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Annexure I

1. Project Title: Hand gesture recognition for the Dumb

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1. Abstract

1.1 Abstract

The dumb people can't speak so that they use a sign language which includes hand gestures. Each of their hand gesture has a relevant meaning according to their sign language. When the dumb wanted to convey their feelings they will use these gestures but normal people can't understand their gesture and the inner meaning of that gesture. So, the dumb people will face difficulty in communicating with normal people. Now we are planning to develop a code that could decode few of their gestures like gesture for word 'Good luck', alphabet 'V', word 'Fantastic', number '4', word 'stop'. The main idea is all the above five gestures will have different number of fingers like 'Good luck' gesture has one finger, 'V' gesture has two, 'Fantastic' has three, '4' has four and 'Stop' has five fingers in the gesture. So, we wrote a code that counts the number of fingers in the gesture. Initially we also assigned the corresponding comment for the count. Coming to the test process the hand gesture will be captured and will be made noise free, that is eliminating all other disturbances or objects around the hand by performing skin detection operation. Then pure hand input can be obtained, now figure detection operation is performed. This figure detection keeps only fingers and removes all other portion of the hand so that counting the fingers will be easy and accurate. Now after getting the count the corresponding comment assigned to that count will be displayed and also voice announcement will be given. In this way we decoded above five gestures and displayed them and also provided voice announcement for those gestures.

Keywords : Hand gesture, Sign language, Dumb

1.2 Motivation

By this project the dumb people will be able to convey their feelings effectively that is at least five gestures. Normal people can also understand what the dumb is trying to say. As voice is being announced we can say that dumb can speak indirectly. This project is mainly intended for doing social service that is service to the dumb people.

The purpose of the System Analysis is to produce the brief analysis task and also to establish complete information about the concept, behavior and other constraints such as

performance measure and system optimization. The goal of System Analysis is to completely specify the technical details for the main concept in a concise and unambiguous manner.

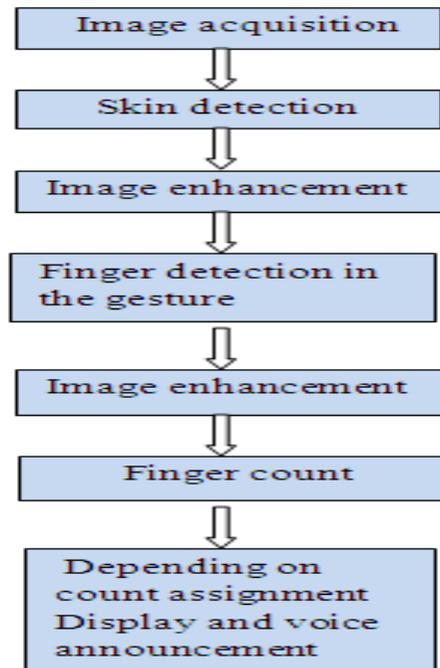
1.3 Objective

The Objective of our project is to make dumb people express their feelings comfortably to normal people. To make this possible we are designing a code that could decode the few gestures of the dumb people. After decoding the corresponding information will be displayed as well as will announced as voice.

2. Block Diagram & Technical Specifications

2.1 Block Diagram and Working:

2.1.1. Block Diagram:



2.1.2. Working:

This block diagram includes image acquisition by which hand gesture image can be acquired and then skin detection which removes other disturbances and gives only hand image and then image enhancement in order to develop image and then finger detection to easily count fingers and again image enhancement to further develop image and finally counting the fingers and depending on the count assignment displaying and announcing the comment. This is how block diagram is organized.

2.2 System Requirement Specification

2.2.1 Hardware Requirements

- PROCESSOR : 733 MHz Pentium III Processor

- RAM : 3 GB
- HARD DRIVE : 350GB
- MONITOR : 14" VGA COLOR MONITOR
- KEYBOARD : 104 Keys
- MOUSE : Logitech Serial Mouse
- DISK SPACE : 20 GB

2.2.2.a Software Requirements

- PROGRAM LANGUAGE : MATLAB
- TOOL :MATLAB R2012a
- OPERATING SYSTEM : Microsoft Windows 7, Windows XP

2.2.2.b. Software Overview

MATLAB is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java. You can use MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing.

