Context Aware Computing Used For Education and Communication of People with Special Needs; Focus on Deaf and Dumb

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***Abstract*—Context Aware Computing is a specialized area of research and applications that uses mobile or handheld systems that are able sense and adapt to surrounding physical environment. A voluminous body of research is available focused on the exploitation of context aware computing in various individual, commercial, industrial, as well as social situations. This paper is intended to present a picture of current state of research and technology in the area of context aware computing with an emphasis on its applications to assist people with special needs especially deaf.**

***Keywords*— Context aware computing, Special Needs People (SNP), Education and Communication System.**

I. INTRODUCTION

Context-awareness is a mechanism in mobile computing using which applications can discover and take advantage of user's context i.e. information regarding its users time and space. Such information may include location, time, people and devices in purlieu, as well as any activity being performed. Various context aware applications have been developed as a result of several research studies of the phenomenon [1].

Extensive research conducted on context-aware systems and their applications, suggests that these systems support in collection and propagating context and applications that adapt to changing context [2]. Context aware application depends on type of context in which they are used and models of context information. Now a day's users interact with various devices (mobile or fixed) featuring variety of interfaces and used in variety of environments. The prominence of ubiquitous computing can be understood from the fact that the proliferation of such specialized devices has outnumbered users [3].

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The puzzle of ubiquitous computing is still missing some important pieces. Most importantly, interaction paradigms embedded in contemporary devices are unable to apprehend variations between the static desktop and mobile interaction models. Present-day computing devices are commonly used in dynamic environments, but fail to adjust to those changes very well. Depending on the use, a computing device may encounter myriad of situations as it moves away from desktop model, but such devices rarely aware of their proximity [4].

The richness of user experience depends on the information available in the milieus of mobile devices and thus creates a context for interaction between users and devices. In order to enhance user experience, it is recommended to allow the devices and applications to acclimatize with the differences in physical and operational environments [5].

Context can be defined as "Any information characterizing a situation related to the interaction between users, applications and the surrounding environment." Context awareness is the most profound subject of recent researches done in the field of ubiquitous computing. "Although, the concept of context can involve very subtle and high-level interpretations of a setting, much of the effort within the ubiquitous computing community takes a bottom-up approach to context". The concentration is mainly on improvising the automatic perception of context from physical environment and utilizing the information gained through sensors to better predict the behavior of an application [7].

Schilit divides context into three categories namely: "Computing context, User context and; Physical context. Time is also an important and natural context for many applications. Since it is hard to fit into any of the above three kinds of context, we propose to add a fourth context category as time context" [8].

"Although information about the current context may be available to mobile applications, how to effectively use that information is still a challenging problem for application programmers". Schilit defines context-aware computing by categorizing context-aware applications in 4 categories such as: "Proximate selection; Automatic contextual reconfiguration; Contextual information and commands and; Context-triggered actions" [9].

Pascoe proposes "taxonomy of context-aware features, including: Contextual sensing; Contextual adaptation;

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Contextual resource discovery and; Contextual augmentation".

When these ideas are combined and mapped to three general categories of context-aware features that context-aware applications may support: "Presentation of information and services to a user; Automatic execution of a service and; Tagging of context to information for later retrieval"[9].

II. SPECIAL NEEDS PEOPLE (SNP)

Special Needs People (SNP) is a part of any society. There are different types of special needs people with respect to their disabilities; blind, deaf and dumb, mentally distorted etc. and in most of the countries special needs people are supposed to be social burden on their family and in the society as a whole. This research refocuses on special needs people who are Deaf and Dumb.

There is a need to incorporate deaf and dumb people in different organizations in order to lessen the social burden of their closed ones. Therefore a proper education system is required to educate them as per the requirements of society to make them valuable for their family as well as society. These people encounter a number of difficulties in their career, which create barriers in finding the proper job and to assimilate at suitable workplace [9].

Deaf people communicate in sign language in their community. Different people of different region follow their own native natural languages as deaf people are the part of all region therefore they make own gestures which can commonly understood, as with spoken languages. Like spoken languages, sign languages are living languages [10].

The social interaction of deaf and dumb people involves communication with both normal and special people (deaf and dumb people)[10].

Therefore two types of communication model are existing for deaf persons (Li Min.et.al, 2012):

- Deaf-to-Deaf Communication Model
- Deaf-to-Normal Communication Model

The Deaf-to-Deaf Communication Model is beneficial for deaf persons. This model exhibits the communication between deaf people using sign language. Deaf people have difficulty to work with Deaf-to-Normal Communication Model. This model shows interaction between normal and deaf person. Here the deaf one will face problem due to the fact that not all normal persons are able to understand sign language designed for special people. A context aware computing system is proposed for improving their education requirements and reduced communication gap between normal people and them [11].

