Dialogue Framework

*Developer Document*

*System Design, Configuration Format and User Cases*

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1. System Overview

Introduction

This document is written for system developers who are going to implement the dialogue framework. Also, it is useful for application developers who will use the dialogue framework to develop specific dialogue applications. The RSVP Dialogue Framework depends on a grammar compiler/parser for understanding natural language input. It is designed to enable application developers easily build up different dialogue systems with specific interactive settings. The implementation details should be included in another functionality specification document (FSD).

Contact Information

In case you encounter issues, please contact:

**RSVP Technologies**

[kunxiong@internetanswer.com](mailto:kunxiong@internetanswer.com)

System Architecture

Bot Farm

Developers

Users

Chat

Dialogue Framework

Provide

Grammar

Compiler

Dialogue

Config

Grammar

File

Profile

Storage

Session

Storage

Dialogue framework acts as a central hub between application developers and end users. It wraps underlying low level implementation and provides application developers APIs to only focus on designing chat bots’ behavioral logic. By submitting dialogue configurations and grammar definitions, application developers can specify how their chat bots accept user input and generate responding answer. Moreover, the dialogue framework provides APIs to empower application developers to build more complex logic such as randomization and recursion. And it communicates with session storage server and profile storage server under the hood so that application developers can also access users’ native attributes, dialogue history, and sessional information.

At run time, dialogue framework’s built in grammar compiler will compile provided grammar files and initialize chatterbot instances with dialogue configurations. It hosts a bot farm system built on top of Akka’s Actors and can not only keep multiple independent chat bots concurrently to server users with different needs, but also boost performance and throughput. Meanwhile, dialogue framework will route requests from users using different applications to appropriate chat bots accordingly.

System Workflow

Based on dialogue configurations, to provide a dialogue service, the dialogue framework coordinates with session storage, profile storage, and grammar parser for each user request to generate corresponding response. Its workflow is shown as the following.

Grammar Parser

Dialogue Framework

query

Request

Parse

query, session id, user id

parsed query

Session/Profile Server

User

session id, user id

Fetch

Chat Bot Instance

user session, profile

Execute Logic

Respond

updated user session, profile

answer

Update

status

When end user submits a query, the dialogue framework will first call the grammar parser to process it and the result can then be referred to later. The chat bot instance handling given request will try to match parsed query and direct it to specific category accordingly. During logic execution, it can then access the session/profile storage at request and perform procedures defined in dialogue configuration to generate answer to send back to user. When the request/response cycle completes, dialogue framework will update session/profile storage to record necessary information and keep track of user session and history.

Bot Life Cycle

In our system, a bot class extends Akka Actor. And the bot farm class extends Akka Round-Robin Router. As handling of each user request takes roughly the same amount of computing power, round-robin routing is a simple but good enough fit. The number of instances for each bot can be specified inside the configuration file. Thanks to Akka’s supervision and recycling system, we only need to implement the logic to generate a response after each user request. And Akka will take care of exception handling and restarting each bot (actor) instance if it died unexpectedly.

When dialogue framework starts, it will load all bots defined under the bot folder, each folder must contain a valid bot file structure where the name of the folder is the name of the bot. The bot actor farm will then instantiate specified number of instances for each bot and load all properties and aiml categories into memory so aiml pattern matching and template evaluation will all be in-memory process afterwards. Then the life cycle of each bot instance is taken care by Akka’s Actor system, unless a specific ‘reload’ command is issued towards a bot then it will reset all of its instances and reload all of its properties and aiml categories.

Configurations

To define a dialogue system (chatterbot)’s behavior, an application developer need to provide two types of configuration files.

Properties

Each bot has its own internal properties, such as its name. Properties are stored as a text file under each bot’s folder and defined as key value pairs and will be loaded when a bot instance starts running. Properties can be accessed in aiml templates when bot responses are generated.

Grammar File

Grammar files are used to determine what input can be accepted. Detailed explanation on how grammar files work can be found in our grammar file specifications document.

Dialogue Configuration

Dialogue configurations are written in xml format based on the Artificial Intelligence Markup Language (AIML). We extends AIML by allowing using grammar files to accept user input instead of its native pattern matching mechanism. We support majority of tags defined in AIML standard and also add a few of our custom tags. Detailed description and explanation of our customized AIML specifications can be found in its dedicated document.

An Example

Here is a simple example demonstrates how a grammar file and aiml file can work side by side to generate response to a user’s request.

namespace basic

hello := strings{Hello,Hi,Hey}

public greeting : hello

basic.gram

basic.aiml

<?xml version="1.0" encoding="UTF-8"?>

<aiml>

<category>

<pattern>

<grammar>

basic.greeting

</grammar>

</pattern>

<template>

Hello, how are you?

</template>

</category>

</aiml>

The grammar file will catch ‘Hello’, ‘Hi’, ‘Hey’ and produce the public term ‘basic.greeting’. In the aiml file, it will look for user inputs that matches grammar term ‘basic.greeting’, and generate response based on its content inside template node. In this case, it will reply back ‘Hello, how are you’ when user says ‘Hello’, ‘Hi’, or ‘Hey’.

Of course, our customized aiml format supports way more than just plain text, and please refer to our aiml specs for further reading on how templates are evaluated.

Data Storage

Session Storage

Profile Storage

Data Storage

Session Storage

Profile Storage

Deployment

Prerequisites

Installation

Confidentiality and Access

The readers should be aware that you must not disclosure this document itself or any information related with it to others, and that any load test or malicious access is not allowed.