2.2.2.b. Key Features

- High-level language for numerical computation, visualization, and application development
- Interactive environment for iterative exploration, design, and problem solving

- Mathematical functions for linear algebra, statistics, Fourier analysis, filtering, optimization, numerical integration, and solving ordinary differential equations
- Built-in graphics for visualizing data and tools for creating custom plots
- Development tools for improving code quality and maintain ability and maximizing Performance
- Tools for building applications with custom graphical interfaces.
- Functions for integrating MATLAB based algorithms with external applications and Languages such as C, Java, .NET, and Microsoft Excel

2.2.2.c. Numeric Computation

MATLAB provides a range of numerical computation methods for analyzing data, developing algorithms, and creating models. The MATLAB language includes mathematical functions that support common engineering and science operations. Core math functions use processor-optimized libraries to provide fast execution of vector and matrix calculations.

Available methods include:

- Interpolation and regression
- Differentiation and integration
- Linear systems of equations
- Fourier analysis
- Eigen values and singular values
- Ordinary differential equations (ODEs)
- Sparse matrices

MATLAB add-on products provide functions in specialized areas such as statistics, optimization, signal analysis, and machine learning.

2.2.2.d. Data Analysis and Visualization

MATLAB provides tools to acquire, analyze, and visualize data, enabling you to gain insight into your data in a fraction of the time it would take using spreadsheets or traditional programming languages. You can also document and share your results through plots and reports or as published MATLAB code

2.2.2.e. Acquiring Data

MATLAB lets you access data from files, other applications, databases, and external devices. You can read data from popular file formats such as Microsoft Excel; text or binary files; image, sound, and video files; and scientific files such as netCDF and HDF. File I/O functions let you work with data files in any format. Using MATLAB with add-on products, you can acquire data from hardware devices, such as your computer's serial port or sound card, as well as stream live, measured data directly into MATLAB for analysis and visualization. You can also communicate with instruments such as oscilloscopes, function generators, and signal analyzers.

2.2.2.f. Analyzing Data

MATLAB lets you manage, filter, and preprocess your data. You can perform exploratory data analysis to uncover trends, test assumptions, and build descriptive models. MATLAB provides functions for filtering and smoothing, interpolation, convolution, and fast Fourier transforms (FFTs). Add-on products provide capabilities for curve and surface fitting, multivariate statistics, spectral analysis, image analysis, system identification, and other analysis tasks.

2.2.2.g. Visualizing Data

MATLAB provides built-in 2-D and 3-D plotting functions, as well as volume visualization functions. You can use these functions to visualize and understand data and communicate results. Plots can be customized either interactively or programmatically. The MATLAB plot gallery provides examples of many ways to display data graphically in MATLAB. For each example, you can view and download source code to use in your MATLAB application.

2.2.2.h. Documenting and Sharing Results

You can share results as plots or complete reports. MATLAB plots can be customized to meet publication specifications and saved to common graphical and data file formats. You can automatically generate a report when you execute a MATLAB program. The report contains your code, comments, and program results, including plots. Reports can be published in a variety of formats, such as HTML, PDF, Word, or Latex.

2.2.2.i. Programming and Algorithm Development

MATLAB provides a high-level language and development tools that let you quickly develop and analyze algorithms and applications.

2.2.2.j. The MATLAB Language

The MATLAB language provides native support for the vector and matrix operations that are fundamental to solving engineering and scientific problems, enabling fast development and execution. With the MATLAB language, you can write programs and develop algorithms faster than with traditional languages because you do not need to perform low-level administrative tasks such as declaring variables, specifying data types, and allocating memory. In many cases, the support for vector and matrix operations eliminates the need for for-loops. As a result, one line of MATLAB code can often replace several lines of C or C++ code. MATLAB provides features of traditional programming languages, including flow control, error handling, and object-oriented programming (OOP). You can use fundamental data types or advanced data structures, or you can define custom data types. You can produce immediate results by interactively executing commands one at a time. This approach lets you quickly explore multiple options and iterate to an optimal solution. You can capture interactive steps as scripts and functions to reuse and automate your work. MATLAB add-on products provide built-in algorithms for signal processing and communications, image and video processing, control systems, and many other domains. By combining these algorithms with your own, you can build complex programs and applications.

