

Maker Lab

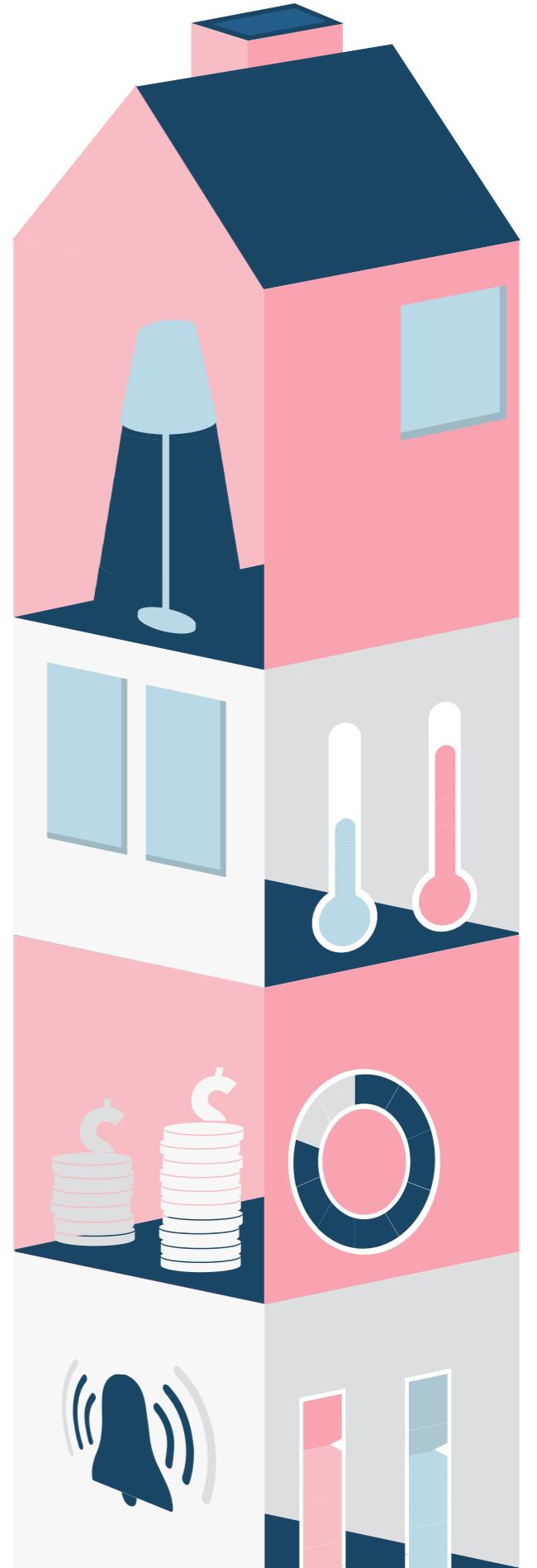
Audio and Speech

Mehdi Rizvi

Faculty of Computer Science

Free U. of Bozen-Bolzano

www.inf.unibz.it/~gennari/makerlab.html



Let's start with

audio and pygame

NB: All audio files used in this lecture are available here:
<https://www.dropbox.com/s/dr4ikxf0yxhnki/audioFiles.zip?dl=0>

pygame mixer

```
from pygame import mixer  
  
mixer.init()  
mixer.music.load('foo.mp3')  
mixer.music.play() #to play once, same as mixer.music.play(0)
```

PLAYING AUDIO: REFERENCE POINT

Using pygame.mixer

You can use a number of python libraries to play audio files. We will use pygame library which comes pre-installed in RPi and is also available in LinuxLab/VMware.

pygame mixer

```
from pygame import mixer  
  
mixer.init()  
mixer.music.load('foo.mp3')  
mixer.music.play(3) #to play 4 times
```

```
from pygame import mixer  
  
mixer.init()  
mixer.music.load('foo.mp3')  
mixer.music.play(-1) #playing forever
```

Playing audio a number of times..

You can choose how many times you want to play the file, e.g., 4 times as above.

