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Handsfree Interactive Application for Kid's Communication

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Abstract:
Our aim is to develop a handsfree interactive application. This application is useful for kids under the age of five. This application focuses on kids to perform their timely activities. It helps the kid to develop a good command over languages by making interactive, simple and convenient. The interactive feature of the application ensures to enhance and nurture the kid's behavior and speaking abilities. It improves the kid's learning skills and increases the kid's ability to understand and analyze things better. This application lets the kid learn to be independent at an early age. The basic idea behind creating this project is to guide the kids under the age of five in the right track which includes good behavior and discipline along with communication.

Keywords: NLP, text-to-speech, speech-to-text, pattern extraction

I. INTRODUCTION

Handsfree is a term used to describe the technology that uses several features to accommodate a user's ability to communicate without the use of their hands. Handsfree technologies use the wireless system that are used in the emerging mobile technologies and other wireless networks which allows the user to communicate with the nearby hardware devices that sends and receives data as voice or digital packets. This interactive communication app that is designed for kids is a handsfree app. This allows the kids to be independent to perform his/her daily activities. It is designed for kids under the age of 5 to help them in developing their learning and speaking ability while keeping in mind to nurture and enhance their behavior and skills. The handsfree approach used in the app ensures that the kids avoid maximum interaction with the gadget itself. The development of the app is divided into three modules:

The first module of the app deals with the implementation of the app's communication with the kid. It provides the day-to-day schedule of the kid on a timely basis. The app lets the kid know what activities are to be performed on a specific day at what time. It provides the kid with the right amount of relaxation period while also keeping him/her active and entertained throughout the day. This module helps in improving the kid's communication skills and the ability in learning and understanding languages like the app repeats a greeting or instruction at least three to four times which lets the kid grasp and understand the language. The second module focuses on the interaction between the app and the kid. This module lets the app and the kid interact with each other. This helps in letting the app know the kid's interests in specific activities. It stores these interests as well as the other information of the kid. This module also provides the feature of letting the parents to review the trend in the child's data and progress. The third module of the app has the option of recording voices. The recordings would mostly be done by the family i.e. the parents, grandparents etc. The recordings can be anything ranging from a simple greeting to a set of instruction for the kid. This module gives the kid a feeling of familiarity and hence increasing the comfort of the kid.

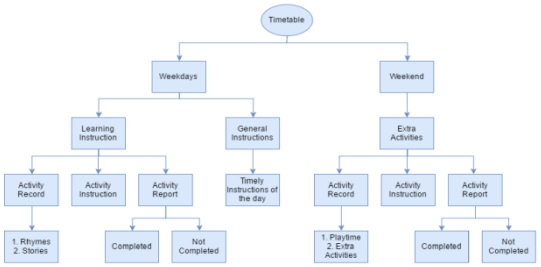

Figure.1. The schedule representation

The app functions on a schedule. The instructions of a day consist of learning instructions and general instructions. The learning instructions are those instructions where activities like reciting rhymes, reading stories etc are performed. Whereas the general instructions are the daily and frequent instructions like take bath, have breakfast etc.

II. LITERATURE SURVEY

A literature survey, also known as literature review, in a project report is the research and analysis made in the field of a topic which also has the results already published. The literature survey gives direction in the area of research. Comparison between existing project

- Yes/No Answers HD

This app is useful for non-verbal people and those limited communication skills for simply saying 'yes' or 'no', or demonstrating a choice between two options. There is no interactive communication taking place.

- Scene and Heard

This is a communication and learning tool. Its features also include displaying video or taking to another scene when the area on the screen is touched.

The existing systems though good, lack the interactive and hands-free features. These systems do not guarantee the limited interaction of the kids with the electronic gadget. The proposed system considers the drawbacks of the existing system and takes motivation from them to create an application that is interactive, convenient, simple yet handsfree. The handsfree interactive techno-guide for kids' communication app uses Eclipse tool for development. It provides the ideal integrated development environment (IDE). This app is

developed using natural language processing (NLP), speech to text conversion methods and text to speech conversion methods.

A. Natural Language Processing:

NLP is a method in Artificial Intelligence that is used in the communication between the human and the machine [1]. It focuses on the human-computer interaction. The natural language processing systems take strings of words, i.e. sentences, as input and produce structured representation of the captured meaning of those strings as output. The steps involved in natural language processing can be shown in the following figure 2.1.