2.2.2.k. Development Tools

MATLAB includes a variety of tools for efficient algorithm development, including:

2.2.2.i. Command Window

Lets you interactively enter data, execute commands and programs, and display results

2.2.2.m. Matlab Editor

Provides editing and debugging features, such as setting break points and stepping through individual lines of code

2.2.2.n. Code Analyzer

Automatically checks code for problems and recommends modifications to maximize performance and maintainability

2.2.2.o. Matlab Profiler

Measures performance of MATLAB programs and identifies areas of code to modify for improvement. Additional tools compare code and data files, and provide reports showing file dependencies, annotated reminders, and code coverage.

2.2.2.p. Integration with Other Languages and Applications

You can integrate MATLAB applications with those written in other languages. From MATLAB, you can directly call code written in C, C++, Java, and .NET. Using the MATLAB engine library, you can call MATLAB code from C, C++, or FORTRAN applications.

2.2.2.q. Performance

MATLAB uses processor-optimized libraries for fast execution of matrix and vector computations. For general-purpose scalar computations, MATLAB uses its just-in-time (JIT) compilation technology to provide execution speeds that rival those of traditional programming languages. To take advantage of multi core and multiprocessor computers, MATLAB provides many multithreaded linear algebra and numerical functions. These functions automatically execute on multiple computational threads in a single MATLAB session, enabling them to

execute faster on multi core computers You can take further advantage of multi core desktop and other high-performance computing resources such as GPUs and clusters with add-on parallel computing products. These products provide high-level constructs that let you parallelize applications with only minor changes to MATLAB code.

2.2.2.r. Finger Count

After obtaining the fingers and locating them with bounding box now the count of fingers can be taken by connected components property of numobjects which gives the number of objects present that is the number of fingers.

2.2.2Count Assignment

As initially discussed that depending on the number of fingers in the hand gesture the has to be identified so that the count should be assigned with the corresponding information related to that gesture. As we are taking five gestures which include different number of fingers, each count is assigned related to its gesture as below:

Count	Comment
1	Good luck
2	V
3	Fantastic
4	Four
5	Stop

Table 2.1: Showing count and corresponding comment

Now after counting the fingers depending upon then count the corresponding comment will be displayed.

Display and Voice Announcement

Finally after counting the number of fingers the count value is checked for any of the following counts 1 or 2 or 3 or 4 or 5. If any count matches then corresponding comment assigned to that count will be displayed and also will be announced as voice.

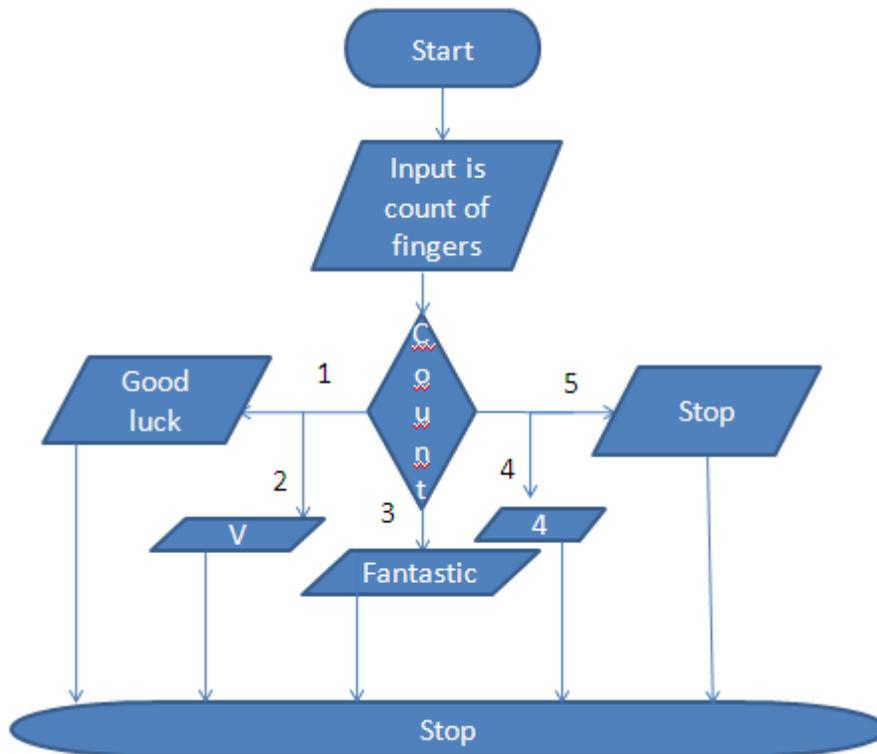


Figure 5.1: Flow chart for count checking

RESULTS

2.3 For count value One:

If the number of fingers detected are one that means the count value will be one. Then the corresponding comment assigned to count one that is “Good Luck” will be displayed and also will be announced in voice.

