# Chapter 54
# Features of Gaze Control Systems

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## ABSTRACT

*Severely disabled people will often spend a significant part of their waking day using gaze control. Technology has a positive impact on many areas of their life. What simple features do people who have severe and complex disabilities need to use gaze control technology? In this chapter, we consider features that are enhancing the effective use of this innovative and rapidly growing method of computer control. It also provides practical hints in finding and choosing the best gaze control system for each individual.*

## INTRODUCTION

Originally, gaze control appealed to people who had eye movement, but very limited movement in other parts of their body. Now, there are a burgeoning number of companies who pitch gaze control systems at the disabled population. Gaze control is a rapidly developing field, in the wake of this wave of innovation it is no longer disregarded by those who have involuntary movement. By broadening its appeal, there are many people who have severe and complex disabilities that rely on this method of computer control.

In comparison to other methods, participants in the COGAIN project have reported on gaze control offering greater comfort, speed, accuracy, privacy and independence (Donegan et al., 2009). Further in-depth information is presented in the COGAIN report entitled "D3.2 Report on features of the different systems and development needs" (Donegan et al., 2006a). Inevitably, striking new features will emerge, as this technology continues to seize the imagination of end-users and researchers. This chapter describes a mere sample of the basic features, and principles, as they are at the time of writing. Herein it reflects the perspective of those who are new to this field.

## CHOOSING THE BEST SYSTEM FOR EACH INDIVIDUAL

The first question to ask is: "which gaze control system is best for me?" In surmising this question, three simple principles are captured by The KEE concept by Donegan and Oosthuizen (2006a). These are as follows:

- **Knowledge-based:** Founded on what is known of the user's physical and cognitive abilities;
- **End-user focused:** Designed to meet the end-users" interests and needs; and
- **Evolutionary:** Ready to change in relation to the end-users response to gaze control technology and software provided.

This concept provides a framework for finding the system that best meets the needs of each individual

Throughout the COGAIN user trials, the prime concern regarding the motor and cognitive skills of users was the demands of involuntary movement. To refer to how and why systems are able to tolerate involuntary movement. Devices differ in the degree of involuntary movement they do comfortably tolerate. It seems obvious to say that the physical ability of the individual determines how important this is and to what degree. So this feature shall be introduced through a sample of typical gaze control users. The four brief paragraphs that follow present examples of people who have Motor Neurone Disease (MND), Cerebral Palsy (CP), a Spinal Cord Injury and Locked-In Syndrome.

Describing the ways in which gaze control is of real benefit, encounter Jack Orchard, who appears in a video on the LC Technologies (2011) website. In a news item aired on KSDK-TV Jack says "there is so much left to do, so for now, back to work." Jack experiences Amyotrophic Lateral Sclerosis (ALS), one form of MND. Like anyone else, fulfilling purposeful roles is his "lifeline" (see, LC Technologies, 2011). Evidently, gaze control gives him the means to socially communicate; be creative; and regain independence. Jack is excellent at using his gaze control system and has, in fact, written an entire book with it (Quintero, 2009). Tolerating involuntary movement isn't essential. What is essential, however, is reliability; as Jack's girlfriend says, "as soon as he gets up and is ready he is at his computer". For people whose health is deteriorating, timely and flexible assistance is envisaged, since the software settings and user interface will need to evolve over time

For more information about MND, please see the websites of the MND Association (www.mndassociation.org). For people based in England, please see NHS Choices (www.nhs.uk). The training section of the COGAIN wiki (2011) has online videos related to ALS communication.

By way of contrast, people who have CP have to adopt gaze control systems that support involuntary movement. CP is not a specific disorder or single syndrome; it assumes different forms (Merck Manuals Online, 2001). For example, people who have Athetoid Cerebral Palsy can experience involuntary movement such as a mobile spasm, a fleeting irregular localised contraction or an intermittent tonic spasm, etc. The MyTobii website introduces individuals who have Athetoid CP, evidencing the efficiency of this access method (User Stories, 2011).

Spinal Cord Injury similarly might cause involuntary movement. Sarah has a high cervical injury and good head control. In her case, she prefers to use gaze control over a mouth stick. For her, the particular strengths of gaze control are made clear. It is more comfortable, direct and faster than a mouth stick because of the speed of eye movement. The major weakness of the mouth stick is the need to keep her head still while she waits for a mouse click; which becomes tiring and painful over time (Yeo, 2006). The differences between gaze control systems are often quite subtle and subjective so best to compare several, in order to discern which one is perceived to be the best for the individual.

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