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# A Review on Gesture Vocalizer

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***Abstract: Gesture Vocalizer is a boon to facilitate two-way communication between the dumb and others. Normally the deaf use hand gestures to communicate with others which is very difficult for others to understand same as deaf and dumb cannot communicate using any verbal language. Gesture Vocalizer System is a device which uses two sensors i.e. accelerometer and flex sensors fixed on the digital glove. These sensors are used to gauge the hand gestures. This system uses a speech synthesizer circuit that converts the hand movements into speech output and the display gives the text in the desired human understandable language for the corresponding movements. In the same way, the speech input is converted into the desired gestures for the dumb to understand.***

***Keywords: Gesture Recognition, Flex Sensor, Microcontroller, Accelerometer, Speech Synthesis, Gesture Vocalizer, Digital Glove***

## I. INTRODUCTION

Gesture recognition makes computers to understand human gestures. It ensures a two-way communication between computers and human beings without using peripheral devices for providing the input to the system. The primary objective of this system is to make a Human-Computer Interface which interprets sign linguistics in a way that people with disabilities may communicate with others in a simple and efficient method. The goal of the paper is to plug the gaps of previous works in this field and present an advanced version which is fully functional.

The American Sign Language has its own grammar and has around 6000 gestures of words commonly used with finger spelling. Finger spelling uses 26 gestures and one hand to express 26 letters that are used in English. The project aims at developing a system which is capable of converting American Sign Language into text format. To have a meaning for conversation the sign language glove is a useful aid.

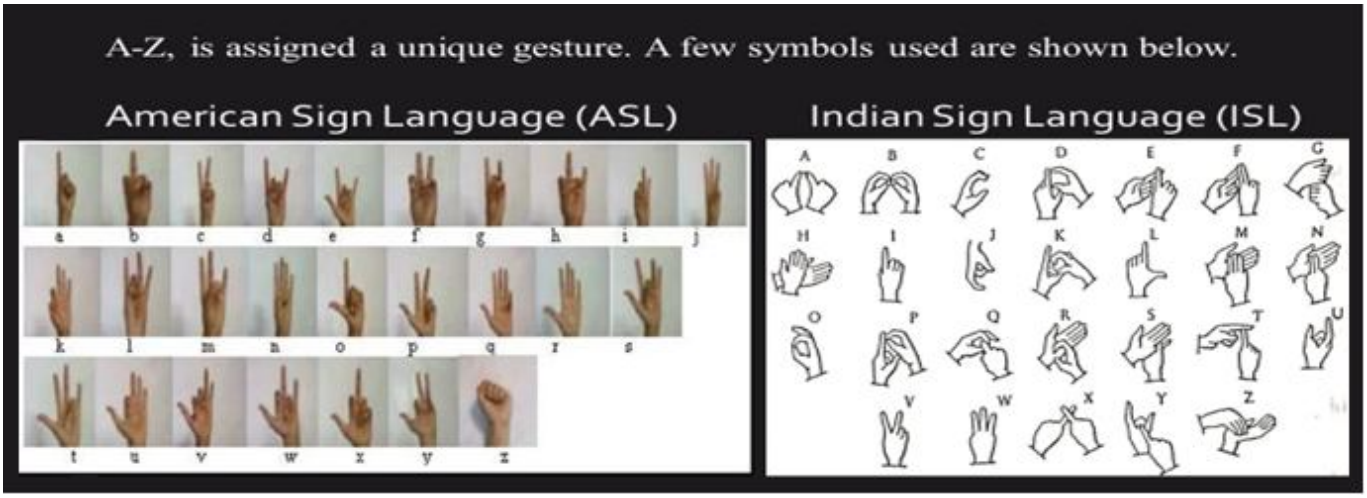


Fig. 1 Indian and American Sign Language

There are many hardware techniques which are used for collecting information regarding body positioning. Mostly image based or device based trackers are used. The first step is to gather the gestures and the second step is for recognizing those gestures. This research paper is an attempt to analyse the data from data glove mounted with flex sensors to be used to identify the gestures that are made. In the result notwithstanding several limitations like certainty and noise of the equipment, the rate of accuracy for the device is quite high.

In recent times the number of hearing impaired and speech disabled has risen rapidly. These people have their own language to express themselves. But we need to understand their language which is quite difficult at times. The project aims at removing this difficulty and facilitating a two-way communication using flex sensors whose output is passed to the microcontroller. The

microcontroller process the signals and convert analog signals into digital signals. Further, the gesture is analysed and the desired output is displayed along with the speech output.

