # record("a_high.wav")

      #preberi iz datoteke
      data, _ = sf.read("a_high.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'a' (višji ton)")
```



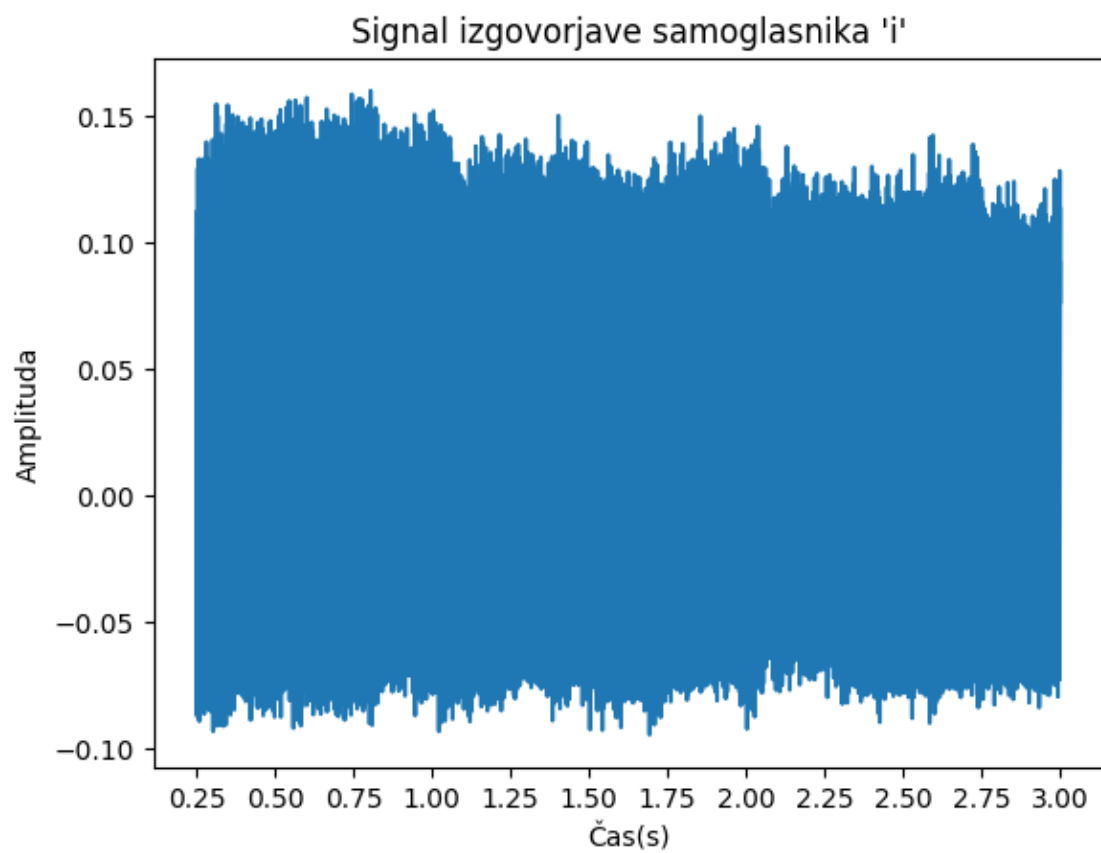


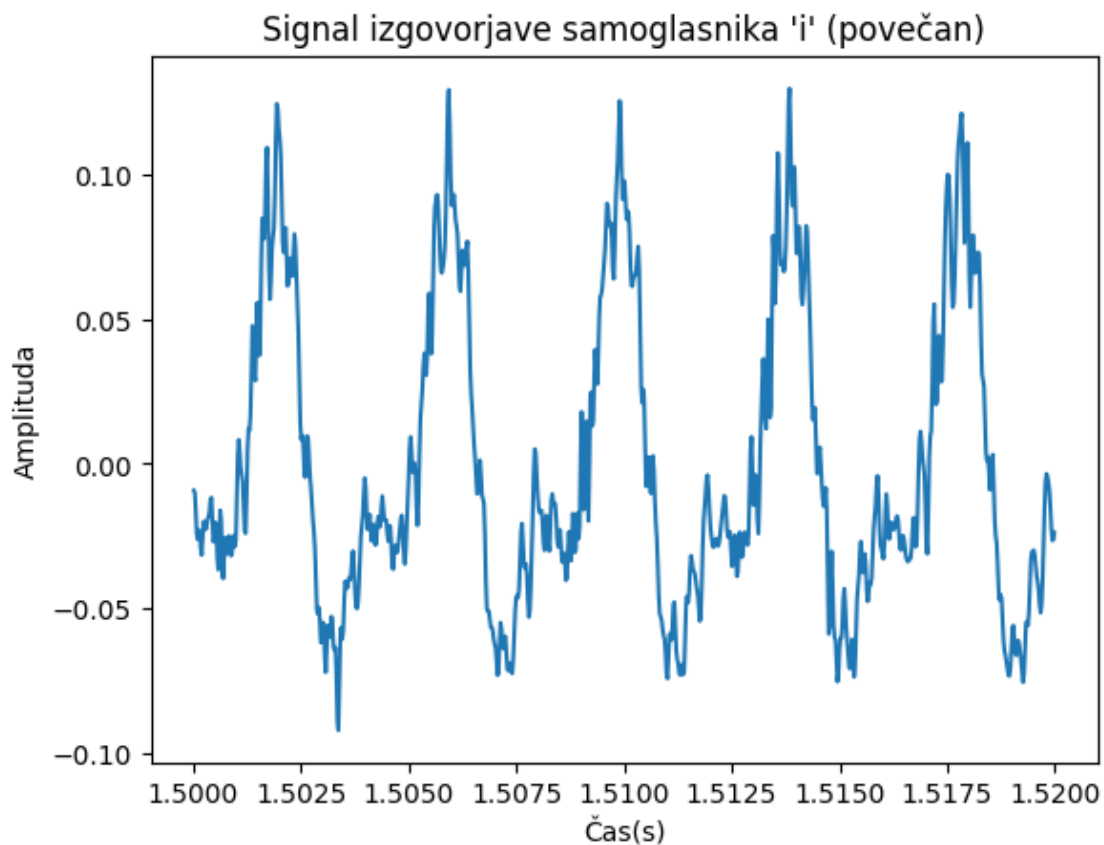
```
[28]: #snemi
      # record("i.wav")

      #preberi iz datoteke
      data, _ = sf.read("i.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'i'")
```



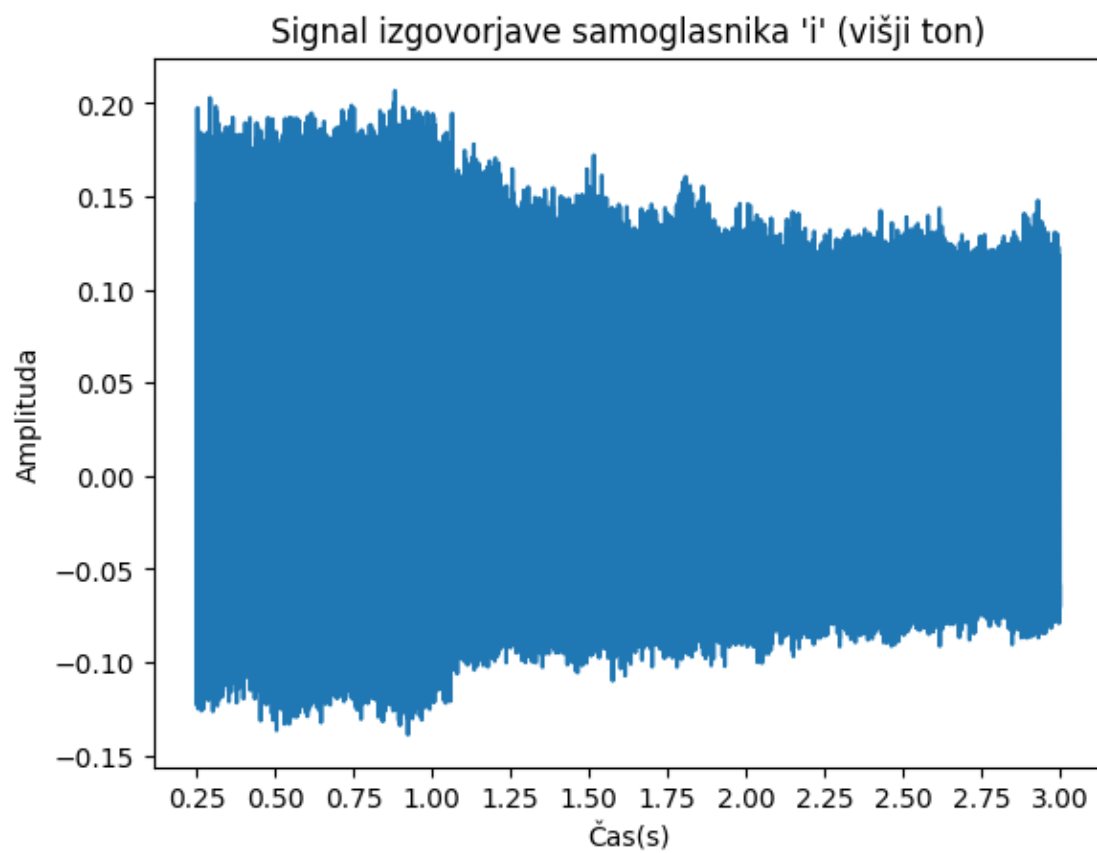


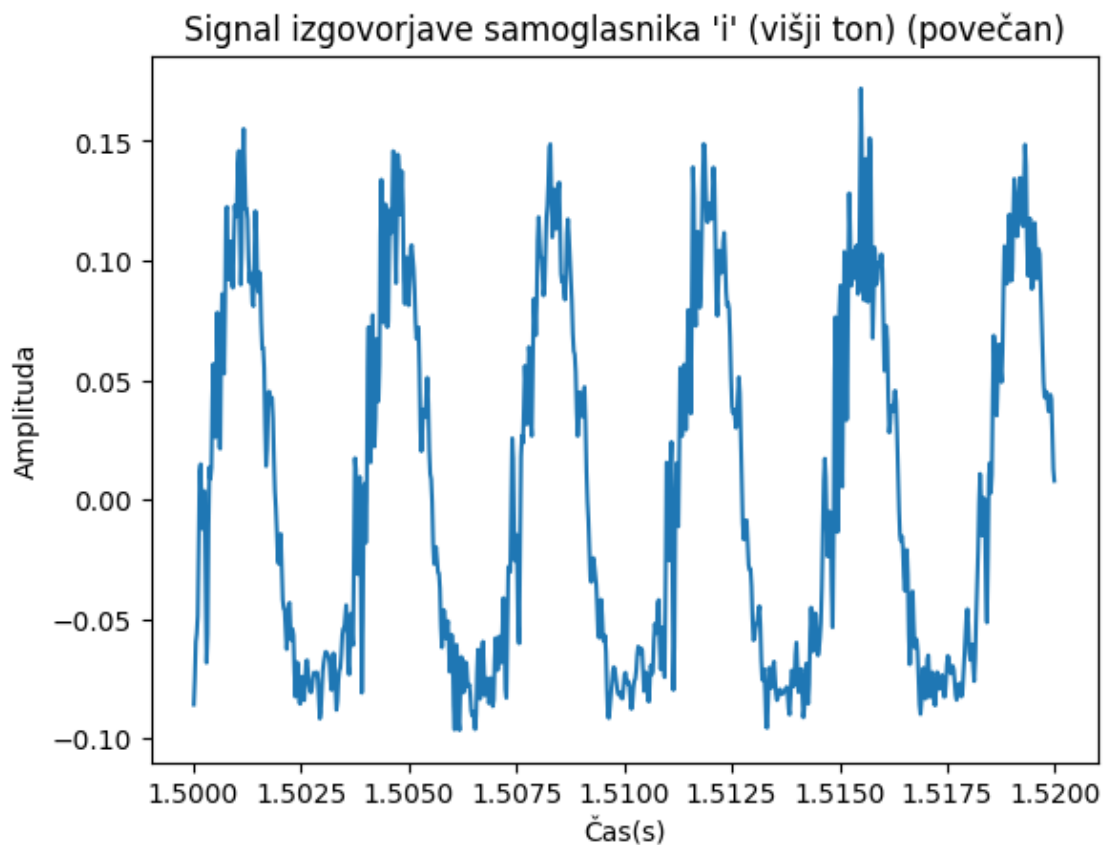
```
[29]: #snemi
      # record("i_high.wav")