You can also play it forever, as above.

pygame mixer

```
from pygame import mixer  
  
mixer.init()  
mixer.music.load('foo.mp3')  
mixer.music.play()  
mixer.music.load('bar.mp3')  
mixer.music.play()
```

Making sure the full audio file plays

Try out the above code. What happens?

Mu 1.0.3 - slides_gtts_play.py



slides_gtts_play.py

```
1 from pygame import mixer
2
3 #Making sure the full audio file plays
4 mixer.init()
5 mixer.music.load('foo.mp3')    #this file says: hello hello hello hello hello
6 mixer.music.play()
7 mixer.music.load('bar.mp3')    #this files says: ciao a tutti
8 mixer.music.play()
9
```

Python

Terminal

Mu 1.0.3 - slides_gtts...

<https://www.dropbox.com/s/6gzwd9edtpocchw/playmeall.mov?dl=0>

pygame mixer

```
from pygame import mixer

mixer.init()
mixer.music.load('foo.mp3')
mixer.music.play()
while mixer.music.get_busy()==True:
    pass
mixer.music.load('bar.mp3')
mixer.music.play()
```

Making sure the full audio file plays

If you have two subsequent audio files, say first 'foo.mp3' and 'bar.mp3', the latter will stop playing as soon as the former starts, unless you specify that you want to wait while the mixer is busy playing.

See above how to do it.

pygame mixer

```
from pygame import mixer  
from time import sleep  
  
mixer.init()  
mixer.music.load('foo.mp3')  
mixer.music.play()  
sleep(1)  
mixer.music.stop() #stops all audio
```

Stopping

At times, you might want to stop audio based on some event. See above how to do it.

This will not wait for audio files to finish, but it will stop it right away

pygame mixer

```
from pygame import mixer

mixer.init()
mixer.music.load('foo.mp3')
mixer.music.set_volume(0.5) #50% of maximum volume.
mixer.music.play()
```

Changing volume

At times, you want to change the volume. For this use `set_volume(val)`. See above.

You can change this volume even while an audio file is still playing, like on a `keyboardInterrupt` or a `SenseHat` key press event etc.

Let's continue with

text-to-speech and gTTS

gTTS

```
from gtts import gTTS  
  
tts1=gTTS(text='hello world')  
tts1.save('english.mp3')
```

TEXT-TO-SPEECH: REFERENCE POINT

For mapping text to speech, we will be using **gTTS (Google Text-to-Speech)**.

gTTS is a Python library which interfaces with the online **Google-translate text-to-speech API**, generating audio files of text.

```
from gtts import gTTS
from pygame import mixer

tts1=gTTS(text='hello world')
tts1.save('english.mp3')

mixer.init()
mixer.music.load('english.mp3')
mixer.music.play()
while mixer.music.get_busy()==True:
    pass
```

Playing the converted speech

gTTS will only generate an mp3 audio file for the given text.

You need a python library to play this file and we will use the pygame library.

```
from gtts import gTTS
from pygame import mixer

tts1=gTTS(text='hello world', lang='en')
tts1.save('english.mp3')

tts2=gTTS(text='ciao a tutti', lang='it')
tts2.save('italiano.mp3')

tts3=gTTS(text='salam', lang='ur')
tts3.save('urdu.mp3')

mixer.init()
for eachFile in ['english.mp3','italiano.mp3','urdu.mp3']:
    mixer.music.load(eachFile)
    mixer.music.play()
    while mixer.music.get_busy()==True:
        pass
```

Choosing language

There are 60+ languages supported. You will need to specify which language you want to use. See above.

For the full list type **gtts-cli --all** on a terminal window.

```
from gtts import gTTS
from pygame import mixer

tts1=gTTS(text='what is your name?', lang='en')#default, same as 'en-gb'
tts1.save('english.mp3')

tts2=gTTS(text='what is your name?', lang='en-us') #american
tts2.save('english2.mp3')

tts3=gTTS(text='what is your name?', lang='it')#mismatched text and lang
tts3.save('italianish.mp3')

mixer.init()
for eachFile in ['english.mp3','english2.mp3','italiano.mp3']:
    mixer.music.load(eachFile)
    mixer.music.play()
    while mixer.music.get_busy()==True:
        pass
```

Changing Language Accents

Some languages have different regional accents supported. You can also play with accents by generating speech from text mismatched with languages, e.g., English text but Italian as language. It's not perfect, but it's fun.

