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A Review Paper on Mouse Pointer Movement Using Eye Tracking System and Voice Recognition

Prajakta Tangade[1], Shital Musale[1], Gauri Pasalkar[1]

Miss. Umale M.D., Miss. Awate S.S.

[1]Computer Engineering, DCOER, Pune, India

Abstract: *The field of human computer interaction has been undergoing a new renaissance lately. While many companies have and are still spending millions to develop highly visually appealing GUIs and state-of–art interaction systems for the common users since the inception of desktops, the development of interaction systems for the disabled has taken a kick start recently. The Eye gaze system is a communication and control system for people with complex physical disabilities i.e.* ***You*** *can run system with your eyes. We all are blessed to operate the computer with ease using our hands. But there are some who can't use their hands* ***and for*** *them the voice guided systems have been in use for quite some time now. But in case of paralytic patients with no mobility and speech even though their brains and vision are functional, they can't utilize their intelligence and stay unemployed. Thus, our eye gaze system helps in providing solution to this problem.*

Our system controls the computer cursor by following the user's gaze. By looking at the control keys displayed on a screen, a person can synthesize speech, control his environment, type, operate a telephone, run computer software, operate a computer mouse, and access the internet and e-mail .

Thus, our scheme can be used to enhance the quality of life of people with disabilities, all over the world.

Keywords: *Interaction systems, Eye Gaze system, Speech synthesize.*

1. INTRODUCTION

1.1. Eye Gaze System

Since the average computer user spends most of their active computing time looking at a computer screen a number of researchers have found the detection of eye gaze to be a fruitful goal. Eye gaze is a technique used in a variety of areas, including neuroscience, psychology, cognitive science, human computer interaction, etc. However, most previous usage has focused on using the eye tracker as a tool for studying the cognitive processes of the brain, or the human visual system itself. The concept of using an eye tracker as an input device for the control of a computer is a much less studied area of research, mostly focusing on helping those with motor impairments such as quadriplegics, where the eyes could be used as a substitute for the hands. There are different types of eye gazing methodologies available, few of them are listed below:- The simplest approach to eye gazing is with electrodes placed on the user's skin around the eye. Muscle activity is monitored to track the position of the eye relative to the head. However the electrodes necessary for this approach are somewhat invasive, and this method is mostly useful for measuring the position of the eye relative to the head rather than to an external object such as a computer monitor. This is pretty uncomfortable for the user. A more invasive technique involves placing a contact lens with a magnetic coil against the user's cornea and adhering it in place with suction. The coil then moves with the eye through an electromagnetic field, which produces an induced current. This current is then measured to determine the location of the user's eye. This again has the same drawback. Thus, here we use Eye Tracker System.

1.2. Speech Synthesis

Broadly the Speech API can be viewed as an interface or piece of middleware which sits between applications and speech engines (recognition and synthesis). In SAPI versions 1 to 4, applications could directly communicate with engines. The API included an abstract interface definition which applications and engines conformed to. Applications could also use simplified higher-level objects rather than directly call methods on the engines. In SAPI 5 however, applications and engines do not directly communicate with each other. Instead each talk to a runtime component (sapi.dll). There is an

API implemented by this component which applications use, and another set of interfaces for engines. Typically in SAPI 5 applications issue calls through the API (for example to load a recognition grammar; start recognition; or provide text to be synthesized). The sapi.dll runtime component interprets these commands and processes them, where necessary calling on the engine through the engine interfaces (for example, the loading of a grammar from a file is done in the runtime, but then the grammar data is passed to the recognition engine to actually use in recognition). The recognition and synthesis engines also generate events while processing (for example, to indicate an utterance has been recognized or to indicate word boundaries in the synthesized speech). These pass in the reverse direction, from the engines, through the runtime dll, and on to an event sink in the application.

2. AIM

Develop an application which helps the handicapped as well as immobile people to get opportunity to use their intelligence and get known with the external world. As well create opportunity to make them employable.

2.1. Existing System

The existing system such that the interaction amongst the computer and human is carried out with eye-tracking and blink-detection. In this concept, human computer interface system exists which tracks the direction of the human eye. The particular motion and the direction of iris is employed to drive the interface by positioning the mouse cursor consequently. The location iris is completed in batch mode. Here the frames are stored in a permanent storage device and are retrieved one by one. Each of the frames is processed for finding the location of the iris position and there by placing the mouse cursor consequently. Such a system that detects the iris position from still images provides an alternate input modality to facilitate computer users with severe disabilities.

2.2. Drawbacks of Existing System

- It affects eyes of users and causes problems in vision for them.
- It can only handle blinks and is not able to handle short blinks.

  Short blinks it simply avoids.

3. PROPOSED SYSTEM

The eye-gaze system is a direct-select vision-controlled communication and control system. The system i.e. Eye Gaze, a real time gaze determination software that controls a computer cursor by following the user's gaze. Only requirements to operate the Eye gaze are control of at least one eye with good vision & ability to keep head fairly still. Its primary users can be adults and children with cerebral palsy, spinal cord injuries, brain injuries, ALS, multiple sclerosis, Brainstem strokes, etc. Eye gaze can be used in homes, offices, schools, hospitals, and long term care facilities. By looking at control keys displayed on a screen, a person can synthesize speech, control his environment (lights, appliances, etc), type, operate a telephone, run computer software, operate a computer mouse, and access the internet and also e-mail.

3.1. Advantages of Proposed System

- Hands-free computing
- Facilitating the handicapped using the computer.
- Controlling the mouse pointer through eye movement.
- Eye based human computer interaction provide real time eye tracking and eye gaze estimation.
- Simulate mouse functions-
  - User can control mouse events like left click, right click, double click etc by movement of eyes.
  - User can control and trigger mouse using voice commands.

