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Human Computer Interaction: Study of Disabled Users

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Abstract: Analyzing the users mainly refers to the ones who are able. But there is no complete acceptance behavior for such an approach. The disabled people also must have complete chance to use all the technologies. So these users need to be studied. All the accessibility tools can be utilized here and verify what is the performance of disabled users using these accessibilities such as keyboard accessibilities, screen accessibilities etc. methods should be identified which are for ease of these users. How do disabled users utilize these keys and accessibilities? Are they able to use it same as like normal users using keyboard keys and mouse movements? To study these characteristics of disabled users a support vector machine can be used. State space would create the data that users (disabled users) used to a certain task. Edge pace captures certain transitions. Thus support vector machine can be applied to these representations to have successful study.

Keywords: Accessibility, Support vector machine (SVM), State space, Edge space.

I. INTRODUCTION

The support vector machine was used to study the normal users in efficient manner. It includes state based analysis which further includes state space and edge space representations. These were applied on keyboard keys such as arrow keys, shift key etc. and mouse movements. Similar method can be used to know about disabled users. Thus studying on how they use the accessibilities that are provided to them. The basic accessibilities include screen accessibility, keyboard accessibility and other accessibilities.

II. ACCESSIBILITY

There are people who are partially or completely challenged with vision, hearing and mobility related problems. Product usability wouldn't look into their requirements which would result in lack of acceptance. There are several tools called accessibility tools that help these people.
There are two ways in which accessibility is provided:

1. Basic accessibility: making use of features provided by underlying infrastructure.
2. Product accessibility: accessibility provided through standards and guidelines.

Here we are focusing on basic accessibility, which is provided by hardware and operating system. All the input and output devices of the computer and their accessibility options are categorized under basic accessibility.

Keyboard accessibility:
Keyboard is the complex output device to be used by the disabled users such as for vision impaired and mobility impaired persons. Keyboard keys with modification in sizes and shortcut to function keys are examples of improving accessibility. Some improvements are as follows:
Sticky keys: <CTRL><ALT><DEL> Used for log in, log out, locking and unlocking machines, shutdown, and bringing up task manager. This keyboard sequence is complex for even normal users without disabilities as it requires coordination to hold three keys together. The setting of sticky keys in the operating system removes holding the three

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keys together with coordination as it becomes difficult for vision and mobility impaired persons. When this feature is enabled, <CTRL> and <ALT> keys are pressed once and released by the user before pressing the <DEL> key. This requires only a single finger to do the operation.

Filter keys: These keys stops or slows down the repetition of keys. When keys are pressed for more than a particular duration, they are assumed to be repeated. This often troubles physically challenged people.

Toggle key sounds: When toggle keys get enabled, the vision impaired person feel it difficult to know the status of the toggle keys, hence toggle key sounds are enabled. Different tones are played when enabling and disabling toggle keys.

Sound key: When each character in the keyboard is pressed it pronounces those characters and hence helps the vision impaired users.

Arrow keys for controlling mouse: The arrow keys can be used as a way of mouse pointers. Since the mobility impaired users faces problems in moving the mouse.

Screen accessibility: Hearing impaired users also require visual helps on the screen. Some features are:

Visual sound: Waveform of the sound that helps the hearing impaired users to get the visual effects of the sound on the screen.

Enabling captions for multimedia: Multimedia speech and sound enabled with text equivalents which are displayed on the screen.

Other accessibility features:

Vision and mobility impaired users find it to difficult as to use the keyboard and the mouse normally so other accessibility features are provided such as joystick which can be used as an alternative to a pointing device, soft keyboard displaying keyboard on the screen etc.

In this paper, we focus on the disabled users using some of the keyboard accessibilities. A study is conducted to improve the facts for vision and mobility impaired users.

III. RELATED WORKS

So far there were methods that helped the normal users, their study on interaction with the system. Machine learning tools were utilized in order to study these users. The main method adopted was the use of decision trees and support vector machines. The data regarding to the number of the mouse clicks, the left and right shifts, zoom in and zoom out etc. were the click event features which were calculated with respect to certain task such as ”Finding Waldo”. With regard to this game certain measures were got and a decision tree and support vector machine was constructed to study the interactions of the users.

On account of study of disabled users a multimodal was created which uses speech and gestures to interact with the computer. The myopathic patients may not be able to use devices such as keyboard, mouse, trackball etc. in order to interact with computer. For such users’ speech and head movements were taken as an asset to interact with the computer.

The literature on similar paper refers to identifying the new techniques; this paper focuses on developing a study on the disabled users using the keyboard accessibilities. The late part of this paper gives an idea of support vector machine and how it is used to know more about the vision and mobility impaired users.

