DAGR

Wield the Cursor

Adrian Po Villanueva
California State University, Long Beach
Introduction

In 1962, Douglas Engelbart, a Director of Augmentation Research Center at Stanford Research Institute, set out to augment human intellect. Engelbart and William (Bill) English, a colleague, required a device to move a cursor to interact with information displays. Together, they considered items such as light pens and joysticks. Their research led to the mouse for its efficient design and configuration.

With its efficient and practical design, the mouse has not diverged from its original design throughout the years. Today, it is used in many environments such as the business, domestic, and educational environments.

Objective

Design a pointing input device that allows individuals to interact with an information interface
Microsoft Wheel Mouse Optical USB

0.75" Diameter Scroll Wheel Functions

Left/Right Click Functions

Right Click

Left Click

0.75" Diameter Scroll Wheel

1.5"

2.5"

1"

5"
Market: The Accountant

Unfulfilled Salaryman Stagnant

Makes $30,000 to $50,000 per year
Sits in front of a computer for 8 hours a day minimum
Works in a colorless and stressful environment
Negatively effected by their desktop computers through stress, disconnection, communication breakdown, and health
Ergonomically concerned
Task

Payroll
Balancing Budgets
Pay Invoices
Allocating Funds
Reimbursements
Inventory Control
Competition
## Competitive Matrix

<table>
<thead>
<tr>
<th>Name</th>
<th>Retail Price</th>
<th>Hardware Interface</th>
<th>Sensor Technology</th>
<th>Color</th>
<th>Lights</th>
<th>Battery</th>
<th>Number of Buttons</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>AmazonBasics 3-Button USB Wired Mouse</td>
<td>$6.99</td>
<td>USB</td>
<td>Optical</td>
<td>Black</td>
<td>None</td>
<td>None</td>
<td>3</td>
<td>ABS</td>
</tr>
<tr>
<td>Ettekcity Scroll Endurance Vertical Gaming Mouse</td>
<td>$25.00</td>
<td>USB</td>
<td>Optical</td>
<td>Black/Silver</td>
<td>None</td>
<td>None</td>
<td>6</td>
<td>ABS</td>
</tr>
<tr>
<td>DBPOWER® USB2.0 Wireless Finger Handheld Mouse</td>
<td>$29.99</td>
<td>Wireless</td>
<td>Optical</td>
<td>Black</td>
<td>None</td>
<td>AAA x1</td>
<td>5</td>
<td>ABS</td>
</tr>
<tr>
<td>YCCTEAM 4000 Professional Gaming Mouse</td>
<td>$49.99</td>
<td>USB</td>
<td>Laser</td>
<td>Black/Aluminium</td>
<td>Multi-Color (7 Colors)</td>
<td>None</td>
<td>10</td>
<td>ABS</td>
</tr>
<tr>
<td>Logitech M570 Wireless Trackball</td>
<td>$59.99</td>
<td>Wireless</td>
<td>Trackball</td>
<td>Black</td>
<td>Green</td>
<td>AA x 1</td>
<td>S</td>
<td>ABS</td>
</tr>
<tr>
<td>Apple Magic Mouse</td>
<td>$69.99</td>
<td>Wireless</td>
<td>Laser</td>
<td>White/Clear</td>
<td>None</td>
<td>AA x 2</td>
<td>1</td>
<td>Polycarbonate Aluminium</td>
</tr>
</tbody>
</table>
Ergonomics

Despite the various forms of pointing input devices, the primary affected areas of using such devices are the wrists and forearms. These areas affect secondary areas such as the shoulder and back. Naturally, the human body's most comfortable wrist position is aligned to the forearm. In addition, a forearm in an arm neutral position is the ideal arm position.
Constraints

Seating Position of the User Affects Ergonomics

The largest factor that affects the experience of a pointing device is the user’s seating position. An ideal seating position will minimize any discomfort experienced by the user.

Desk Organization

Without proper desk organization, the possible areas for a pointing device becomes scarce.

