CHARLATAN: A Task-Independent Dialog Platform

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Abstract

In this paper, we describe a task-independent dialog platform which is called CHARLATAN. It is a Java application that can work in stand-alone mode and as an applet added in a website. This dialog platform integrates dialog management, natural language generation, user simulation, and a parameterization of the task-dependent issues. Currently, it allows us to develop dialogs in two domains: a train services information system, and a sport booking system. However, due to the task-independence of CHARLATAN, new domains can be easily incorporated. Dialogs are automatically generated by means of a user simulation technique, or interacting with real users through the graphical interface.

Index Terms: stochastic dialog management, user simulation, task independence, synthetic acquisition

1. Introduction

Advances in developing of spoken dialog systems are usually hard-worked because of different problems: low confidence of the information interchanged among the dialog modules, high cost of the corpora acquisition, subjectivity in real users evaluation, or high task-dependence in the design of the modules. In the development of the CHARLATAN platform, we have focused on solving some of these problems: the acquisition of the corpora (by the user simulation technique) and the independence between the modules and the domains (by isolating the task parameters in configuration files).

The adaptation to new semantic domains is one of the aims in the EDECAN project [1]. In this research frame, the CHARLATAN dialog system has been developed to attend different semantic-restricted tasks: the BASURDE and DIHANA tasks [2], which access a train information system; and the EDECAN-SPORT task, which provides access to a sport courts booking system. In CHARLATAN, the information that is related to the task has been encapsulated into the models, the scenarios, and other configuration files. Thus, the data-structures are initialized reading these files, and the methods have been appropriately parameterized.

In this paper, we present the CHARLATAN platform that is working appropriately in both tasks, and very soon it will be attending other different tasks, because of its parameterization of the task-dependent issues.

2. The dialog platform

The CHARLATAN dialog platform integrates the user and system dialog managers, the user and system natural language generators, and the database manager. It can also integrate understanding modules. Figure 1 shows its block diagram.

The dialog manager [3] is based on a stochastic dialog model, which is a bigram model (BM) of dialog acts, and includes a historic register (HR), which stores all the data provided in previous turns. This module (SDM in Figure 1) can attend different tasks, just reading their corresponding domain parameters (DP) from configuration files.

The user simulator [4] selects states of the same BM, and applies a set of target planning rules (TPR) that implement a collaborative strategy. These rules are task-independent, and they serve to acquire consistent dialogs in any task. This module (UDM in Figure 1) allows us to acquire synthetic dialogs, learn dialog models, and evaluate the dialog system.

Both managers, SDM and UDM, receive and generate frames, which are semantic representations of the natural language sentences. The natural language generators (ULG and SLG in Figure 1) translate the frames into sentences in natural language (currently, in Spanish and English). Both language generators work using a set of templates and rules for instantiating the templates.

According to this design, we have developed a JAVA dialog platform [5]. Using it, we can acquire dialogs for any task that would be appropriately defined by means of a set of CHARLATAN configuration files. In the interactive mode, real users can provide the frames that correspond to their dialog intentions through a graphical interface, and they can read the system answers, carrying out whole dialogs. In the simulation mode, dialogs are completely done by CHARLATAN, allowing us to simulate dialogs turn by turn, or whole dialogs, or series of any number of dialogs, and to specify which scenarios are simulated. In addition, the user frames can be modified by including errors (deletions, insertions, substitutions) in the attributes whose values are critical to the success of the dialog.

