

# ECE480 Senior Design

## Application Note

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11/14/2014

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### Abstract:

V-stamp is based on the RC systems' RC8660 chipset. It integrated text-to-speech processor. The advantages of it are that it has high voice quality and unlimited vocabulary, and it is able to convert any ASCII text into speech automatically. Also, it has functions of doing record, download, upload, and playing sound files.

### Keyword:

V-stamp, Exception dictionary, Sound library.

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## Introduction

To solving the problem in the project, using V-stamp is a necessary part during our process. V-stamp is feature-rich, self-contained voice/sound synthesizer and recorder, and the size is only 1.7 square inches, which is perfect to be an add-on for the insulin pump. V-stamp has many functions, among those function, we are using its text-to-speech conversion, audio recording, and playback. The graph (figure-1) below is how the V-stamp looks like.

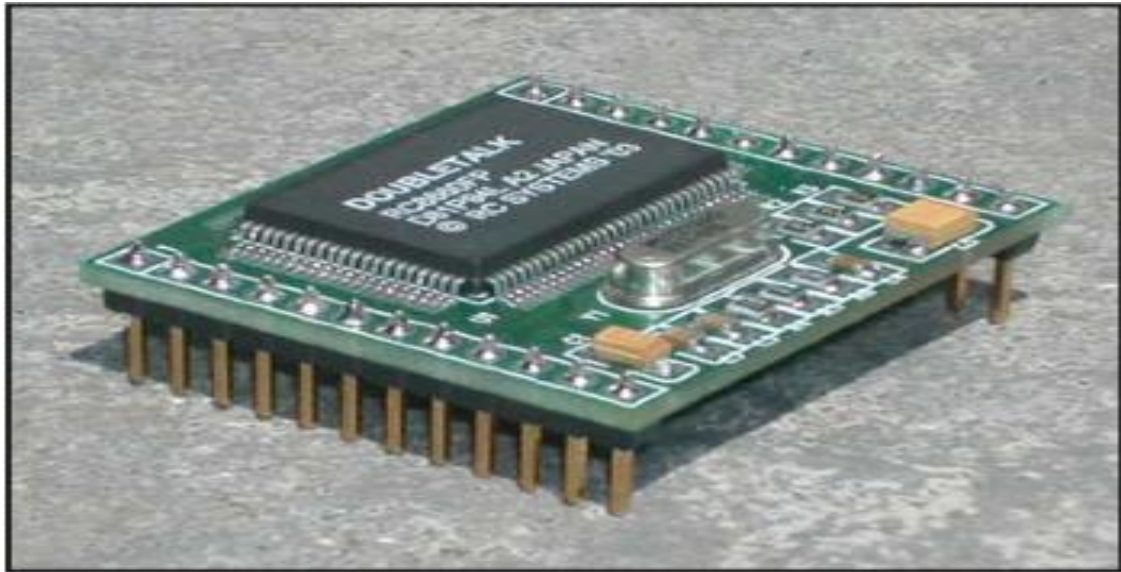


Figure-1

Since transferring the output from the insulin pump into V-stamp, and let it speak out the correct information we need is a very complex progress. We are using MSP430 as a control panel, and using V-stamp as a memory part. In that case, we are sending out orders from MSP430, and using the library we downloaded in the V-stamp to transfer the code into words and to speak them out.

### How to convert the code from insulin pump to understandable word

Though the software 'Teraterm', we are able to figure out what information the pump is sending out every time we press the button on the pump. By using this software, we knew that the code coming out from the pump is usually a series of numbers and characters. Such as 'KSIM V2 86', 'KSIM V2 88', 'KSIM V2 337 0', and so on. By doing the research, we knew that these are series of ASCII code, but it is a challenge for us to transfer them directly to normal words that we are able to understand. So we plan to just define the different part of those codes, because we know what code will come up when the button is pressed. Since each series code has the same part that they all have 'KSIM V2' at the beginning, we are just going to define the numbers after that. Because the V-stamp is not able to recognize the space between each characters, so when the

code come out, it will read it one by one, but not follow the definition in the dictionary.

## Software for using V-stamp

To use V-stamp to speak out the word with the right pronunciation we want, we have to use the software for V-stamp to make some definitions. What we are using is a software called RC-Studio; it is an integrated RC8660 development tool. Through this software, we are able to utilize the chipset's features, such as creating exception dictionaries, managing sounds libraries, and recording. And the RC-Studio is free to download online. The following graph (figure-2) is the overview for RC-Studio.

