A Novel, Cost-Effective and Scalable Helping Aid for the Specially Abled

Jayaraj Sajjanar, Darshan Deshpande, Sachin S M, Rakesh Gulaganji, Pavan Mahendrakar

Abstract— This paper presents a general framework for developing a helping aid for the specially abled by capitalizing on the various advancements that have come into the computer arena . People with "Mobility Disability" or people who are bed ridden will be vastly benefitted. Existing voice based & gesture based techniques are complex,costly and are less scalable. By the virtue of simple acoustic signals produced by hand fingers, this paper proposes a computer interface for controlling the home appliances.

Index Terms— Physically Disabled, Helping Aid, Acoustic Signals, Computer Interface, Home Appliances, Audio Processing, Low cost .

1 INTRODUCTION

With the growing influence of technology on our lifestyle ,we become more obliged to contribute to the welfare of the differently abled and the less privileged. In this regard, a mechanism to help the people who are immobile,be it for a short term or a long term,would be very beneficial . Making the mechanism user friendly and cost-effective can be an additional icing on the cake. Some existing systems take a good note of the necessities of the immobile people and therefore are good examples for reference. Low cost systems described in paper [1] provide an efficient mechanism . However it does suffer with problems in terms of complexity and involves redundant hardware. The usage of switches, relays and gloves make it less cost-effective. Voice recognition and touch screen technology [2] , while efficient and sophisticated in their approach, are a bit lacking in the cost effective and simplicity factors. Even the installing and maintenance grossly affect the diversity of the target users.

Another problem associated with the voice based technology[3] is that of the need for sophistication. Since detection and processing of the voice based signals can be such a daunting task, the system needs to have measures to accurately detect the signals and actuate the corresponding tasks consistently. All the above said factors make voice based systems good contenders for "user friendly" but are "not cost-effective" .

- *Jayaraj Sajjanar is currently pursuing Bachelors degree in computer science engineering in BLDEA'S VP Dr PGHCET , Bijapur . University :Visveswaraya Technological University,Belgaum, India, PH-91-8861191810. E-mail: jayarajsajjanar2010@gmail.com*
- *Darshan Deshpande is currently pursuing Bachelors degree in computer science engineering in BLDEA'S VP Dr PGHCET , Bijapur . Visveswaraya Technological University,Belgaum, India .*
- *Sachin S M is currently pursuing Bachelors degree in computer science engineering in BLDEA'S VP Dr PGHCET , Bijapur . Visveswaraya Technological University,Belgaum, India*
- *Rakesh Gulaganji is currently pursuing Bachelors degree in computer science engineering in BLDEA'S VP Dr PGHCET , Bijapur . Visveswaraya Technological University,Belgaum, India*
- *Pavan Mahendrakar is currently teaching as Assistant Professor in Computer science engineering Dept , BLDEA'S VP Dr PGHCET , Bijapur Visveswaraya Technological University,Belgaum, India*

Gesture based systems[4] also face the similar kind of issues that plague the Voice based systems. Howsoever user friendly they might seem in their approach, the costly nature of theirs seem to outweigh the pros when it comes to commercialising the product.

Keeping in mind the needs and constraints, this paper proposes a system that achieves the same functionality but at the same time tries to deal with the issues that plagued the heretofore mentioned systems. The system will be cost-effective as it involves very less hardware . The user friendliness is implicitly taken care of . And the scalable feature that this system comes with, adds an edge, wherin any number of applications can be integrated with it and therby be controlled contactlessly

