VTCALCS for Matlab v1.0

Satrajit S. Ghosh satra@cns.bu.edu
Department of Cognitive and Neural Systems, Boston University
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Contents

Chapter 1

Acknowledgements

The underlying C code for generation of transfer functions and calculation of formants was written by Dr. Shinji Maeda (shinji@tsi.enst.fr), as part of a DOS program called VTCALCS.

The Matlab code for synthesis of vowels is part of a package called Track Draw, developed by Peter Assmann (assmann@utdallas.edu), and is available at the following URL: http://www.utdallas.edu/ assmann/TRACKDRAW/trackdraw.html

Chapter 2

Installation and User guide

2.1 Downloading the program

The program may be downloaded from the following URLs:

- http://cns-web.bu.edu/ satra/pub/vtcalcs.tgz - for Unix
- http://cns-web.bu.edu/ satra/pub/vtcalcs.zip - for MS Windows

2.2 Installation

The program can be installed in any directory. However the directory structure has to be maintained when unpacking.

1. Choose a directory for installation.
2. Copy the archived file into the directory.
3. Unzip the file while *maintaining the directory structure* . On UNIX systems one may use the command:

   gunzip -c vtcalcs.tgz | tar xf

   On Microsoft Windows systems either use an unzip program like Winzip or use pkunzip with the command:

   pkunzip -d vtcalcs.zip

   Most linux systems support the following command directly:

   tar zxf vtcalcs.tgz

4. A directory called vtcalcs will be created with three subdirectories: data, doc, and src. 'data' contains some necessary data files for running the program. 'doc' contains this document. 'src' contains the source code for compiling the mex functions.

5. If you are installing it on a system for which mex files have not been provided you need to create the mex files. This is described in the next section.

2.3 Creating the mex files

Creating the mex files requires that you have the Matlab compiler installed properly. For installing the Matlab compiler please refer to the documentation provided by Mathworks. On a MS Windows system this typcially requires both the Matlab compiler as well as an additonal compiler such as Microsoft Visual C++. Matlab v5.3 works fine however v5.2 and below is known to have problems on newer Linux systems and can result in segmentation violations. The following URL should help solve the problem:

http://www.mathworks.com/support/solutions/v5/11129.shtml

1. Start Matlab

2. Change to the source directory.

3. At the Matlab prompt type Makefile('unix') or Makefile('windows').The function is case sensitive. If the compiler has been set up properly, the call should have created mex files for you specific platform.

4. Copy or move the mex files from the 'src' directory to the vtcalcs directory. The files will have different extensions on different platforms. Some common platforms and extensions are listed below. Please refer to the compiler documentation for any other platforms.

Platform	Extension
Windows 9x/NT	.dll
Linux	.mexlx
Solaris	.mex4

2.4 Using the program

To start the program open Matlab in the same directory where the m-file vtcalcs.m is. On Unix this can be accomplished by starting Matlab in the directory containing the file. On Windows one can change the directory from within Matlab by using the 'cd' command. Once you are in the directory start the program by typing vtcalcs at the Matlab prompt. This launches the user interface (UI) for the program.

The UI has three menu options relevant to running the program. These are:

- VT Calculation
- Tract configuration
- Physical constants

2.4.1 VT Calculation from Models

The current version provides 5 different methods of calculating the transfer function. When selected it provides the user with the 5 options. The sixth option is currently not available and has been disabled. Choosing any of the other options opens a dialog box with rather intuitive controls. Most of the pushbuttons with numeric values on them popup dialogs which allow those values to be changed. Some push buttons toggle states and some perform a particular action (eg. synthesize). The sliders change values continuously. The allowable range of the values are provided in Appendix A.

2.4.2 Changing Tract Configuration

When this menu option is selected a dialog box with four pushbuttons pop up. Clicking on any of the buttons toggles its state and the current state is displayed on the button.

2.4.3 Changing Physical Constants

When this menu option is selected a dialog box with five pushbuttons pop up. Clicking on any of the buttons opens a dialog box where one can enter a new value. If no value is entered, the current value is retained. This dialog also keeps the entered value within range of possibly allowed values.

2.5 Registered Trademarks

- Matlab is a registered trademark of Mathworks Inc.
- Microsoft Visual C++, Microsoft Windows, MS Windows, Windows 9x/NT are registered trademarks of Microsoft corporation.
- Solaris is a registered trademark of Sun Microsystems.

Chapter 3

Known bugs and limitations

Although the current bugs do not hinder the functionality of the program directly, they will be removed in the next version. Some of these bugs, when removed, will add further possibilities to the program.

The following are the list of bugs as of 18.Oct.1999. Please send a mail to satra@cns.bu.edu for any new bugs.

3.1 18.Oct.1999

1. The program has to be started in the vtcalcs directory of the unzipped structure. No, directory change can be made while the program is running.
2. The popup dialog box vanishes behind the main figure.
3. radimp-spec is not currently read.
4. saggital-to-area does not work with a provided set of area functions.

Appendix A

Ranges of parameters

These parameters indicate the choices one can make from the graphical interface. Not all of them are necessary if any of the functions are to be embedded in a program.

A.1 Physical constants

Parameter	Max	Min
Air density	1.5e-3	0.9e-3
Sound velocity	3.6e+4	3.3e+4
Wall resistance	2000	1000
Wall mass	2	1
Wall compliance	4e+5	2e+5

A.2 Uniform tube model parameters

Parameter	Max	Min
Area	15	0
Length	20	5
Segments	60	5
Nasal coupling	3	0

A.3 Two tube model parameters

Parameter	Max	Min
A1	10	0
x1	20-x2	0
A2	10	0
x2	20-x1	0
Nasal coupling	3	0

A.4 Three parameter model parameters

Parameter	Max	Min
At	8	0
Xt	13	3
Al	4	0
Nasal coupling	3	0

A.5 Articulator model parameters

Parameter	Max	Min
All articulators	3	-3
Vowel	11	0
Nasal coupling	3	0

The vowels are as follows:

0	1	2	3	4	5	6	7	8	9	10	11
None	iy	ey	eh	ah	aa	ao	oh	uw	iw	ew	oe

A.6 Area function model parameters

Parameter	Max	Min
No. of Sliders	30	5
Tube length	20	5
Internal tube segments	60	5
Nasal coupling	3	0