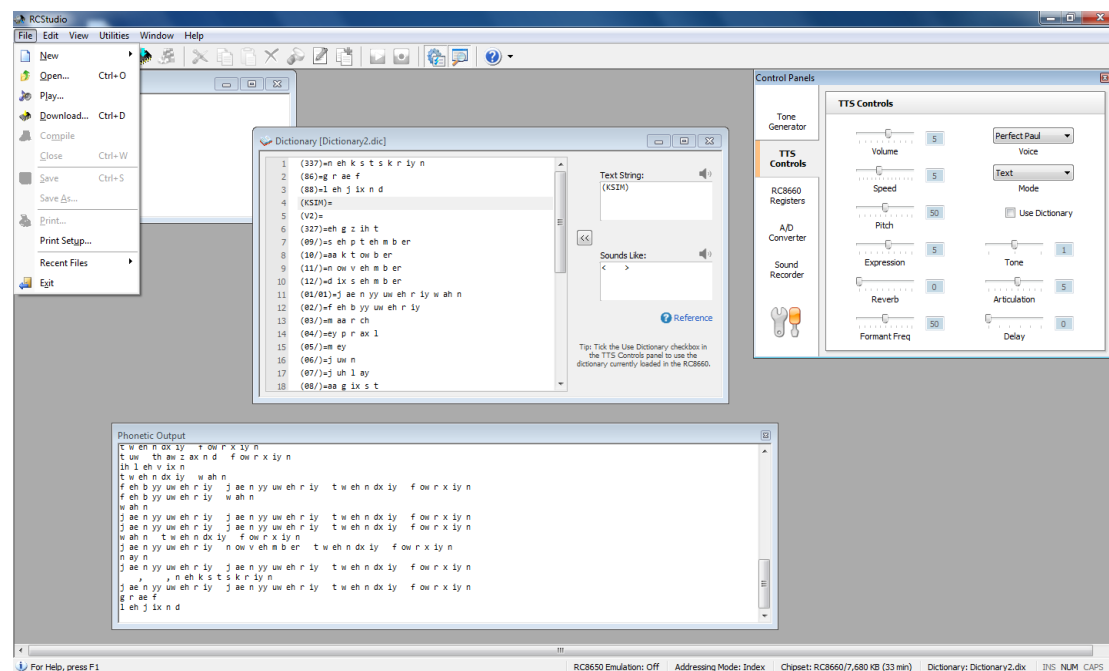


Figure-2

## What is exception dictionary?

Creating an exception for V-stamp is able to make V-stamp memorize the special pronunciations we want for some words or characters. The exception has the general form  $L(F)R = P$ , which means that when the text fragment 'F', occurring with left context 'L' and right context 'R', it will get the pronunciation 'P'. All these three parts of the exception to the left of equality sign must be satisfied before the text fragment will receive the pronunciation by the right side of the exception. Here is an example of exception:  $C(O)N = AA$ . In this state, the O after C and before N will get the pronunciation of AA. Such as the 'o' in the conference, economy, and so on will be pronounced according this exception.

An exception dictionary is composed of two sections: one for text mode, and the other for Character mode. Each section is completely independent of the other one. When the operating mode is switched between Text and Character modes. Dictionary sections are automatically switched also. By leveraging this

behavior, dictionaries for two completely different application, or even two languages can be implemented.

### How to create an exception dictionary

Click on the 'File' on the left corner of RC-Studio, and choose new → dictionary. Then, there will be window jump out. (figure-3)

