Developing a virtual assistant for answering music related questions

Claudio SCALZO   Luca LOMBARDO

v1.0.0

Contents

1 Introduction **2**
- 1.1 Why a virtual assistant? . . . 2
- 1.2 Scope of the project . . . 2
- 1.3 Expected results . . . 2

2 Natural Language Understanding **3**
- 2.1 What is NLU? . . . 3
- 2.2 How it works? . . . 3
- 2.3 Advanced techniques (Papers) . . . 3
- 2.4 State of art . . . 3

3 Dialogflow **4**
- 3.1 What is Dialogflow . . . 4
- 3.2 Why Dialogflow . . . 4
- 3.3 How it works? . . . 4

4 DOREMUS **5**
- 4.1 What is DOREMUS . . . 5
- 4.2 How is organized . . . 5
- 4.3 How to integrate it in our project . . . 5

5 The bot **6**
- 5.1 The architecture . . . 6
- 5.2 Intents . . . 7
  - 5.2.1 Retrieving a set of works . . . 8
  - 5.2.2 Finding some artists . . . 10
  - 5.2.3 Finding some future and past performances . . . 10
  - 5.2.4 Know more about an artist . . . 10
- 5.3 The flow . . . 10
- 5.4 The spell checker . . . 10

Chapter 1

Introduction

1.1 Why a virtual assistant?

1.2 Scope of the project

1.3 Expected results

Chapter 2

Natural Language Understanding

2.1 What is NLU?

2.2 How it works?

2.3 Advanced techniques (Papers)

2.4 State of art

Chapter 3

Dialogflow

3.1 What is Dialogflow

3.2 Why Dialogflow

3.3 How it works?

Chapter 4

DOREMUS

4.1 What is DOREMUS

4.2 How is organized

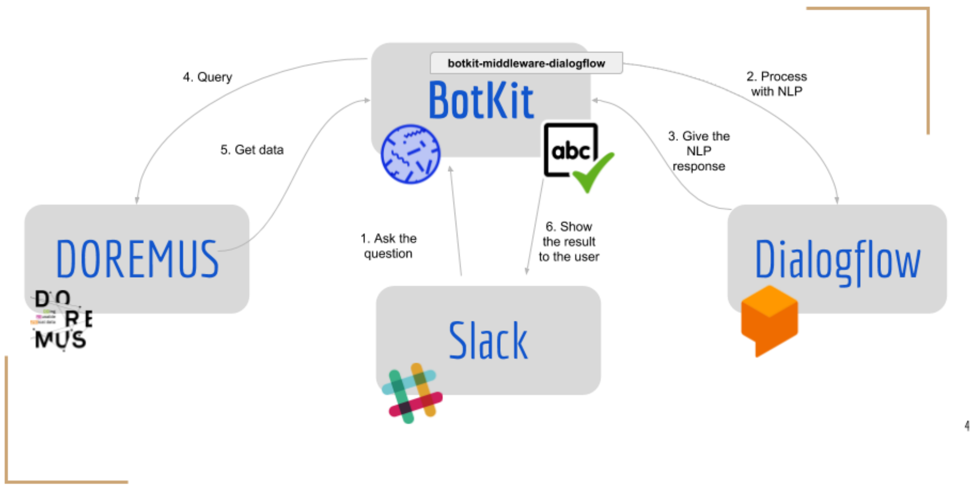
4.3 How to integrate it in our project

Chapter 5

The bot

5.1 The architecture

The architecture of the bot is divided in four categories:



First of all we can find the client, that in the case of our development, testing and validation process, has been *Slack*. Of course, it can be any of the clients which support the installation of the bot on it (*Telegram*, *Facebook Messenger*, etc.). The use of Slack let us to exploit the beautiful *Slack Cards*, to make the answers of our bot (works, artists, performances) prettier and easier to understand in a glance. A set of examples will be provided in the last chapter.

The second part of the architecture is represented by the NLP. In this case, as told in the previous chapter, we used *Dialogflow*, to exploit its advanced slot-filling techniques and its NLU power.

However, we didn't use *Dialogflow* on its own, exploiting the direct integration with *Slack*, but we used something that we placed in the middle of the two: *BotKit*. *BotKit* is a bot-making toolkit that aims to ease the building process of a bot, potentially exploiting different NLPs and/or different clients. In our case, *BotKit* has been deployed on a web server, and thanks to the *NodeJS* code we were able to come up with a series of features (like the spell checker) that would have been impossible to reach with a simple (direct) integration between *Slack* and *Dialogflow*. We'll talk more about that in the following paragraphs.

The last part of the architecture is of course represented by the data source: *DOREMUS*. We talked about that in the previous chapters, but from the architecture is important to notice how the knowledge base is queried: each query is dynamic, in the sense that according to the intent, the number of filters and the desired results wanted by the user, the query will have a different shape and a different content. The code in the web server is able to add different pieces of queries according to what *Dialogflow* is able to understand and to provide as output values of the API.

5.2 Intents

The intents are grouped in a simple and clear way, according to what the user wants to retrieve from the *DOREMUS* knowledge base:

- `works-by`
  Retrieves a set of works according to different filters (artists who composed the works, instruments used, music genre and/or year of composition).

- `find-artist`
  Finds a set of artists according to some filters (number of composed works, number of works of a given genre, etc.).

- `find-performance`
  Propose to the user a future performance (that can be filtered by city

and/or date period), or shows to the user the details of a past performance.

- `discover-artist`
  Shows a card with a summary of an artist, with its birth/death place and date, a picture and a little bio. After the card visualization, a set of works of the artist (connection with the `works-by` intent) can be asked.

Now we're going to go deeper in the intent descriptions.

5.2.1 Retrieving a set of works

The `works-by` intent is the most complex one in the entire bot's intents set. It can retrieve a certain number of works from 1 to L, where L is the number specified by the user if it's smaller than the number of available works. Otherwise, if it's greater, all the avilable works are returned. Its default value (if not specified by the user) is 5.

The filters can be various:

- **Artist:**
  the artist name (full or surname).
  "Give me 2 works composed by Bach"

- **Instruments:**
  the instrument(s) (in `and/or` relation).
  "Give me 2 works for violin, clarinet and piano"
  "Give me 2 works for violin or piano"

- **Genre:**
  the music genre.
  "Give me 2 works of genre concerto"

- **Composition period:**
  the artist name (full or surname).
  "Give me 2 works composed during 1811"

The filters can be specified in every way: this means that the user can specify all the available filters, some of them and even none. If the number of filters in the first query is smaller than two, the bot asks the user if he wants to apply other filters. The user can answer positively or negatively, and then decide which kind of filter (and the value) to apply. It's important to notice that the kind of filter and the value can be specified together or not; let's see an example to make it more clear.

First of all, we are in the context in which the bot asks the users if he wants to apply some filters:

Please give me 3 works by Beethoven!

User

You told me few filters. Do you want to add something?

DOREMUS Bot

Yes!

User

Ok, tell me what

DOREMUS Bot

In this case, two scenarios can happen:

The composition year

User

Of course! Tell me the time period.

DOREMUS Bot

Between 1787 and 1812

User

or directly...

Only works composed between 1787 and 1812

User

5.2.2 Finding some artists

5.2.3 Finding some future and past performances

5.2.4 Know more about an artist

5.3 The flow

5.4 The spell checker