Heavy Use of Numeric Keypads

A large part of accounting is heavy use of numeric keypads to complete numbers-based tasks.
# Configuration

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Conventional</th>
<th>Trackball</th>
<th>Vertical Conventional</th>
<th>Trackpad</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Convenience</strong></td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>Discomforts</strong></td>
<td>Wrist and forearm discomforts which potentially leads to shoulder and back discomforts. Discomforts are produced by incorrect wrist movements. Despite using this configuration ergonomically correct, the forearm’s twisting nature produces discomforts during use.</td>
<td>With no objective movement, the input of this configuration relies heavily on the fingers which focuses all discomforts in the wrist. With the focus of small movements using fingers, the wrist is strained for its constant use.</td>
<td>A vertical configuration limits the potential discomfort that may be produced by the forearm. As a result, any discomfort caused is incorrectly using the wrist to move the mouse which will lead to shoulder and back discomforts.</td>
<td>Although this is the most convenient configuration, the trackpad focuses too much discomfort on the wrist like a trackball. Trackpads are small which means a smaller surface area for movement. This is due to the constant movement of the fingers rather than the whole arm to move a cursor.</td>
</tr>
</tbody>
</table>
Shorthand
With the use of subtle gestures, shorthand may be a way to increase the efficiency of accountants by programming mice.

Pen and Tablet
In the creative world, a pen and tablet is the most efficient way to create art to substitute a touchpad or a mouse as a cursor.

Optical Head-Mounted
Eyes are used by people to focus on a particular area in their work. As technology advances, an eye focusing on an area or object will be easily read by a in the near future.
Arthritis

Causes
- Injury in the Joints
- Abnormal Metabolism
- Infections
- Overly Active Immune System

Statistically, right-handed individuals are more likely to develop arthritis due to the excessive use of the right hand throughout their lives.

Symptoms
- Pain
- Swelling
- Changes in Surrounding Joints
- Warmth
- Crepitation
- Looseness
- Cysts
Pointing Stick

Echoed Movements
Pressure Sensitive
Isometric Joystick
Adjustable Settings
## Painpoints

<table>
<thead>
<tr>
<th>Painpoints</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetically Unpleasing</td>
<td>Most Pointing Input Devices are Aesthetically Pleasing and Looks Dull in Many Environment.</td>
</tr>
<tr>
<td>Cheap to the Touch</td>
<td>Many Pointing Input Devices also Feel Dull in the Limited Materials used.</td>
</tr>
<tr>
<td>Hard to Hold</td>
<td>Holding a Common Mouse Requires the Hand to Fully Open to use.</td>
</tr>
<tr>
<td>Touchpoints</td>
<td>Key Attractors</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Aesthetically Pleasing</td>
<td>Beautiful Form Language That Highlights the User’s Hand</td>
</tr>
<tr>
<td>Soothing Touch</td>
<td>Variation in Material, Finish, and Textures.</td>
</tr>
<tr>
<td>Easy to Hold</td>
<td>Ergonomic, Comfortable, and Arthritis Friendly</td>
</tr>
<tr>
<td>Functioning Indicator</td>
<td>LED to Indicate Device’s Status</td>
</tr>
<tr>
<td>Easy to Input</td>
<td>Focuses Limited Movements of the Hands. Also Incorporates Pressure Sensitive</td>
</tr>
</tbody>
</table>
Ideation
Refinement

Features

Through the process of ideation and refinement, the following features must be included in the final product:
- Conform to as Many Possible Arthritic Hand Forms
- Easily Placed and Removed from the Hand
- Easy typing with Device in the Hand
- Extremely Ergonomic
- Mirroring Form for the Left Hand
- Must include Basic Left Click
- Pressure Sensitive Surface for Pointing Input
- Variety of Color, Material, and Textures

The listed features will be proved in a prototyped form. Right hand form shown.
Many peers find the form to be extremely comfortable to hold. Since none who tested the prototype did not have arthritis, many preferred using their own fingers for keyboards. In addition, some tested the right-handed prototype on their left hands and found it comfortable. The form is also easily removed and placed into a relaxed hand position.

Nurse Comments

As part of their daily lives, nurses are aware of arthritic conditions to the body. Almost destroying the prototype, the nurse consultant tested the form by tightly squeezing while mocking arthritic hands. Arthritic hands come in many forms, but the key characteristics is the tightening of the overall hand and can constant joint pains. The form was approved by the nurse.

Designer Comments

With the approval of randomly chosen individuals and a nurse consultant, the form is surprisingly comfortable. In addition, a mirrored form, to be used as a set, will allow individuals to use a keyboard easily. Overall, this concept will open new doors to the pointing input device industry.
Designed with arthritic conditions in mind, individuals suffering from rheumatoid arthritis can now navigate in all information interfaces again! It is time to take matters into their hands again!

