CHAPTER 10
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Voice Recognition Software

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INTRODUCTION

The *BUGS* Voice Recognition system, a computer software package, recognizes commands by comparing the energy levels of the spoken word with its previously trained word template. Therefore, words with multiple syllables contain more distinct energy patterns, which greatly reduces the chances of recognition error. By using the UPDATE command in the *BUGS* program to update previously trained words, the acceptance rate of the spoken word is dramatically increased as well. The system in use requires no external software; *BUGS* consists of a card that is installed in an expansion slot and the files located on the hard-drive in order to run the program. Also, the *BUGS* system is speaker-dependent, meaning that every user must train the system to their own particular voice template. However, this is not a problem since the typical amount of space available on the hard-drive of the computer is sufficient to support as many lexicons as necessary.

The primary objectives of this project are: 1) to implement a voice recognition system as a computer interface for clients who lack muscular control/coordination of their extremities, 2) to train clients' voice templates to a customized lexicon or command set. With these tasks completed, clients are able to use three specific software applications, WordPerfect 2.1, Lotus 123 and Autocad. Trial and error in these applications dictated the modifications to be made to clients' lexicons. The *BUGS* software application is very user-friendly such that other engineering students can carry on this effort without much difficulty.

SUMMARY OF IMPACT

The *BUGS* Voice Recognition System gives physically disabled clients the ability to utilize their verbal power for the operation of a microcomputer. The voice operated software system not only provides a means for clients to interface with a computer, but it also provides an excellent opportunity for clients to practice speech therapy.

Since consistent speech is a vital factor for the success in using the *BUGS* system, speech therapists are working with clients to improve the repeatability of voice recognition. The most important outcome of this project is that it allows clients to be more self-sufficient, instead of being totally dependent on the workshop coordinator. This computer ability will also enable them to work whereas otherwise they might feel useless or unneeded. Finally, in addition to greatly expanding the capabilities of client interaction with computers, the *BUGS* system may be implemented into virtually any household device, which will undoubtedly improve their quality of life.

TECHNICAL DESCRIPTION

The *BUGS* system allows up to 200 commands within each lexicon, or voice-template file. Due to the large amount of memory consumed by these voice-templates, a maximum of 75 commands may be active at one time. To adhere to this requirement, the lexicon designed consists of four command sets: master, letters, symbols and function. The master command set includes those words that are most commonly used during the session, such as keystrokes used to change directories as well as loading often used software applications. The master command set is always active as long as the *BUGS* system is active. The other command sets consist of the keystrokes that are located on a computer keyboard. For instance, if a client wants to format a document and needs to hit a shift key, the functions command set would be activated, while simultaneously turning the letters and symbols command sets off. With the master and function command sets containing a

maximum of 37 commands each, the active-word maximum of 75 is adhered to.

With the four command sets currently in the lexicon, a total of 95 command words have been trained. The remaining 105 commands available may be used for additional command sets that are used in a particular application, such as CAD software package.

Since any command word trained may designate up to 64 keystrokes, multiple functions or macros could be developed which would minimize the number of commands necessary for these command sets. Therefore, the clients should have enough commands available for virtually any software applications of their choosing.

Figure 10.1. Client Working with the BUG System.

Flutophone Assembly Unit

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INTRODUCTION

The objective of this project is to design a device to aid in the assembly and packaging of a flutophone. The parts are tight fitting and difficult to assemble for a client whose manual dexterity is limited. The designed device will help the assembly process in three different aspects. First, an attachment is built and manufactured to fit a ring around the mouthpiece. Second, a post is provided to ensure proper alignment of the flutophone components. Finally, a securing device is mounted on the frame of the unit to improve the packaging process. This unit is to be designed such that it may be manipulated by a client with the use of only one hand.

SUMMARY OF IMPACT

The flutophone assembly unit greatly simplifies the task of assembling and packaging flutophones. Previously, the client assembled the flutophone in an assembly line with great difficulty. The most difficult piece to assemble was the tightly fitting ring that attaches to the mouthpiece. The ring must be placed onto the mouthpiece along the same axis for correct fitting. Incorrect alignment will crack the ring during the assembly process. In order to correct the problem, a wooden cylinder is designed over which the mouthpiece could slide and force it together with the ring. The other components of the flute are pressed together in a clamp-like device that does not always keep the parts positioned correctly. Packaging, the last step of the assembly process, is a troublesome and most frustrating job for the client. The plastic sleeve provides a tight fit for sheet music and the flutophone. For the client with limited manual dexterity, this step can become time consuming and tedious.

By centralizing the assembly process to one station, the flutophone design project not only increases the amount of flutophone assembly and packaging done by the client, but also reduces the time required to operate. Use of a cylindrical rod prevents misalignment during the flutophone assembly. Once the flutophone is assembled, it may be slipped into the plastic sleeve that is held in place by a clipboard. Since the sleeve is restrained by the clipboard, the client is able to manipulate the flutophone into its casing with more freedom. The newly designed flutophone assembly unit has improved the efficiency of the assembling and packaging processes.

TECHNICAL DESCRIPTION

The flutophone assembly unit is constructed of a $21" \times 12" \times 3/4"$ plywood base (Figure 10.2). The unit is divided into three main assembly steps: ring attachment, flutophone assembly, and flutophone packaging. For correct alignment, a wooden cylinder was initially designed over which the mouthpiece could slide and force it together with the ring. This worked for a short time, until the wooden cylinder deteriorated and loosened, resulting in misalignment. To correct this problem, the wooden cylinder was replaced by a machined aluminum cylinder that will not loosen or deform.