      #preberi iz datoteke
      data, _ = sf.read("i_high.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'i' (višji ton)")
```

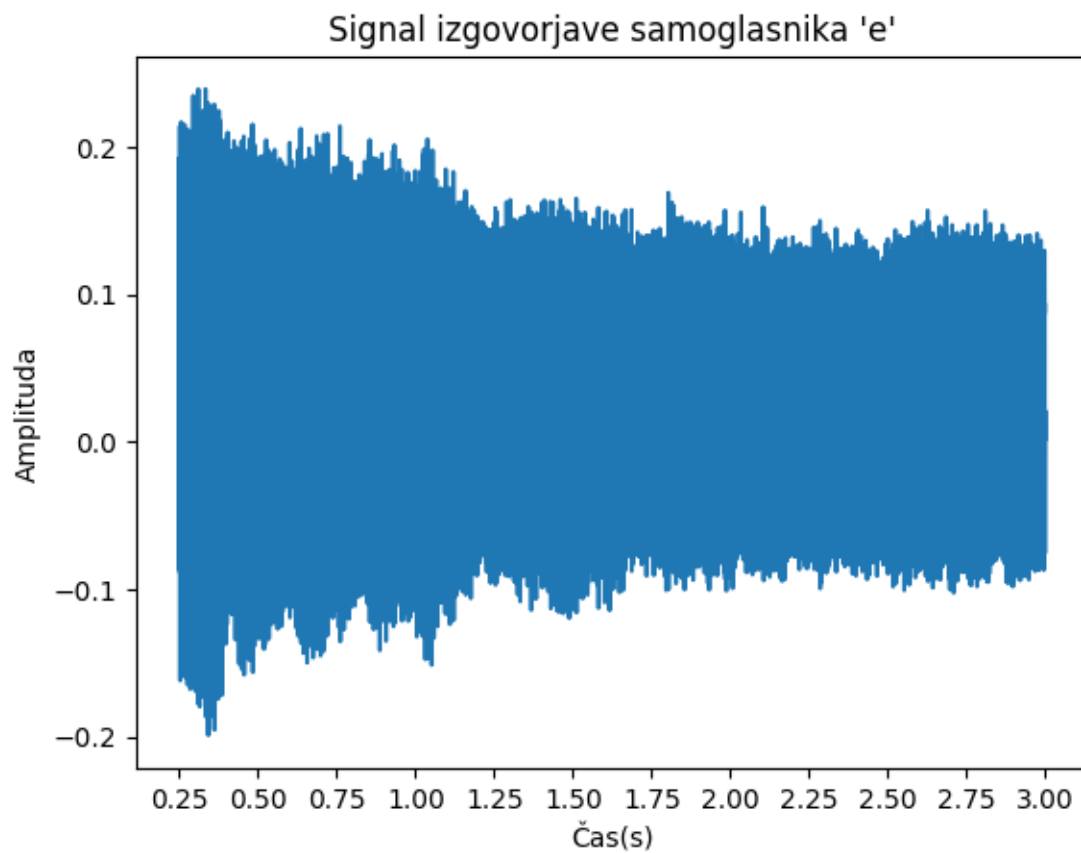


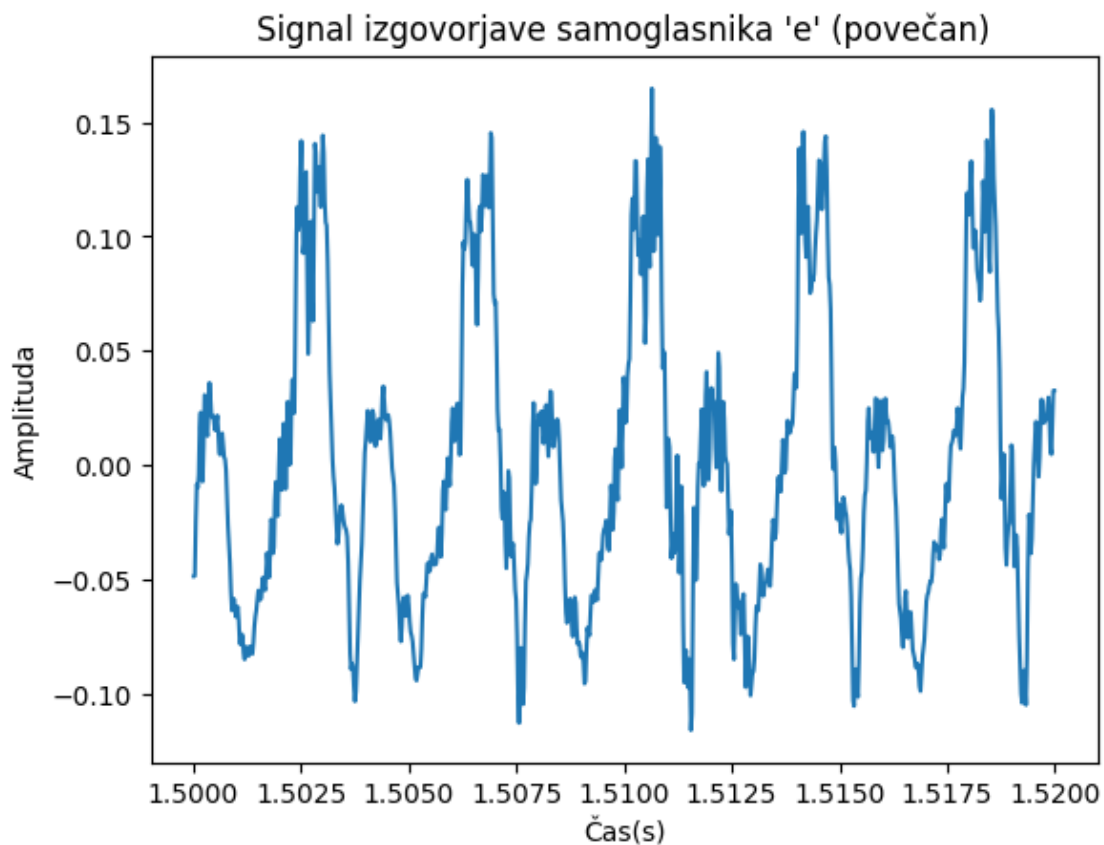
```
[34]: #snemi
      # record("e.wav")

      #preberi iz datoteke
      data, _ = sf.read("e.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'e'")
```



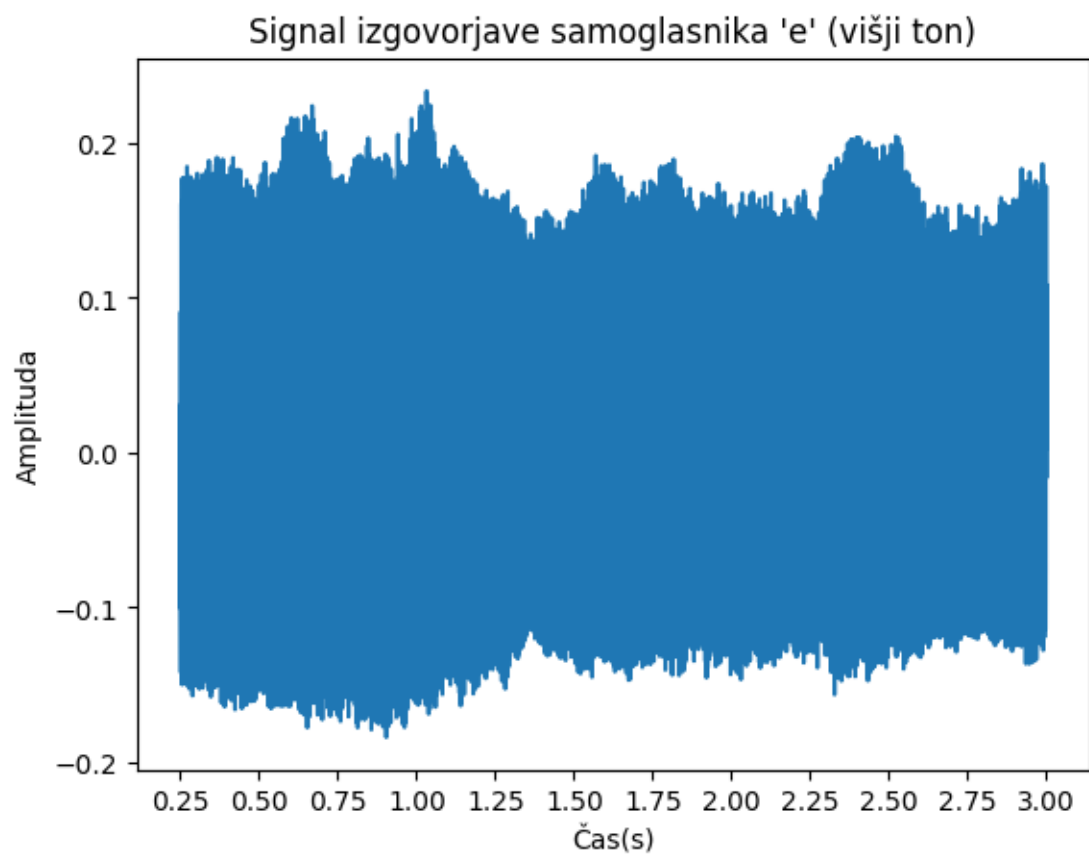


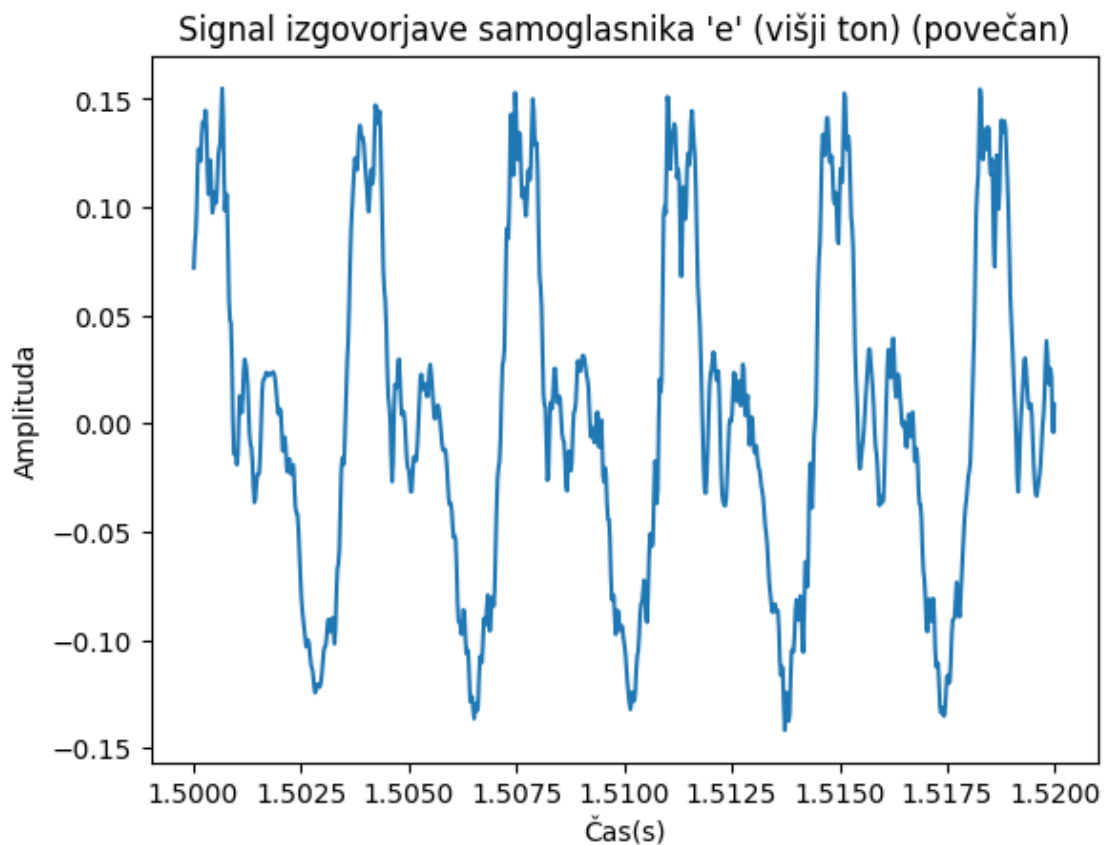
```
[36]: #snemi
      # record("e_high.wav")

