Mobile Speech Recognizer

by Piotr Zmudzinski

ptr.zmudzinski@gmail.com

About

Wouldn't your prefer to let your users speak instead of making them type?

This plugin uses OS components for speech recognition and send it to your Unity scripts as *String* objects.

Plugin supports:
- **Android >= 3.0 (haven't tested below, it might work though…),**
- **iOS >= 10.0.**

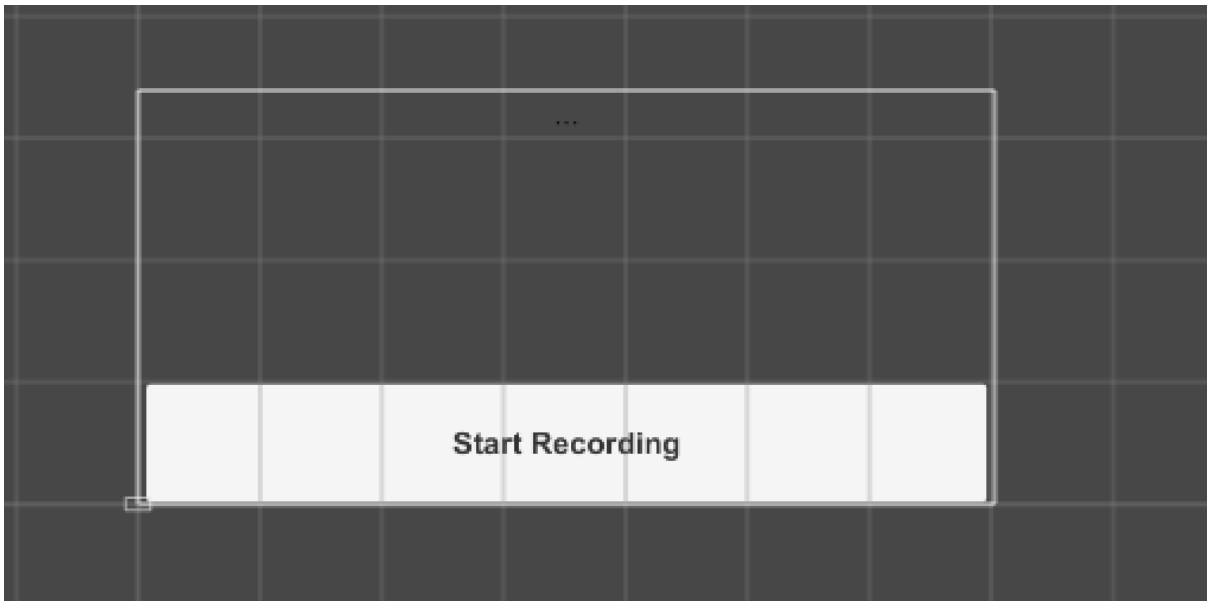
That doesn't mean you can't target iOS lower than 10 - you simply have to prepare fallback code to cover cases when user doesn't have access to speech recognition (*SpeechRecognizer.EngineExists()* for the help!). Keep in mind that both iOS and Android might use Internet connection for speech detection, which means it might fail in case there's no active connection.

Plugin doesn't work in Editor!
You have to run your app on real iOS or Android device.

Quick Start

Open example scene

Go to *KKSpeechRecognizer/Example* folder inside Unity and open *ExampleScene*:



It shows basic usage of a plugin, which is:

1. Detecting if speech recognition exists on user's device (keep in mind that it won't be available on e.g. iOS 9 or old Android phones),
2. If it exists, and user clicks on "Start Recording" button it listens for recognized text and displays it on a screen,
3. On Android, speech recognition automatically detects when user finishes speaking, but on iOS we have to wait for user clicking "Stop Recording" to finish whole process (i.e. get final results).

Before running it on Android or iOS device you have to…

Setup permissions

iOS

After generating Xcode project (keep in mind that you have to use Xcode 8 or higher) you have to add two permissions keys to your project:

NSMicrophoneUsageDescription

explanation from Apple docs:

> *This key lets you describe the reason your app accesses any of the the device's microphones. When the system prompts the user to allow access, this string is displayed as part of the alert.*

NSSpeechRecognitionUsageDescription

explanation from Apple docs:

> *This key lets you describe the reason your app sends user data to Apple's speech recognition servers. When the system prompts the user to allow access, this string is displayed as part of the alert.*

You can do it in two ways:

- Automatic (default and recommended)

Open *KKSetSpeechRecognitionPermissionsoniOS* script from *Editor/KKspeechRecognizer* folder inside your project. Change values of those texts:

```
public static string microphoneUsageDescription = "Put something here about microphone usage";
public static string speechRecognitionUsageDescription = "Put something here about speech recognition usage";
```

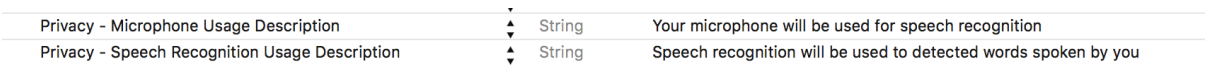
Generate your Xcode project. Your are ready.