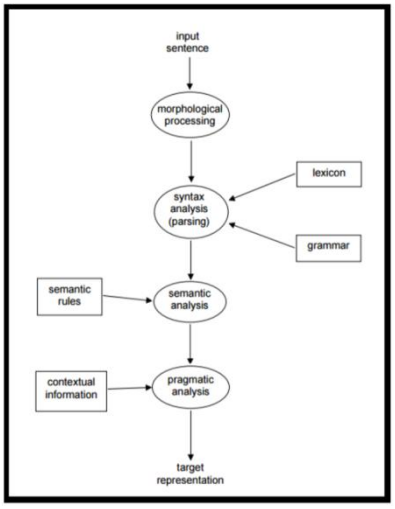

Figure.2. NLP Process

Step 1: Morphological and Lexical processing- The smallest meaningful or grammatical unit of a language is called Morpheme. So, morphology is the study of analysing, identifying and description of these structures of words. Lexicon of a language is defined as the collection of words and phrases in a language. Lexical analysis divides the text into paragraphs, sentences and words.

Step 2: Syntax Analysis (parsing) - It is the analysis of words in a sentence and depicts the grammatical structure of the sentence. The sentences that are grammatically incorrect are rejected by the syntactic analyzer.

Step 3: Semantic Analysis- It extracts the exact or dictionary meaning from the text. The meaningfulness of the text is checked by mapping syntactic structures and objects in the task domain.

Step 4: Discourse Integration- The meaning of any sentence depends on the sentence that precedes it. It also invokes the meaning of the sentence that succeeds it.

Step 5: Pragmatic Analysis- In this, what was said is re-interpreted on what it actually meant. It involves deriving those aspects of the language that require real world knowledge.

B. Speech to Text:

Speech to text conversion is also known as speech recognition [3]. A speech recognition engine takes an audio stream as input and turns it into a text transcription. The front end processes the audio stream isolating segments of sound that are probably speech and converting them into a series of numeric values that characterize the vocal sounds in the signal. The back end takes the output produced by the front end and searches across three databases: an acoustic model, a lexicon, and a language model. The process is shown in figure 2.2.

The speech to text conversion comes into picture in the second module of the development process of the app. As the second module focuses on the interaction between the app and the kid and vice-versa, this conversion method is quite useful. It takes the kid's speech as the input and the app gives as output the required information or activity.

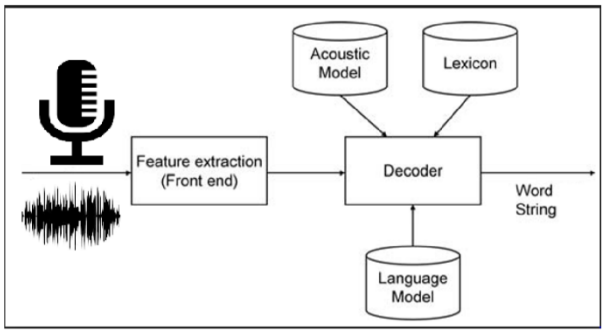

Figure.3. Speech-to-Text Process

C. Text to Speech:

Text to speech is also referred to as speech synthesis [4]. A speech synthesizer takes text as input and produces an audio stream as output. In this, the front end analyzes the text using natural language rules. It analyzes a string of characters to determine where the words are. This front end also figures out grammatical details like functions and parts of speech. All of these elements are critical to the selection of appropriate pronunciations and intonations for words, phrases, and sentences. The front end does extensive analysis to understand how a word or phrase is being used as the rules are different for each language. The back end takes the analysis done by the front end and generates the appropriate sounds for the input text. The conversion process is shown in figure 2.3. This conversion method is used to analyse and understand the kid's speech to be able to give out an appropriate reply to the kid with respect to his/her speech or query.

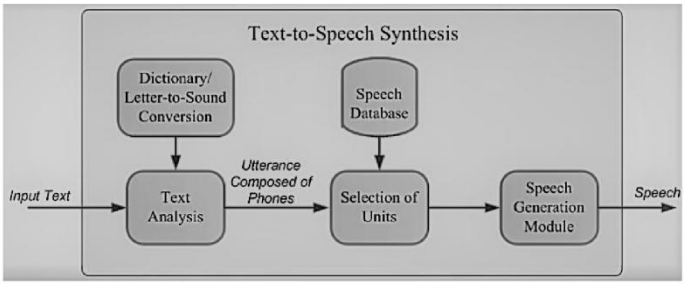

Figure.4. Text-to-Speech Process

III. PROPOSAL

A project proposal can be defined as the detailed description of a number of activities, the plan of action which is required to reach the completion of the project. The proposal of this interactive app is described as follows:

A. PROPOPSED SYSTEM

The application will guide the child on timely basis about the daily activities which needs to be performed. Every activity of the child throughout the day will be spoken out by the application in parents' /guardian's voice. This application will

be a techno-guide which will provide extra information to the child about daily activities, recite poems and rhymes which the child is supposed to know. Handsfree is the key feature of the application which instructs the child to perform tasks on timely basis without making frequent interaction with the device.The sample of one day's schedule is as shown in figure 3.1.

