

FingerReader A WEARABLE INTERFACE FOR READING ON-THE-GO

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What is Finger Reader?

Finger Reader is a device that assists visually impaired users with reading texts or words. It's basically a ring the user wears on their index finger that houses a tiny camera and some haptic actuators for feedback. When a visually impaired person wants to read some text around them, maybe a business card, a menu in a restaurant, a sign, they point their finger at the surface with the text and the device reads the words out loud. They can go faster, slower, go back, etc, and get feedback if they are veering off a line of text nudging their finger back in the right direction.

Finger Reader is just a prototype at this point what's the next step?

Indeed, Finger Reader is a proof of concept prototype. A lot more work needs to happen to make this into an easy to use, reliable product that could be commercialized and useful for the public.

Briefly, what is the process by which this work could become a product (how does it get licensed and commercialized)?

The students at the MIT Media Lab are very entrepreneurial, about 1 in 3 or 4 of our graduates start a company based on their graduate research. We also work with some of our industry sponsors in commercializing our inventions, as well as offer internal funding programs annually.

Do you have an estimate on when the Finger Reader will be available for purchase?

Usually the process of turning a research project to a product takes between 1 and 2 years; this estimate is gathered from other projects in our lab that went into productization. However, as the project is still under development, we cannot say when we will start productization, so there is not a clear timeline right now.

How did the idea come about?

Our research lab at the MIT Media Lab is focused on developing more natural user interfaces. By that we mean devices that are more of a natural extension of people and their behaviors. We

thought wearing a camera on your index finger would make for a natural interface, because people naturally point at things to ask questions about what's around them.

People with a vision impairment (who constitute 2.8% of the population) also naturally rely on tactile feeling through their fingers to read Braille and gather information about the environment. We speculated that giving them a finger-wearable device that is quick to use and gives them real time feedback would make their lives easier.

This work is a continuation of our work on the EyeRing (<http://fluid.media.mit.edu/projects/eyering>), which is also a finger-wearable assistive device not only for the blind but also for children and others.

This may help visually impaired people but what about other communities with specific needs?

While most of our work so far has gone into helping visually impaired, the same approach of a ring on the finger could be used to help people without a visual impairment. Such as people with dyslexia, second language learners, tourists in need of translation, young children learning their first language or even people recovering from brain trauma. We are very interested in exploring these other applications of the device.

Is it correct that the system can translate from one language to another as it's reading? (Like simultaneous translation?)

We have not actually implemented this application yet, but we do not see a reason why that could not be done. There are similar apps available for Smart Phones today, what the finger reader would add is that the whole process would be more quick and seamless, effectively just pointing your finger at some text and saying "translate".

What is the future of wearable tech?

It is clear that today's personal devices such as tablets and phones are very disruptive in their use. There is a lot of research these days both in academia and in industry on more natural user interfaces that give us more seamless access to digital information and services while we are going about doing other things. We suspect in the coming years we will see a lot more wearable devices such as glasses, bracelets and watches enabling us to glance at some relevant information without running into a telephone pole or getting into an accident.

Are there plans for the ring to be attached to a smartphone or mobile device instead of a computer?

This would obviously be one of the next steps in turning this into a commercial product. One feature of this ring is exactly that it can be used more easily in a mobile context without causing much disruption.

What upgrades/improvements do you want to do to the Finger Reader?

Make it faster, more reliable, smaller and explore applications for people without visual impairments.

Is there an estimate of the market size for this type of device?

Almost 3% of the population is visually impaired, so that is the market size for the FingerReader. But down the road we think it has potential to assist not only visually impaired persons but also the elderly, children, language learners and tourists.

Is this the end of Braille?

We do not think so, since there is much more to do and perfect before it can be reliable compared to Braille. Perhaps in the future, when many of problems are resolved and VI people can rely on this technology to be robust, some may no longer need to learn Braille as they could access regular printed text. Not all VI people know Braille to begin with, only 9%, and actually many VI people manage regular printed books and large-prints.