      #preberi iz datoteke
      data, _ = sf.read("e_high.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'e' (višji ton)")
```



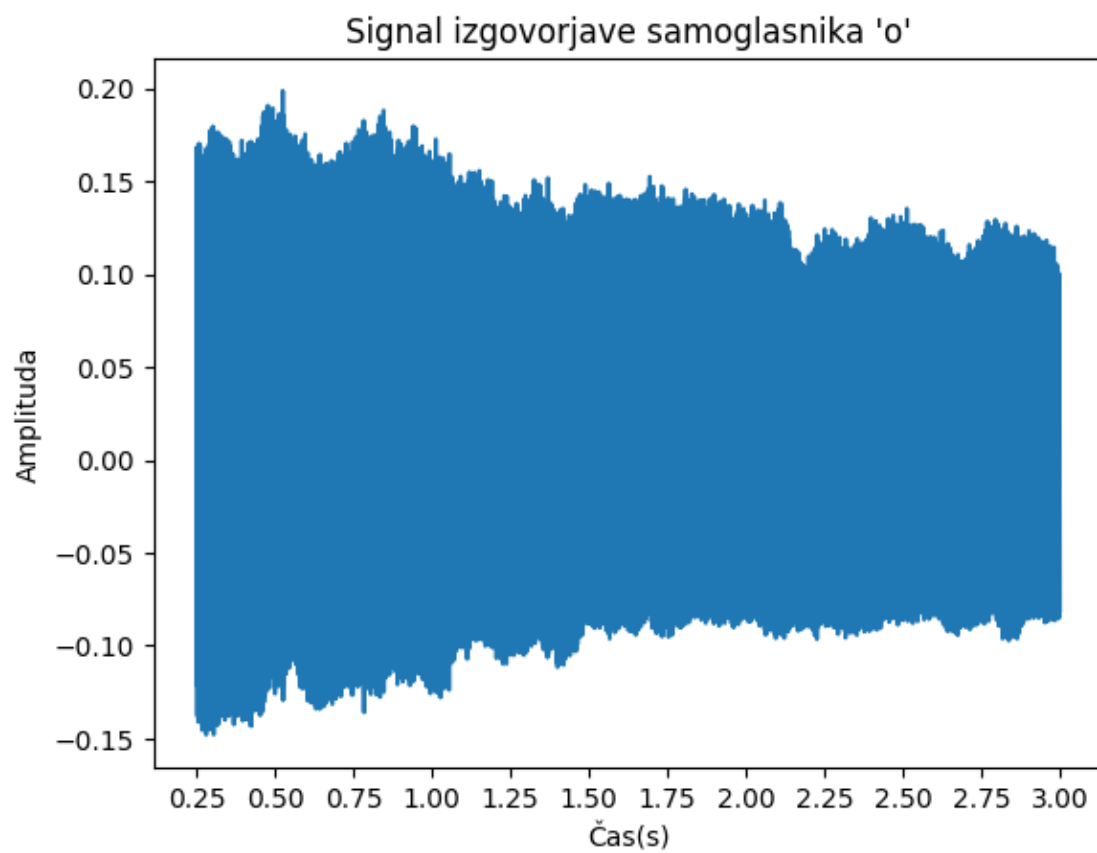


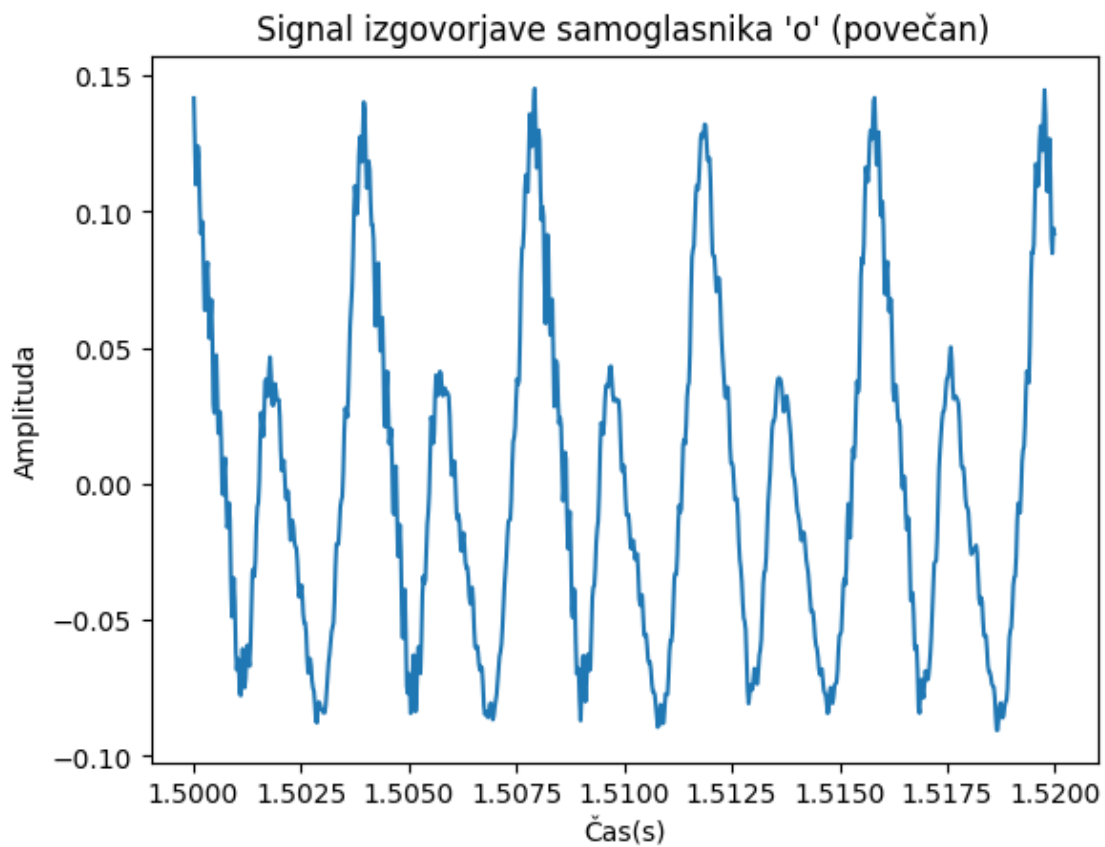
```
[37]: #snemi
      # record("o.wav")