3.2. Block Diagram of System

As a user sits in front of the computer, a video camera mounted above the monitor observes one of the user's eyes. Advanced image processing algorithms implemented in the software continually

analyzes the video image of the eye and determine the user is looking on the screen. Nothing is attached to the user's head and body. There is absolutely no need for additional hardware apart from the video camera.

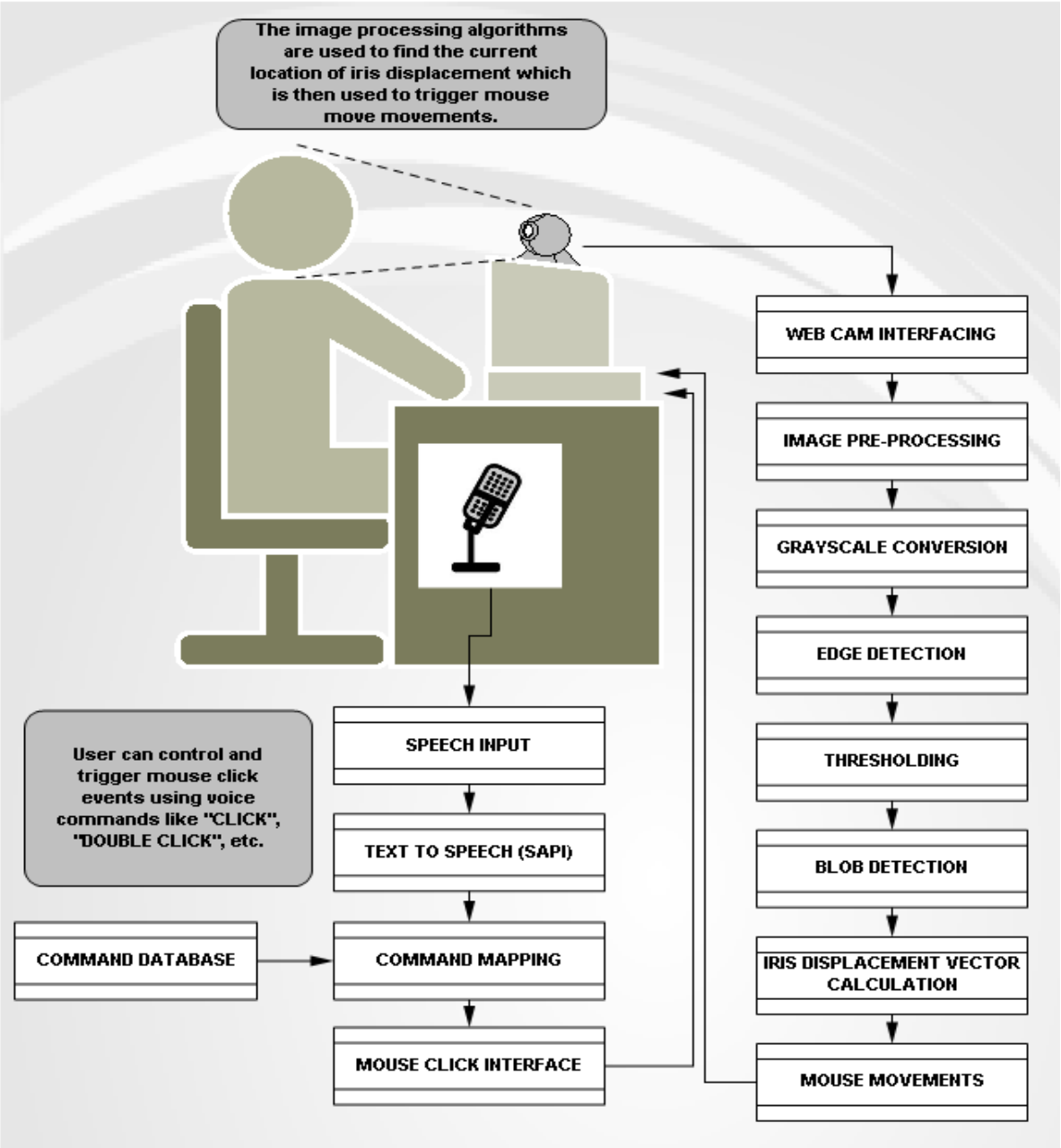

Fig1.1. *Block Diagram of System*

4. MATHEMATICAL MODEL

In graphics software Gaussian blur is a widely used. Noise can be reduced using this Gaussian blur. Gaussian smoothing is also used as a pre-processing stage in computer vision algorithms in order to enhance image structures at different scales.

Applying a Gaussian blur to an image is the same as convolving the image with a Gaussian or normal distribution. It is a type of image-blurring filter. It uses a normal distribution for calculating the transformation to apply to each pixel in the image.

The equation of Gaussian distribution in N dimension is

$$G(r) = \frac{1}{(2\pi\sigma^2)^{N/2}} e^{-r^2/(2\sigma^2)}$$

Or in two dimension

$$G(u, v) = \frac{1}{2\pi\sigma^2} e^{-(u^2+v^2)/(2\sigma^2)}$$

Where r is the blur radius (r2 = u2 + v2) σ is the standard deviation of the Gaussian distribution.

The values produced from this distribution are used to build a convolution matrix. This convolution matrix is then applied to the original image, which later results in a blur that preserves boundaries and edges better than other, more uniform blurring filters.

5. CONCLUSION

We have introduced an easy solution for efficient Eye gaze determination by performing:

- Image Processing
- Eye Gazing
- Simulate mouse functions
  - User can control mouse movement by eye movement..
  - User can also control and trigger mouse events using voice commands.

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