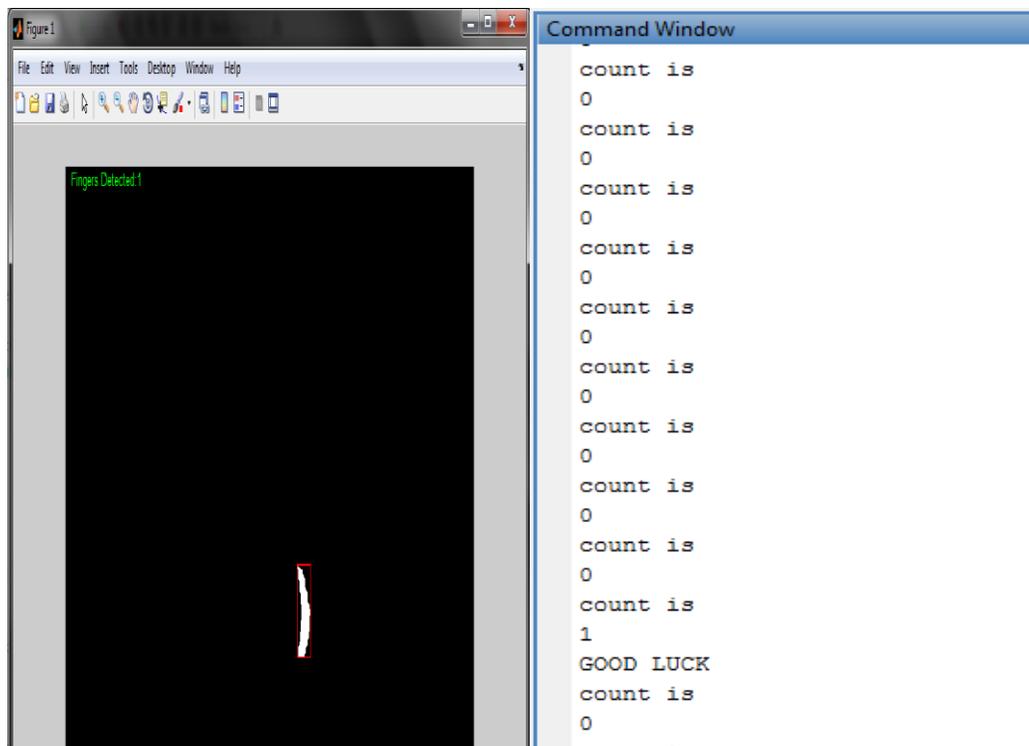


Figure 2.3. Output windows showing one fingers and displaying “Good Luck”

2.3.1: For count value Two:

If the number of fingers detected are two that means the count value will be two. Then the corresponding comment assigned to count one that is “V” will be displayed and also will be announced in voice.