- Manually

Disable *KKSetSpeechRecognitionPermissionsoniOS* script by either removing it or setting *shouldRun* variable to false.

After generating your Xcode project open *Info.plist* file and right-click on it and click *"Add row"*. Then enter two required two keys with descriptions.

In the end it should look like it:



Android

You must add those two permissions to your AndroidManifest.xml:

```
<uses-permission android:name="android.permission.RECORD_AUDIO" />
<uses-permission android:name="android.permission.INTERNET" />
```

If you don't know how to do that check that link: http://answers.unity3d.com/questions/525838/help-about-adding-permissions-on-android.html

In addition:

> *If the device is running Android 6.0 (API level 23) or higher, and the app's `targetSdkVersion` is 23 or higher, the user isn't notified of any app permissions at install time. Your app must ask the user to grant the dangerous permissions at runtime.*

This can be achieved with Unity API, like here:

```
private void Start()
{
  #if PLATFORM_ANDROID
  if (!Permission.HasUserAuthorizedPermission(Permission.Microphone))
  {
    Permission.RequestUserPermission(Permission.Microphone);
  }
  #endif
}
```

Android 11 permission

Starting from Android 11 you need add those lines to your *AndroidManifest*

```
<queries>
    <intent>
        <action android:name="android.speech.RecognitionService" />
    </intent>
</queries>
```

More info in this StackOverflow question:
https://stackoverflow.com/questions/64319117/speechrecognizer-not-available-when-targeting-android-11

Now you are ready to play with the app. Press Build&Run and…

Play with speech recognition app

Click on *“Start Recording”* button and start talking. You should see live results in text above. Notice that on Android it automatically detects when you stop talking, but it rely on user when it comes to iOS.

You can start looking at *RecordingCanvas* script which covers all functionality, but if you need more details take a look at **API Overview** chapter below.

You can also take a look at *SetLanguage* scene, which shows a way of getting list of supported languages and overwriting default detection language.

API Overview

Plugin consists of two main classes:

- *SpeechRecognizer* which lets you start/stop recording and return availability/ permissions informations,
- *SpeechRecognizerListener* which sends you callback methods when speech has been detected or any error occur.

Both of them are under *KKSpeech* namespace so remember to put

```
using KKSpeech;
```

in your scripts.

Check *RecordingCanvas* script for example usage.

SpeechRecognizer

Basic usage:

```
if (SpeechRecognizer.IsRecording()) {
        SpeechRecognizer.StopIfRecording();
} else {
        SpeechRecognizer.StartRecording(true);
}
```

static bool ExistsOnDevice()

Returns *true* if speech recognition service exists on device.

!!! **You should call it before using other *SpeechRecognizer* methods and prepare your UI in case recognition system is missing. !!!**

static void RequestAccess()

This method should be used together with *onAuthorizationStatusFetched* event from *SpeechRecognizerListener*.

Behaviour differs on each platforms:

- iOS

It will show OS dialog asking user for permission to execute speech recognition (it will happen for first-time call only). Result will be returned in *onAuthorizationStatusFetched*. You should prepare yourself that user won't allow engine to run.

- **Android**

It calls Unity's *Permission.RequestUserPermission* which will prompt user with microphone permission dialog.

Possible returned values (in *onAuthorizationStatusFetched* event):

```
public enum AuthorizationStatus {
        Authorized,
        Denied,
        NotDetermined,
        Restricted
}
```

- **Authorized** *[iOS&Android]*

on Android, it means that there's correct permission setting in manifest.
on iOS, as Apple docs say:

> *The user authorized your app's request to perform speech recognition.*

- **Denied** *[iOS&Android]*

on Android it means that there's **invalid** permission setting in your AndroidManifest.xml.
on iOS, as Apple docs say:

> *The user denied your app's request to perform speech recognition.*

- **NotDetermined** *[iOS only]*

from Apple docs:

> *The authorization status of your app's request to perform speech recognition is unknown.*

- **Restricted** *[iOS only]*

from Apple docs:

> *The device denies your app's request to perform speech recognition.*

static bool IsRecording()

Returns *true* if speech recognition engine is currently running.

static AuthorizationStatus GetAuthorizationStatus()

Returns current authorization status. Check *RequestAccess* description for possible returned values.

static void StopIfRecording()

Stops engine from recognition process if it's currently running. Keep in mind that on Android, engine automatically stops when user stop talking so it's mostly for iOS platform use.

static void StartRecording(bool shouldCollectionPartialResults)

Starts recognition process. Pass *true* if you want to collect partial results. In order to get results use *GotPartialResult* and *GotFinalResult* from *SpeechRecognizerListener*.

public static void GetSupportedLanguages()

Gives you an array of supported languages. In order to listen for a result register yourself to a *onSupportedLanguagesFetched* event from SpeechRecognizerListener (see details below).

public static void SetDetectionLanguage(string languageID)

By default, plugin uses language set in a device, but you can overwrite that setting by passing IETF language tag (as defined by BCP 47).

