

Voice Key Board: Multimodal Indic Text Input

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ABSTRACT

Multimodal systems, incorporating more natural input modalities like speech, hand gesture, facial expression etc., can make human-computer-interaction more intuitive by drawing inspiration from spontaneous human-human-interaction. We present here a multimodal input device for Indic scripts called the Voice Key Board (FKB) which offers a simpler and more intuitive method for input of Indic scripts. FKB exploits the syllabic nature of Indic language scripts and exploits the user's mental model of Indic scripts wherein a base consonant character is modified by different vowel ligatures to represent the actual syllabic character. We also present a user evaluation result for FKB comparing it with the most common input method for the Devanagari script, the *InScript* keyboard. The results indicate a strong user preference for FKB in terms of input speed and learnability. Though FKB starts with a higher user error rate compared to *InScript*, the error rate drops by 35% by the end of the experiment, and the input speed of FKB is found to be 81% higher than *InScript*. Our user study results point to interesting research directions for the use of multiple natural modalities for Indic text input.

Categories and Subject Descriptors

H.5.2 [User Interfaces]: User interface management systems; Voice I/O; Natural language; D.2.2 [Software Engineering]: Design Tools and Techniques - user interfaces;

General Terms: Algorithms, Human Factors

Keywords: multimodal systems, text input, voice keyboard, human-computer-interaction, syllabic scripts, Indic text.

1. INTRODUCTION

The lack of a good system for Indic text input has been one of the primary barriers to penetration of computing systems in India. Keyboards for Indic text input have proven unnatural, and difficult to learn and use. Multimodal systems [1] which use multiple modalities like speech, touch and gestures for interaction, potentially require very little learning and are less

intimidating because they use modalities which are natural to our everyday human communication. We are therefore motivated to explore the use of multiple modalities to address the problem of Indic text input.

Indic scripts such as Devanagari, used for Hindi and other Indic languages, are defined as "syllabic alphabets" in that the unit of encoding is a syllable, however the corresponding graphic units show distinctive internal structure and a constituent set of graphemes. The formative principles behind them may be summarized as follows [2]:

- graphemes for independent (initial) Vs (vowel)
- C (consonant) graphemes with inherent neutral vowel *a*
- V indication in non-initial position by means of *matus* (V diacritics)
- ligatures for C clusters
- muting of inherent V by means of a special diacritic called *virama*

Most Indic scripts have of the order of 600 CV units and as many as 20,000 CCV ones in theory, although only a much smaller subset (especially of CCV units) is used in practice. The V diacritics and ligatures for C clusters are not standardized in some scripts. Therefore, standard QWERTY keyboards as means of text input in Indic scripts such as Devanagari, Tamil etc., as well as other syllabic scripts like Sinhalese and Thai, face unique challenges due to script complexity and the sheer size of the syllable set. Complex keyboard layouts for Indic script input add to the already existing complexity and unfamiliarity of traditional desktop user interfaces, and further raise the barrier to adoption by lay users.

In this paper we describe the Voice Key Board (FKB). In order to enter a CV character, the user presses the key corresponding to a consonant C on the keyboard while simultaneously uttering the syllable CV in speech. This results in information from the two modalities (keyboard and speech) which are both supplementary and complementary in nature. The accurate recognition of C from the keyboard can be used to disambiguate recognition of the spoken CV syllable.

The paper is organized as follows. We review related Indic text input work in Section 2. We describe the Voice Key Board system in Section 3. Some comparisons with an existing system and user evaluation results are presented in Section 4. We conclude with discussion, summary and next steps, in Section 5 and Section 6.

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Voice Key Board Multimodal Indic Text Input

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Voice Key Board Multimodal Indic Text Input:

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Voice input vs. keyboard accelerators Randy Pausch, James H. Leatherby, 1991

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