TIME	MONDAY- FRIDAY
7.30 AM	Good Morning!
7.45 AM	Brush your teeth and take a bath.
8.00 AM	Breakfast time.
9.00 AM	Get ready for school.
9.15 AM	Pack your bag. Don't forget your lunch box!
9.30 AM	Leave for school now. Have a great day!
1.00 PM	Hi! Welcome back.
1.05 PM	Go freshen up.
2.00 PM	Story time!
3.00 PM	Time for your nap.
5.00 PM	Rhyme/Song
6.00 PM	Playtime
7.00 PM	Freshen up
7.15 PM	Let's start the homework.
8.00 PM	It's dinner time.
9.00 PM	Brush and bath.
10.00PM	Read a story.
10.30PM	Good night. Sweet dreams.

Figure.5. Schedule of the day

It will be a two-way interaction between the application and the child. The application will sink in the details and views of the child in voice format convert it into text and analyze it with the help of natural language processing. The application will provide necessary response to the child using the concept of artificial intelligence. The child's view point will be recorded by the application in the database, to which the parent can make a frequent check and analyze it.

B. PROPOSED METHODOLOGY

The basic requirements for the app include the day-to-day schedule of the kid. This schedule, once inserted in the app, runs on timely basis. The day is scheduled in such a way that it has equal amount of learning as well as relaxing time for kids under the age of five.The app has a flexible feature allowing parents to make appropriate changes in the schedule, if required. The main functioning of the app is to guide the kid to perform the necessary task according to the given schedule. This application also has the feature of interaction with the kid, which allows the kid to put forth his/her choices for a particular task on the basis of all the choices provided by the application. Moreover, the app also enables the parent to use pre-recorded voice features due to which, the kid feels the instruction is given by the parent on the spot.

IV. PLANNING AND FORMULATION

A. Project Planning

There is no way to understand the progress of a project without proper planning. Project planning states how to complete the activities of a project within a certain time frame. The first step to plan the development of a project is to lay out the basic structure of the project based on the tasks and actions to be performed for the completion of the project. The steps involved in project panning are:

1. The activities of the project which include-

- Analysing and understanding the requirements
- Literature survey
- Analysis
- Proposed work
- Report
- Design
- Coding
- Testing
- Implementation

2. Estimating the completion time of each task of each activity.
3. Review and record the progress of the project periodically.

V. DESIGN OF SYSTEM

The design of a system defines the modules, interfaces and data required for a system. The system design is represented in the form of data flow diagrams and sequence diagram.

A. Data Flow Diagram

The data flow diagram, shown in figures 5.1(a) and 5.1 (b), represents the flow of the data of a system. The database of the app stores the entire schedule of the kid. The app takes the system time as the input. The app takes this time and starts the process of mapping the time with the schedule present in the database. When the input time and the schedule time match, the app takes the information stored in the database at that particular time and gives as output. This output is given in the form of voice notification.

Figure.7. (a)

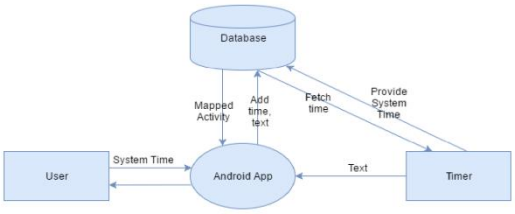

Figure.8. (b)

B. Sequence Diagram

The sequence diagram, as shown in figure 5.2, gives the in depth detail of the sequence of the process in a time sequence. This provides the interaction of different tasks with each other, mainly how they operate and in what order.

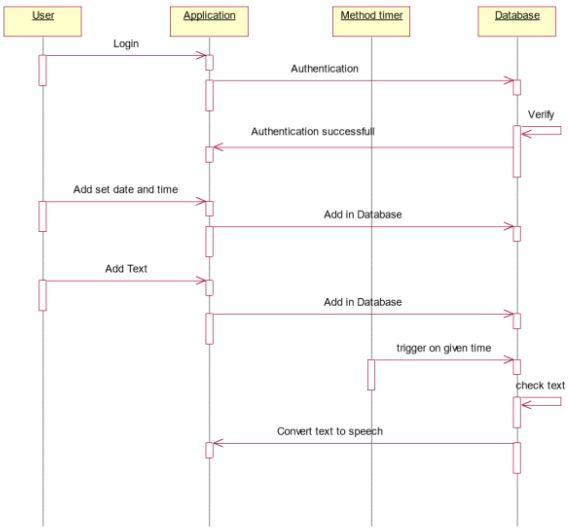

Figure.9. Sequence Diagram of the app

VI. CONCLUSION

This application is useful for kids under the age of five. This application focuses on kids to perform their timely activities. It improves the kid's learning skills and increases the kids' ability to understand and analyze things better. This application guides the kids in the right path of growing which includes good behavior and discipline. This application helps them in developing their learning and speaking ability while keeping in mind to nurture and enhance their communication skills. The handsfree approach used in the app ensures that the kids avoid maximum interaction with the gadget itself.

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