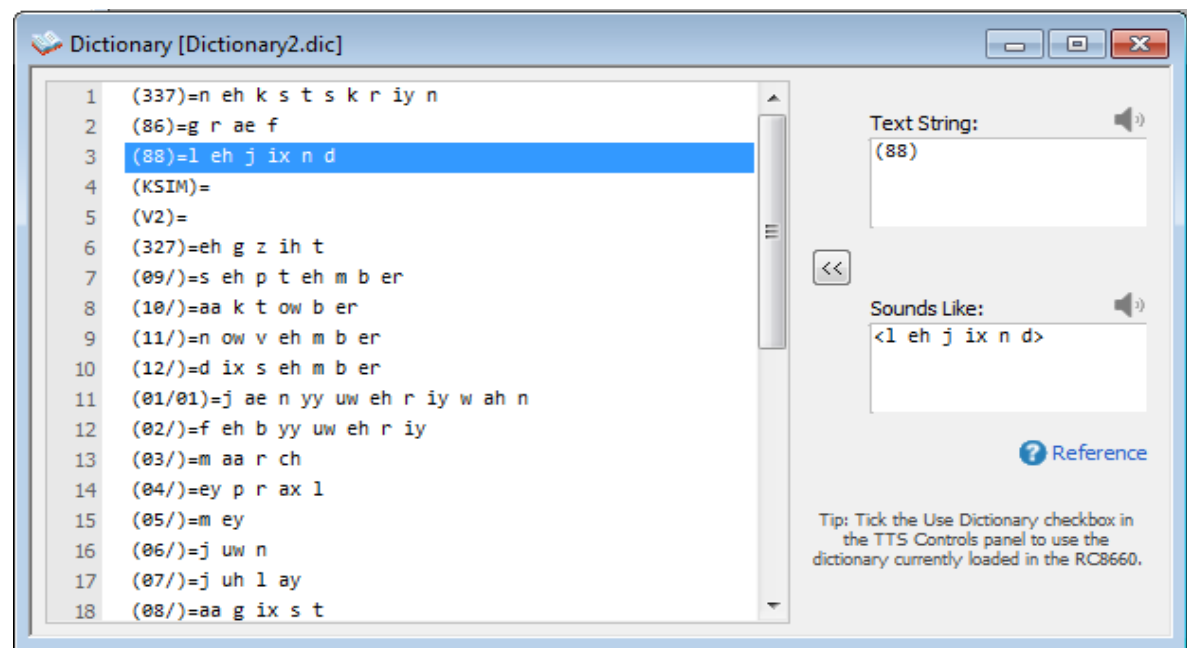


Figure-3

2) Under the 'Text String', type in the character we want to define, and then type in the phoneme symbols under the 'Sounds Like'. After that, press the arrow to save it in the dictionary.

3) To know what is the phoneme symbol for every pronunciation, we can check it from the table (figure-4) below. Or we can type some words, which have the pronunciation we want in the text file (figure-5), and let the V-stamp speak it out, and the phoneme symbols will be shown in the phonetic output window (figure-6).

| Phoneme Symbol | Example Word    | Phoneme Symbol | Example Word     |
|----------------|-----------------|----------------|------------------|
| A              | das (Spanish)   | N              | new              |
| AA             | cot             | NG             | rung             |
| AE             | cat             | NY             | niño (Spanish)   |
| AH             | cut             | O              | no (Spanish)     |
| AW             | cow             | OW             | boat             |
| AX             | bottom          | OY             | boy              |
| AY             | bite            | P              | pop              |
| B              | bib             | PX             | spot             |
| CH             | church          | R              | ring             |
| D              | did             | RR             | tres (Spanish)   |
| DH             | either          | S              | sell             |
| DX             | city            | SH             | shell            |
| E              | ser (Spanish)   | T              | tin              |
| EH             | bet             | TH             | thin             |
| EI             | mesa (Spanish)  | TX             | stick            |
| ER             | bird            | U              | uno (Spanish)    |
| EW             | acteur (French) | UH             | book             |
| EY             | bake            | UW             | boot             |
| F              | fee             | V              | valve            |
| G              | gag             | W              | we               |
| H              | he              | WH             | when             |
| I              | libro (Spanish) | Y              | mayo (Spanish)   |
| IH             | bit             | YY             | you              |
| IX             | rabbit          | Z              | zoo              |
| IY             | beet            | ZH             | vision           |
| J              | age             | space          | variable pause * |
| K              | cute            | .              | short pause      |
| KX             | ski             | .              | medium pause     |
| L              | long            | .              | long pause       |
| M              | me              |                |                  |

