Chapter 5
Audio

A smartphone or tablet can double as a portable music player. It can play music held as MP3 files on the device. It can play audio streamed over the internet, it can record sound using its microphone … and more.

5.1 Music

Music files can be copied onto your device by a variety of means. Music can also be purchased and downloaded onto your device from a variety of on-line services. The supported formats for music files are listed in Table 5-1. If your file is in another format, there are programs available to convert it to a supported format. The names used in the 'container' column of the table are likely to be the same as the filename extensions used in the filenames on the computer (e.g. "track1.mp3"), but this is not guaranteed to be the case.

Table 5-1: Supported music formats

Codec	Container	Notes
AAC	M4A	Only unprotected (DRM-free) files are supported
MP3	MP3	Layer III of MPEG-1 to be precise
WMA	WMA	Zune converts lossless WMA to another format

The TouchDevelop API provides the media resource. However due to

security restrictions, many methods of this resource are available only for use on the Windows Phone and on Android devices. On other devices, it is not possible to access song albums or the entire collection of songs held on the device.

On the Windows phone and Android devices, the media resource has methods for retrieving collections of all the songs, all the song albums, and all the playlists held on the phone. TouchDevelop does not provide any mechanism for changing any of these three collections. They are *immutable*. It is therefore impossible for a mistake in a TouchDevelop script to cause any music file on the phone to be accidentally deleted. The three media methods are listed in Table 5-2.

Table 5-2: Accessing media resources (WP8 and Android only)

Method	Description
media→songs : Songs	Gets a collection of all the songs on the phone
media→song albums : Song Albums	Gets a collection of all the song albums on the phone
media→playlists : Playlists	Gets a collection of all the playlists on the phone

5.1.1 Working with collections of songs

Although the TouchDevelop documentation and this book use the words 'music' and 'song', the API calls are of course not restricted to working with music. They will work equally well with recordings made in any of the audio formats listed in Table 5-1.

Note that the TouchDevelop API also provides methods for working with audio recordings in the WAV format but these recordings are not usually used for music, they are short in duration, and they are represented in the TouchDevelop API by the Sound datatype. The Sound type is covered later in this chapter.

The methods for using songs, song albums, and playlists are listed in Table 5-3. The is invalid and post to wall methods (available for all datatypes) are omitted from the table.

Table 5-3: Using songs and song albums (WP8 and Android only)

Method of Playlist Datatype	Description
duration : Number	Returns total duration of all songs in the playlist in seconds
name : String	Returns name of the playlist
play : Nothing	Plays all the songs in the playlist
songs : Songs	Gets all the songs in the playlist as a collection
Method of Song Album	**Description**
art : Picture	Gets the album cover art
artist : String	Gets the album artist's name
duration : Number	Gets the total duration of all songs on the album in seconds
genre : String	Gets the music genre
has art : Boolean	Returns true if cover art is available
name : String	Returns the name of the album
play : Nothing	Plays all the songs on the album
songs : Songs	Returns a collection of all songs on the album
thumbnail : Picture	Gets a thumbnail picture of the cover art
album : Song Album	Gets the album in which the song appears
artist : String	Gets the song artist's name
duration : Number	Gets the song duration in seconds
genre : String	Gets the song's music genre
name : String	Gets the name of the song
play : Nothing	Plays the song
play count : Number	Gets the number of times song has been played
Method of Song Datatype	**Description**
protected : Boolean	Returns true if the song is DRM protected
rating : Number	Gets a rating set by the user; -1 if not rated
track: Number	Gets the track number of song on the album

TouchDevelop also provides one event related to songs. This is the active song changed event which is triggered at the moments that its name suggests. For example, an album or a playlist may be in the process of being played, and the event will be triggered whenever the phone advances to the next song in the list.

5.1.2 Obtaining an individual song, available on all devices

It is possible to import an individual music track into a TouchDevelop script, no matter which platform the script is running on.

One possibility is to download a music file from the web. The action

```
var song := web → download song(url)
```

will load the music into the variable song (with type Song), where url is a string giving a URL for the location of the file.

Alternatively, the script can open a choose file dialog where the user can navigate to the music file on their computer or tablet. The usage is as below.

```
var song := media → choose song
```

5.1.3 Playing an individual song

The play method of the Song, Song Album or Playlist types will start a song or a sequence of songs playing on the phone. For example:

```
song → play
```

More precise control over the playing of songs is provided by the player resource in the API. The methods directly related to playing songs are listed in Table 5-4.

Table 5-4: Methods of player resource for songs

Method of player resource	Description
player→active song: Song	Gets the current song, if any
player→is muted : Boolean	Reports whether the player is muted
player→is paused : Boolean	Reports whether current song is paused
player→is playing : Boolean	Reports whether a song is playing
player→is repeating : Boolean	Reports whether song is in repeat mode
player→is shuffled : Boolean	Reports whether the songs are shuffled
player→is stopped : Boolean	Reports if the player is stopped
player→next : Nothing	Stops current song and advances to next one in the queue waiting to be played
player→pause : Nothing	Pauses the current song

player→play(song : Song): Nothing	Adds a song to the queue of songs
player→play many(songs : Songs) : Nothing	Adds all songs in the collection to the queue
player→play position : Number	Gets the position in seconds within the current song
player→previous : Nothing	Stops current song and goes back to the previous one
player→resume : Nothing	Resumes a paused song
player→set repeating(repeating : Boolean) : Nothing	Sets the repeating mode for the current song
player→set shuffled(shuffled : Boolean) : Nothing	Sets shuffling on or off for songs in the queue
player→set sound volume(x : Number) : Nothing	Sets the sound volume: 0.0 is silent, 1.0 is the volume when TouchDevelop started
player→sound volume : Number	Gets the sound volume in the same 0 to 1 scale
player→stop : Nothing	Stops playing a song
player→volume : Number	Gets player volume, from 0.0 (silence) to 1.0 (full volume).