## II. THE ORE OF THE PROJECT IDEA

Once I was travelling in a bus and I saw two people talking. They were using their hand's gestures to communicate. Unfortunately, they were mute but it was quite interesting to watch them communicating with their hands and they were very fast. It was very impressive communication going on between the two. Most of the passengers were taking a keen interest but none of us were able to understand the language. There is a communication barrier between the mute/deaf people and others. Dumb people are usually deprived of normal communication with other people in the society. It has been observed that they find it really difficult at times to interact with normal people with their gestures.

Hence I got an idea to design a device through which this communication gap can be filled. Computer recognition of sign language is an important research problem for enabling communication with hearing impaired people.

## III.LITERATURE REVIEW

In the image processing technique, the image is captured by the camera and then analysed using algorithms to give text on the display. In sign language identification system there are many problems such as lightning condition and the overall condition of the background. A higher resolution camera consumes more computation time and memory. In another approach, the user needs to use gloves consisting of flex sensors and motion tracker. Data is gathered from the sensors and depends on the hand and finger. Another way is to use a portable accelerometer and tactile sensors when EMG sensors are kept on the hands it generates a different sign gesture. Signals from the sensors are fed into the computer to identify the hand gestures and convert it into text.

There are two techniques which are mainly used for sign language detection and recognition vision based and microcontroller and sensor-based glove.

The vision-based technique uses a camera for capturing hand gestures as images and then uses different algorithms to analyse them for identifying the meaning of the particular gesture.

In the microcontroller and sensor-based technique flex sensors and accelerometers are used to detect the hand gestures. The system excludes wireless transmitters and hence is a complex system.

## IV.METHODOLOGY

### *A. Digital Glove*

A digital glove is nothing but a regular hand glove which is embedded with 5 flex sensors to the fingers by threading or by using adhesive. To help the sensors bend properly and to give accurate voltage drop which can be sensed by the controller appropriate hand gestures. The digital glove used in this system comprises of accelerometer and 5 flex sensors[2]. The accelerometer is mounted on the wrist. The flex sensors used in this module are mounted on every finger of the digital glove.

### *B. Flex Sensor*

The Flex Sensors are fitted on the thumb along with each finger of the digital glove to control & analyse the bending and tilting of the fingers. It is an analog variable resistor sensor that changes the resistance based upon the measure of a bending in the flex. The yield of flex sensors depends on the order and measure of the bend provided by the sign[3]. The result is then forwarded to the microcontroller in the operation where the same is executed & transformed into digital mode. The Incidence of this output alters with the bending of the flex sensor.

### *C. Accelerometer*

The Gesture Vocalizer system has an Accelerometer which is nothing but a small, thin, low power; three is axis accelerometer with voltage outputs that are signal conditioned. An accelerometer is a tilt action sensor, which identifies the hand gestures. The latent speedup of gravitation in sensing the tilt & the dynamic acceleration due to motion, shock, and vibration is also measured with the assistant of this module[5].

An accelerometer is used to analyse the hand gestures and sends the detected data to the Gesture Detection component of the system.

The result of the accelerometer is obtained by amplification in the form of analog signals which is to be regenerated into an equivalent digital format by the A/D of the microcontroller.

*D. Analog to Digital Processing System*

Analog to Digital Processing device (A/D) is a device which regenerates the analog signals from the accelerometers into digital form so that the microcontroller can read the output and convert it into voice. The A/D data retrieval module is a unified CMOS chip along with an 8- bit analog-to-digital converting device, multiplexer, and microprocessor congenial control logic.

*E. Microcontroller*

The microcontroller used to fetch the result from the Analog to Digital Processing device (A/D) and process it to get the meaning of the result generated[1]. The microcontroller examines the output obtained from the Analog to Digital Processing system (A/D) with already stored values in the buffer of the microcontroller and based on these values, the microcontroller determines that the identified gestures have proper meaning or not. The microcontroller stores these meanings in primary memory. We can also store different letters in the controller so that the controller can create its own library which has not been stored in the controller. The speech synthesizer receives data from the previous module and knows the meaning of each data received.

*F. Gesture Synthesizer*

The movement of the finger gets identified in Gesture Synthesizer module. The hand gestures are identified and combined in this module and since it is quite sensitive to each and every movement of all the fingers including the thumb simultaneously. After reading the fetched data, the module examines whether the result is meaningful or not. The result given by tilt apprehension component of the system in the microcontroller is analysed further. When the bending sensor and tilt apprehension of the hand, both gives meaningful information, it signifies that the gesture as a sum is meaningful.