      #preberi iz datoteke
      data, _ = sf.read("o.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'o'")
```



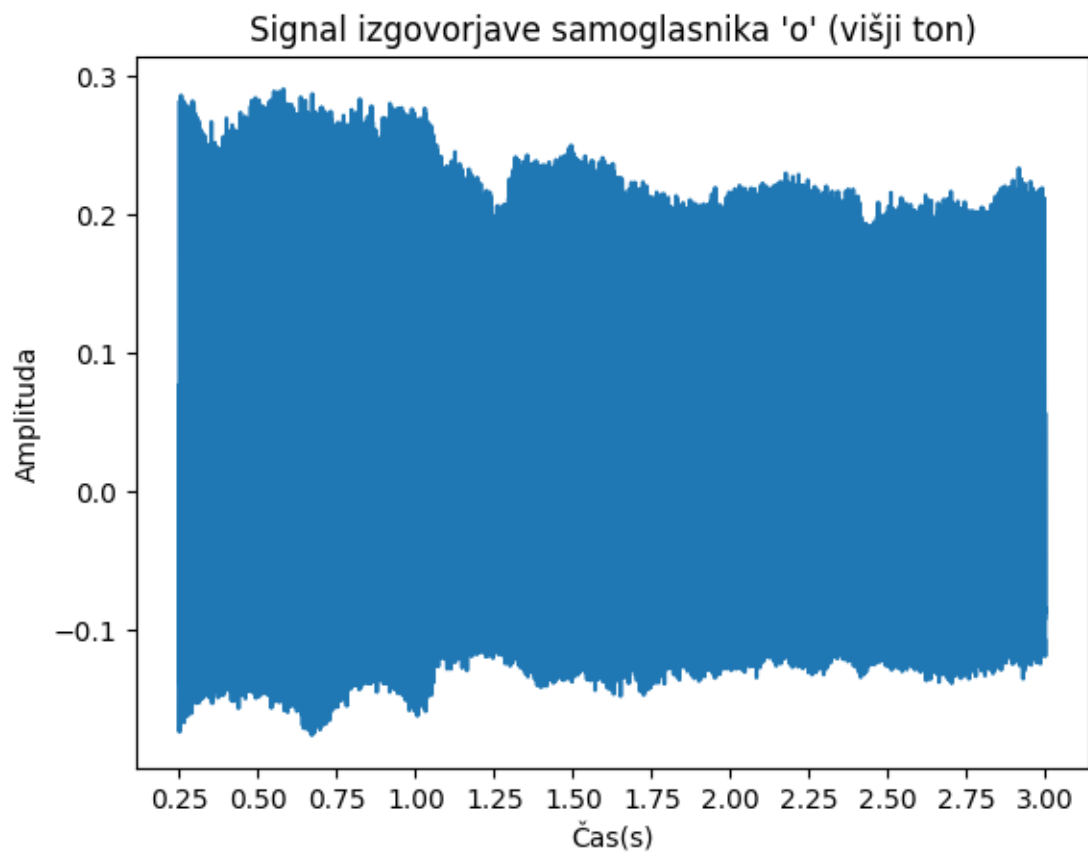


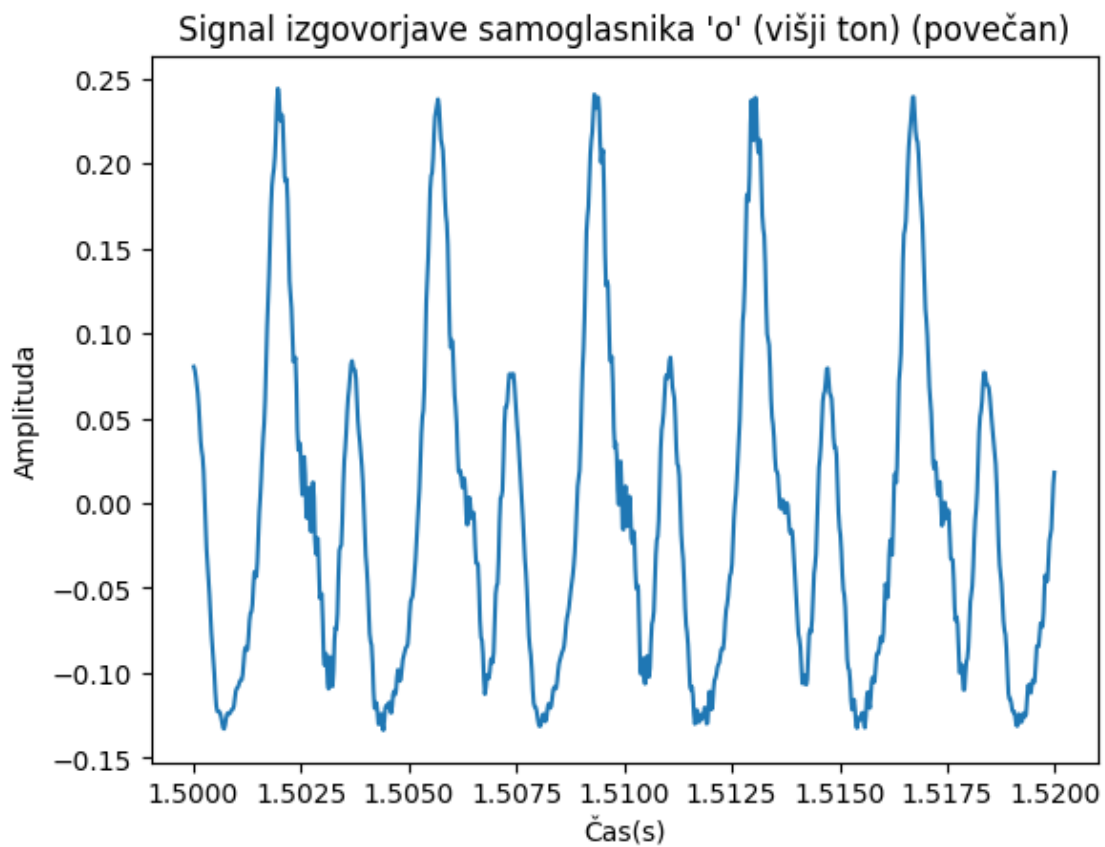
```
[38]: #snemi
      # record("o_high.wav")

      #preberi iz datoteke
      data, _ = sf.read("o_high.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave samoglasnika 'o' (višji ton)")
```

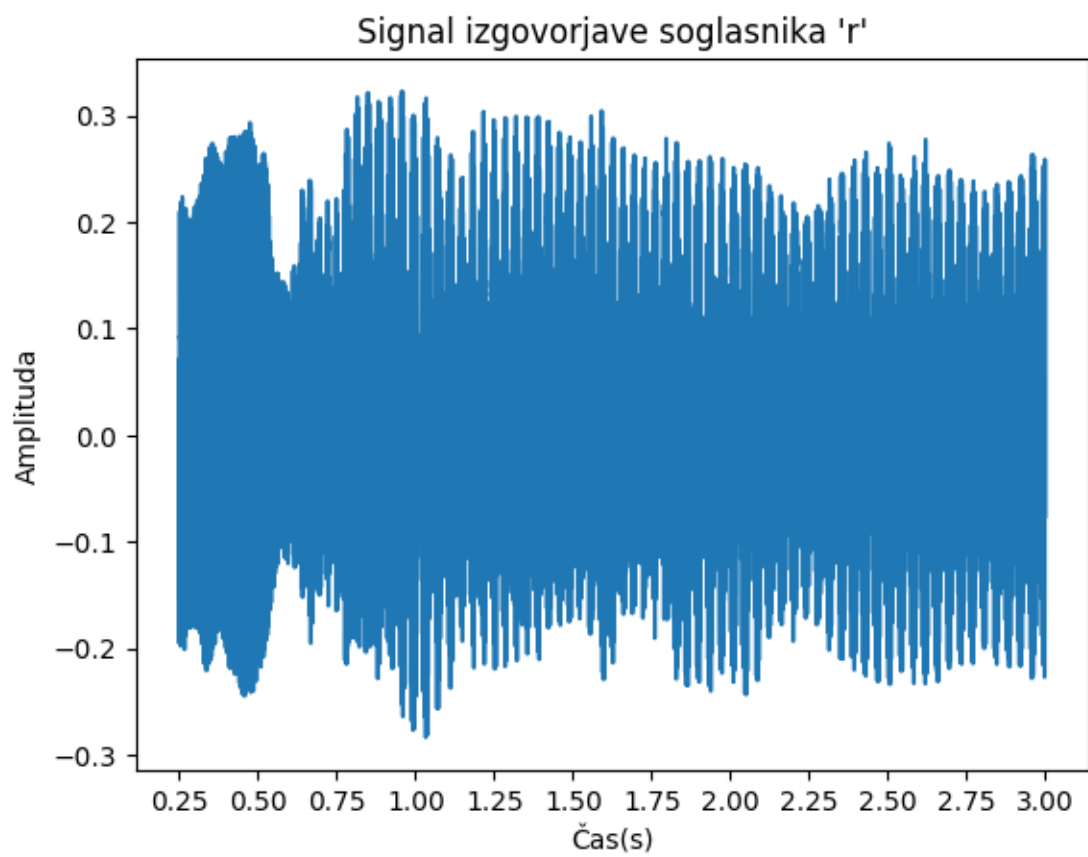


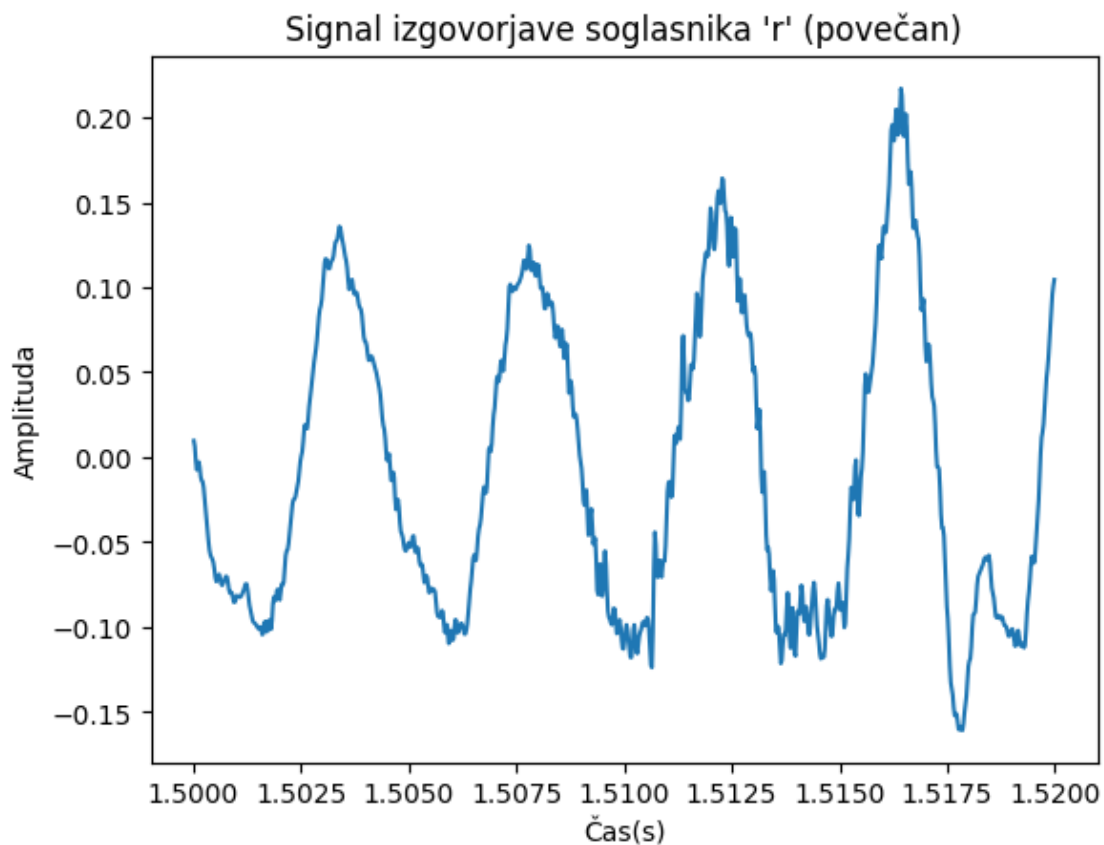
```
[44]: #snemi
      # record("r.wav")