Communication between deaf and dumb people with normal people is only possible:

- if the normal people can handle the sign language,
- if the deaf people communicates with clear gesture

At the moment there is no such education system where deaf and dumb people can get education with normal people without any communication gap [11].

III. CONTEXT AWARE COMPUTING FOR PEOPLE WITH SPECIAL NEEDS

Education is the process of learning that involves both physical and non-physical constraints. It can be effectively done with the help of technology. However the important element in this learning process is environment. Human learning behavior is observing and adopting things from their environment. This behavior involves interaction between humans, humans and technology, humans and surrounding. Human to human communication is based on language spoken and gestures used by the persons to understand the meaning of sentence. This phenomenon doesn't work in communication between humans and technology. Here communication take place through an intermediary bridge called translator that works for understanding of both user and machine.

Education is one of the important areas where context aware computing technology can use to interact and communicate amongst individual and technology. Education with other tools makes specific technology.

This proposed model helps the teacher to collaborate with the students with special needs.

Technology has not only enhanced abilities of special needs people (SNP) but also helps them in learning activities. Information and computing technologies have made distinction by developing embedded devices that are able to solve or aid people with major disabilities in reducing vast variety of limitations that halts the involvement of students suffering with speech and hearing impairments.

Context-aware persistent learning environments involve embedded computing devices that are interconnected.

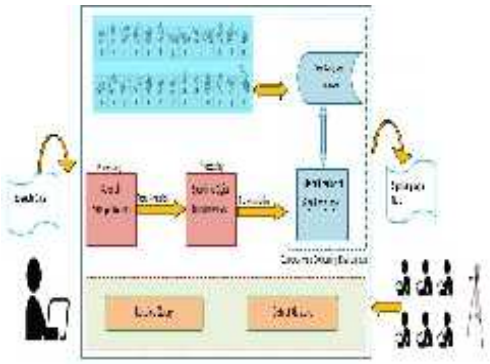

Figure.1: Proposed Education system for Deaf and dumb people using Context aware Computing to reduced communication gap between deaf and normal people

Proposed system is facilitating the interactive system of special needs people using the context aware computing and reducing the communication gap. Communication is a two way process which involves sender and receiver that exchange messages through a communication channel. Exchanging of messages involves two way traffic responsible to carry the message from sender to receiver and vice versa. Technology has a huge impact on communication systems. Variety of computing devices is available to enable communications. Such devices have not only revolutionized ordinary users' life but also help in improving the living style of people with special needs. Another big achievement in this area is acquisition of context awareness in computing devices used for communication.

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Special people are part of community and to attain progress in the development of a country, such people need to be assimilated in organizations so that they do not become a burden on the economy. It is believed that context aware devices can be used as tools for creating such an environment where people with special needs can work with normal people in a comfortable way.

Suppose an organization hires a few deaf and dumb employees with other normal people. In such a situation it will be difficult for the heterogeneous staff members to have a conversation with each other.

A simple solution to this problem can easily be provide by using the concept of context aware computing and arrange a system with the help of physical device like computing device embedded with sensors and context aware computing applications to convert voice to text or sign language in real time. Projectors, microphones, speakers, and other peripheral devices are required to complete the process. Also integrate devices (used by special people) to the surrounding devices. In education environment the basic entities are teacher(s) and student(s), when teacher addresses the students the microphone will take voice as input to the system, which will be filtered through speech recognition techniques to convert voice into text. This text is then converted to sign language symbols using machine learning and sends as output to projection or display devices of the deaf users. This way the whole talk can be seen in the form of sign language symbols on multimedia. The session can be easily carried out by speaker simultaneously for all type of audience (see figure-1).

On the contrary when a deaf and dumb student wants to communicate or ask any question from the teacher/ normal person poses another problem which can be resolved with the help of a camera integrated with a network of sensors devices. The problem or question of deaf and dumb people can be understood by teacher/ normal person by mean of following options:

A special person can be provided a computer with keyboard that on pressing any key will produce a sound as an input to the speaker and digital signals over the network to the speakers system, where these signals will read the symbol assigned to that particular key in the database and show it on multimedia.

IV. RESULT & DISCUSSION

Now the next part is to take visual data as input and convert it into text and voice. Deaf person will communicate with the help of sign language and these gestures are taken as input by camera applying image processing mechanism. The translated sign language is now shown on the speaker side as text.

V. CONCLUSION

Proposed system can overcome the communication gap amongst deaf and normal people which provide flexible education system. After go through the system special people can easily be a part of a working environment equipped with context aware devices are able to generate revenue like any healthy member of a society. Integration of such devices in organizations will lead a country to another level of prosperity.

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