

## **A MEMS-GYRO BASED COMPUTER MOUSE FOR DISABLED**

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### **Introduction**

Computers are an important part of our daily lives, and to be able to control them is in many cases necessary to be able to work, communicate or take part in our modern society of today. Therefore are persons that can not use an ordinary computer mouse in need of an alternative mouse. The reason of why an ordinary mouse can not be used is very different from person to person, depending on their abilities and needs. The need can also vary over time, not all persons are permanent handicapped, it can be a disability or bodily injury that can be healed. From these aspects, a computer mouse that can be used by a wide range of people with different types of disabilities and that can be applied on different body parts has been developed and evaluated.

### **Materials**

The development of this mouse is based on the needs and desires that disabled persons have for an alternative mouse. From interviews with a small group of disabled persons with movement handicaps (e.g. disabled users) and persons working with testing out technical aids for disabled persons (medical professional, e.g. occupational therapists) a mouse specification was made. To complete the specification, viewpoints from other studies was also taken into consideration. The final specification contained the desired mouse characteristics that both the users and the professionals had. The characteristics were a combined list of desires and demands such as behavior, function, technical specification, interface, physical size and design.

### **Methods**

From that specification a technical investigation started on what kind of technology and electrical components that could be used for the task. The computer interface was very easy to determine. The natural choice was the USB-interface. USB is a common, "plug&play" interface that all modern computers have. Another benefit is that no software driver is needed to be installed on the computer because the most operating systems have built-in support for USB-mouses. For the behavior it was obvious that some kind of programmable device was necessary. One reason was that the user shall be able to have their own levels and functions designed after what suits them best. Another reason was to be able to calibrate and adjust the sensors for cursor movements and click-function. To get a movement sensor that responds to the demand specification in physical and technical aspects such as size, weight, sensibility and precision, and also in the aspects of how the user want to move the body part they control, the choice ended on a gyroscope. Therefore, a MEMS gyro was chosen. The gyro is not an ideal component so some signal processing was necessary to get a valid signal for the CPU to handle. To allow different solutions for the click function a device interface was built-in that allow the most common click-devices to be connected to the unit. This means that the user have the possibility to use his own private input device and not only devices that are obtained with the system. This gives more freedom and flexibility for the user.

### **Results**

First-time users understood intuitive how to use the mouse, but had some problem before they had become familiar with the behavior of the mouse and had made their own settings. The system works well and the users are able to control a computer even if they have a limited mobility. This is possible thanks to the MEMS-gyroscopes that is very sensitive even to very, very small movements.

### **Conclusions**

This system is very easy to install and allow people with disabilities to use and control a computer. The mouse is easy to adjust for each individual user. It shows that it is possible to design a small and comfortable computer mouse for disabled persons. The use of MEMS-gyros makes it possible to develop and manufacture a high performance technical aids with a very high sensitivity to a modest cost.