      #preberi iz datoteke
      data, _ = sf.read("r.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave soglasnika 'r'")
```



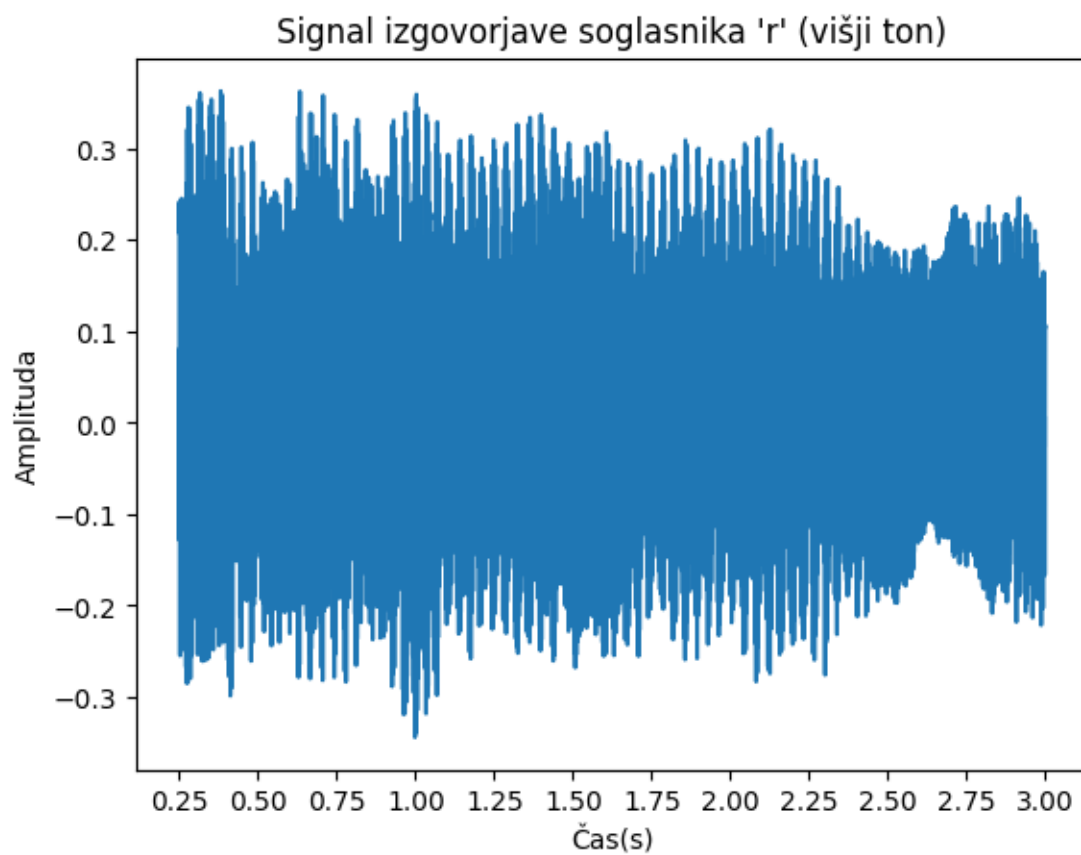


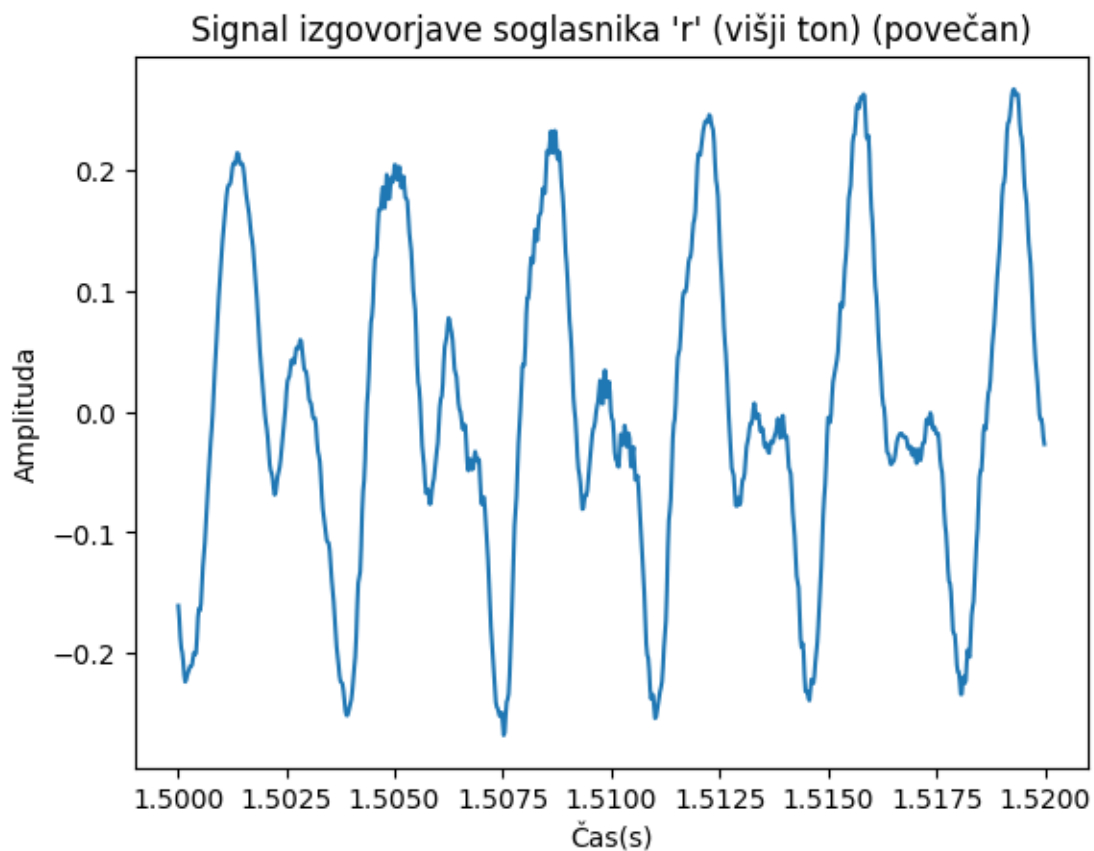
```
[45]: #snemi
      # record("r_high.wav")

      #preberi iz datoteke
      data, _ = sf.read("r_high.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave soglasnika 'r' (višji ton)")
```



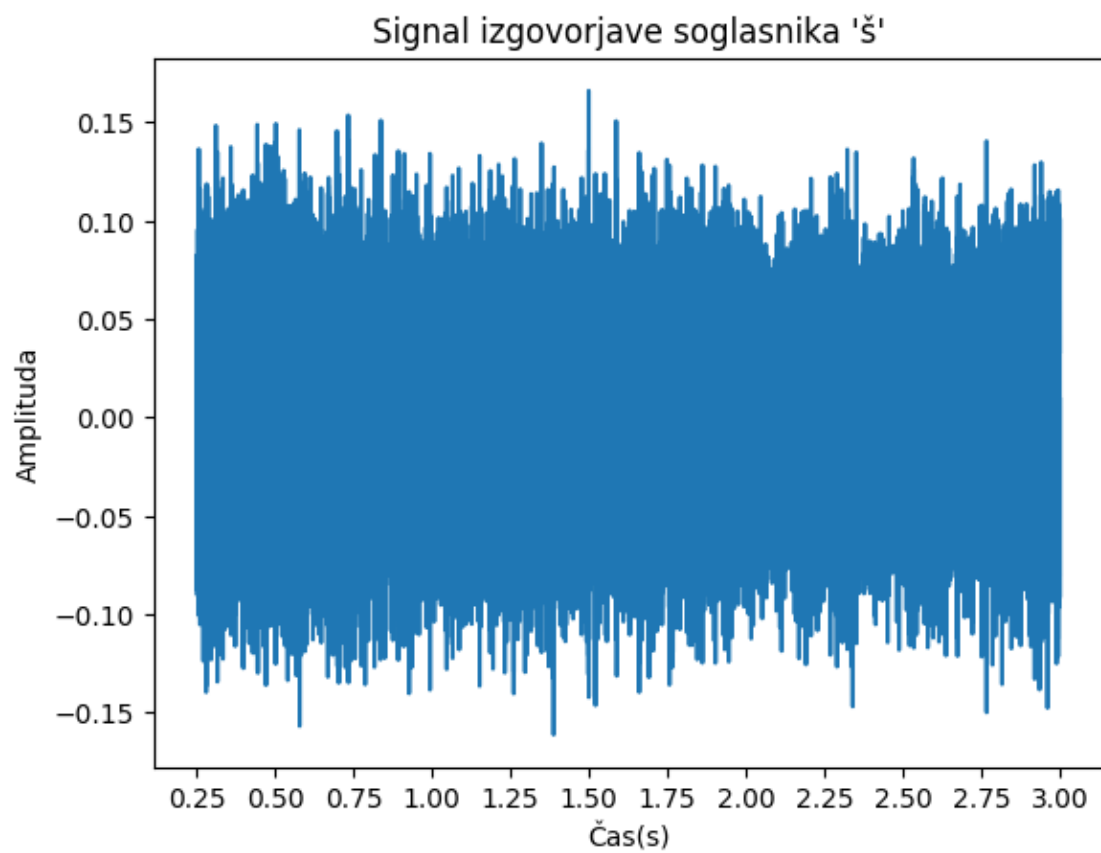


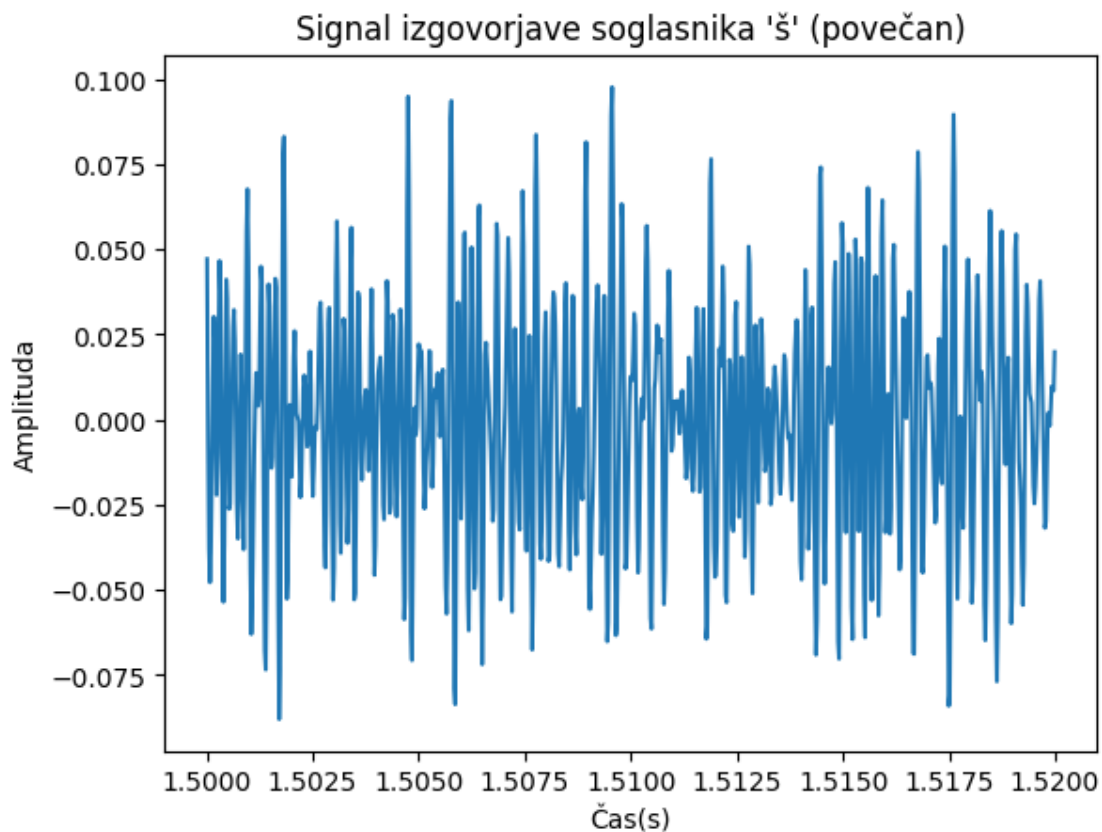
```
[46]: #snemi
      # record("sh.wav")