*G. RF Transceiver*

The 2.4 GHz CC2500 is an RF transceiver which is built for very low-power wireless connectivity and it is a very cost-effective system. An RF Transceiver is used for wireless connectivity via SPI interface[6]. The RF Transceiver is practiced on a remote-control system and other wireless security systems.

*H. Speech Synthesis*

The function of the Speech Synthesis is to provide speech for the particular gesture information collected from the preceding module of the system. It accepts the data as an input by the prior component of the system and associates the received records with the values that have already been stored in the microcontroller. Now the microcontroller fetches the speech output for the respective input gestures. And finally, the system gives voice to the input gestures.

*I. LCD Display*

The "Gesture Identification" component of the system has already identified and fetched the gestures as the output. The signals as a result is further sent to the speech synthesizer, The LCD display component receives alike signal by the Gesture Identification component of the system. The AVR microcontroller has the output in voice as well as in text form which is displayed on the LCD Display Unit along with the voice simultaneously.

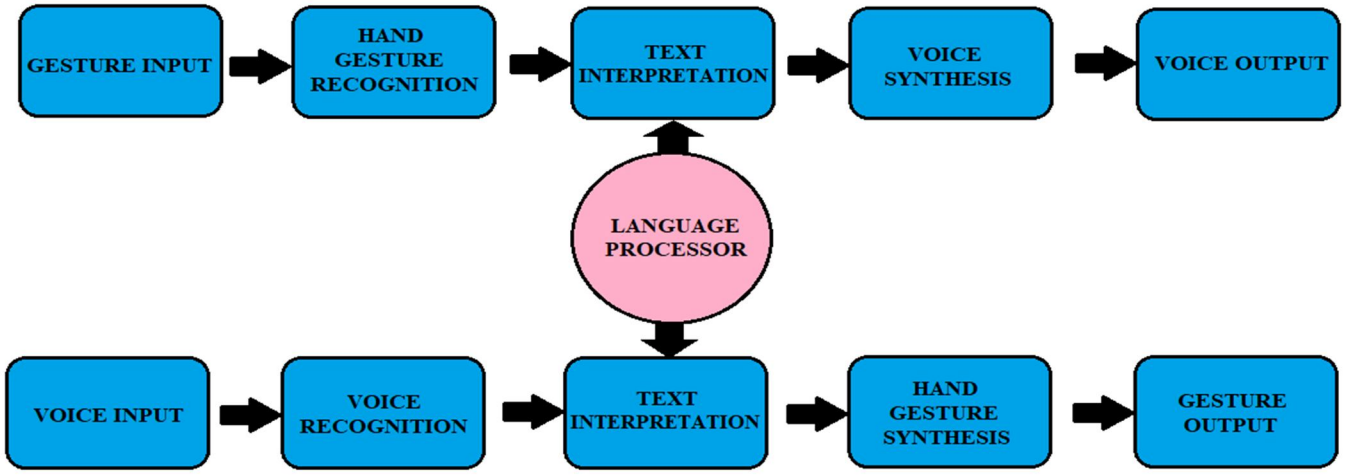


Fig. 2 Design and Working of a Gesture Vocalizer System

## V. ALGORITM

Step 1: The digital glove has Flex Sensors on the thumb along with each finger. The flex sensors are made to fetch data that varies on the basis of the ratio of bending.
Step 2: Flex sensor gives a group of signs that draw data collected as an information for this operation.
Step 3: The yield of the sensor is provided to A/D to convert it into digital format.
Step 4: The microcontroller processed and compare the data with the data already stored in internal program memory, and select the suitable word accordingly.
Step 5: Finally, the output text is displayed on the LCD along with the sound output played out via speaker.

## VI. HARDWARE IMPLEMENTATION

At the sender end, the Transmitter block consists of a Digital glove, an Analog to Digital Processing device (A/D), and an RF Transceiver. The gestures collected by the data gloves through flex sensors in the form of signals are converted from analog to digital signals and further transmitted to AVR Microcontroller. The task of the microcontroller is to analyse and fetch the meaning of each and every signal received and store it into the memory buffer. These values are further transferred to RF transceiver of the transmitter block to transmit it to the receiver block.