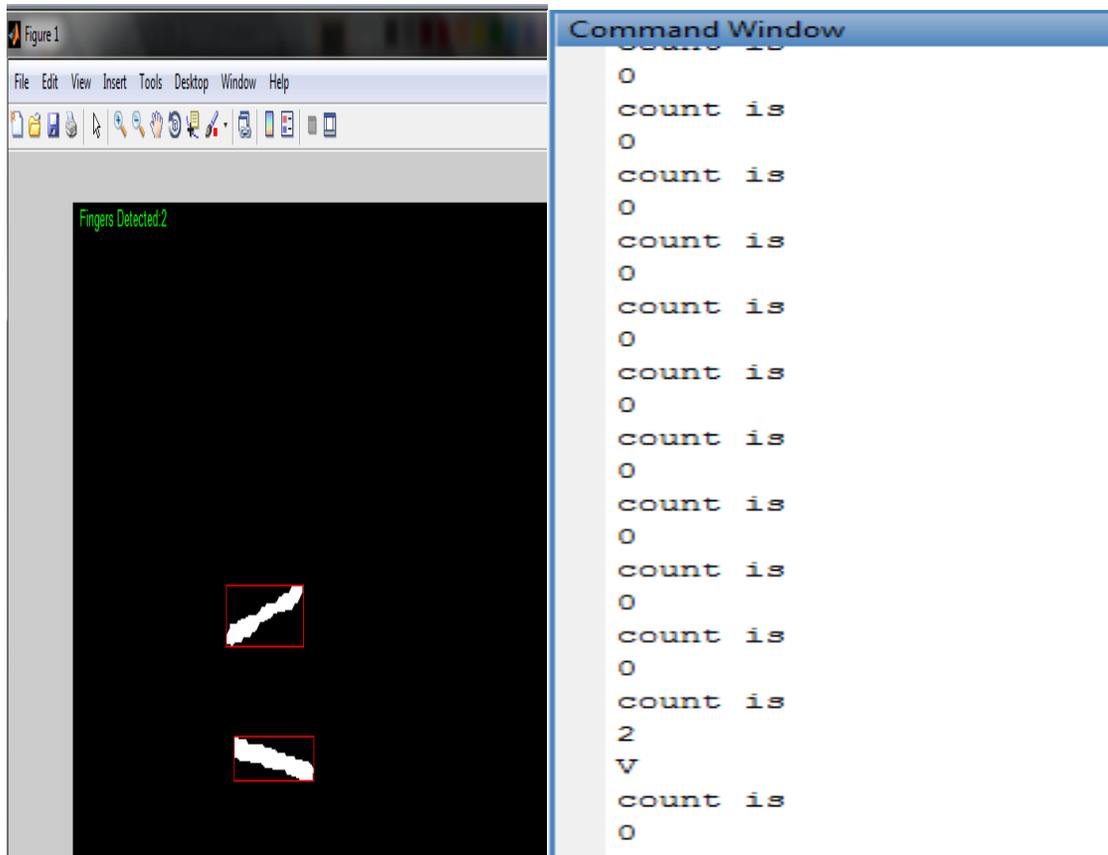


Figure 2.3.1: Output windows showing two fingers and displaying “V”

2.3.2: For count value Three:

If the number of fingers detected are three that means the count value will be three. Then the corresponding comment assigned to count one that is “Fantastic” will be displayed and also will be announced in voice.