2 SYSTEM OVERVIEW

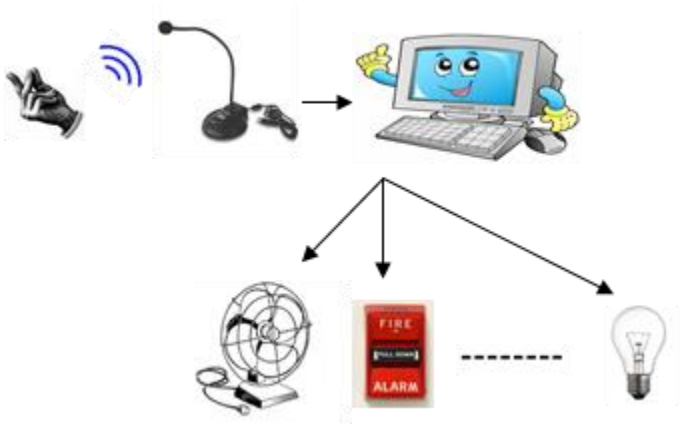

Fig.1 – Illustrates the system overview

The above shown figure shows the design of the proposed system. Accoustic signals are produced by simple hand actions which can be amplified/filtered or not depending on the environment of the installation. A microphone captures the signals and sends the same to a computer for processing .

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The microphone and the computer constitute the major part of the hardware requirement and a virtue of which can be its easy availability. The processed signals can then be used to actuate or control the integrated appliances such as the fan,fire alarm,light bulbs etc .

The numbers obtained are analysed to determine the intended input of the user which can thereby be mapped to a table of predefined corresponding actions.

3 PROCESS OVERVIEW

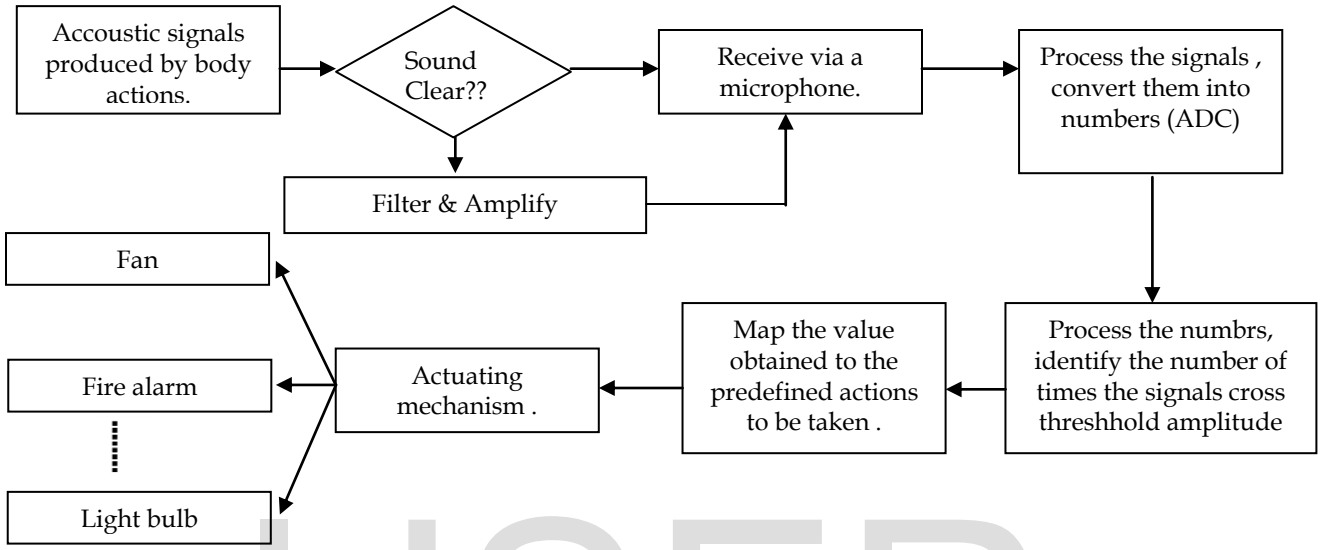

Fig. 2. Data and control flow diagram of the proposed system.

Fig 2. represents the data and flow diagram of the proposed system . The signals that are produced by the user , if are in a noisy environment ,are sent for amplifying and the noises are filtered out using standard algorithms. The signals whether directly from the source or from an amplifier mechanism are captured by a microphone. It should be noted here that the micropohone is such chosen that it is readily available and can be easily configured without needing the presence of any professional. The microphone is attached to a computer which too is readily available thereby making the whole assembly very easily configurable thereby complimenting the simplistic nature of the system.