      #preberi iz datoteke
      data, _ = sf.read("sh.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave soglasnika 'š'")
```



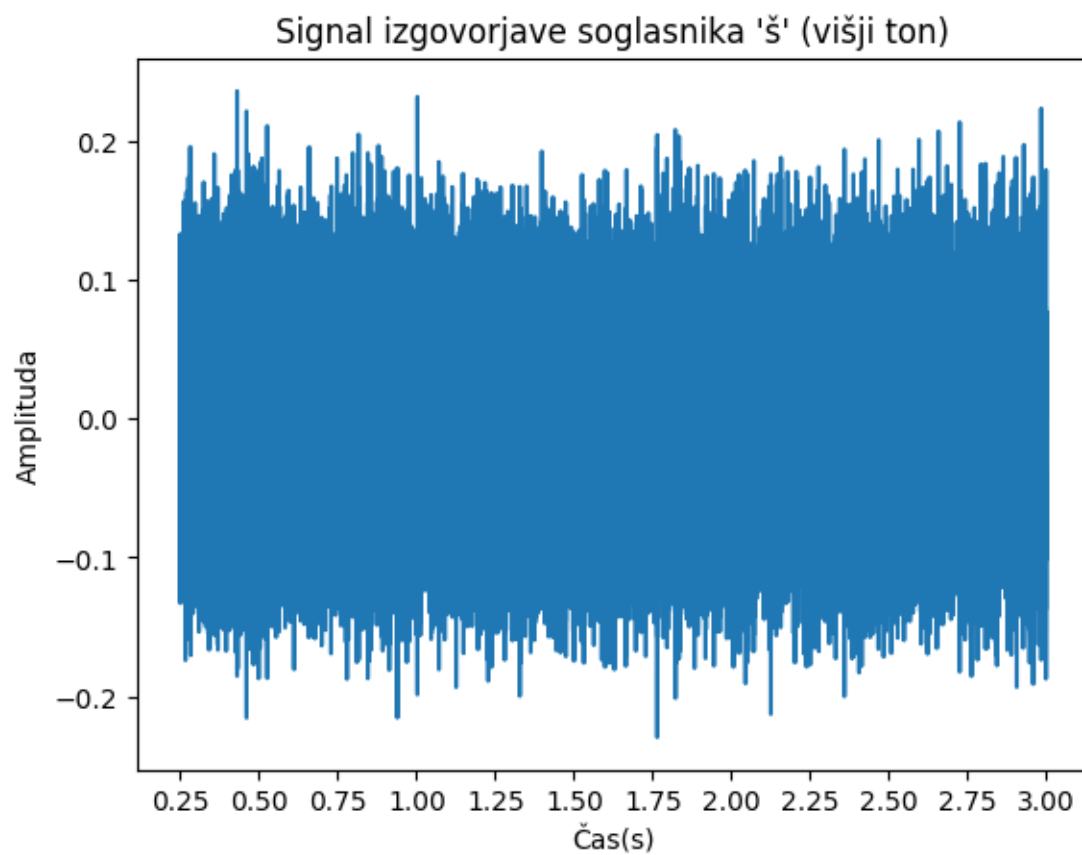


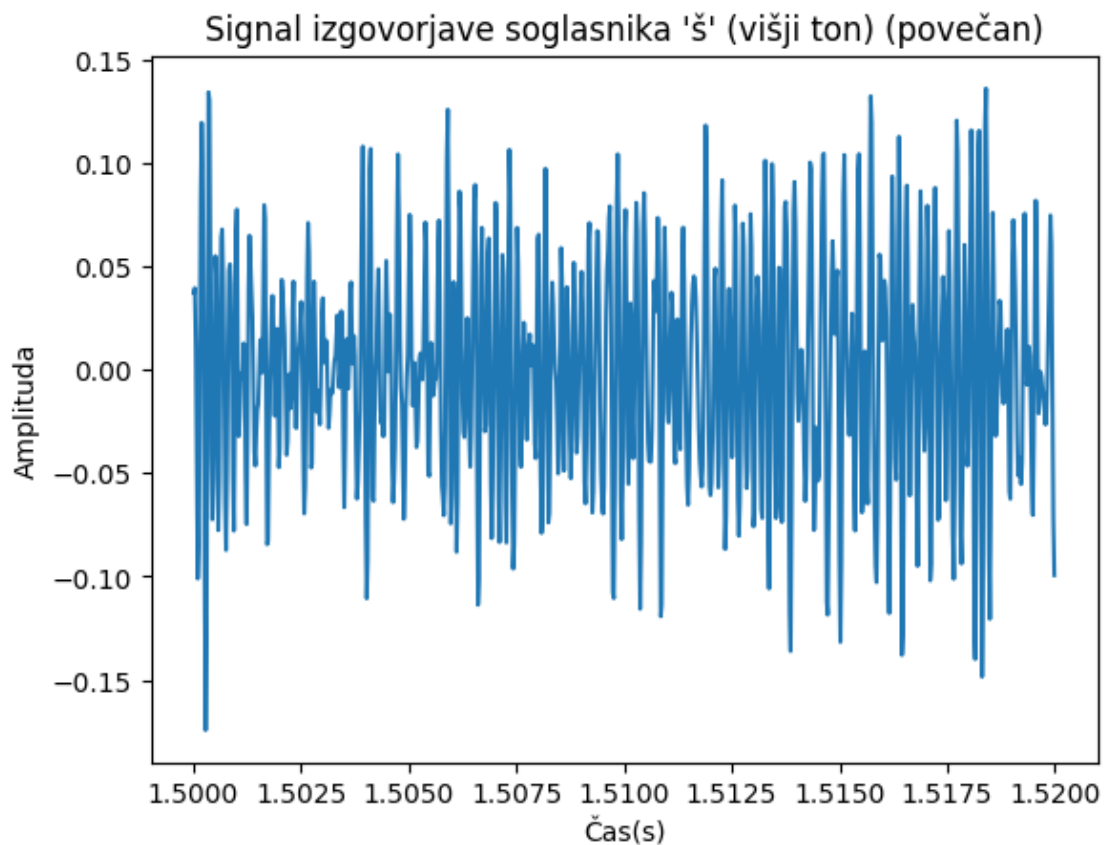
```
[47]: #snemi
      # record("sh_high.wav")

      #preberi iz datoteke
      data, _ = sf.read("sh_high.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave soglasnika 'š' (višji ton)")
```

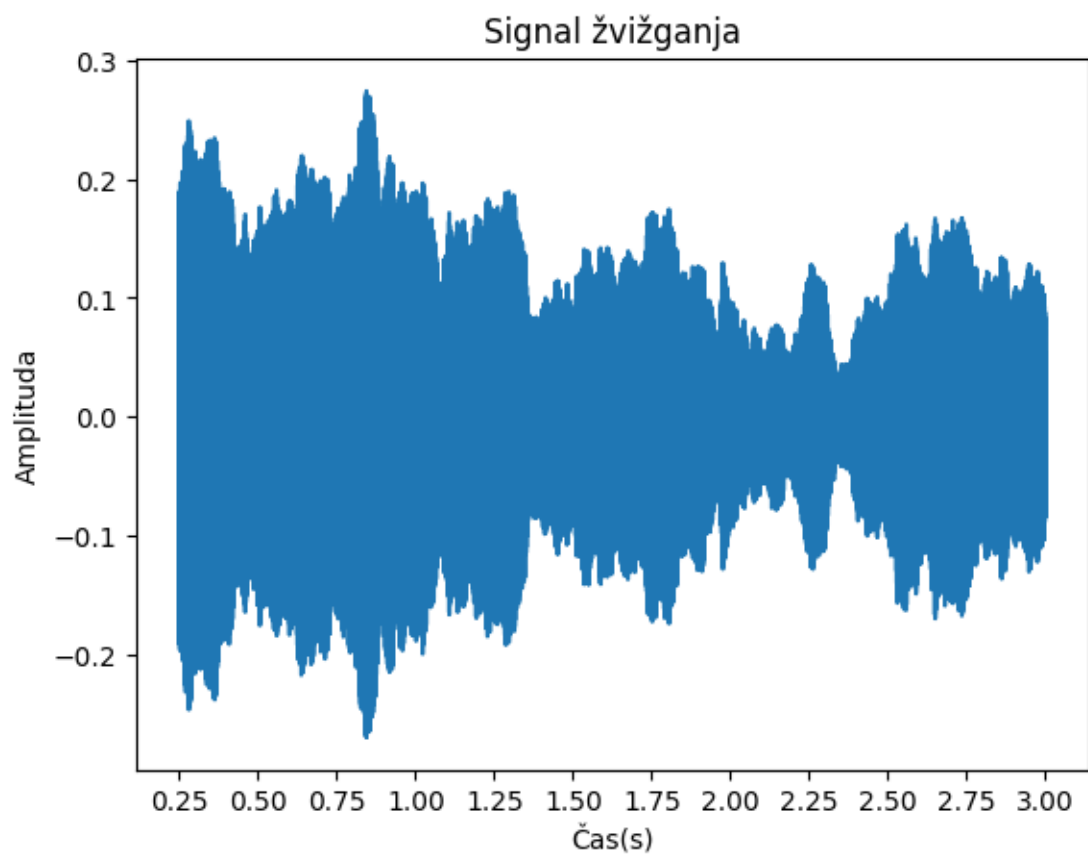


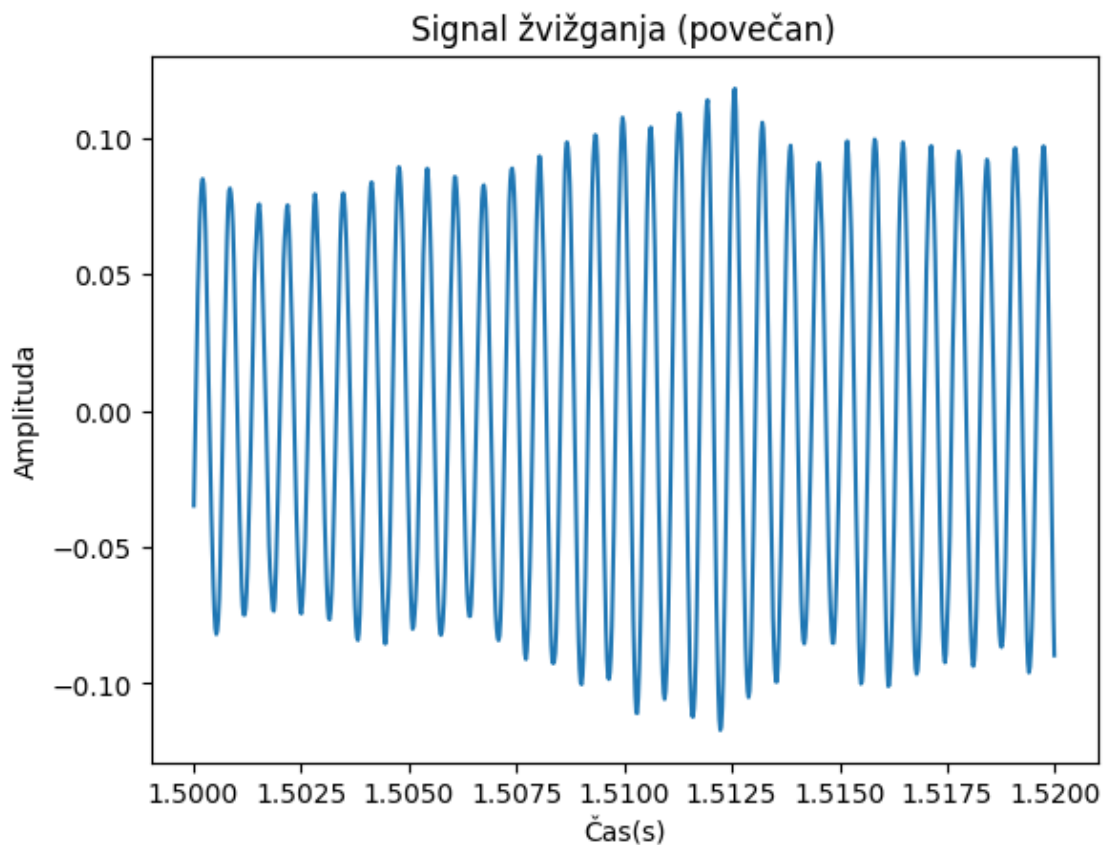
```
[57]: #snemi
      # record("whistle.wav")