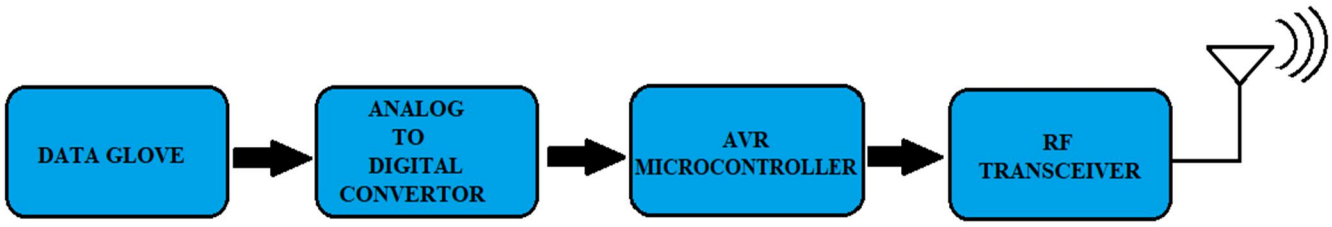


Fig. 3 Transmission Block of a Gesture Vocalizer System

At the receiver end, the Receiver block consists of an LCD display unit, an AVR Microcontroller, an EMIC Module and an RF Transceiver. The RF Transceiver at the receiver end receives processed data from the transmitter block and pass it to the AVR Microcontroller. The Microcontroller makes the data ready for output on the screen as well as on the speaker. The LCD displays the output on the screen and the EMIC module gives the output through speaker simultaneously.

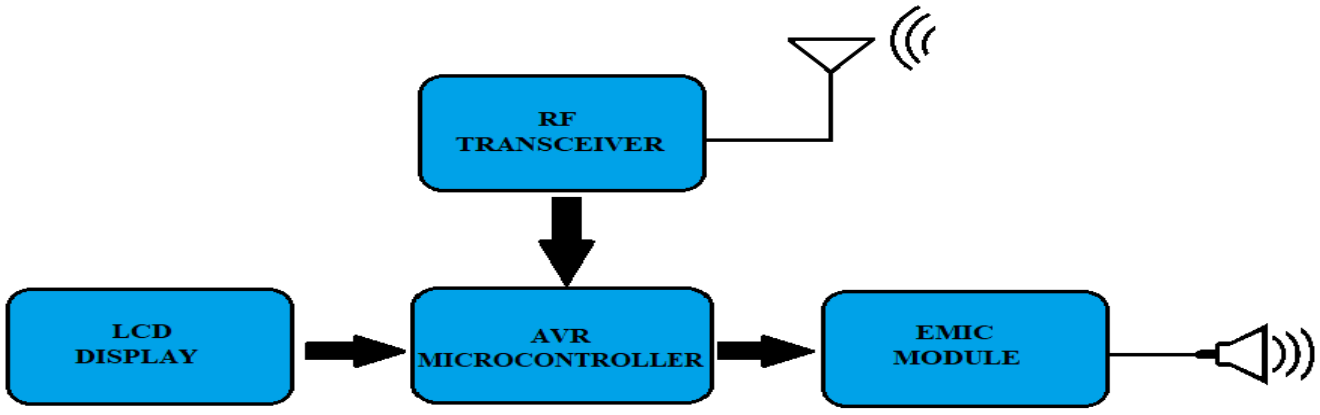


Fig. 4 Receiver Block of a Gesture Vocalizer System

## VII. APPLICATIONS

*A.* Gesture recognition and conversion.
*B.* It is useful to convert sounds into sign language for Mute people.
*C.* It can be used for Mobiles for SMS sending.
*D.* Conversion of sign language into a language that can be easily understood by the local people.
*E.* To use as an interpreter for Mute people.

## VIII. CONCLUSION

Here we have encapsulated a survey on the different systems implemented for gesture recognition and Gesture Vocalizer. The layout and functioning of the system are presented in brief. This system facilitates communication between silent, hearing-impaired and blind people and normal people. It also helps the mute, hearing-impaired and blind to interact among themselves. It is not an easy task for the normal people to perceive the intended meaning of these sign language used by the hearing-impaired and silent. Moreover, the blind people cannot watch their gesture. Official sign language is used by the dumb and deaf but is not familiar with the normal world and the people who are blind cannot follow sign language. This device converts gestures into voice and vice-versa which is suitable for both disabled and normal people. To help the deaf people the gestures are converted into text. This text gets displayed on a screen.

One can get encouraging results by using Data gloves for effective communication. To rehabilitate the deaf, blind and dumb, we can use it to monitor the hand movements. The same can be used for advanced virtual interactive gaming and telerobotic surgery.

The objective of the project is to bridge the communication barrier between the deaf persons and the other common people. This paper is aimed at being a model for analysing the feasibility to recognize sign language using data gloves.