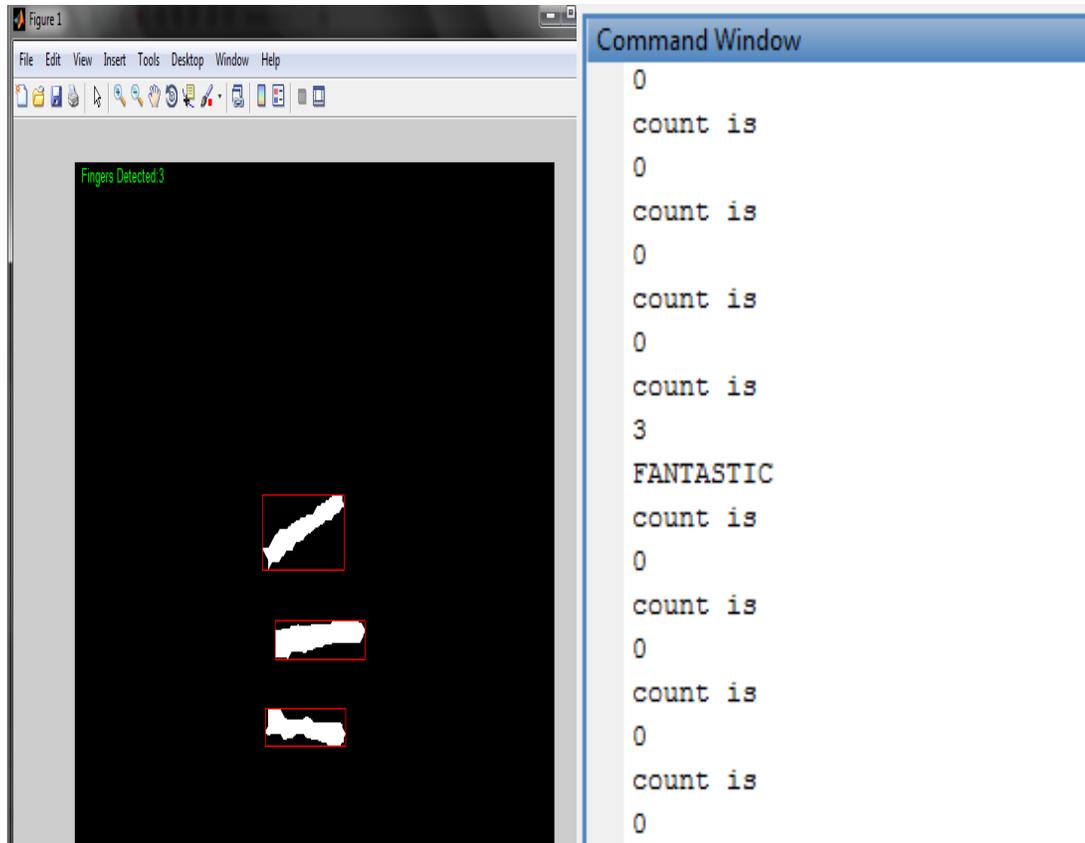


Figure2.3.2: Output windows showing three fingers and displaying “Fantastic”

2.3.3. For count value Four:

If the number of fingers detected are Four that means the count value will be four. Then the corresponding comment assigned to count one that is “4” will be displayed and also will be announced in voice.

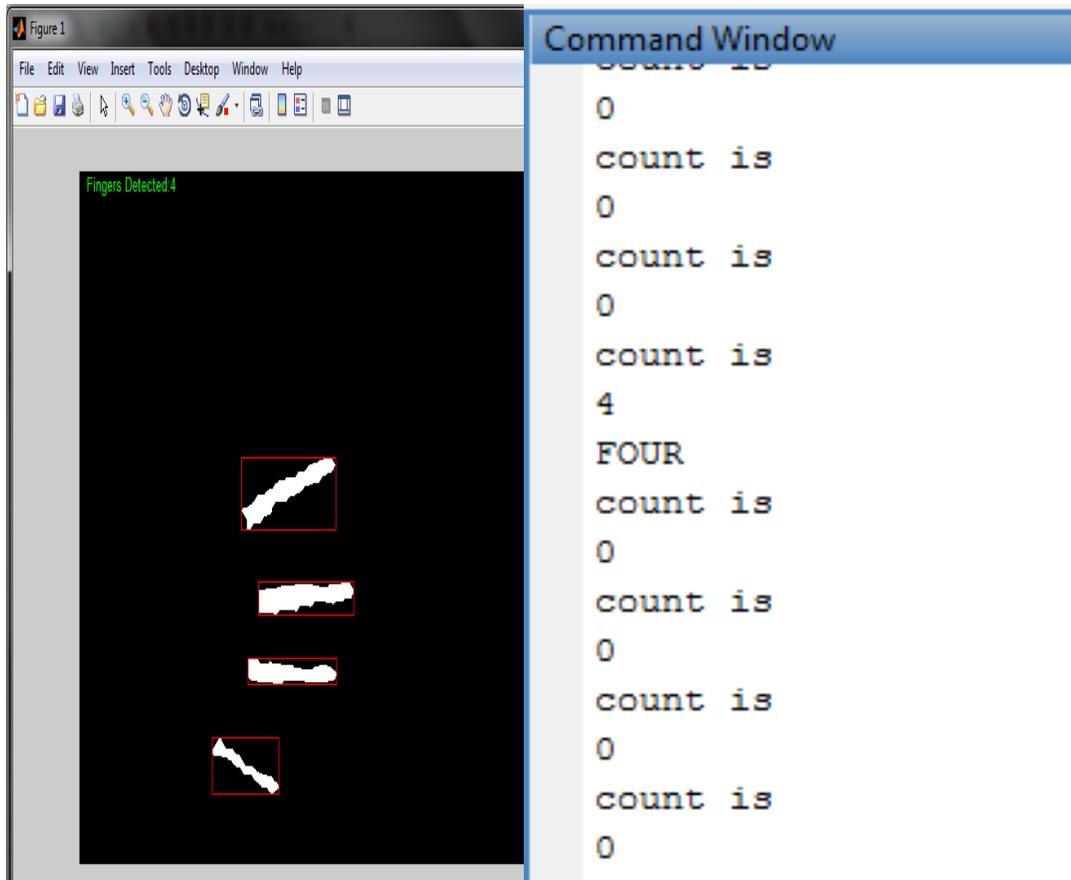


Figure 2.3.3: Output windows showing Four fingers and displaying “4”