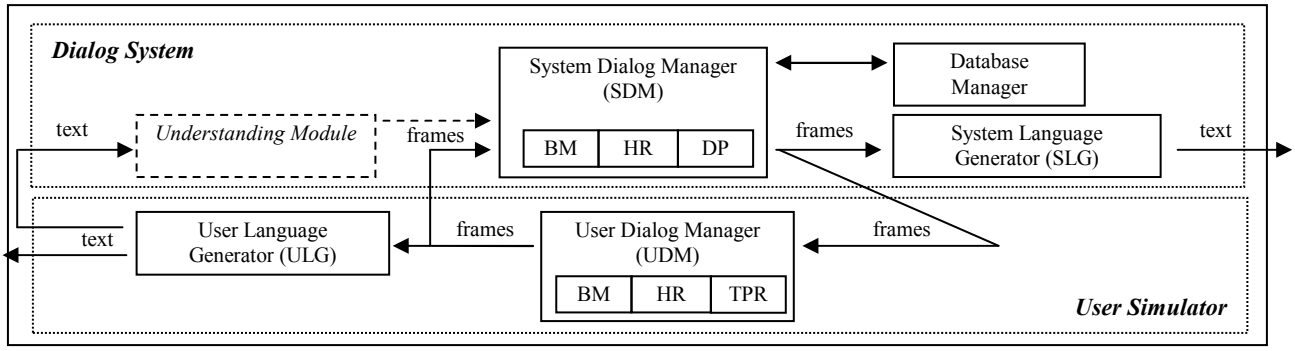

Figure 1. *Dialog system block diagram*

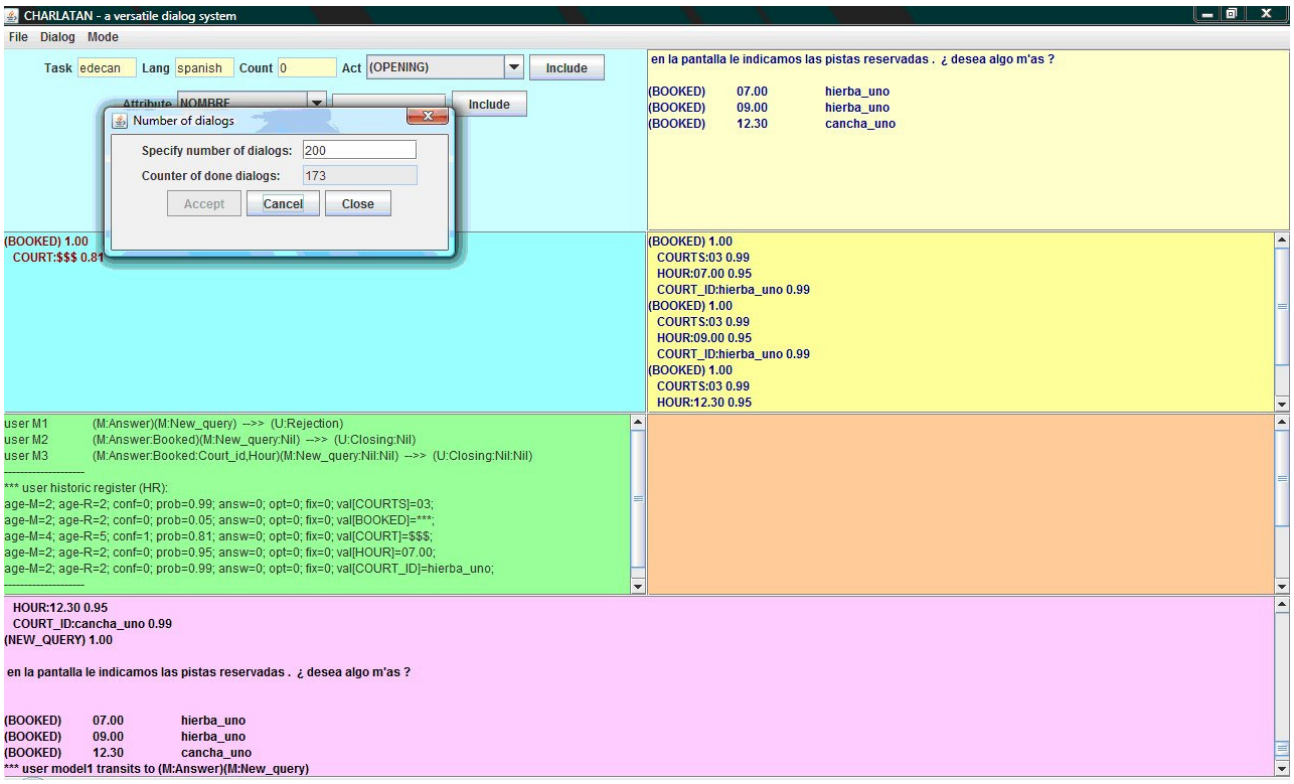

Figure 2. *The CHARLATAN platform acquiring a set of simulated dialogs*

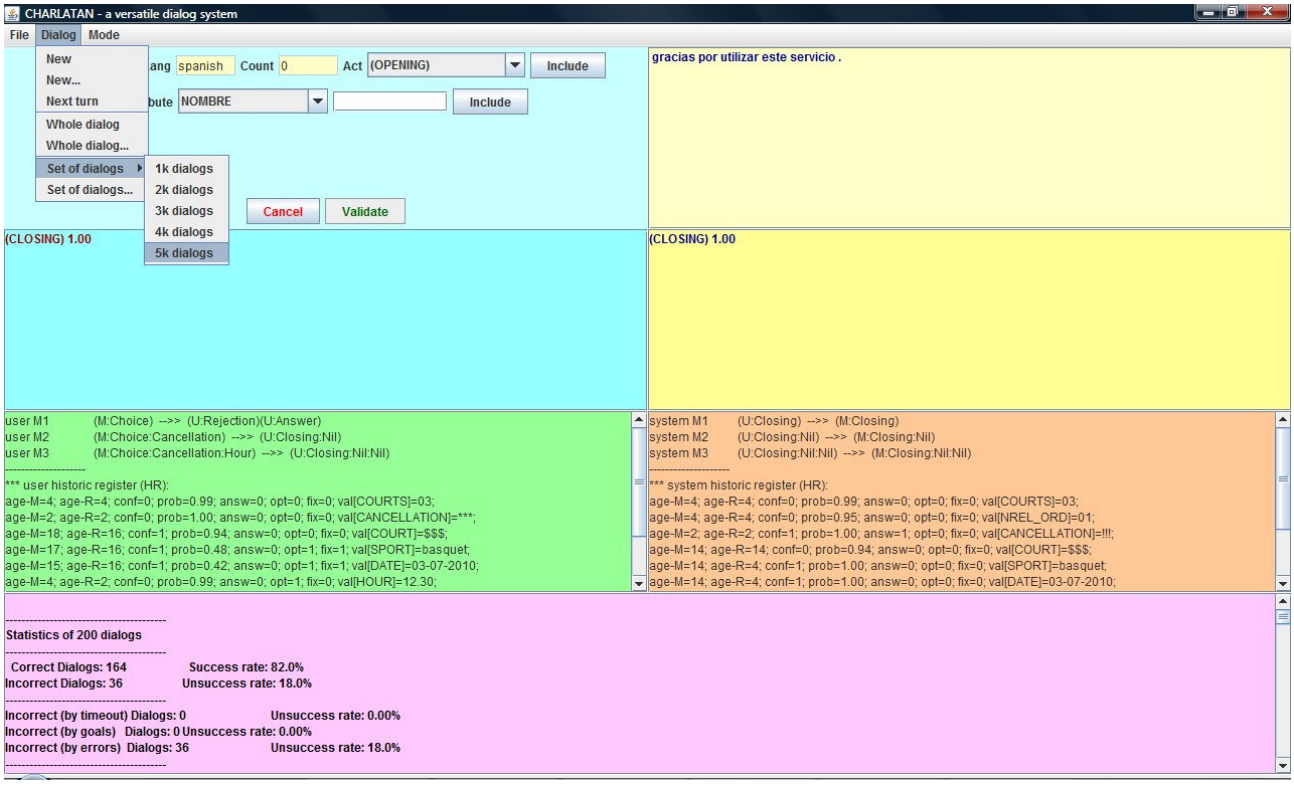

Figure 3. *The CHARLATAN platform at the end of a simulation*

3. Interface description

In this section, the interface of the CHARLATAN dialog platform is described by means of several screenshots (Figures 2, 3, and 4) that show the operation of the platform while acquiring dialogs in the EDECAN-SPORT task.