Braille still makes sense, especially for Books and also in situations where the user does not want to hear the words spoken out loud (personal correspondence, health matters). But many books and other texts are *not* currently available in Braille: Only a fraction of books exists in Braille format. In addition, things like letters, menus, reports, magazines, etc do not and most likely will not exist in Braille. One of the main values of the device is that it makes a lot more content accessible to the blind in an immediate and real time way.

Any VC interest?

We have been overwhelmed by the positive response to our prototype and frankly have not had a chance to think deeply about how to best commercialize this and who to approach.

What are the alternatives to FingerReader? How does it differ from them?

Since the FingerReader is still an academic project, rather than a product, we are not in competition with any of the alternative commercial products. Therefore hereby we provide a list of alternative applications and devices as a service to the community.

The following are commercially available applications and devices targeted at capturing and analyzing printed text in a mobile setting:

Text Detective: <http://blindsight.com/textdetective/>

Text Grabber: <https://play.google.com/store/apps/details?id=com.abbyy.mobile.textgrabber.full>

StandScan: <http://standscan.com/index.php/product/standscan-pro.html>

SayText: <https://itunes.apple.com/us/app/saytext/id376337999?mt=8#>

ZoomReader:

<https://itunes.apple.com/us/app/zoomreader/id414117816?mt=8&ign-mpt=uo%3D8>

KNFB Reader: <http://www.knfbreader.com/>

AbiSee ROL: <http://www.abisee.com/products/eye-pal-rol-general.html>

The following are general purpose applications and devices for aiding people with low vision:

LookTel: <http://www.looktel.com/>

EyeNote (from the US Bureau of Engraving and Printing): <http://www.eyenote.gov/>

OrCam Glasses: <http://www.orcam.com/>

The vOICe - Seeing with sound: <http://www.seeingwithsound.com/>

The major differences separating our technology from other text-reading solutions are:

- The FingerReader gives real-time feedback on the progression of the scan, e.g. staying in the line, angling the device, etc., where solutions that focus on capturing a whole page or block of text mostly do not.
 - Our device maintains the connection of the finger to the medium, by instrumenting a well-practiced gesture of using the index finger to trace written text, and the tactile feeling of the paper at the tip of the finger.
 - Our algorithm specializes in reading multiple words, essentially a whole line of text, and not a single word like a Reading Pen.
 - Existing solutions can take a long time to get a good read (in new environment/circumstances, i.e. not at home, could take even like 3 minutes to start reading,) while the FingerReader is almost immediate.
 - FingerReader works in tandem with existing personal technologies, e.g. smartphone, tablet or PC, which are already utilized by people with impairments of all kinds, thus it doesn't require purchasing additional hardware.
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Facts & Numbers:

World Health Organization (WHO):

- 285 million people are estimated to be visually impaired worldwide: 39 million are blind and 246 have low vision.
- About 90% of the world's visually impaired live in developing countries.
- 82% of people living with blindness are aged 50 and above.
- Globally, uncorrected refractive errors are the main cause of visual impairment; cataracts remain the leading cause of blindness in middle- and low-income countries.
- The number of people visually impaired from infectious diseases has greatly reduced in the last 20 years.
- In America: 2.8% of population have a visual impairment.
- Globally the principal causes of visual impairment are uncorrected refractive errors and cataracts, 43% and 33% respectively.

The Royal National Institute of Blind People (RNIB):

- out of the thousand most best-selling **e-books** in the U.K., 84% were available in blind-accessible formats, however only 0.23% of the most best-selling **books** (print) are accessible.
- Nearly three-quarters (74%, 72%) of blind and partially sighted people cannot read the information provided by their hospital or their GP (Dr Foster Intelligence, 2009).
- Over half (52%) of the general public would be uncomfortable with a neighbour reading out the results of a medical test (TNS-RI Omnibus, 2010).

National Institutes of Health (NIH) - National Eye Institute (NEI):

- According to the 2010 Census, in the U.S. there are 1,288,275 people over the age of 40 living with blindness, and 2,907,691 have low vision.