2.3.4. For count value Five:

If the number of fingers detected are Five that means the count value will be five. Then the corresponding comment assigned to count one that is “Stop” will be displayed and also will be announced in voice.

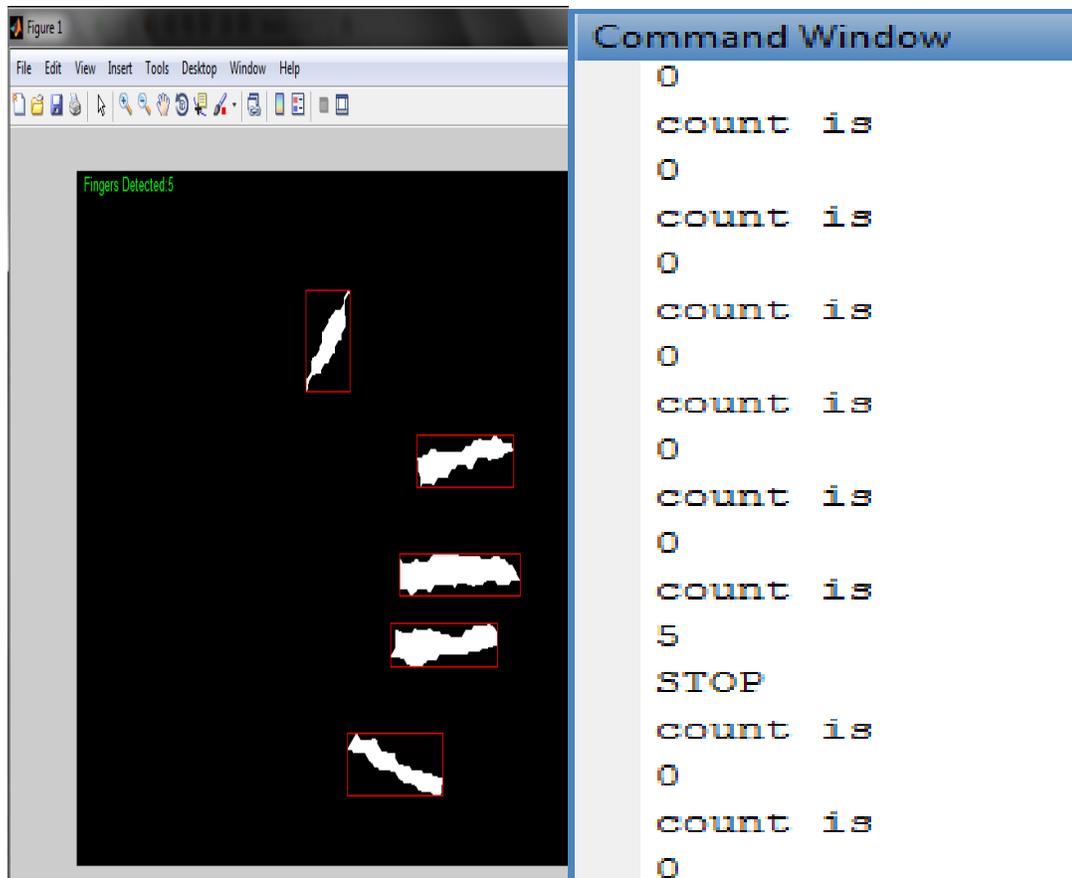


Figure 2.3.4: Output windows showing Five fingers and displaying “Stop”

3.1. Conclusion

Finally, by counting the number of fingers in the hand gesture we decoded the gesture and there by displayed the corresponding comment for that gesture and also announced it in the form of voice. Thus with a view of social service we did this project for the sake of the dumb people. We identified their problem of communication with gestures with normal people who don't know that language and found a solution that could solve their problem atleast to some extent.