The CHARLATAN applet interface consists of seven areas of text. The left side of the applet corresponds to the user, and the right side corresponds to the system. The three areas on the left, from top to bottom, are the real user graphical interface, the output of the UDM (user frames), and its internal state (BM transitions, and HR content). The three areas on the right, from top to bottom, are the output of the SLG (system

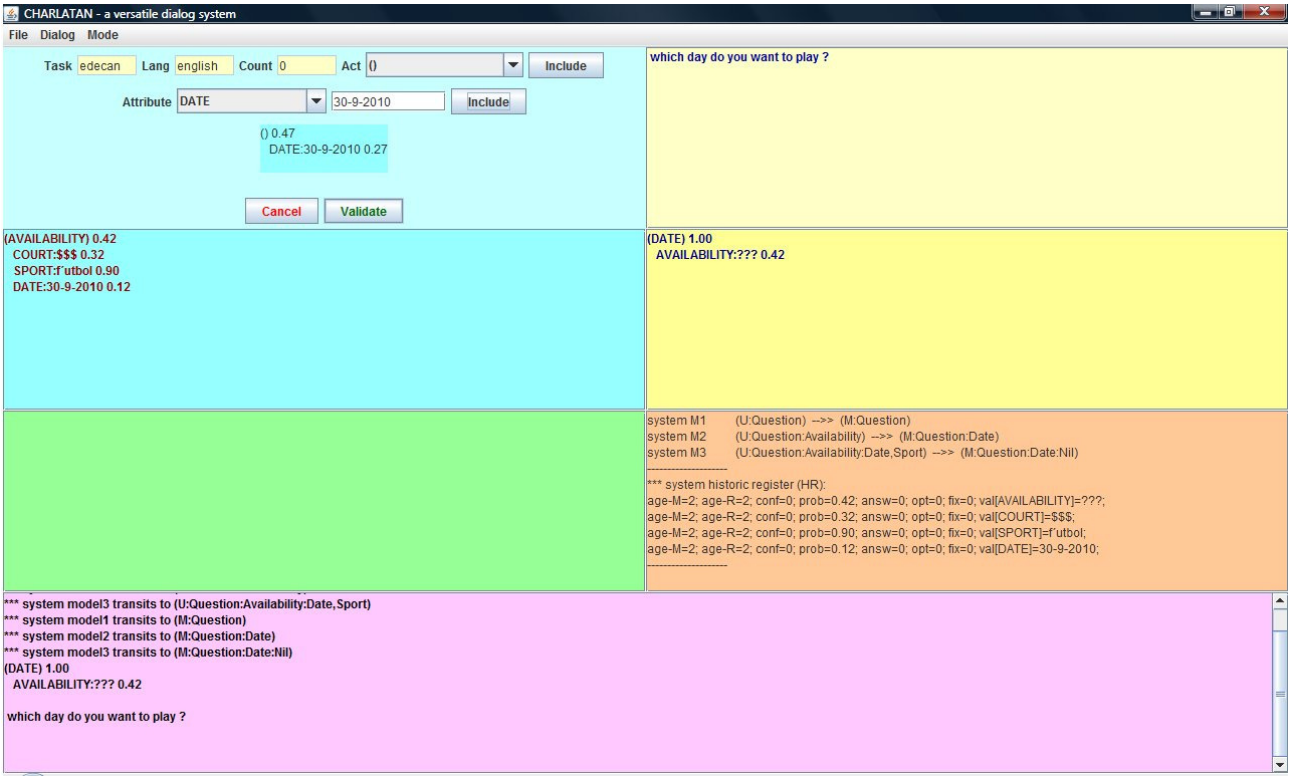

Figure 4. *The CHARLATAN platform interacting with a real user*

sentences), the output of the SDM (system frames), and its internal state (BM transitions, and HR content). In the bottom text area, the whole dialog is collected, or statistics of a series of dialogs are collected, depending on the way of operation.

