

# Reading with a Digital Roll

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We introduce the Digital Roll, a cylindrical e-reader with a curved display wrapped around it. The device is designed for recreational reading on the go. We investigate a display metaphor illustrated by the mock-up above, where text is glued on the tube and scrolling is performed by manual rotation of the whole device.

## Benefits:

- Obvious affordance for text scrolling
- Smaller volume than flat e-readers
- Can be built with current technology

## Drawbacks:

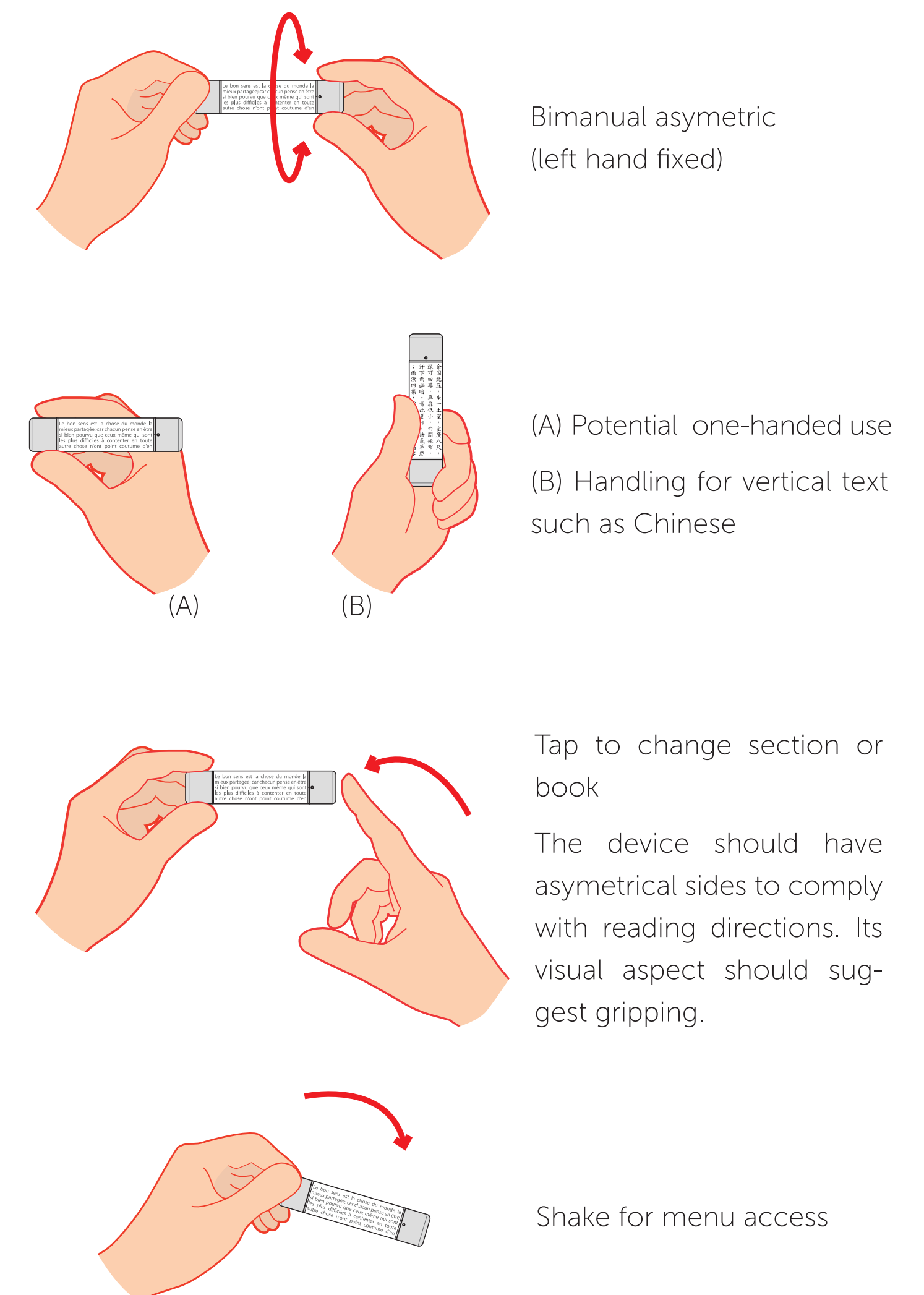
- Visual distortion (prevents images)
- Reduced context
- Limited navigation and book skimming

## Design

For reading comfort, the roll length matches the width of a pocket book page: 8–10cm.

A diameter in the range 2–3cm makes the roll reasonably small, while providing a good grip and acceptable context, and requiring a low rotation speed: less than 4 RPM for a high reading speed of 500 words/min.

Continuous text scrolling can be performed one-handed or bimanually. The roll's shape also provides a rich design space for gestures, based on the way it is touched, held or shaken. Such gestures can be used for navigation or less frequent operations, as illustrated on the right.



## Simulation

- A simulator allows us to separate the design of the display from that of the input method.
- Input sensor: Intersense IMU encased in PVC tube, 180Hz sampling frequency, total weight is 90g.
- Output: 3D scene using off-screen rendering of HTML file as 250dpi texture.