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IV. ANALYSING THE DISABLED USERS

To study these users we need to assign a task to the disabled users. Let us assign it to be to type a word document. Also the users can take breaks when they feel hesitated or tired. They can utilize the accessibilities for keyboard which would help us to study about these users.

State space

The state space would contain the vector space containing the set of all data that is being calculated on the basis of usage of the sticky keys, filter keys, toggle key sound, sound keys and arrow keys. Here the analysis mainly focuses on the use of how many time the user log out using sticky key, for what time the filter keys are assigned, how many time the arrow keys are moved with respect t mouse movements. Thus the training samples are the number of time each key is used in each line of the document.

Support vector machine is a successful machine learning tool and here we utilized to identify the outcome of using different keyboard accessibilities by calculating the mean of each key. From this we can infer how disable users use these keys and know about them in statistical manner. This may help us in further study and developments which would further help these types of users. Now, there are two classes under which the classification is done that is fast users and slow users. For each key a graph is plotted that is calculating the mean of the number of times the keys are used. These training samples are separated to fast groups with those users who use the keys above the mean value. And other users are assigned below the mean and referred to as slow users. Support vector machine is the learning technique that linearly separates the users. To determine the classifier the mean is utilized which separates into two classes say, class 1 and class 2, respectively fast and slow users.

Edge space

The edge space shows the vector space for the transitions in each line of the document pointing on the usage of each key in each line. With this we can analyze the user whether he/she improves after each line or else is tired of the concept of using this.

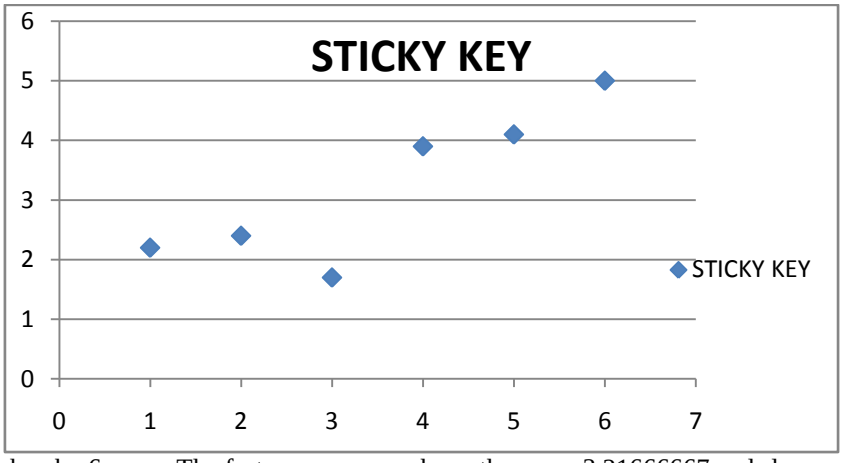

Fig1: usage of sticky key by 6 users. The fast users appear above the mean 3.21666667 and slow users below the same.

Figure 1 shows use of sticky key and thus separation shown by mean which is used as the linear classifier to separate two classes.

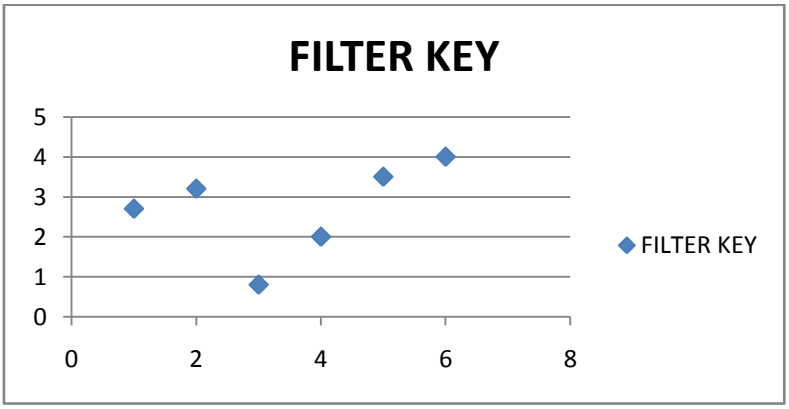

Fig 2: usage of filter key by 6 users. Fast users appear above mean 2.7 and slow users below the mean.

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Similarly, the other keys are also studied such as for filter key in figure 2.
The support vector machine with the weights less than the mean and above the mean shows the classifications. With this we can infer that the feature vectors which are near to the mean or on the mean are support vectors. By this method we check that the unknown feature belongs to which class. The hyper plane that divides the classes determines that where the input features belongs to.

V. CONCLUSION

This paper gave an idea to study the disabled users with the existing technologies like how normal users are studied. New technologies were implemented to know about these users such as analyzing the speech and head movements, creating a multimodal HCI [2]. Here we focus on the how the already available basic accessibilities are used by the disabled users. This study would further give us an idea of whether a further development can be made to make the users interface to the computer simpler and easier.

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