Early vocabulary development through picture-based software solutions

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Abstract

Assistive technology enables children with disabilities to gain access, function independently and take advantage of schooling and social opportunities[1]. The need for alternative and augmentative communication (AAC) in all children is not the same[2] but AAC can aid in expressive language and also support intelligible speakers in developing and using communication skills in varied situations. While the range and flexibility of AAC has grown over the years, making devices accessible to children at varied economic and regional backgrounds, is still a challenge.

KAVI-PTS is designed as a picture-to-speech Android application, and has been made available in several Asian languages. This application is conceived of as an inexpensive software alternative to communication charts. It can be easily configured to adjust contrast levels and customize selection modes, enabling children to have access to a tailor-made communication solution.

Index Terms: picture to speech application, AAC, Assistive technology

1. Introduction

With the advent of mobiles and Tablets, the use of alternative and augmentative communication (AAC) software in a public setting such as a classroom, or a playground has become very easy.The primary mode of communication for children with motor disabilities that also affects there speech, e.g. cerebral palsy (CP), are often picture charts and flash cards. These aids are difficult to prepare and customize for individual use, they can become expensive to purchase and they often are worn out by use. A simple app to replace the use of picture charts and flash cards was required. KAVI-PTS goes beyond this, as it helps to build conversations, communicate independently, and allows individuals to express their feelings and emotions.

Most individuals want the communication to be in their local language. The Indic language support in KAVI-PTS makes the software accessible to people more comfortable in vernacular languages.

In addition, both the images and the audio can be categorized and added through the app, making it is highly customizable for the specific needs of the individual. The added functionality of KAVI games makes the software more interactive allowing for an improvement in vocabulary through these picture games

2. Functionality Description

KAVI-PTS began as a picture to speech software, developed for the Andorid platform in collaboration with Mindtree

Foundation, Bengaluru. Today, it has grown to include a number of features, multiple languages, and even acts as a platform for artists to present their picture library. However, the core of the software lies in its Indic text to speech engine, that has been developed by a consortium of academic researchers.

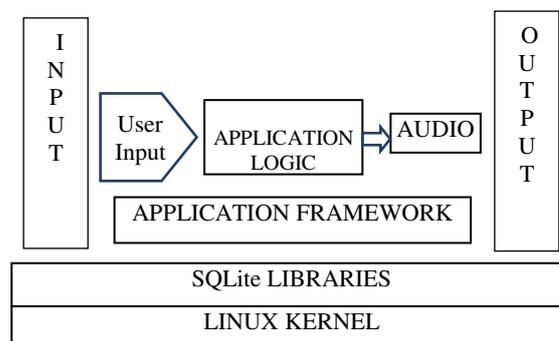The system architecture is as shown in Figure 1:

Figure 1: *System Architecture of KAVI-PTS*

KAVI-PTS is launched in GridView. Upon launch of the application, it displays the various categorized item names. Each item represents a category like People, Feelings, Things, Body Parts, Food, Places etc.

A sample screen shot displaying various categories that appears as the application is launched is shown in Figure 2.

Figure 2: *Home Screen displaying Categories*

Upon selection of any of these main items the sub list of the main item appears, and the images pertaining to those sub items appear on the screen.

On pressing or selecting any of the items, an audible voice is played with zooming the item and then, a new screen is

launched. The subsequent screen further contains items related to the main menu

When the application is launched, it is started with the initial/preset values of Pictures and Audio files. All these pictures and audio files are saved in the resource folder within the application. SQLite Database is used in this application as android supports this Database.

2.1. Changing User Preferences

The app allows a user to modify the interface as per his or her needs. The settings include

- **Operational Modes:** The app supports two modes of operation: Tutor and Student. Only the tutor has the rights to change the other settings.

- **Level:** The app operates in two levels: Level 1 and Level 2. The level 1 has a grid size configured to four items display and level 2 to 10.

- **Number of Columns:** If the level selected is 2, then the number of columns can be changed from 2 to 5. In level 1, the columns are fixed to 2.

- **Zoom Speed:** Speed at which the image is zoomed can be changed

- **Gender:** The audio for the app can be selected as Male or Female

- **Modes of Navigation:** It has three different modes of navigation, by scanning of pictures, selection on touch and selection by cross hairs

- **Mass Customization:** Mass customization of Pictures, Audio and Labels is possible

- **Label Text Color:** The color of the label can be customized

- **Reset:** All the changes made to item(s) pictures, voices, and labels will get restored to factory settings.

2.2. Other Settings

In addition to the above preference settings, the app also allows the user to do the following:

- Change the Background Color

- Choose the language of his/her choice (English, Tamil, Kannada, Malayalam, Hindi, Gujarati, Odiya). For purposes of ease, separate applications were released for the southeast Asian languages ofBahasa and Vietnamese.

- A user can navigate to Kavi Games and participate in activities based on the various categories and images

- If registeration is completed, usage data is captured by the app and the same can be sent by the user by using the share option. This allows the data analytics to be performed to understand the usage and the effectiveness of the app, and later on to improve its performance.

2.3. Customizing or Adding New Categories/Items

It was found that there is a need for different categories for different users or for users in different locations. Hence, a provision is made to allow the user to add the categories or items under these categories.

An in-app recording feature is available to record the audio too for the required category or items

2.4. Indic TTS Integration

- A consortium project (funded by the Department of Electronics and Information Technology (Deity), Ministry of Communication and Information Technology (M CIT), Government of India)[3] to develop HTS based statistical speech synthesis for 13 Indian languages was undertaken by a group of Organizations with IITM leading that consortium.

- KAVI-PTS uses the same TTS for the local languages that it supports (Hindi, Tamil, Malayalam, Kannada, Telugu, Marathi, Odiya, Gujarati)

3. Summary

We have released KAVI-PTS, a picture to speech app for people (primarily children) with cerebral palsy, autism, learning disabilities speech disorders, ADHD at their early levels of literacy. The application helps the children to improve their vocabulary and also to communicate about their needs. KAVI-PTS is customizable. The categories, pictures, labels, audio output can be customized according to the need and ability of the children. The application is available in multiple languages as English, Tamil, Malayalam, Kannada, Hindi, Gujarati and Odiya. The app will also see release in other languages like Telugu, Bengali and Marwari soonKAVI-PTS is also developed in South East Asian languages as Bahasa, and Vietnamese, though these do not have native TTS engines as the Indian languages do.
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An AAC software also has a role to play as young adults transition into independent living. Leveraging off our experience with KAVI-PTS, we released vBill, a billing software for use in vocational training centres.

4. Acknowledgements

5. References

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