      #preberi iz datoteke
      data, _ = sf.read("whistle.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal žvižganja")
```





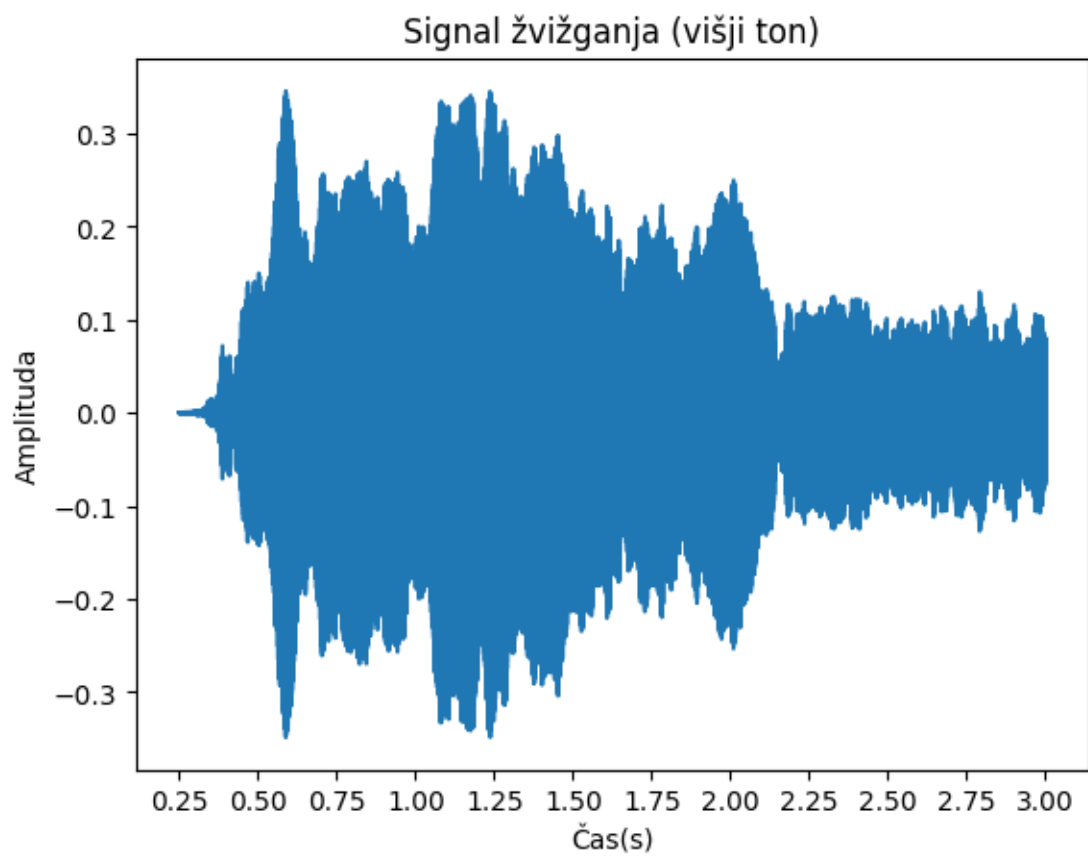
```
[58]: #snemi
      # record("whistle_high.wav")

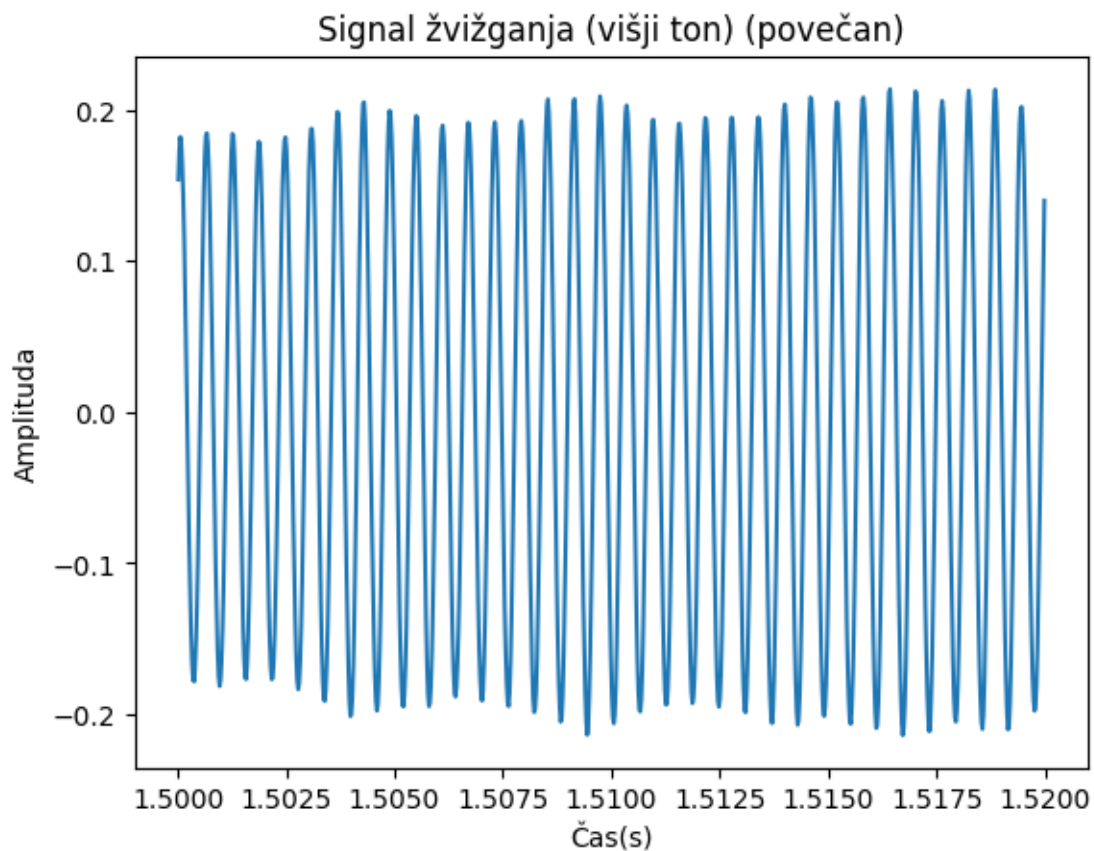
      #preberi iz datoteke
      data, _ = sf.read("whistle_high.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal žvižganja (višji ton)")

      #v teh dveh posnetkih žvižgov lahko vidimo, da prevladuje sinusoidna oblika
```





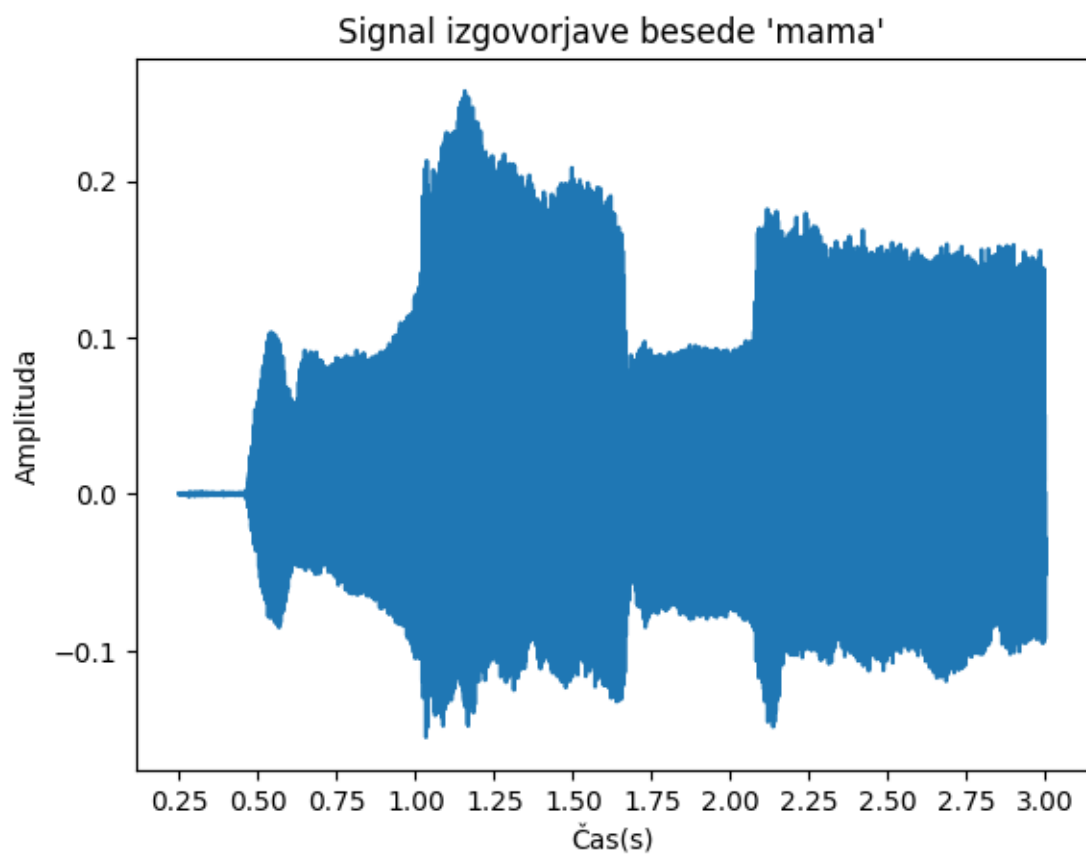
```
[74]: #snemi
      # record("mama.wav")

