

PARMAK HAREKETLERİNE DAYALI FARE NAVİGASYON SİSTEMİ

Hand Based Mouse Navigation System

Canberk Aslan, Dionysis Goularas

Bilgisayar Mühendisliği Bölümü, Yeditepe Üniversitesi

Özet

Bu projenin amacı, engelli kişilerin bilgisayar kullanımını kolaylaştıran bir fare navigasyon sistemi geliştirmektir. Bu sistemde sadece iki parmak kullanılır. Standart fare işlevleri (hareket, tıklama ve çift tıklama) farklı renklerdeki iki parmağın hareketleriyle gerçekleştirilir. Parmak hareketleri kamera tarafından alınır. Bu görüntü, renk tanıma yöntemiyle işlenir ve fare hareketleri gerçekleştirilir. Sistem, kullanım kolaylığı sağlamakta ve gerçek zamanlı sonuçlar vermektedir.

Abstract

The aim of this work is to provide a navigation tool for disabled people in order to perform various mouse operations on a computer. This tool uses only two fingers and it is based on color detection. Different positions of the fingers allow executing the standard mouse operations: move, click and double click. The system, despite a real time response and an easy adaptation on it, is been proven to be sensible to different light conditions. The system is evaluated and the results are printed.

Introduction

Since many years, an effort has been made from researchers in order to develop new tools that will replace the traditional mouse and keyboard. Unfortunately, only the recent multi-touch screens of mobile phones were able to propose a new type of interaction. Despite this fact, there are some cases that people with particular difficulties are not able to use the mouse or the keyboard. This work targets this population, aiming to replace the mouse and give them the possibility to perform mouse navigation to some particular cases of disabled persons.

Method

For this work, a computer and a web camera is needed. The user half covers his index and middle finger with colored special objects (magenta and green) adapted to his fingers. The green finger is detected by the system as the mouse cursor. Click and double click operations are activated according to the relative position of the fingers and the distance between them.

