CAMMIA − A CONTEXT-AWARE SPOKEN DIALOG SYSTEM FOR MOBILE ENVIRONMENTS

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ABSTRACT

Spoken dialog systems in mobile environments must notice changes in the user's environment to be effective in dynamic situations. Such systems are described as *context-aware,* and utilize contextual changes to offer relevant information to users. In this demonstration, we illustrate the functionalities that support dynamic user contexts in the CAMMIA dialog system: (a) providing the user with useful information when he or she moves to a new location (location/time context), (b) robust task management when the communication uplink is lost (network context), and (c) the ability to handle ambiguous user utterances (dialog context). Preliminary experimental results show that context-awareness improved both user performance and user satisfaction in laboratory and driving environments. CAMMIA is a multilingual system, and the demonstration will include both English and Japanese.

1. INTRODUCTION

For the past few years, spoken dialog systems have been studied in pedestrian and automotive environments [1,2]. Such systems include both a navigation interface (to provide route guidance) and remote data access (to provide information on points of interest, tourist sites, etc.). In mobile environments, spoken dialog systems must provide robust speech recognition, multimodal interaction with a small screen interface, and a flexible architecture that can support different types of mobile devices. In our most recent work, we have focused on supporting of some degree of context awareness to be effective in dynamically changing user environments. Such systems are described as *context-aware,* and utilize contextual changes to offer relevant information to users [3]. In this demonstration, we illustrate the functionalities that support dynamic user contexts in the CAMMIA (Conversational Agent for Multilingual Mobile Information Access) dialog system.

Fig. 1. CAMMIA Screen Interface.

2. CAMMIA DIALOG SYSTEM

The CAMMIA is a context-aware multilingual spoken dialog system which provides route guidance and information services in English and Japanese. The CAMMIA system supports multimodality in the form of a speech interface combined with a tactile screen (Fig. 1). In the demonstration, we illustrate three aspects of context-awareness in English and Japanese, described below.

2.1. Notification of useful information (location/time context)

When traveling to a location not previously visited, the system adapts to the new environment by suggesting useful information based on the current location and user profile. For example, the system may suggest popular

tourist sites, cuisine or rest areas near the current location or notify unavailability of the destination based on the estimated time and open hours. The user can modify the system's actions when setting user preferences, for example, by adding parking lot availability as a feature that should always be notified.

2.2. Robust task management (network context)

The network is not stable in mobile environments; network connectivity can be lost when the radio signal is unavailable (e.g. inside a tunnel). When the network is not available, the user cannot access remote information and must request that information later when the network becomes available again. As the CAMMIA can represent the dialog history and automatically restart the dialog when the network becomes available, so the user does not need to ask for information a second time. At certain intervals, the system can automatically prune obsolete dialogs.

2.3. Disambiguation (dialog context)

One user utterance can be interpreted in different ways based on the dialog context. For example, in Japanese, "どのくらいかかるの？" has several meanings: How much, how far, how wide, how tall, etc. The CAMMIA system disambiguates such utterances based on the dialog context and domain rules.

3. USER INTERRUPTION

When suggesting new information to the user, the system may interrupt an ongoing user activity or dialog, and this should be carefully designed to minimize user distraction. This raises three interesting design questions: what to say to the user, when to say it, and how to say it [5]. The CAMMIA system uses a reasoning component and domain-specific rules to decide whether an interruption is needed (due to a context change), and when to interrupt (i.e. not when the user is speaking). The reasoning component may be extended in the future to handle interruptions based on other important context features, such as car speed, gas status, and temperature in a driving environment.

4. EVALUATION

Preliminary evaluations were conducted in both laboratory and driving environments, with twenty one participants. The goal was to determine how much context-awareness (especially location, time and network context) affects the user's task performance [6]. The participants were asked to use two different systems: the system configured with context-aware functionalities, and the system configured without those capabilities. The user tasks were to find weather information and search for restaurants and sightseeing sites, with special conditions such as parking lot availability, credit card acceptance and opening hours. The experimental results show that context-awareness improves user performance. The time to complete the tasks improved on average by 46%, and the number of user turns decreased by 66%. After each task, participants completed a user satisfaction questionnaire. The results show that user satisfaction improved 40% in terms of ease of use and helpfulness during tasks.

5. FUTURE WORK

We are planning more work on how to determine relevant dialog content and better timing of system utterances based on the user's situation. User models will be incorporated into our system for more adaptive and personalized services.

6. REFERENCES

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