

I n t e r n a t i o n a l T e l e c o m m u n i c a t i o n U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

F.746.7

(08/2018)

SERIES F: NON-TELEPHONE TELECOMMUNICATION
SERVICES

Multimedia services

Metadata for an intelligent question answering service

Recommendation ITU-T F.746.7

ITU-T

ITU-T F-SERIES RECOMMENDATIONS
NON-TELEPHONE TELECOMMUNICATION SERVICES

TELEGRAPH SERVICE

Operating methods for the international public telegram service	F.1–F.19
The gentex network	F.20–F.29
Message switching	F.30–F.39
The international telemesssage service	F.40–F.58
The international telex service	F.59–F.89
Statistics and publications on international telegraph services	F.90–F.99
Scheduled and leased communication services	F.100–F.104
Phototelegraph service	F.105–F.109

MOBILE SERVICE

Mobile services and multideestination satellite services	F.110–F.159
--	-------------

TELEMATIC SERVICES

Public facsimile service	F.160–F.199
Teletex service	F.200–F.299
Videotex service	F.300–F.349
General provisions for telematic services	F.350–F.399

MESSAGE HANDLING SERVICES

F.400–F.499

DIRECTORY SERVICES

F.500–F.549

DOCUMENT COMMUNICATION

Document communication	F.550–F.579
Programming communication interfaces	F.580–F.599

DATA TRANSMISSION SERVICES

F.600–F.699

MULTIMEDIA SERVICES

F.700–F.799

ISDN SERVICES

F.800–F.849

UNIVERSAL PERSONAL TELECOMMUNICATION

F.850–F.899

ACCESSIBILITY AND HUMAN FACTORS

F.900–F.999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T F.746.7

Metadata for an intelligent question answering service

Summary

Recommendation ITU-T F.746.7 describes metadata for the intelligent question answering service (IQAS) framework specified in Recommendation ITU-T F.746.3. This Recommendation specifies metadata and service flow for different functions to support the IQAS, which provides advanced functions to generate answers for user questions in natural language. The scope of this Recommendation covers metadata for a natural language processing function, question analysis function, candidate answer generation function, answer inference/generation function, as well as an input and output function. This Recommendation also describes general information flows to describe how metadata are used in the (IQAS).

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T F.746.7	2018-08-29	16	11.1002/1000/13658

Keywords

Intelligent system, natural language processing, question answering, QA, QA metadata

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/113658-en>.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2019

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

	Page
1 Scope.....	1
2 References.....	1
3 Definitions	1
3.1 Terms defined elsewhere	1
3.2 Terms defined in this Recommendation.....	2
4 Abbreviations and acronyms	2
5 Conventions	3
6 Overview.....	3
7 Functional components and information flow of the intelligent question answering service	4
8 Information for natural language processing.....	5
9 Information for question analysis	11
10 Information for candidate answer generation	14
11 Information for answer inference/generation	16
Appendix I – Example of named entity types.....	20
Bibliography.....	25

Recommendation ITU-T F.746.7

Metadata for an intelligent question answering service

1 Scope

This Recommendation describes metadata related to the intelligent question answering service (IQAS). The IQAS framework in [ITU-T F.746.3] already identifies some elements and attributes related to an IQAS; however, it does not define all elements needed to provide the basic features of an IQAS. This Recommendation specifies metadata for the following IQAS features as well as the general information flows to describe how metadata are used in the IQAS.

- information for natural language processing;
- information for question analysis;
- information for candidate answer generation;
- information for answer inference/generation;
- information for input and output.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T F.746.3] Recommendation ITU-T F.746.3 (2015), *Intelligent question answering service framework*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 co-reference resolution [ITU-T F.746.3]: A function that detects the preceding referents of the pronouns which replace the noun phrases of the input sentences.

3.1.2 named entity recognition [ITU-T F.746.3]: A function that recognizes named entities such as PLO entities which are people, locations and organizations from the sentences. The PLO can be decomposed into more detailed named entities depending on the applications.