Examples:

- *"en-US"*,
- *"fr-CA"*

SpeechRecognizerListener

In order to get callbacks from Speech Recognition you have to drag&drop *KKSpeechRecognizerListener* prefab from *KKSpeechRecognizer/Prefabs.* **Keep in mind that you cannot change name of that GameObject!**

Later on, you can register yourself to callbacks, as here:

```
SpeechRecognizerListener listener =
GameObject.FindObjectOfType<SpeechRecognizerListener>();

listener.onAuthorizationStatusFetched.AddListener(OnAuthorizationStatusFetched);
listener.onAvailabilityChanged.AddListener(OnAvailabilityChange);
listener.onErrorDuringRecording.AddListener(OnError);
listener.onErrorOnStartRecording.AddListener(OnError);
listener.onFinalResults.AddListener(OnFinalResult);
listener.onPartialResults.AddListener(OnPartialResult);
listener.onEndOfSpeech.AddListener(OnEndOfSpeech);
```

Callbacks descriptions:

onAuthorizationStatusFetched(authorizationStatus)

Check *SpeechRecognizer.RequestAccess()*

onPartialResults(string)

If you passed true into *SpeechRecognizer.startRecording* method you will receive partial recognition results as a parameter.

onFinalResults(string)

You will get final recognition results as a parameter, although behaviour differs on each platform:

- iOS

It will be called after calling *SpeechRecognizer.stopIfRecording()*, as iOS engine doesn't automatically recognizer when user stops talking.

- Android

It will be called after *onEndOfSpeech*, as Android automatically recognise when user stops talking (i.e. after *onEndOfSpeech* callback).

onSupportedLanguagesFetched

You will get results for *SpeechRecognizer.GetSupportedLanguages()* call as an array parameter of *LanguageOption* structs, where each element consists of:

- id

BCP 47 language tag, such as *"en-US"*. You can use it inside *SpeechRecognizer.SetDetectionLanguage*.

- displayName

This is user-friendly representation of language tag, such as *"English (United States)"*. Usage is optional. Device's language will be used in a translation.

onAvailabilityChanged(bool) *[iOS only]*

from Apple docs:

> *availability of the speech recognizer has changed.*

It might mean that even that speech recognition engine exists on device, it became unavailable, e.g. because of network connection issues.

onErrorDuringRecording(string)

Engine failed during recording process. Explanation is passed as a parameter

onErrorOnStartRecording(string)

Engine failed before recording start. Explanation is passed as a parameter.

onEndOfSpeech() *[Android only]*

from Android docs:

> *Called after the user stops speaking.*

You should get final results after that.

Android Error Codes

On Android, in case of error you will receive error code in message which correspond to those values (e.g. *error code 7*):

CODE	MEANING
1	Network operation timed out.
2	Other network related errors.
3	Audio recording error.
4	Server sends error status.
5	Other client side errors.
6	No speech input.
7	No recognition result matched.
8	RecognitionService busy.
9	Insufficient permissions.

iOS Error Codes

In case of error on iOS you will get message with detailed information what went wrong, as here:

```
{
    NSUnderlyingError = "Error Domain=SiriCoreSiriConnectionErrorDomain Code=16
\"(null)\" UserInfo={NSUnderlyingError=0x170247200 {Error
Domain=NSPOSIXErrorDomain Code=50 \"Network is down\"
UserInfo={_kCFStreamErrorCodeKey=50, _kCFStreamErrorDomainKey=1}}}";
}
```

Automatic Xcode project configuration

Plugin automatically configures Xcode project in two steps:

- Sets permissions-keys for microphone and speech recognition usage in project's *Info.plist* file (explained in **Quick Start** chapter),
- Adds optional *Speech.framework* in *Link Binary With Libraries* tab.

In case any of those steps isn't working for you, simply remove according script file from *Editor/KKSpeechRecognizer* directory.

Future plans

~~Currently, plugin uses language which is set on device. I am planning to add API to use specific language (e.g. Spanish) in recognition process~~ **(added in 1.2)**. Suggestions appreciated!

Troubleshooting

Android mute issue

You might notice that your app doesn't play sounds after recognition finishes, which is caused by a bug from some specific versions, as mentioned here:

- http://answers.unity3d.com/questions/1165825/sounds-mute-in-unity-made-game-when-sound-from-any.html
- http://answers.unity3d.com/questions/1202987/android-app-sound-mute-at-time-of-notification-sou.html

I've noticed that issue on 5.3.5 but don't see it on 5.4.1. If you see it - simply update your Unity to something newer.

Contact

Do you meet issues while using this plugin?
Do you have suggestions how to improve API?
Feel free to contact me: ptr.zmudzinski@gmail.com