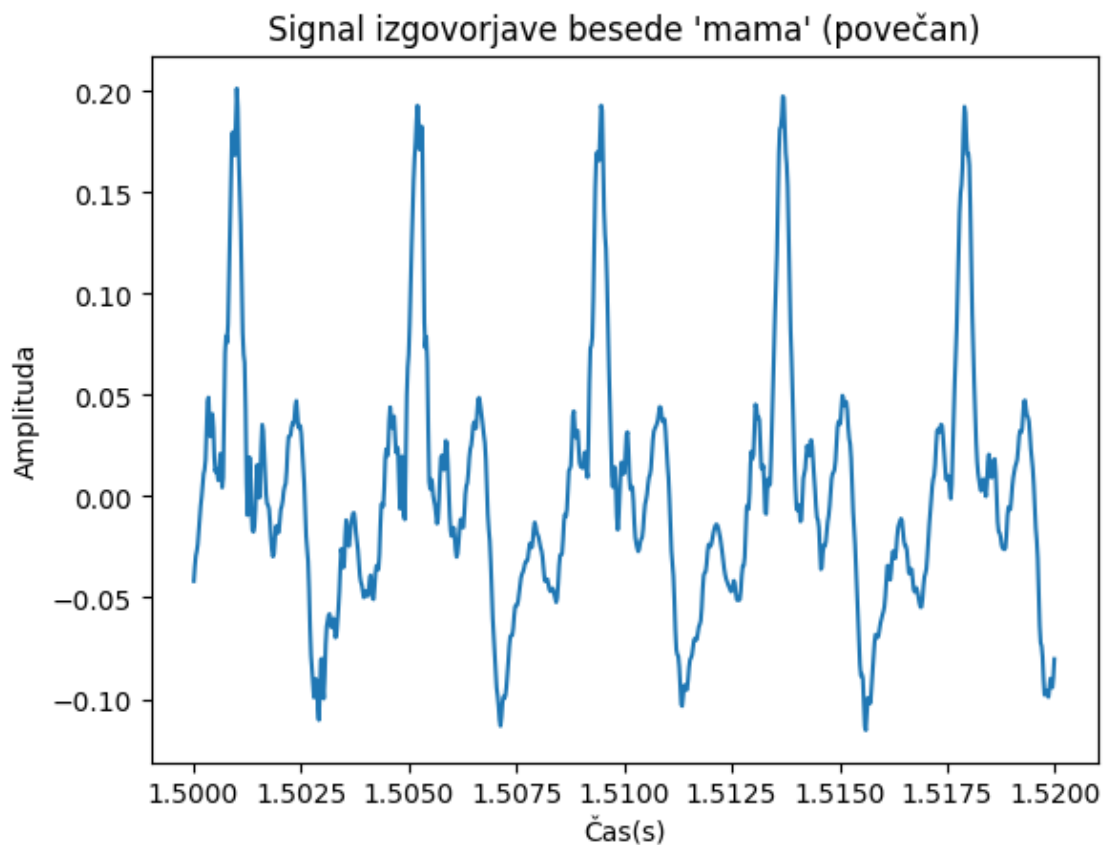
      #preberi iz datoteke
      data, _ = sf.read("mama.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave besede 'mama'")

      #tu lahko vidimo jasno razliko med izgovarjavo 'm' in 'a', pri čemer ima 'a'
      ↪ večjo amplitudo
```





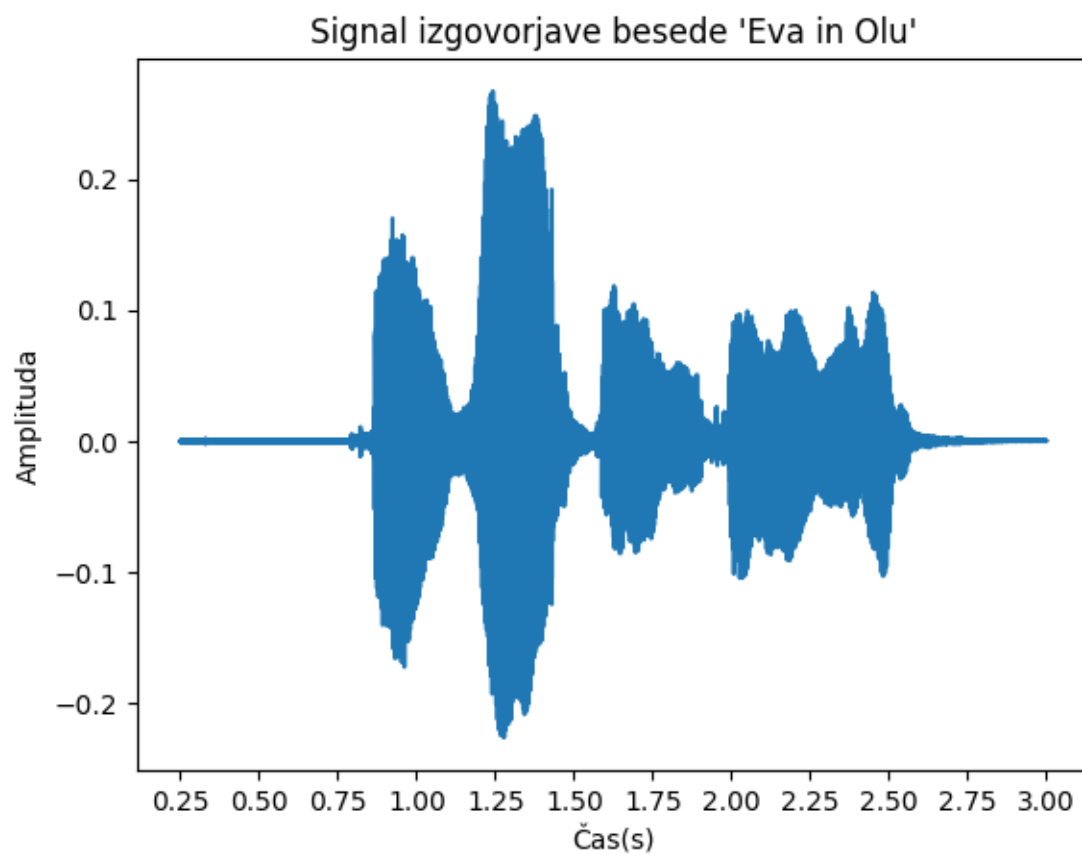
```
[77]: #snemi
      # record("eva_in_olu.wav")

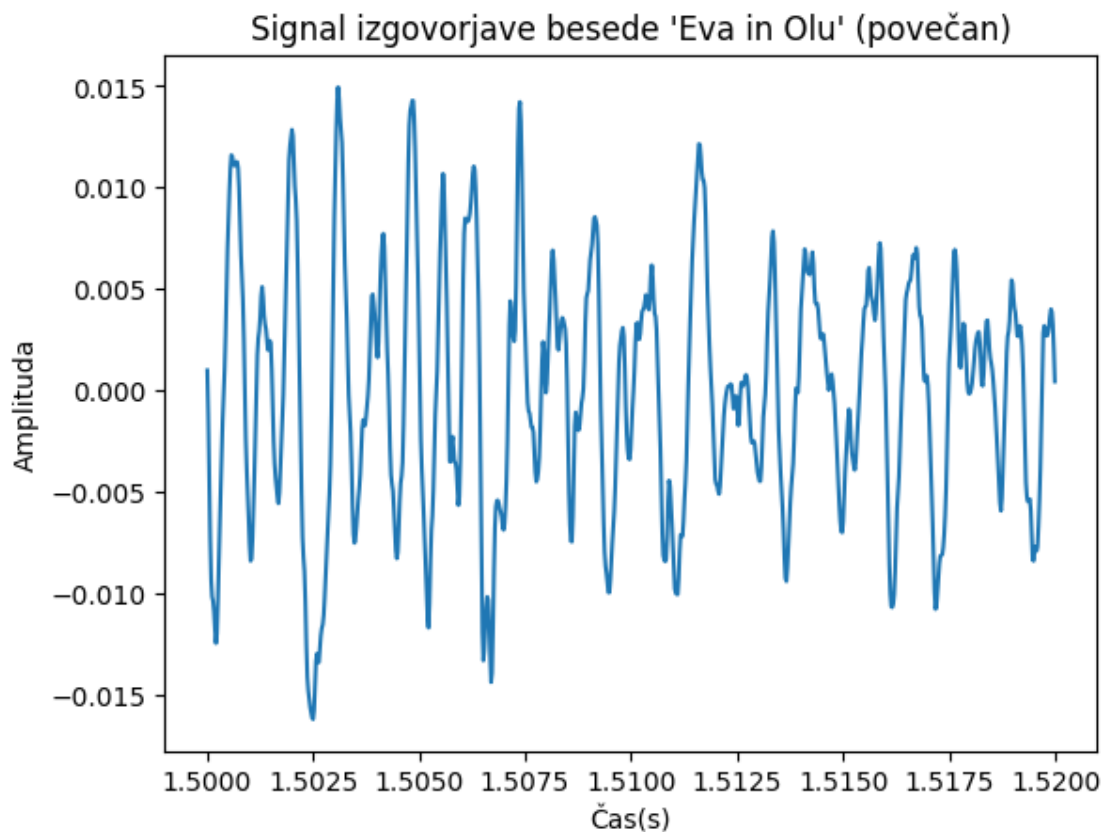
      #preberi iz datoteke
      data, _ = sf.read("eva_in_olu.wav")

      #predvajaj
      sd.play(data, fs)
      status = sd.wait()

      #izriši
      graph_signal(data, "Signal izgovorjave besede 'Eva in Olu'")

      #tudi tu lahko razlikujemo med samoglasniki ter soglasniki in presledki med
      ↪ besedami
```



```
[78]: e_start_index = 0
e_end_index = 0
a_start_index = 0
a_end_index = 0
i_start_index = 0
i_end_index = 0
o_start_index = 0
o_end_index = 0

for i in range(0, len(time)):
    if time[i] >= 0.9 and e_start_index == 0:
        e_start_index = i
    elif time[i] >= 0.92 and e_end_index == 0:
        e_end_index = i
    elif time[i] >= 1.25 and a_start_index == 0:
        a_start_index = i
    elif time[i] >= 1.27 and a_end_index == 0:
        a_end_index = i
    elif time[i] >= 1.68 and i_start_index == 0:
        i_start_index = i
```

```

elif time[i] >= 1.7 and i_end_index == 0:
    i_end_index = i
elif time[i] >= 2.05 and o_start_index == 0:
    o_start_index = i
elif time[i] >= 2.07 and o_end_index == 0:
    o_end_index = i
    break

#izris 'e' iz signala v intervalu [0,9, 0,92]

plt.figure(1)

plt.title("Izgovorjava 'e' v besedi 'Eva in Olu'")
plt.xlabel("Čas(s)")
plt.ylabel("Amplituda")

plt.plot(time[e_start_index:e_end_index], data[e_start_index:e_end_index])

plt.show()

#izris 'a' iz signala v intervalu [1.25, 1.27]

plt.figure(2)

plt.title("Izgovorjava 'a' v besedi 'Eva in Olu'")
plt.xlabel("Čas(s)")
plt.ylabel("Amplituda")

plt.plot(time[a_start_index:a_end_index], data[a_start_index:a_end_index])

plt.show()

#izris 'i' iz signala v intervalu [1.68, 1.7]

plt.figure(3)

plt.title("Izgovorjava 'i' v besedi 'Eva in Olu'")
plt.xlabel("Čas(s)")
plt.ylabel("Amplituda")

plt.plot(time[i_start_index:i_end_index], data[i_start_index:i_end_index])

plt.show()

#izris 'o' iz signala v intervalu [2.05, 2.07]

plt.figure(4)

```

```
plt.title("Izgovorjava 'o' v besedi 'Eva in Olu'")
plt.xlabel("Čas(s)")
plt.ylabel("Amplituda")

plt.plot(time[o_start_index:o_end_index], data[o_start_index:o_end_index])

plt.show()
```

