Super Toy – Child Monitoring System  
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Abstract — Super toy is a child monitoring system which can help the parents to maintain smooth relationship with their child. This will be very useful when both parents go to work. The system is capable of understanding the “baby language” and translates it to the natural language. Since children are more attracted to soft toys as the main interface a teddy bear is selected. When a child says something to the teddy bear, it’ll detect the voice, understands the request and translate it to a text message. This will be sent to the parent’s mobile phone. If they reply, teddy bear will say it to the child. If the parent does not reply default sentence will be said. The system facilitates the parents to get to know about the exact meaning of the word/sentence child says. This system will help to build a good connection between the child and the parent. The system tends to merge information technology with child psychology and produce an efficient and attractive child monitoring system.

Keywords — Voice to text transmission, Child Psychology, Voice Recognition, Wi-Fi, Algorithms, Custom Grammar builder.

I. INTRODUCTION

Due to the present circumstances of the fast moving world, keeping in touch with their child has become a huge parental issue. There are many communication softwares available with video such as Skype, Viber and Google talk; which have taken steps to bring down the distance to a certain extent. However they do not provide an exact solution. A small kid hardly ever cares for a distant figure shown in a screen. None of those softwares have been able to catch the attention of a child in the level of closeness or attachment. When pondering over this situation, the research team came up with an idea to connect the child with his parents through a source to which a child would get attached. As the result the system “Super Toy” was designed and developed.

The main objective of the research was to build a child monitoring system combining the concepts voice recognition, custom grammar builder and child psychology. The system is capable of monitoring children between the ages of 2 to 5. In present when both parents go to work, they keep their children under the care of a nanny. Since they are not spending much time with their own children they might not be able to understand the child’s language. A child’s ways could only be understood through spending some quality time with him or her. The Super toy helps in a great deal in strengthening the bond between the parent and the child who are usually far from each other. It throws the baby to grow up mostly under the influence of his parents rather than a nanny’s. “Super Toy” is also developed to support parents to be confirmed on the level of security their child is under. Since Wi-Fi facility installed in the system helps to detect the location of the child. When the child is moving from the defined location text message will be sent to the parent.

II. THE LITERATURE REVIEW

According to child psychology every child is more indulgent towards their favourite toys than for their parents and evidently [1]. Children, age group between 2 to 5 is more attached to soft toys.

When analysing the literature there many child monitoring systems has been designed form 1992.

A. Voice Recognition Systems

In 2002 the communication device provides the capability to automatically convert between voice and text messages. It allows a computer to identify the words that a person speaks into a microphone or telephone. The "holy grail” of ASR research is to allow a computer to recognize in real-time with 100% accuracy all words that are intelligibly spoken by any person, independent of vocabulary size, noise, speaker characteristics and accent, or channel conditions. Despite several decades of research in this area, accuracy greater than 50% is only attained when the task is constrained in some way [2].

In 2003 there was a communication system which connects the hearing user with the assisted user. The relay creates the text message stream containing the words spoken by the hearing user. The relay then combines the digital characters with the text message with the packets of digitalized voice spoken by the hearing user and sends the combined digital data packets to the station of the assisted user [3].

In 2004 a system and method for searching, assembling and manipulating a variety of multi-media using voice converter to text command. It introduces a method for voice-to-text reduction for real time messaging. It uses a microphone, Voice-to-text converter, Receiver, Transmitter and a Rendering device [4]. Also in the same year a method or system for voice-to-text reduction for real time messaging. It uses a microphone, Voice-to-text converter, Receiver, Transmitter and a Rendering device. In this it uses large-vocabulary speech recognition of different speakers over different channels, accuracy is no greater than 87%, and processing can take hundreds of times real-time [5].
B. Child Monitoring Systems

There were several books which gave the knowledge for the parents in monitoring the children. *Children of different worlds*, is the first to integrate research on children's source monitoring, readers will find an accessible overview of source-monitoring theory and findings from the research programs of leading investigators in this area [6].

There was a child monitoring system, in which a specific distance was given. That is, the system will recognize the child’s voice within a certain distance only. If the child exceeds the distance, a beep sound will be heard, informing that the distance has been exceeded [7].

There are child monitoring systems including a combination bracelet and camera transmitting assembly, and a receiver for tracking and providing audible and visual contact with the child or object within a predetermined area or domain [8].

There are inventions provide adults with an effective way of keeping track of small children and pets in large areas. The child or pet, wearing a sensor, would set off an alarm when they near the motion detectors. This would let the adults know that a breach has occurred [9].

In 2011, Child guard monitoring System transmitter sending a constant signal compact wireless transmitter is strategically hidden in a plastic toy looking transmitter [10].

In 2012, the child monitoring system with the GPS facility was introduced. The system will keep on sending messages to the mother about the child’s activities. There are child monitoring systems, wrist tags adjust to fit snugly against the child’s skin, and contain a strong locking mechanism that cannot be easily opened without a key, which comes with the Base Unit. Icare is another system with Geolocation GPS system. That enables you to monitor the child. The Icare disabled child GPS is also suitable for monitoring disabled children [11].

The figure 1 explains the research gap it tries to fill.

When we consider the research gap, there are few existing child monitoring systems in the market. In real world, servants take care of the baby. There was a system which had a combination of bracelet and camera transmission. The voice recognition systems are for adults. None of them were more attracted to children. This system will be more attracted to children since, they are more attracted to soft toys. This contains a custom grammar builder which is built especially for small children.