Mu 1.0.3 - slides_gtts_accent.py



slides_gtts_accent.py

```
2 from pygame import mixer
3 from time import sleep
4
5 tts1=gTTS(text='what is your name?', lang='en')
6 tts1.save('english.mp3')
7
8 tts2=gTTS(text='what is your name?', lang='en-us')
9 tts2.save('english2.mp3')
10
11 tts3=gTTS(text='what is your name?', lang='it')
12 tts3.save('italianish.mp3')
13
14 mixer.init()
15 for eachFile in ['english.mp3','english2.mp3','italiano.mp3']:
16     mixer.music.load(eachFile)
17     mixer.music.play()
18     while mixer.music.get_busy()==True:
19         pass
20         sleep(2)
21
22
```

Python

Terminal

Mu 1.0.3 - slides_gtts...

<https://www.dropbox.com/s/y2kjxw3mrkitsao/accents.mov?dl=0>

```
from gtts import gTTS
from pygame import mixer

tts=gTTS(text='hello world',lang='en',slow='True')
tts.save('english_slow.mp3')

mixer.init()
mixer.music.load('english_slow.mp3')
mixer.music.play()
while mixer.music.get_busy()==True:
    pass
```

Changing the Speed of Speech

If required, the generated speech can be spoken slower. For this, the parameter **slow** has to be set to **True**. There are no further options/variations.

```
from gtts import gTTS
from pygame import mixer

def playAudioFile(filename):
    mixer.init()
    mixer.music.load(filename)
    mixer.music.play()
    while mixer.music.get_busy()==True:
        pass

def text2speech(lang,text):
    filename='audio.mp3'
    tts=gTTS(text=text, lang=lang)
    tts.save(filename)
    playAudioFile(filename)

lang='en'
text="what is your name?"
text2speech(lang,text)
```

It's always better to create function out of the chunks of code which you are expected to use again and again.

```
from gtts import gTTS
from pygame import mixer
import os

def playAudioFile(filename):
    mixer.init()
    mixer.music.load(filename)
    mixer.music.play()
    while mixer.music.get_busy()==True:
        pass

def text2speech(lang,text):
    filename='audio.mp3'
    tts=gTTS(text=text, lang=lang)
    tts.save(filename)
    playAudioFile(filename)
    os.remove(filename)#this deletes the audiofile to save space.

lang='en'
text="what is your name?"
text2speech(lang,text)
```

