

# EonTex Conductive Stretchable Sensor Response on Smart Glove for Sign Language

Anton Yudhana  
Electrical Engineering  
Ahmad Dahlan University  
Yogyakarta, Indonesia  
eyudhana@ee.uad.ac.id

Jihad Rahmawan  
Electrical Engineering  
Ahmad Dahlan University  
Yogyakarta, Indonesia  
jihadrahmawan20@gmail.com

Son Ali Akbar  
Electrical Engineering  
Ahmad Dahlan University  
Yogyakarta, Indonesia  
sonali@ee.uad.ac.id

**Abstract**—EonTex Conductive Stretchable sensor is a sensor with e-textile technology where the sensor is in the form of a sheet of fabric. EonTex Conductive Stretchable sensor has a resistive property, where if the sensor is pulled or spun and then returned as before again the EonTex Conductive Stretchable sensor responds with a change in resistance value. With these characteristics, it can be read analog signals for the sensor reading process. Speech Tuna requires special needs when communicating with normal people in general. With Tuna Sign Language can communicate with normal people. Not everyone understands sign language, with sign language translator tools, it can make it easier for normal people to communicate with speech. Sign language uses the hand to communicate, with the glove media a sign language translator is made. And with the characteristics of EonTex Conductive Stretchable sensors that can read flexibility, it can also be applied to gloves to read finger curvature when communicating with Sign Language. Microcontroller is added to read analog signals and then to be processed for the Sign Language translation system.

**Keywords**—eontex conductive stretchable sensor, speech impaired, microcontroller, analog signal

## I. INTRODUCTION

Persons with disabilities in Indonesia for ages 18 to 30 years alone reach 1.15% of the total population of Indonesia. For the hearing impaired alone, it reaches 0.26%. In 2010 speech impaired children under five reached 0.14% and in 2013 rose 0.15%. And according to a study by the Ministry of Health of the Republic of Indonesia, this number can continue to rise every year [1].

One of the media to make it easier for the speechless to communicate with normal people is gloves, [2] in addition gloves have properties that are easy to use [3] The gesture activities of the limbs are the most used part of the hand to communicate [4].

Making sign language interpreter using gloves that have been added to the sensor. The sensor used here is a LSM9DS0 Breakout Board sensor [5].

A glove with ethile sensor material with a better degree of flexibility than a flex sensor with fabric media, the sensor will be fused with the finger when using it. [6]

Glove data collection is important for further research [7] with gesture data collection Sign language [8] can be seen the characteristics of the sensor when translating sign language.

Sign language is a language by doing certain movements on the hand or finger, so that later it will be understood by others [9].

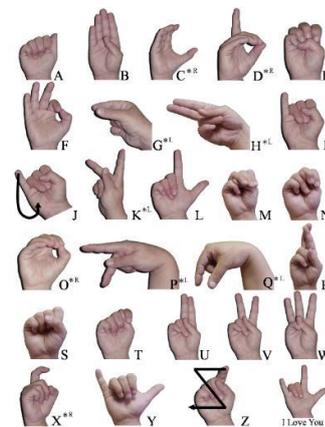


Fig. 1. American Sign Language

Figure 1 is a sign language for letters, sign language has been agreed and used in various countries [8].

Sign language has characters with curved fingers, and fingers have their angles and characters when forming sign language. [10] sensors that can be used to read finger curvature when forming gesture gesture patterns one of which is a flex sensor [9].

## II. MATERIAL AND METHODS

In this study gloves were made with spandex fabric, spandex fabrics were stretchy and supple properties so they could be tightly attached to the hands. [6] Then the EonTex Conductive Stretchable sensor is attached to the finger to read the flexibility when the finger performs the Sign Language movement. Figure 1 below is an EonTex Conductive Stretchable sensor that is affixed to the glove with spandex fabric.