Figure-4

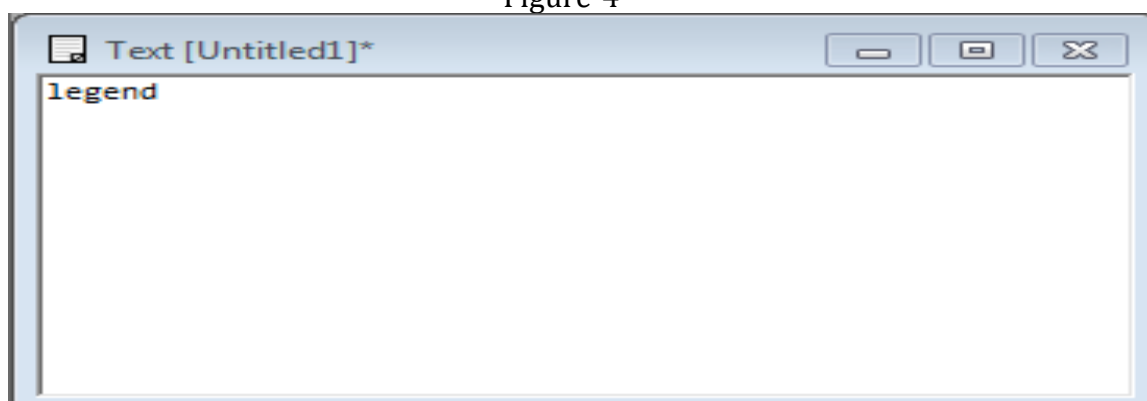


Figure-5

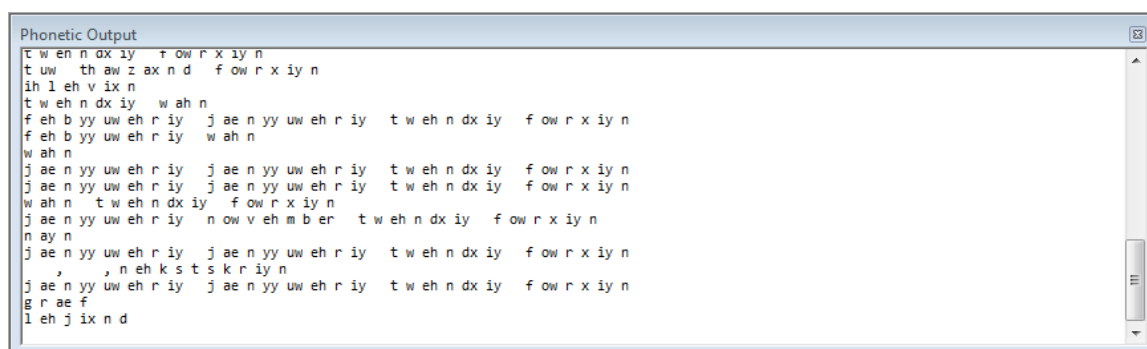


Figure-6

4) After we finish the dictionary, what we need to do is only to save it, and than compile it to the V-stamp. To test the dictionary is working or not, we can also type the word or character we defined, and check the 'use dictionary' in the Control Panel (figure-7). Then the V-stamp will use the phoneme symbols we defined to speak out the input information.

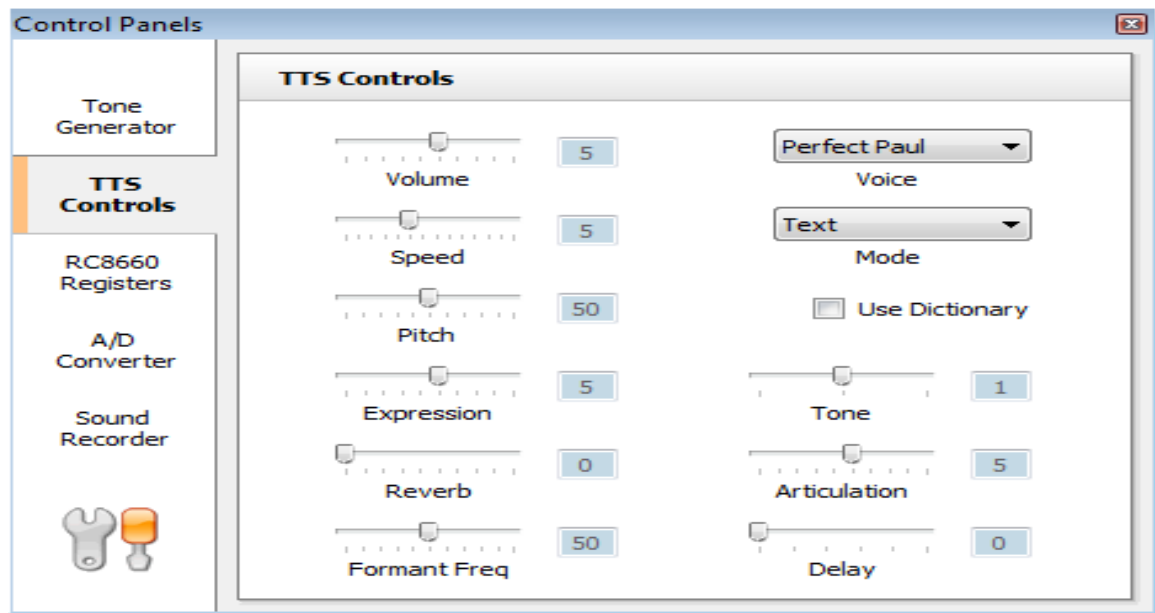


Figure-7

### How to use recorded voices in the dictionary

- 1). We need to apply a microphone to the V-stamp to let it be able to collect our voice.
- 2). Change the numbers in the File management block to 1, and check the Tag (figure-8).