## IX. FUTURE SCOPE

*A.* To develop a system supporting a wider range of signs and language modes.
*B.* To design a sensor-based gesture vocalizer which reads the gestures in a better way to give better output.
*C.* Designing a suit, that gathers signals from animals and reads it accurately.
*D.* Pragmatic reality application e.g., replacing the traditional peripheral devices like mouse and keyboards with the data glove.
*E.* To control machine activity at sites which are not easily accessible by using a Robot control system.
*F.* Making the system wireless giving it portability and commercial viability.
*G.* Developing a “Gesture Vocalizer” which uses wireless transceiver system.

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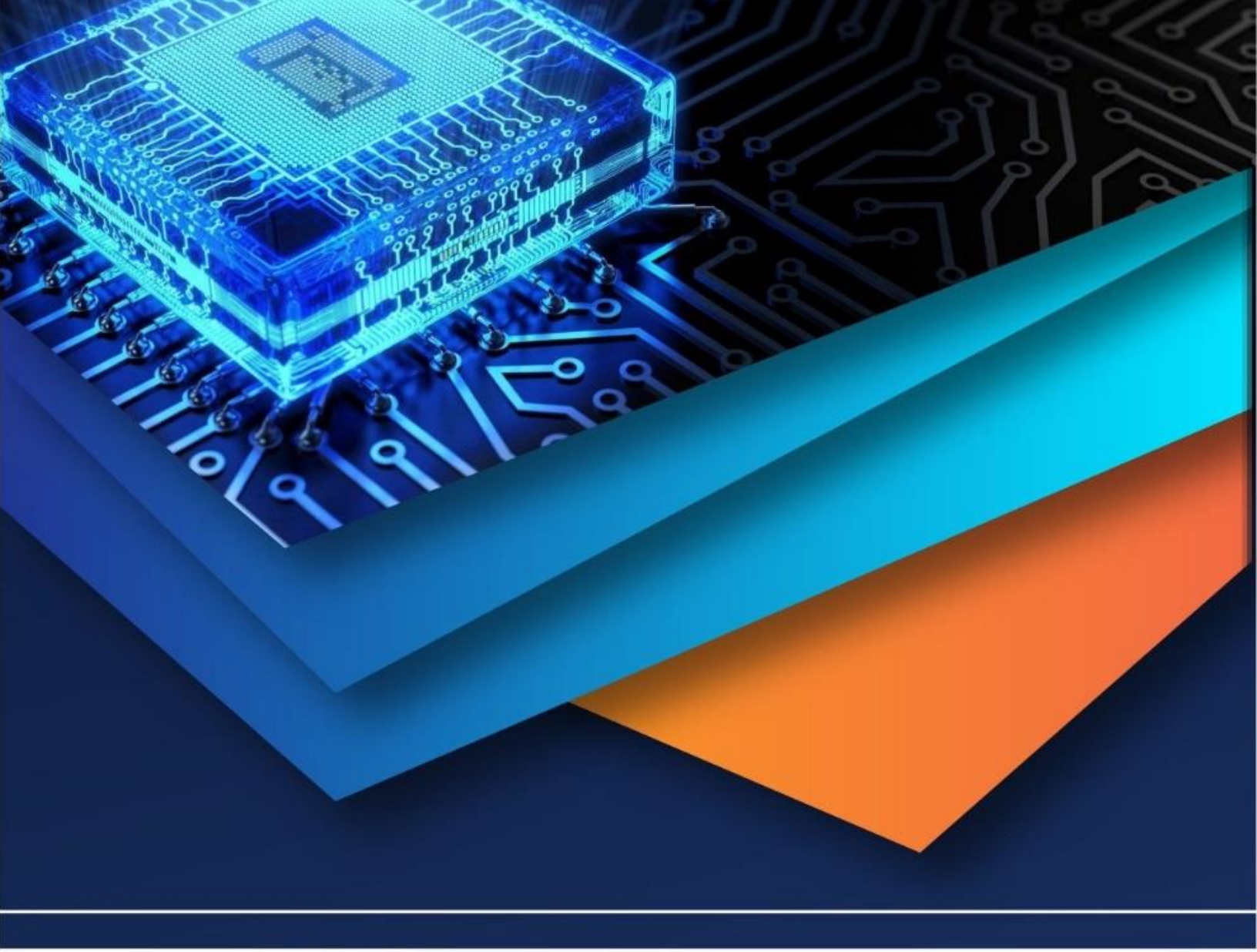

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