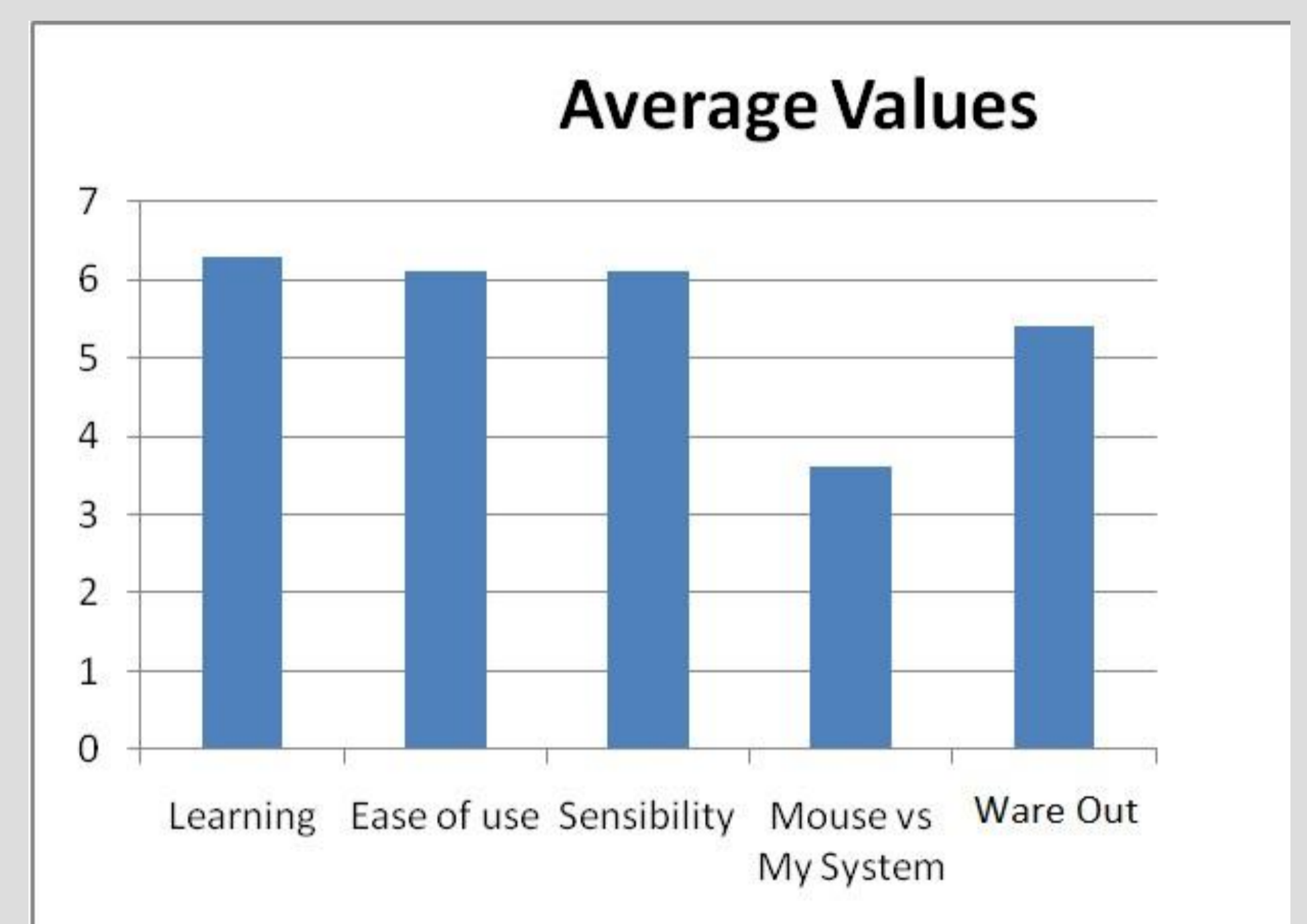
The Algorithm

The main idea is to isolate the colors of the fingers. The HSV color model has been proven to be a more accurate model than RGB concerning the detection of colors. After applying the threshold for each color we locate the center of each region. Our goal is to detect the relative vertical and horizontal position in order to apply the click operations.

```
Get Frame
Do RGB to HSV conversion
Apply green threshold
Apply magenta threshold
Detect center of each region M and G
Pos=0
If M.y>G.y and distM-distG < minDist
then
    Pos=1
Else
    Pos=-1
End if
Calculate relative distance (d)
If d<minDist
    select Pos
    case 1
        do DoubleClick
    case -1
        do SingleClick
End if
```

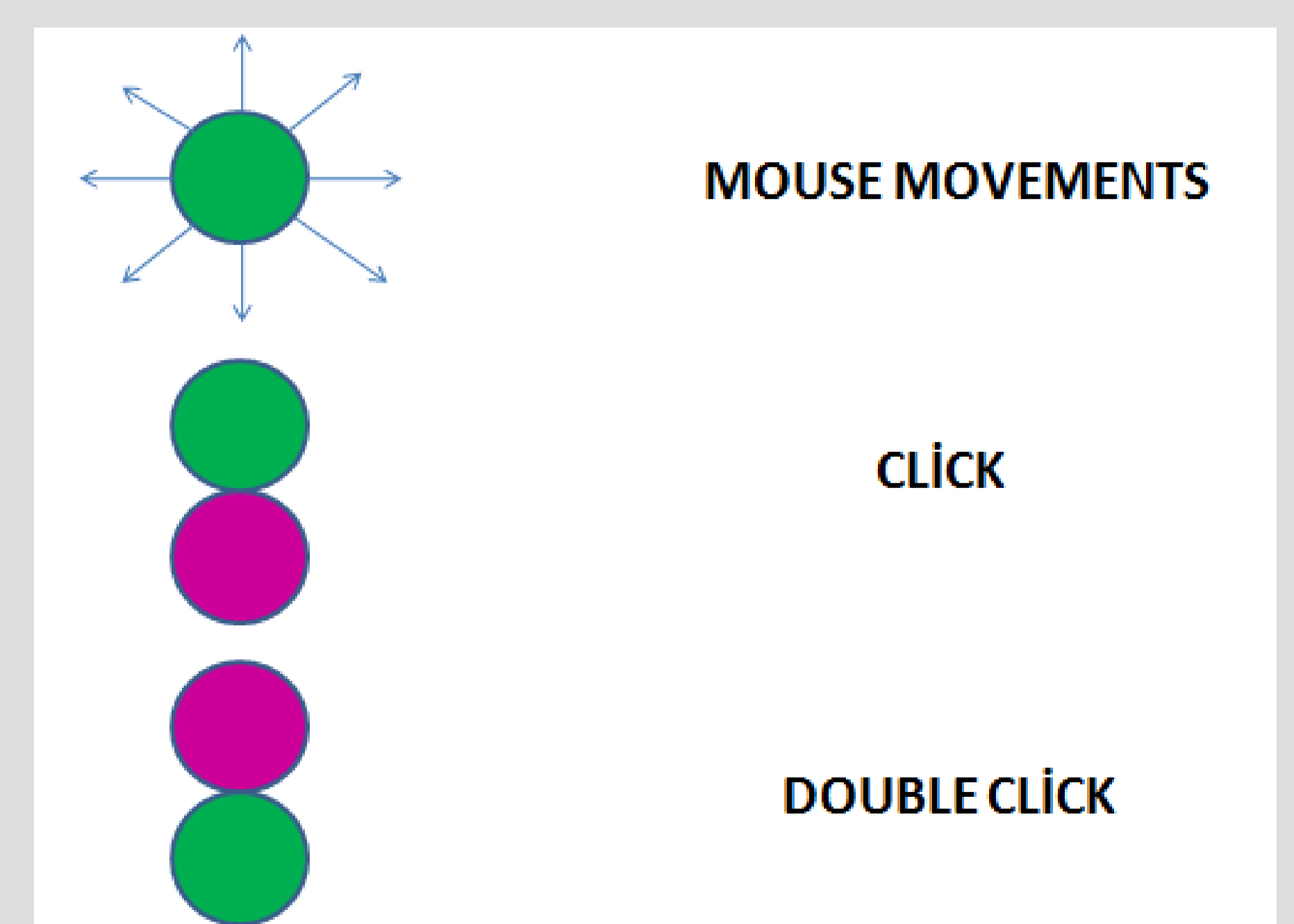
Test and Results

Ten different persons were questioned about the usability of the system, the ability to learn using it and also the comparison with the mouse system. In parallel, the system was tested in different light environments and also with different cameras. The majority of the users agreed that even if it is a navigation system which is easy to learn and use it, is still worse than the mouse system. The light environment was the most important factor for the efficiency of our system.. Despite the quality of the camera, the color based mouse navigation give very poor results when the light conditions are not satisfied.



Acknowledgement

I would like to express my appreciation to Assist. Prof. Dr. Dionysis Goularas whose encouragement and support allowed me to develop this project. In addition to that, I would like to thank him for the words once has told me: "After darkness, there will be always a light that will help you to find your way".



Contact

goularas@cse.yeditepe.edu.tr

canberk.aslan@std.yeditepe.edu.tr