The Eye as a Security Mechanism

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Introduction

The purpose of this project is to explore the use of language- and input-models, meant to facilitate eye typing with uncalibrated eye tracking.

Typing is a ubiquitous input method for human-computer interaction, particularly for human-to-human communication facilitated by computers.

Several methods have been developed to help humans type faster and more accurately, especially on mobile platforms like mobile phones. Some methods are based on probabilistic language- and input-modelling, such as T9 and the replace-as-you-type technologies (colloquially; *autocorrect*) that have mostly replaced T9 on contemporary smartphones, perhaps due to widespread deployment of touchscreens. Other methods use gestures, or leverage creative arrangements of input symbols. Examples include swype for Android and IOS, and Dasher and StarGazer intended for use with eye tracking.

The use of eye tracking as a means of text input (eye typing) can be demanding on the user. Exact and deliberate control of the gaze is difficult and tiring, and in addition to the energy expended when typing, most systems require users to go through calibration routines before use.

One area where eye typing has seen use is as a communication platform for ALS (amyotrophic lateral sclerosis) patients. Patients suffering suffering from ALS often retain the use of their eye muscles longer than that of other muscles, and eye typing can therefore help increase their quality of life. In practice, patients tend to use eye typing for short commands and answers. For such usage patterns, uncalibrated eye typing will be particularly beneficial.

To explore facilitation of uncalibrated tracking, the following work is presented:

1. A language- and input-model is presented, in order to make educated guesses as to the intended user input, in an attempt to compensate for tracker (and user) imprecisions. In particular, the goal of the models is to ease typing by accepting mistakes, to lessen the need of typing, by guessing future inputs.

2. A typing system is implemented, as a simulation using a pointing device (mouse). To solve the problem known as *midas touch*, input symbols continuously move along the perimeter of a circle. This movement is then correlated with the user input.

3. The typing system is evaluated in an informal typing-speed experiment.

The deliverables of is project are software implementations of the language- and input-model, of the eye typing system(s), and a report detailing the project process and results.