When an album or a playlist is sent to the player, the player creates a queue of songs to be played. The songs will by default be played in the order that they appear in the album or playlist. However a random order will be used if shuffle is selected. Requesting a new song to be played before the current song is finished causes the current song to be terminated and the queue to be cleared (if it is not empty) before the new song starts.

Playing songs occurs in the background. This means that the player is performing its task while the device and, perhaps, the TouchDevelop script is doing other things. When a song or collection of songs is given to the player, the player remembers what it has to play and starts playing. Control is returned to the script for it to carry on executing statements while the music is playing.

The playing volume ranges from 0.0 to 1.0. The value of 1.0 does not correspond to the maximum volume which the device is capable of. The value is relative to the volume of the player as set externally to the TouchDevelop script. A script cannot play songs louder than the device's current setting, but it can play at a quieter level by using a value less than 1.0

for the volume.

5.1.4 An example script

There are many example programs on the TouchDevelop website which select and play music. One sample program for the Windows Phone and Android platforms is reproduced below in Figure 5-1. It uses several features provided by the API.

There is one feature of this script that is not obvious when reading it. When it is run, it will display information about each song on the phone which has never been previously played. If the user scrolls through the list of displayed songs and taps one, it will immediately start playing.

Figure 5-1: The 'new songs' script (WP8 and Android only)

```
action main( )
  // Finds songs not played yet.
  var found := 0
  var songs := media→♬songs
  for each song in songs where true
  do
     found := found + ▷display song(song)
  ("Songs played with this script: " ‖ ◳played) → post to wall
  ("Songs never played: " ‖ found) → post to wall

action display song(song : Song) returns result : Number
  // Post a song to the wall if not played yet and returns 1;
  // otherwise returns 0.
  if song → play count = 0 then
     song → post to wall
     result := 1
  else
     result := 0

event active song changed
  // Increment the song played counter.
  ◳played := ◳played + 1

event shake
  // Pauses and resumes playing.
  if player → is playing then
      player → pause
  else
      player → resume
```

5.2 Sounds

The Sound datatype is used for audio recordings in the WAV format. This format is commonly used for uncompressed audio and therefore the files tend to be large. This format should therefore be used only for short sound clips (say 30 seconds or less), such as ring tones, sound effects or warning

noises to be played by your script. For longer pieces, the Song datatype and therefore a compressed sound format should be used, if possible.

The Sound datatype provides many methods for playing the sound clip and altering its properties when played. These are summarized in Table 5-5.

Panning refers to the ability to choose whether the sound should be played wholly through the left earpiece or wholly through the right earpiece or through both together in some proportion. The pan value ranges from -1.0 for fully left to 0.0 for center (i.e. both sides equally) to 1.0 for fully right.

Table 5-5: Methods of Sound datatype

Method of Sounds	Description
duration : Number	Returns the sound clip's duration in seconds
pan : Number	Gets the pan setting: from -1 for full left to +1 for right
play : Nothing	Plays the sound clip
play special(volume : Number, pitch : Number, pan : Number) : Nothing	Plays the sound clip with values supplied for the panning, pitch and volume
pitch : Number	Gets the pitch adjustment from -1 to +1
set pan(pan : Number) : Nothing	Sets the pan setting: from -1 for full left to +1 for right
set pitch(pitch : Number) : Nothing	Sets the pitch adjustment from -1 to +1
set volume(v : Number) : Nothing	Sets the volume from 0 (silent) to +1 (full volume)
volume : Number	Gets the volume, in range 0 (silent) to +1 (full volume)

The pitch adjustment ranges from -1.0 to 1.0. If -1.0 is selected, the playback speed is slowed down so that the pitch is lowered by one octave. The midpoint value 0.0 plays the sound clip at normal speed. The top value of 1.0 causes playback to speeded up so that the pitch is raised by one octave.

As with playing Song values, the volume is a value ranging from 0.0 to 1.0 where 1.0 is the current volume setting for the speakers as set externally of the TouchDevelop script. The script can play sounds at a quieter level than

this setting but it cannot play them louder.

5.3 Microphone

Most devices have a microphone. However, the microphone cannot be accessed from a program running in a browser on a PC, Mac or Linux platform. It can be accessed on the Windows phone and the ability to access it will be supported on iPad, iPhone, iPod Touch and Android platforms in the near future.

The TouchDevelop API provides a method for activating the microphone and making a recording.

```
var snd := senses → record microphone
// snd has the datatype Sound
```

When the above statement is executed in a script, the word “Recording…” and a stop button are displayed on the screen. Simultaneously, the microphone begins recording. When the user taps the stop button, recording stops and an instance of the Sound datatype is returned.

As noted earlier, a Sound value uses the WAV audio format and is not compressed. Therefore the microphone should not be used for long recordings.