Deleting audio files after playing

Generating audio files on-the-go with gTTS will take up too much space on a RaspberryPi over time. It's better to delete these files after playing.

```
from gtts import gTTS
from pygame import mixer
import os
from sense_emu import SenseHat
from math import ceil
def playAudioFile(filename):
    mixer.init()
    mixer.music.load(filename)
    mixer.music.play()
    while mixer.music.get_busy()==True:
        pass

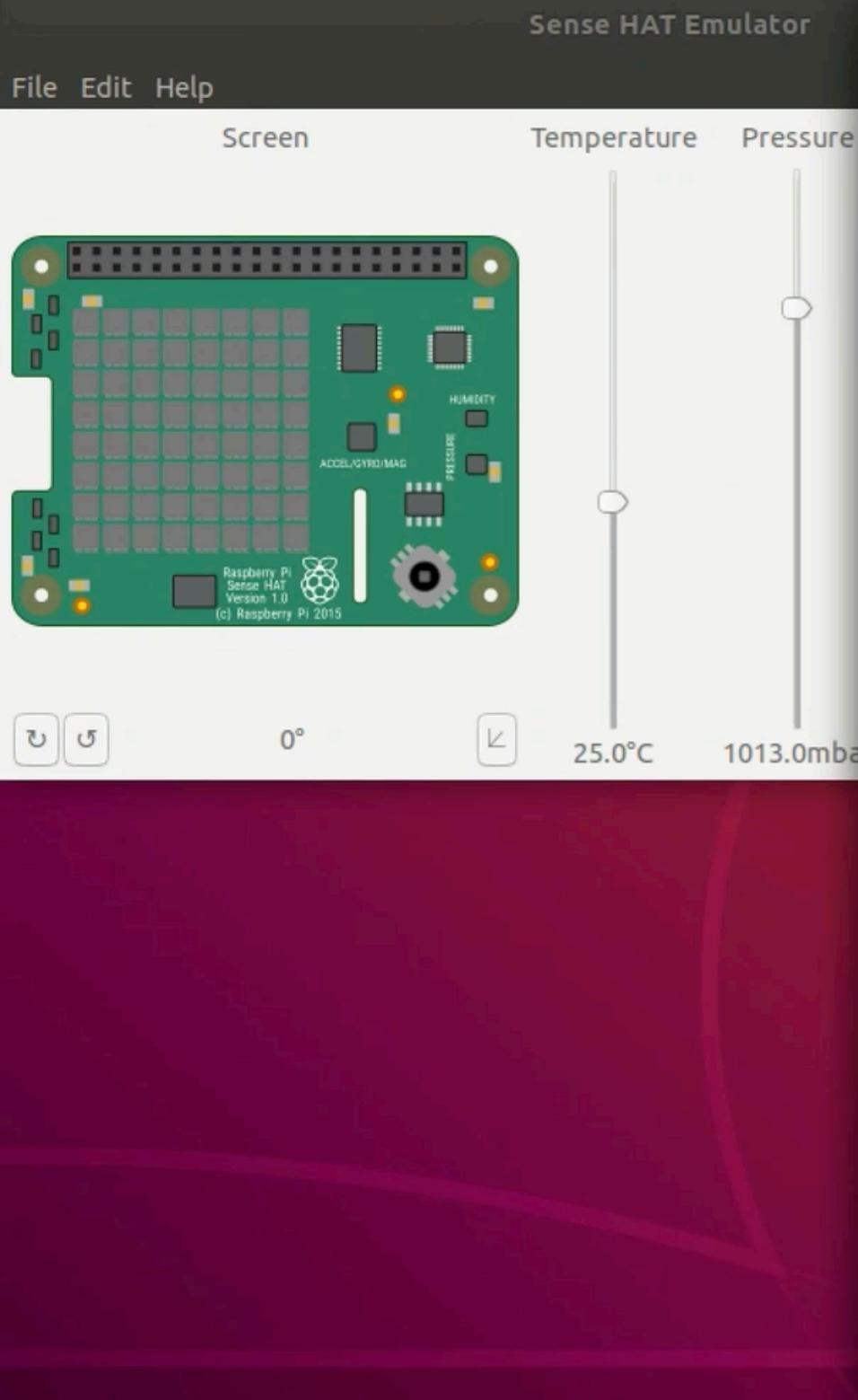
def text2speech(lang,text):
    filename='audio.mp3'
    tts=gTTS(text=text, lang=lang)
    tts.save(filename)
    playAudioFile(filename)
    os.remove(filename)

sense = SenseHat()
temp = sense.get_temperature()

lang='en'
text='temperature is around'+ str(ceil(temp)) + ' degrees celcius'
text2speech(lang,text)
```

Meshing up with SenseHat's sensors

What is the above code doing?



Mu 1.0.3 - alt_gtts_readTemperature.py

```
1 #from sense_hat import SenseHat
2 from sense_emu import SenseHat
3 import os
4 from gtts import gTTS
5 from pygame import mixer
6 from math import ceil
7
8
9 def playAudioFile(filename):
10     mixer.init()
11     mixer.music.load(filename)
12     mixer.music.play()
13     while mixer.music.get_busy()==True:
14         pass
15
16
17 def text2speech(lang,text):
18     filename=lang+text.replace(" ", "_")+".mp3
```

Python

Terminal

Mu 1.0.3 - alt_gtts_re...