3.1.3 natural language processing [ITU-T F.746.3]: A method that analyses text in natural languages through several processes such as part-of-speech recognition, syntactic analysis and semantic analysis.

3.1.4 part-of-speech recognition [ITU-T F.746.3]: A function that recognizes parts of speech (POS) in the sentences and assigns relevant POS tags considering contextual meaning of the target sentences.

3.1.5 semantic analysis [ITU-T F.746.3]: A function that recognizes the semantic relations among the words around predicates that exist in the same sentence. The semantic analysis function then generates a semantic predicate argument structure (PAS).

3.1.6 speech [b-ITU-T H.703]: Speech is the vocalized form of human communication.

3.1.7 syntactic analysis [ITU-T F.746.3]: A function that analyses sentence structures and generates dependency relations among words based on dependency grammars.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 CV_occupation: A named entity tag belonging to the civilization (CV) category that indicates a person's occupation. (e.g., scientist).

3.2.2 CV_prize: A named entity tag belonging to the civilization (CV) category that indicates a prize. (e.g., Nobel prize).

3.2.3 IsA relation: A hierarchical relation between two words in such a way that the meaning of one word includes that of the other.

3.2.4 knowledge base (KB): A collection of knowledge resources that consists of structured and unstructured data. The knowledge base is used to provide information to the various applications that are related to information provisioning such as question answering (QA) systems and search systems.

3.2.5 question answering (QA): A system that provides answers in natural language to questions in natural language form by analysing the questions and all the knowledge resources that are available to the system.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DB	Database
ID	Identifier
IQAS	Intelligent Question Answering Service
KB	Knowledge Base
LAT	Lexical Answer Type
NE	Named Entity
NLP	Natural Language Processing
NLU	Natural Language Understanding
NNG	Noun, General
NNP	Noun, Proper
NP_OBJ	Noun Phrase Objective
NP_SBJ	Noun Phrase Subjective
PAS	Predicate Argument Structure
PLO	People, Location, Organization
POS	Part Of Speech
QA	Question Answering
SRL	Semantic Role Labelling
TV	Television
URL	Uniform Resource Locator

VP	Verb Phrase
VV	Verb
WSD	Word Sense Disambiguation
XSV	Auxiliary Suffix from Verb

5 Conventions

None.

6 Overview

An intelligent question answering service (IQAS) is an advanced function to generate answers for user questions in natural language. Figure 1 illustrates the concept of QA system in the digital signage domain, where a user requests information about shoe stores to the QA system at the mall.