Figure 2 shows a screenshot in which CHARLATAN is acquiring a set of 200 simulated dialogs of the EDECAN task, using Spanish as natural language, with simulation of errors in input frames. The screenshot corresponds to the dialog number 173, at the moment in which the user simulator has asked for booked courts, and the system has answered providing a list with information of three booked courts. The bottom text area is collecting all the turns of this dialog.

Figure 3 shows a screenshot in which CHARLATAN has finished a previous simulation. In such a case, the bottom text area shows the collected statistics of the series. In the menu bar, the *Dialog menu* is expanded, showing the commands to initiate new dialogs, run dialog turns (turn by turn simulation), acquire whole dialogs (choosing the scenarios to be simulated), and acquire sets of dialogs.

Another menu, the *Mode menu*, is available in the menu bar. The *Mode menu* allows us to select the task, the natural language, the type of user (real or simulated), the simulation of input errors (activation or deactivation), and some advanced options like the selection of dialog manager strategy (full stochastic strategy, or hybrid strategy –half stochastic, half heuristic–), the selection of training or test modes in using the dialog models, and the selection of thresholds for adjusting the number of simulated input errors.

Figure 4 shows a screenshot in which CHARLATAN is interacting with a real user, carrying out a dialog of the EDECAN task, using English as natural language. In the previous turn, the user has asked for courts availability (see user frame in the second left text area). The system has replied with a question about the date (see system sentence, system frame, and BM transitions and HR content, in the right text areas), due to the low confidence of this attribute. At the moment of the screenshot, the user is answering, providing again the date value (see user graphical interface, in the first left text area). This graphical interface consists of combo boxes, text fields and buttons, and it allows the user to specify the dialog acts, the attributes and their values (i.e., to build the user frames). The confidence scores of these user frames are randomly generated.

4. An example of a dialog

In order to illustrate the dialogs that the CHARLATAN platform can acquire, we present an example in this section. The following dialog corresponds to a simulation of the scenario 1 of the EDECAN task, in which the user has to obtain the availability of courts, given some restrictions (sport, date, court-type), and then s/he has to choose one of these courts for booking it. Figure 5 shows this dialog, which log has been simplified, and we only present the most relevant information. For each turn, we have included the user frames, the system BM transitions, the system HR content, the system frames, and the system sentences.

The system opens the dialog (in S0 turn) asking for the user queries. The user simulator answers providing an availability frame with the values of the attributes that correspond to its goal. In S1 turn, the system asks for the sport because of its low confidence. It also makes an implicit confirmation of the court-type attribute. Once the sport has been confirmed, the system needs to confirm the date attribute, which is also not enough reliable. The system does it in S2 turn, and it also makes an implicit confirmation of the hour attribute. Given that the user simulator confirms all the mandatory items, at the following turn (S3 turn), the system accesses the database and provides the availability frames. In U3 turn, the user simulator chooses one of these courts for booking it. Such a booking is confirmed by the system in S4 turn. After this, the user simulator has achieved all the goals of the scenario. Thus, it generates a closing frame. And the system also closes the dialog.

S0: (OPENING) 1.00
S0: Welcome to the UPV sport courts booking system. How may I help you?

U0: (AVAILABILITY) 1.00
SPORT: tennis 0.50
DATE: 25-06-2010 0.47
COURT_TYPE: exterior 0.51

*** **System L3-BM** transitions:
(U:Question:Availability:Court_type,Date,Sport) → (M:Question:Sport:Court_type)
*** **System HR** content:
[AVAILABILITY] confidence = 1.00 value = ???
[SPORT] confidence = 0.50 value = tennis
[DATE] confidence = 0.47 value = 25-06-2010
[COURT_TYPE] confidence = 0.51 value = exterior
S1: (SPORT) 1.00
AVAILABILITY: ??? 1.00
COURT_TYPE-ACTUAL: exterior 0.51
S1: On exterior, which sport do you want to play?