III. RESEARCH METHODOLOGY

Super toy combines all features to a single unit as given in figure 1. The system covers the following three areas:

![Child psychology](image1)

![Custom Grammar builder](image2)

![Voice Recognition](image3)

The system was implemented according to the prototype methodology. In the prototype methodology it performed the analysis, design and implementation phases concurrently and all three phases are performed repeatedly in a cycle until the system is completed.

A. Planning

This phase is the most critical and important in software development life cycle. The starting point of the project life cycle is planning phase. In this phase research team will identify why an information system should be built and determining how the project team will build it. The project manager creates a work plan, staffs the project, and puts techniques in place to help him to control and direct the project through the entire SDLC. Finally managing risk and controlling and directing the project has be done.

B. Data Gathering and Analysis

Main literature review was conducted by analysing the past researches on the three main important parts; Child psychology/child monitoring, custom grammar builder and voice recognition.

Questionnaires given in figure 3 were distributed to day care centres and parents to analyse the frequent words used by the children. There were nearly 20 participants in total, including the day care centres. These words were used to test the system prototype.
C. Designing

The primary objective of the design phase was to create a design that satisfies the agreed application requirements. In the design phase four modules were focused:
- The electric circuit
- Graphical user interfaces
- Word database
- The algorithms of the grammar builder

D. Implementation

A good implementation reflects the design decisions. The system was developed using C# language using the IDE Microsoft Visual Studio 2010 which is one of the releases of Microsoft.NET team. To store data Microsoft SQL server 2008 is used. Figure 4 illustrates the main components and the system functionalities.

Parent can Add/Update/Delete word and add song to the system. When child requesting something from the teddy bear, it recognized and translates baby language into natural language. This handles by the custom grammar builder. Then the parent will be able to receive the question and they can reply back the answer by monitoring the child virtually. System will translate parent’s reply into child’s language and tell it to the child through teddy bear. If baby ask a song (talk to the toy) system will check first line of the track list. If the song is found it plays to the child. If it can’t find it a message is sent to the parents’ phone.

The system detects the teddy bear position in every 80 second through “Wi-Fi” signal strength. The Wi-Fi transmitter is placed inside the teddy bear. If the teddy bear is not within the defined location system will send an alert message to that parent saying the child is not in the sight. The system assumes the child carries the teddy bear along with him or her.

1) Custom Grammar Builder:

According to the literature review it was found that children around two to five years speak maximum hundred words.[5]

Grammar used by children is different from the grammar used by the adults. The system is for children between 2-5 years, a special grammar builder has been developed. Usually the children within the specific age group cannot come up with sentences which have no grammatical errors. They only use nouns and verbs to come up with their sentence. Therefore a grammar builder has been developed which checks for the verbs and nouns in the sentence spoken by the child, so the system will assume for what the baby is asking for, and sends a message to the parent.

The grammar builder has been built with three basic rules. As the first rule, the song request will be checked. If there is a song, in the sentence spoken by the child it will be played. As the second rule, the system will check for the repeating words. According to the child psychology, the baby will keep on repeating for what he wants. And the third rule is that, if there is a verb and a noun nearby in the sentence, system will assume that the baby is asking for that. These are the three rules carried out to come up with the grammar builder.

2) Circuit of the Soft toy

A Bluetooth headphone is fixed in the circuit. It takes the child’s voice, amplifies the sound and sends it to the PC. This is how the voice transmission is made. There are two LED’s attached to the eyes of the teddy bear. When the speaker is on, the LED will get the power, and will work. Figure 4 is an image of the circuit.
The circuit is embedded inside the teddy bear given in figure 6.

3) **Wi-Fi Detector:**

Existing products in the market have used Bluetooth and GPS technologies to track the child’s position [6]. The problem of above mentioned technologies are Bluetooth can be used only in a small environmental range also to use the GPS technology mother should be always connected to the internet. In the research, team has used Wi-Fi technology to get the child’s position. It can be used in a large environmental range and internet connection is not essential. It simply sends a SMS to the mother’s phone indicating the child’s position.

Baby reaches maximum level of distance from the super toy, system will send an alert to mother. Baby can communicate with Super Toy.

4) **Graphical User Interfaces**

Figure 7 shows the interface which can use to add a word. In this interface parent can enter the original word and add the pronunciation to the system. A parent can add child’s pronunciation and the meanings of that word.

Figure 8 shows the interface which can be used by the parent to update the phone number. In this interface the existing mobile number can be changed. Also the port number can be selected.

5) **System Integration**

Soft toy is one of the main components of the system. The circuit is embedded within the soft toy. Pc and the soft toy are connected via Bluetooth and Wi-Fi. Pc is the backend of the system.

E. **System Testing**

Nearly 100 possible words have been fed to the system. It has been tested in nearly 400 number of combinations.
Based on the results the accuracy level is around 78%. Since the system is in the prototype level it has not been tested in a real world scenario.

Figure 9-Change number.

IV. CONCLUSION

At present not only science and technology is playing a main role, Information Technology too has greatly reached milestones in extraordinary inventions. The research Super toy tends to look at how to adopt information technology in to the field of child monitoring. This product gives a solution to the problem which most parents are facing today. Since both parents are doing a job and unable to take care of their children.

The system accuracy is 78% it’s not 100% because the child will not tell the exact word. Child language is different from usual language. So the system should be trained according to the child’s language.

As the future work, the circuit built in the system can be fine-tuned and smoothened. Currently additional PC or laptop has to be used to run the software component. In future all can be integrated to one unit and embedded it inside the soft toy. The technology on Bluetooth enhances, it can be used to detect the child location instead of Wi Fi.

REFERENCES