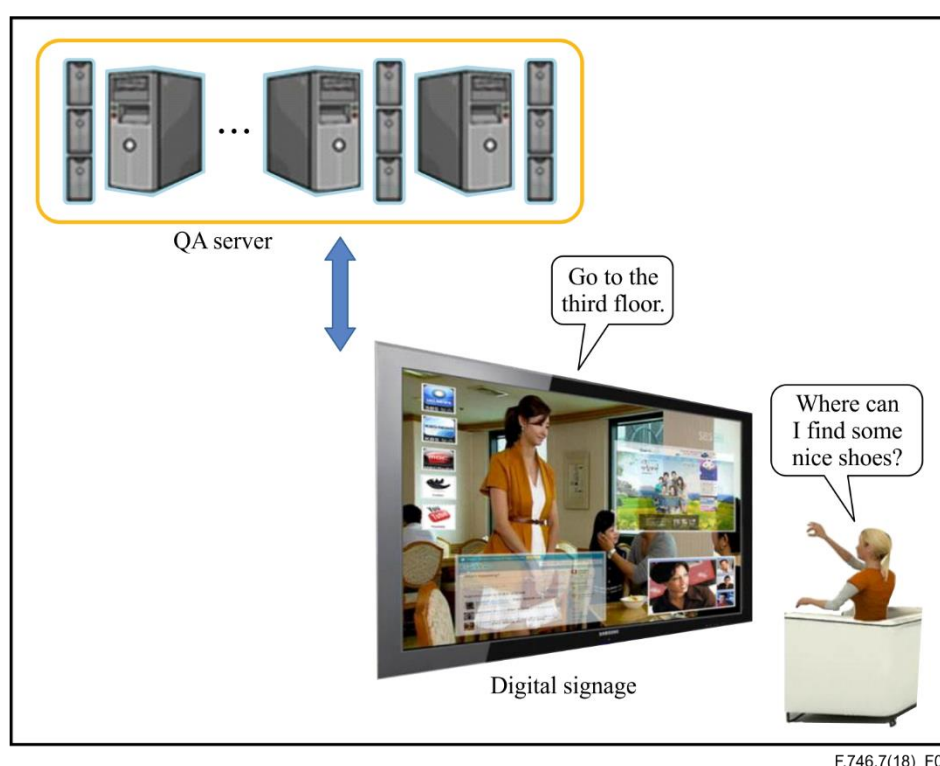
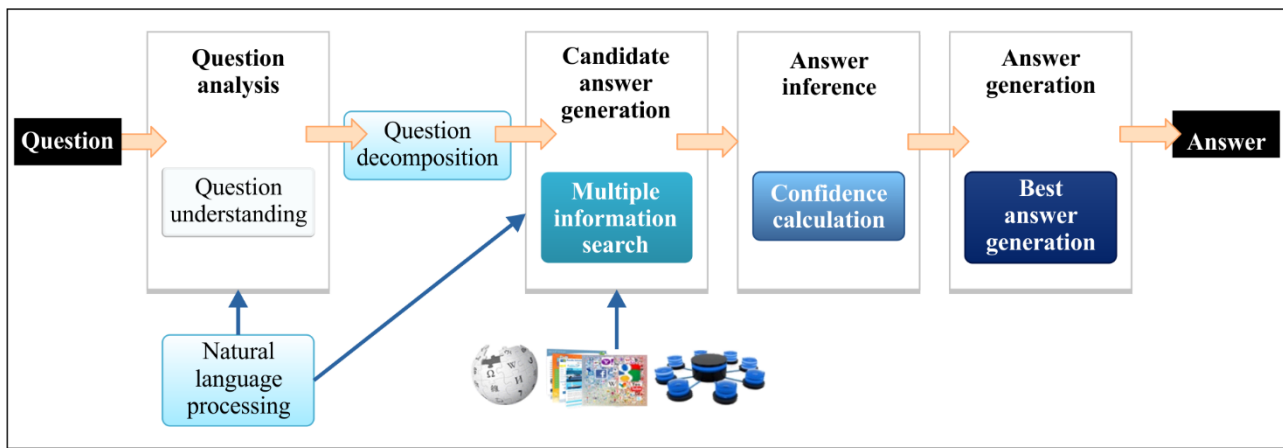


Figure 1 – Digital signage with question answering function: At the mall

Figure 2 presents an example of QA architecture. The QA system consists of several functional blocks: those for natural language processing, question analysis, candidate answer generation, answer inference and generation.



F.746.7(18)_F02

Figure 2 – Example of a question answering architecture in accordance with [ITU-T F.746.3]

This Recommendation addresses metadata related to the IQAS to present details of content and service information. [ITU-T F.746.3] has specified some elements that are applicable to IQASs.

This Recommendation selects basic elements/attributes from these specifications that are applicable to the IQAS. Names of elements/attributes are quoted as they are in the specifications, in order to keep clear the relationship between them.

7 Functional components and information flow of the intelligent question answering service

IQAS functional components are basically composed of natural language processing, question analysis, candidate answer generation, answer inference and answer generation functional blocks, as follows.

- **Natural language processing functional block:** supports natural language processing on the QA server.
- **Question analysis functional block:** supports question analysis on the terminal.
- **Candidate answer generation functional block:** supports candidate answer generation by searching information in various databases (DBs).
- **Answer inference/generation functional block:** supports answer inference based on feature normalization and ranking of candidate answers and best answer generation on the terminal.

See Figure 3.