Sense HAT Emulator

Mashup Project

An Example

Mashup Project (Example)

Create your own **COVID-19 Audio Alert**.

Get data from <https://www.worldometers.info/coronavirus/country/italy/> using beautifulsoup (bs4). The code, when run, should speak out loud the latest statistics of COVID-19 in Italy.

Optional: Use SenseHat joystick to get information about Italy's neighbouring countries.

```
from bs4 import BeautifulSoup
import requests

#'https://www.worldometers.info/coronavirus/country/italy/'
countryname='Italy'
url='https://www.worldometers.info/coronavirus/country/' + countryname + '/'
request = requests.get(url)

# create a soup object by parsing html of request
soup = BeautifulSoup(request.content, 'html.parser')
allStats = soup.findAll("div", {"class": "maincounter-number"})
```

Recap: Using bs4 to scrape the exact data we want

How do i know which div-class to look for, using bs4?

Italy Coronavirus: 219,070 Cases

worldometers.info/coronavirus/country/italy/

worldometer Coronavirus Population

Ads by Google

Report this ad Why this ad? ▶

WORLD / COUNTRIES / ITALY

Last updated: May 11, 2020, 11:35 GMT

 Italy

Coronavirus Cases:
219,070

Deaths:
30,560

<https://www.dropbox.com/s/k40gnai4oe7jtn/inspectElement.mov?dl=0>

```
from bs4 import BeautifulSoup
import requests
from time import sleep
from pygame import mixer
from gtts import gTTS
import os

def playAudioFile(filename):
    mixer.init()
    mixer.music.load(filename)
    mixer.music.play()
    while mixer.music.get_busy()==True:
        pass

def text2speech(lang,text):
    filename='audio.mp3'
    tts=gTTS(text=text, lang=lang)
    tts.save(filename)
    playAudioFile(filename)
    os.remove(filename)#deletes the audiofile to save space.

#the code continues on next slide...
```

COVID-19 Audio Alert (1/2)

```
#...the code continues from the previous slide

countryname='Italy'
url='https://www.worldometers.info/coronavirus/country/' +countryname+ '/'
request = requests.get(url)

# create a soup object by parsing html of request
soup = BeautifulSoup(request.content, 'html.parser')
allStats = soup.findAll("div", {"class": "maincounter-number"})

stats=[ ]

for eachstat in allStats:
    stats.append(eachstat.text)
    #print(eachstat.text.replace(',', ''))

text= 'Covid-19 report for ' +countryname + '. Total cases: '+ (stats[0]) +
'. Total Deaths: '+ (stats[1]) + '. Total Recovered: '+ str(stats[2])

lang='en'
text2speech(lang,text)
```

COVID-19 Audio Alert (2/2)

The image shows a Mac desktop with two open windows. The top window is a web browser displaying the COVID-19 statistics for Italy on worldometers.info. The bottom window is a Python code editor titled "Mu 1.0.3 - meshup_CovidAlert.py".

Worldometers.info (Top Window):

- WORLD / COUNTRIES / ITALY**
- Last updated: May 11, 2020, 23:34 GMT
- Italy** (represented by the Italian flag)
- Coronavirus Cases:** **219,814**
- Deaths:** **30,739**
- Recovered:** **106,587**

Mu 1.0.3 - meshup_CovidAlert.py (Bottom Window):

```
1 from bs4 import BeautifulSoup
2 import requests
3 from time import sleep
4 from pygame import mixer
5 from gtts import gTTS
6 import os
7
8
9 def playAudioFile(filename):
10     mixer.init()
11     mixer.music.load(filename)
12     mixer.music.play()
```

https://www.dropbox.com/s/8dkp2kwugxabl1f/covidAlert_simple.mov?dl=0

Let's move to

references

SUMMARY

Sounds with pygame

Text-to-speech with gTTS

Example Project: COVID-19 Audio Alert

REFERENCES

pygame mixer: <https://nerdparadise.com/programming/pygame/part3>

gTTS: <https://gtts.readthedocs.io/en/latest/module.html#examples>