U1: () 1.00
SPORT: tennis 0.50
DATE: 25-06-2010 0.47
HOUR: 16.00-20.00 0.64

*** **System L3-BM** transitions:
(U:Answer:Date,Hour,Sport:Date,Hour,Sport) → (M:Confirmation:Date:Date,Hour)
*** **System HR** content:
[AVAILABILITY] confidence = 1.00 value = ???
[SPORT] confidence = 1.00 value = tennis
[DATE] confidence = 0.47 value = 25-06-2010
[HOUR] confidence = 0.64 value =16.00-20.00
[COURT_TYPE] confidence = 0.51 value = exterior
[INT_HOUR] confidence = 0.64 value = 16.00-20.00
S2: (CONFIRMATION) 1.00
DATE: 25-06-2010 0.47
HOUR-ACTUAL: 16.00-20.00 0.64
S2: Between four o'clock p.m. and eight o'clock p.m., do you want to play on June the twenty-fifth?

U2: (ACCEPTANCE) 1.00

*** **System L3-BM** transitions:
(U:Acceptance:Date:Nil) → (M:Answer:Availability:Court_id,Hour)(M:New_query:Nil:Nil)
*** **System HR** content:
[AVAILABILITY] confidence = 1.00 value = ???
[SPORT] confidence = 1.00 value = tennis
[DATE] confidence = 1.00 value = 25-06-2010
[HOUR] confidence = 0.64 value = 16.00-20.00
[COURT_TYPE] confidence = 0.51 value = exterior
[INT_HOUR] confidence = 0.64 value = 16.00-20.00
S3: (AVAILABILITY) 1.00
COURTS: 03 0.99
HOUR: 17.00 0.99
COURT_ID: olympic_one 0.95
(AVAILABILITY) 1.00
COURTS: 03 0.99
HOUR: 18.30 0.99
COURT_ID: grass_two 0.95
(AVAILABILITY) 1.00
COURTS: 03 0.99
HOUR: 18.30 0.99
COURT_ID: clay_one 0.95
(NEW_QUERY) 1.00
S3: You can see the available courts on the screen.
17.00 olympic_one
18.30 grass_two
18.30 clay_one
Do you want anything else?

U3: () 1.00
BOOKING: !!! 0.08
HOUR: 17.00 0.99
COURT_ID: olympic_one 0.95

*** **System L3-BM** transitions:
(U:Answer:Booking:Court_id,Hour) → (M:Choice:Booking:Court_id)
*** **System HR** content:
[COURTS] confidence = 0.99 value = 03
[NREL_ORD] confidence = 0.95 value = 01
[AVAILABILITY] confidence = 1.00 value = !!!
[BOOKING] confidence = 0.08 value = !!!
[SPORT] confidence = 1.00 value = tennis
[DATE] confidence = 1.00 value = 25-06-2010
[HOUR] confidence = 0.99 value = 17.00
[COURT_TYPE] confidence = 0.51 value = exterior
[COURT_ID] confidence = 0.95 value = olympic_one
[INT_HOUR] confidence = 0.64 value = 16.00-20.00
S4: (CHOICE) 1.00
BOOKING: !!! 0.08
COURT_ID: olympic_one 0.95
S4: I confirm to you that the olympic_one court has been booked.

U4: (CLOSING) 1.00

*** **System L3-BM** transitions:
(U:Closing:Nil:Nil) → (M:Closing:Nil:Nil)
S5: (CLOSING) 1.00
S5: Thank you for using this service.

Figure 5. *Example of an EDECAN dialog*

5. Conclusions

This dialog platform, called CHARLATAN, is currently a robust, versatile and easy-to-use tool to generate consistent dialogs in different semantic-restricted tasks. At the beginning, we started adapting a BASURDE-task-dependent dialog manager to appropriately attend both tasks (BASURDE and EDECAN). Then, we followed working in the generalization and complete parameterization of the dialog managers. Thus, we have achieved, with our CHARLATAN prototype, a task-independent dialog platform.

6. Acknowledgements

This work has been partially funded by CICYT under project TIN2008-06856-C05-02/TIN, Spain.

7. References

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