The attachment on the finger will make it easier for the sensor to respond to movement of the flexion in the finger [11] with the nature of Sign Language which tends to be a lot of activity on the curvature of the finger [12] so it is good if applied. This design also considers aesthetics to make it easier if applied to the real world for the speechless [13]. Installation of sensors with spandex fabric is attached with special glue so that it can stick well and does not reduce the conductivity of the eontex sensor.

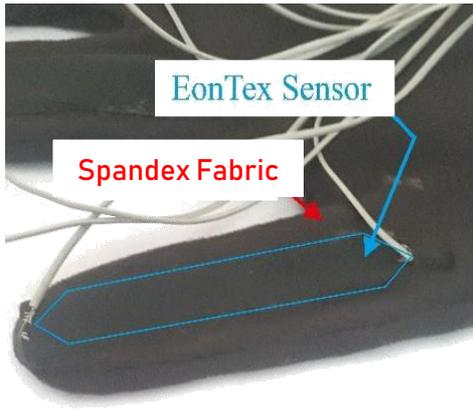


Fig. 2. Location of Eontex Sensor Against spandex fabric

The tip end of the EonTex Conductive Stretchable sensor is attached to the cable as the output measuring point. Seen in figure 1 there is the end of the cable as the output point of the sensor.

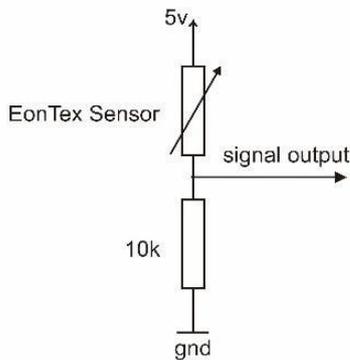


Fig. 3. EonTex sensor reader circuit

The cable located at the end of the eontex connects at a voltage of 5v and at the corresponding signal output point in figure 2. The circuit is arranged in 5 parts for each finger.

The output signal will be read using the ADC on the microcontroller, in this study using the ADC with 10-bit resolution, to facilitate the observation in this study the ADC value is fertilized into the form of voltage. With the conversion formula as in equation 1 below.

$$V_{\text{sensor}} = \frac{\text{ADC Value}}{\left(\frac{1023}{V_{\text{ref}}}\right)} \quad (1)$$

- Where:
- $V_{\text{sensor}}$  : Voltage output Sensor
  - ADC Value : ADC Value from microcontroller
  - 1023 : 10bit Resolution of ADC
  - $V_{\text{ref}}$  : Reference Voltage

Overall the system is made in accordance with the following block diagram 3.

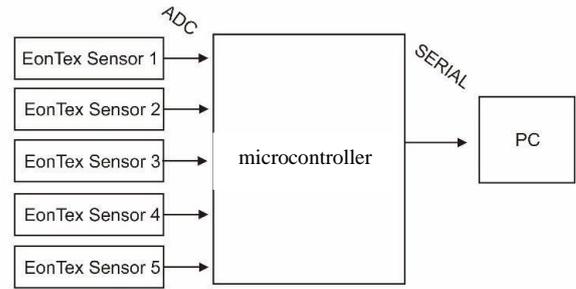


Fig. 4. Block diagram of the EonTex sensor reader

The analog signal data from EonTex will be read on the microcontroller then the results will be converted according to press 1 on the microcontroller, then the value will be sent to the computer for observation. [14] The overall glove is shown in figure 4 where the EonTex sensor has been embedded which will be observed for value when the glove is moved to make gesture of sign language.



Fig. 5. Smart Gloves with Eontex Sensor

Observation of each gesture gesture from letters A to Z and numbers 1 to 9. were taken from 100 data from each gesture and then taken the average for each value of the EonTex voltage on each finger with equation 2 below.

$$\text{Average} = \frac{\text{Sum of data}}{\text{Many of data}} \quad (2)$$

### III. RESULTS AND DISCUSSION

Observation of each gesture gesture was carried out by reading the voltage values on each EonTex sensor attached to the glove located on each finger. Data is taken 100 times by hand modeling or imitating sign language and data from sensors are processed on the microcontroller and the reading results are converted and converted into the form of voltage. Sign language modeling as shown in figure 1 is then averaged so as to produce the data in table 1 below.