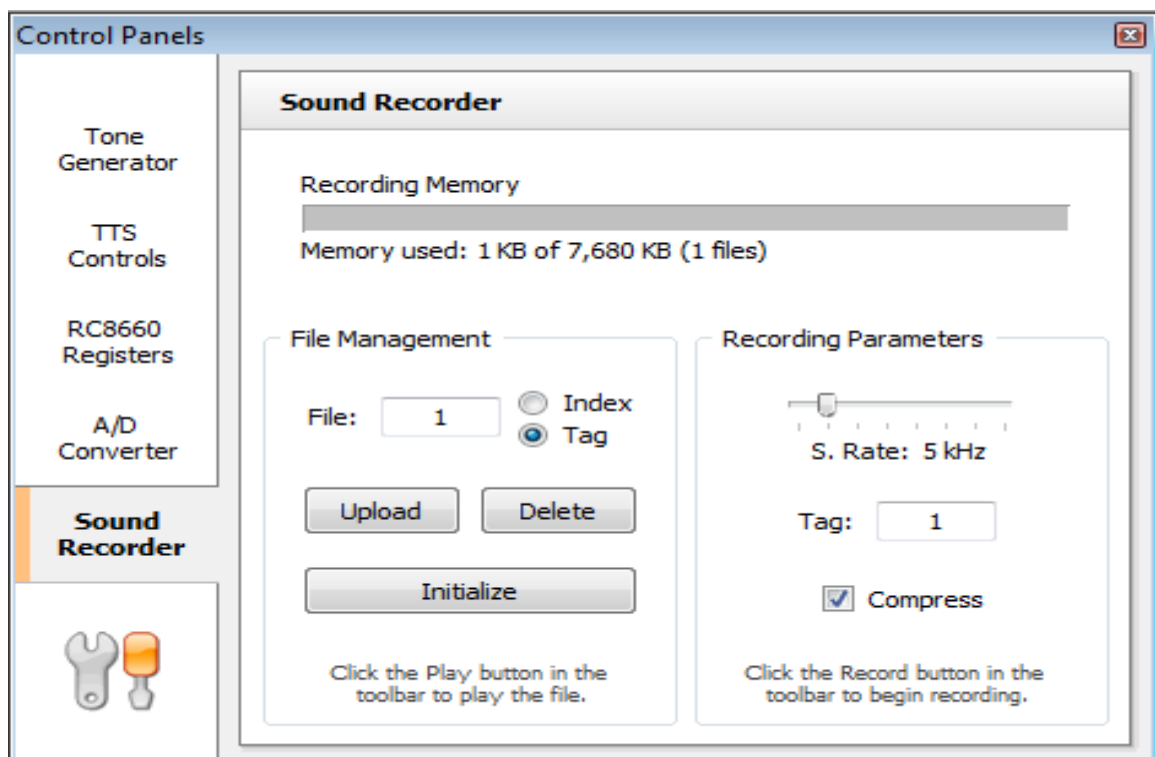


Figure-8

3). After the previous step, click the record button (figure-9) in the tool bar, and our voice will be recorded.



Figure-9

4). When finish the recording, click the Upload in figure-8 to pull out the sound file from the recording memory of V-stamp. Every sound file in the recording memory will have a number. What we need to do is just to apply that sound file into the exception dictionary. For example we record the pronunciation of 'Hello' into a sound file '010', and we want the 'ABC' to be pronounced 'Hello' from V-stamp. Then we can type 'ABC' in the Text String block in figure-3 and type '/010&' in Sounds Like block, and save it.

5). After we compile it to the V-stamp, when we test it by using Text file, and type ABC in the Text file window, the V-stamp will play out the sound file we saved in the dictionary.

## Conclusion

V-stamp has a large size of its memory, so we are able to store lots of information we need to use into it. Defining the code by using phoneme symbols in the dictionary will save us a lot of time, because it only needs typing. But using recording sound files to make dictionary will give us a higher quality of pronunciation of words. Also, by adding an exception dictionary, we are able to make the V-stamp have more language options.

## Reference

### **RC8660 Data Sheet**

[http://www.rcsys.com/Downloads/rc8660.pdf#search="pronunciation%20table"](http://www.rcsys.com/Downloads/rc8660.pdf#search=\)

### **V-Stamp Explanation**

<http://www.rcsys.com/Downloads/v-stamp.pdf>