The signals received by the computer are processed using a suitable tool and are converted into numbers.Fig 3. [5] illustrates the above said process.

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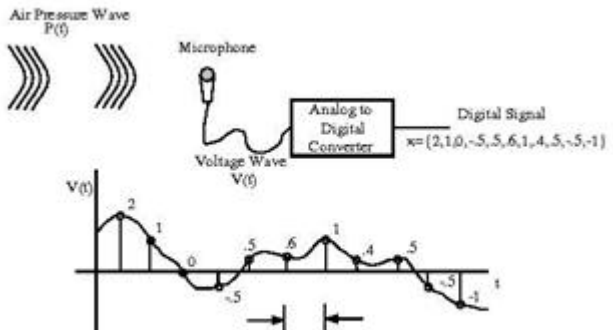

Fig. 3. Illustrative diagram showing the basic process

The determining of the action is done based on the number of times the signal crosses a predefined threshold amplitude. A sample table which can be used for referencing can be as illustrated in Table 1 .

TABLE 1
Illustrative table showing a sample reference

Number of times the signal crosses the threshhold value.	Corresponding action that can be asserted.
1	Switch on the fan.
2	Actuate the fire alarm.
3	Switch on the light bulb.
. . .	. . .
N	Any other remotely controllable appliance.

Thus "Finger Snapping" can be used for complimenting the

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designed system wherin the number of times a finger is snapped determines the action to be taken .In this regard a sample "Finger Snap" is sampled and plotted for visualizing. Figure 4 illustrates the above said feature of finger-snapping.

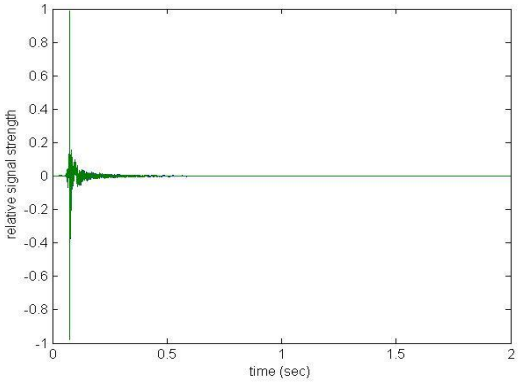

Fig. 4. Graph obtained for single snap.

From the graph obtained it can be observed that the relative signal peaks whenever a distinct finger-snap is made and this nature of the graph can be made use of to determine the number of finger-snaps and thereby the corresponding action to be actuated. Hence Figure 4 is an illustration for finger-snapping done once.

In a similar sense if the number of times the finger snapped happens to be twice then the graph obtained would be as shown in Figure 5.

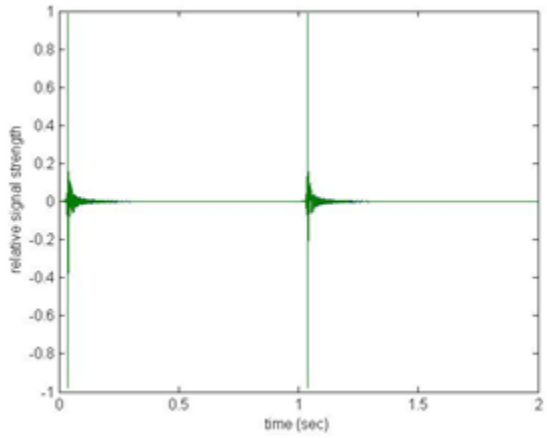

Fig. 5. Graph obtained for double snap.

4 FUTURE SCOPE

1) Contactless handling of hazardous machines in industries or other fields.

2) Inclusion of machine learning(artificial intelligence) to fine tune the procedure and harness the vast potential that this procedure holds in a more efficient manner

5 CONCLUSION

The mechanism illustrated in this paper will prove to be extremely helpful once implemented and can help the physically disabled in its own humble way. Cost-effectiveness, simplicity, scalable etc natures of this mechanism will be the main driving factors for its acceptability .

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