Table I. Sensor Output

sign	Result (Volt)				
	S1	S2	S3	S4	S5
1	3,41	3,40	3,32	2,73	4,30
2	3,47	3,48	2,54	2,68	4,29
3	3,51	3,52	2,52	2,63	4,13
4	2,51	2,51	2,50	2,53	4,29
5	2,42	2,50	2,50	2,56	4,15
6	3,56	2,51	2,50	2,56	4,27
7	2,48	3,53	2,54	2,61	4,29
8	2,42	2,61	3,54	2,61	4,30
9	2,37	2,51	2,58	3,32	4,30
A	3,69	3,65	3,64	3,52	4,19
B	2,50	2,50	2,48	2,50	4,41
C	2,85	3,07	3,00	3,05	4,32
D	3,11	3,23	3,17	2,64	4,30
E	3,60	3,63	3,61	3,60	4,47
F	2,51	2,52	2,52	3,37	4,41
G	3,66	3,57	3,50	2,71	4,23
H	3,52	3,37	2,55	2,68	4,39
I	2,53	3,39	3,54	3,48	4,45
J	2,53	3,39	3,52	3,49	4,41
K	3,58	3,38	2,64	2,52	4,21
L	3,65	3,56	3,47	2,57	4,32
M	3,62	3,41	3,49	3,52	4,22
N	3,65	3,61	3,52	3,44	4,13
O	3,35	3,44	3,55	3,45	4,40
P	3,57	3,35	2,94	2,63	4,20
Q	3,60	3,52	3,53	3,06	4,26
R	3,50	3,35	2,52	2,58	4,38
S	3,58	3,56	3,68	3,65	4,44
T	3,57	3,38	3,57	3,47	4,10
U	3,48	3,30	2,51	2,58	4,28
V	3,48	3,34	2,54	2,65	4,42
W	3,36	2,50	2,53	2,63	4,32
X	3,66	3,58	3,69	3,12	4,45
Y	2,50	3,37	3,46	3,49	4,21
Z	3,56	3,52	3,55	2,78	4,39

From table 1, the data from the average result according to equation 2 are presented from the collection of 100 data from each gesture. S1 is data from the little finger, S2 ring finger, S3 middle finger, S4 index finger and S5 is the thumb.

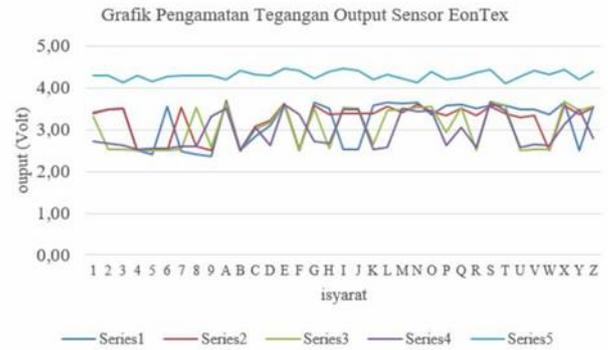


Fig. 6. Graph of the EonTex output signal

Based on the results of the EonTex sensor reading. On the M signal, N, has similarities then the signals 4 and B also have similarities. This happens because the 4 signals have similar forms.

#### IV. CONCLUSION

This research has succeeded in making gloves that are fitted with EonTex Conductive Stretchable sensors. Gloves successfully read every gesture the Sign Languages shown in Figure 5 where the value of each gesture has a value of each. In this study the gloves produce output where there are 4 signals that have similarity values, namely the signal M with N and signals B and 4. Where it happens to 4 the signal has almost the same gesture.

#### ACKNOWLEDGMENT

This study only examines the characteristics of the eontex conductive strained sensor. in the research process, the connection between sensors and spandex fabrics must be accurate so that they are perfectly attached. and connecting conductive threads must be correct.

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