- Arthritis Friendly
- Available Dual Wield
- Easily Held in the Palm
- Pressure Sensing Input
- Silicon Keyboard Thumb

Adrian Po Villanueva
California State University, Long Beach
75% of people with rheumatoid arthritis are of working age

75% with arthritis are women

20% with arthritis are forced to change careers

33% with arthritis are forced to stop working within two years

Users with arthritis can easily place the device within their grasp without opening and closing their hand

Pressure sensitive thumb pad to navigate information systems

The silicon keyboard thumb can be used for keyboards, touchscreens, and trackpads

Contours of the grip allows the device to rest comfortably in the palm of the hand

With dual wield, users can navigate through an interface and type simultaneously

Adrian Po Villanueva
California State University, Long Beach
**Ergonomics**

**Ergonomic Computer Mouse**  
**Ergonomic Equation Part One: Neutral Position**  
**Ergonomic Mouse**  
http://ergonomic-mouse.org/dxt-ergonomic-precision-mouse/  
Hand Pain (Arthritis, Tendonitis, Injuries)  
http://wakesportsmedicine.com/conditions/hand-pain-arthritis-tendonitis-injuries/  
Spire Announces the Archer I Ergonomic Mouse  
Top 10 Tips of RSI Prevention & Recovery  
http://www.eyeprotectorapro.com/2012/01/31/top-10-tips-of-rsi-prevention-recovery/  
Use Apple’s Magic Trackpad with your Windows PC  
**Hand Pain (Arthritis, Tendonitis, Injuries)**  
http://wakesportsmedicine.com/conditions/hand-pain-arthritis-tendonitis-injuries/  
Spire Announces the Archer I Ergonomic Mouse  
Top 10 Tips of RSI Prevention & Recovery  
http://www.eyeprotectorapro.com/2012/01/31/top-10-tips-of-rsi-prevention-recovery/  
Use Apple’s Magic Trackpad with your Windows PC  
**Arthritis**

**Arthritis of Hand**  
http://www.midwestorthopediccenter.com/arthritis-of-hand  
DEALING WITH ARTHRITIS FELDENKRAIS: PAIN MANAGEMENT  
Exercise for Rheumatoid Arthritis  
http://www.thermomedic.com/exercise-for-rheumatoid-arthritis.html  
Judge Rules Cops Can Now Break Fingers To Compel People To Open Cell Phones  
Psoriatic Arthritis  
http://www.papaa.org/gallery/psoriatic-arthritis  
Rheumatoid Arthritis  
https://sushruta.com/rheumatoid-arthritis-introduction/  
What is Ganglion Cyst?  
http://www.bestonlinemd.com/what-is-ganglion-cyst/  
**Efficiency**

Google Glasses: Just a Project or a New Way to See the World  
http://pickthetrick.com/computer/google-glasses-project-new-way-to-see-world  
Mi’kmaq Shorthand  
http://www.flavinscorner.com/shorthand.htm  
Top Ten Places that Banned Google Glasses  
http://www.searchenginejournal.com/top-10-places-that-have-banned-google-glass/66585/  
Wacom Intuos Pen and Touch Review: Perfect for Beginners and Photo Touch Ups  
http://www.graphicstabletguru.com/wacom-intuos-pen-touch-small-review/  
**Constraints**

Concert In a Cubicle  
http://www.wik.com/concert-in-a-cubicle/  
Flickr: the Cubicle Life  
https://www.flickr.com/photos/magillicuddy/25074192  
Gallery for Scattered Papers in Office  
http://thegadgetflow.com/portfolio/satechi-bluetooth-numeric-keypad/  
**Configuration**

Delux M618 Wired Vertical Mouse  
How to Replace Batteries on an Apple Magic Mouse  
http://www.wikihow.com/Replace-Batteries-on-an-Apple-Magic-Mouse  
Portable Finger Hand Held 4D USB Mini Trackball Mice Mini USB Mouse  
The Asus Zenbook: a Steely Marvel with an Appalling Trackpad  
Image References (Continued)

Pointing Stick

Thinkpad
Lenovo ThinkPad S1 Yoga 12.5-Inch IPS Convertible 2-in-1 Touchscreen Ultrabook - i7-4500U, 8GB RAM, 256GB SSD, 1080P Full HD Touchscreen, AC WiFi, Backlit Keyboard, Windows 8.1 Professional (Business Black)
http://www.amazon.ca/Lenovo-ThinkPad-Yoga-Convertible-Touchscreen/dp/B00VPNE75M
Pointing Stick
https://en.wikipedia.org/wiki/Pointing_stick
Review: ThinkPad Lenovo Edge E531 Laptop
http://ourhouzz.blogspot.com/2013/09/review-thinkpad-lenovo-edge-e531-laptop.html
What’s that Red Button in Lenovo Laptops?
http://realnerdherd.com/tag/button/