The machined piece ensures an aligned fit every time without much effort. A $10\frac{3}{4}"$ long, $\frac{1}{4}"$ diameter stainless steel rod is welded to a $3" \times 3" \times \frac{1}{8}"$ steel base and a hole is drilled through the wooden base for the aligning cylindrical rod. The ring attachment is $1"$ in height, a $\frac{1}{2}"$ thick base with a 3” diameter, and a $\frac{1}{2}"$ thick knob with a $11/16"$ diameter. This attachment is located $8\frac{1}{2}"$ from the left side and $2\frac{3}{4}"$ up from the bottom. This design provides a rigid stance for the rod that will be subjected to deflection during flutophone assembly. Finally the clipboard is attached at the right edge of the wooden base allowing the sleeve to hang vertically for ease of packaging. A schematic with dimensions of the top view of

the flutophone assembly unit are shown in Figure 10.3.

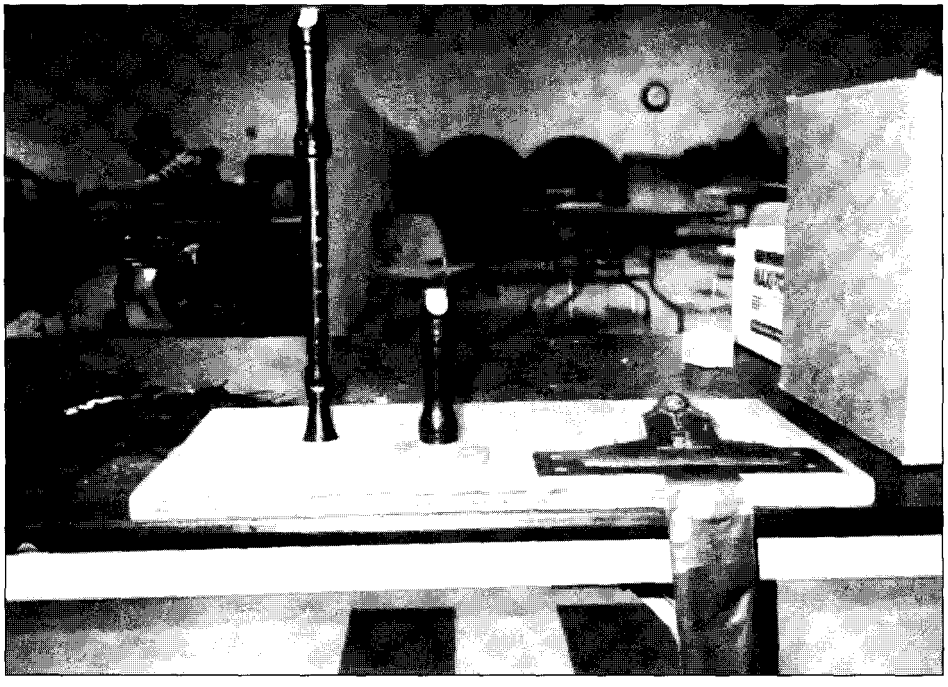

Figure 10.2. The Flutophone Assembly Unit.

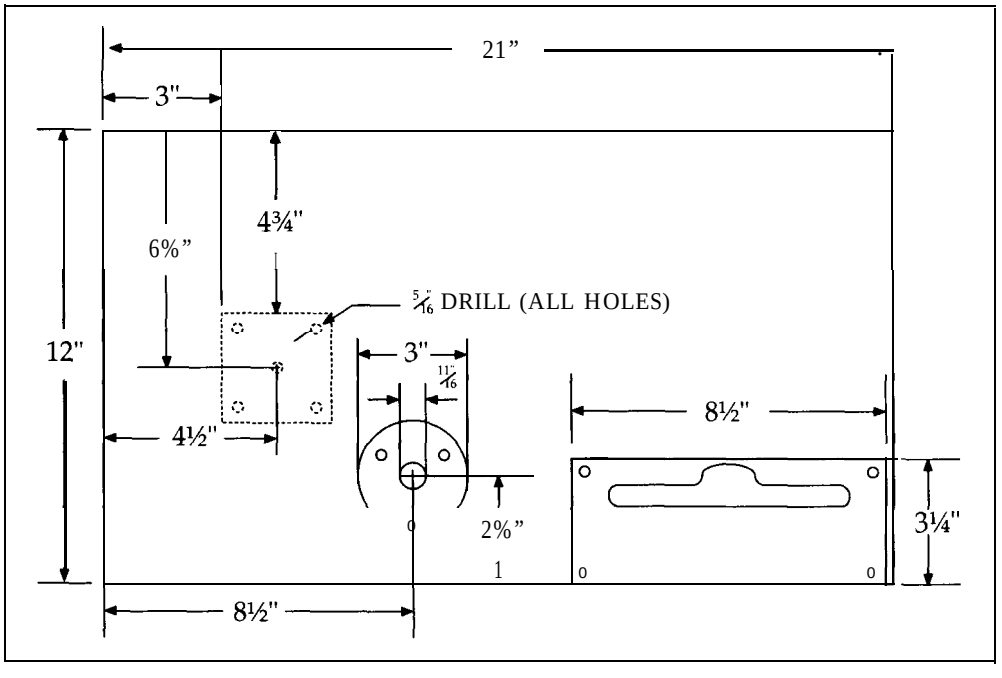

Figure 10.3. The Top View of the Flutophone Assembly Unit.