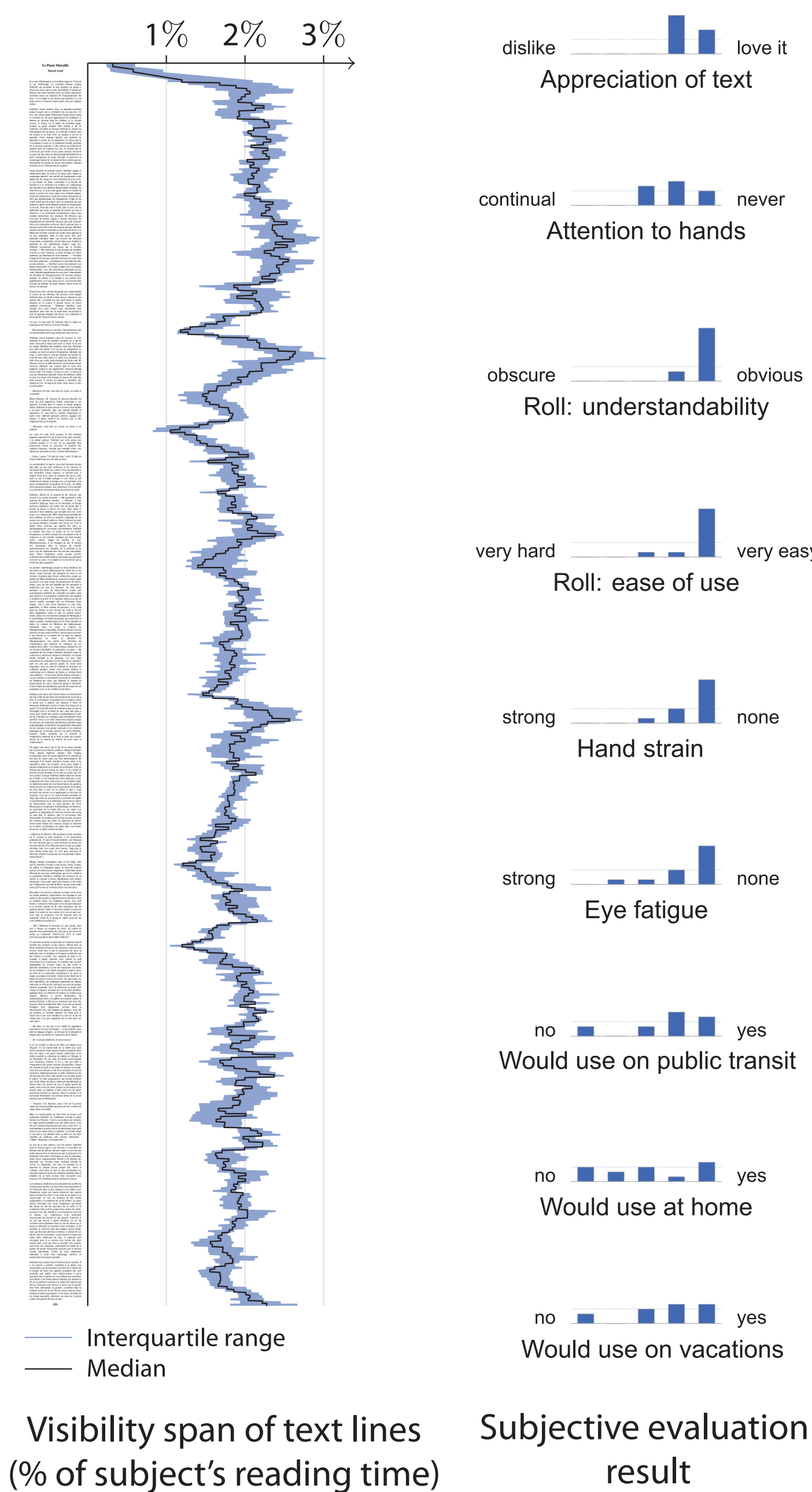


## Preliminary experiment

- 13 subjects were asked to read a complete short novel (3580 words) using the simulator. They filled out a survey afterward.
- Mean age: 43.4 years ( $\sigma = 11.4$ ).
- 11 subjects are daily book readers.
- Hands were video-recorded and sensor data were logged.

### Key findings:

- Reading duration matches that of on paper.
- No perceived fatigue, immediate understanding of the technique.
- Relative variations of reading speed were similar for all subjects and matched text pace, suggesting there was no learning effect.
- Hands had different roles: one turned the roll, one held it.
- Holes in the tube were useful.



## Future work

- How far can we go with the simulator only? What about longer reading sessions?
- Short term: young subjects, other documents (tweets, news), build a specific input sensor with touch capabilities.
- Investigate automatic/assisted text scrolling, HCI design for general management (e-books selection, etc.)
- Longer term: prototype with curved screen, compare it with flat e-readers, make a field study using the prototype.

The simulator can be downloaded at  
<http://cedric.cnam.fr/ilj/d-roll/>  
 It requires a Wiimote  
 and a Mac computer

