FOCUS PEN: FUTURE OF DIGITAL NOTE TAKING

ABSTRACT

The research discusses the problem of keeping focus when consuming written/print/digital media. This is a pervasive problem in today's day and age with the constant incursion of mobile devices.

It is proposed that a connected system of embedded electronics in everyday desk items can be leveraged to augment the experience of consuming and writing text in a natural manner.

The attached video demonstration is a mock prototype of a possible solution using the 'pen' as the primary artefact for an application that enables digital handwriting, content scanning and user monitoring. A companion dock is additionally used as an alternative screen for displaying information that is contextually important while engaged in research.

The project was done in July 2017, of a duration of 3 weeks, at the National Institute of Design - Bengaluru, India.

INTRODUCTION

Studying (more specifically, researching) as an activity requires intense concentration and presence. However, we live in a world of constant distractions caused by our mobile devices. It is to be noted that the observed process of note-taking while doing research has remained largely unchanged despite huge technological progress. Although digital note-taking is possible with new stylus technologies, it is hardly ever used by serious researchers.

The advent of note-taking apps like Evernote enable everywhere access to digital notes but reside on the very devices that cause distractions. Hence, there is an immediate need to decouple these devices from the act of personal note-taking while retaining the benefits of cloud-enabled media retention and digital copies that enable cross-device access.

METHODOLOGY

The first stage was the literature study, wherein, a brief understanding of the various ways in which people read, write, study, reference and work while referencing notes, physical or digital was studied. A number of existing platforms were studied at this point of time. Additionally, mental disorders such as ADHD(Attention-deficit Hyperactivity Disorder) and CDD(Concentration-deficit Disorder) were also analysed to have a basis on the type of cognitive conditions possibly affecting people in their work mode.

The second stage of the research involved unstructured interviews to understand behaviours while studying/ researching. The insights from these informal interviews led to the setup that formed the basis of the third stage of research.

In the third stage, a sample of 7 participants was chosen at random from the Post-Graduation design school, aged between 21-30 years. All of these participants were assigned the same task of going through a dense research paper and explaining their understanding of it. For this purpose, they were allowed access to an array of writing instruments, paper, a laptop and the mobile devices they carried on their person. This experiment and a subsequent informal discussion as to the choice of instruments, paper, websites for referencing etc. was videotaped.

Figure 1: Tools given to test sample. Not shown: Laptop with internet access

FINDINGS

Participants tended to gravitate towards using pencils and ball-point pens (or similar) in conjunction with coloured markers/highlighters to mark the paper that they were asked to peruse. Furthermore, the writing tool also served as a visual anchor to scan through the document. Interestingly, the tool was also being

fidgeted with constantly by most of the test participants.

It was noticed that there was a correlation between intense concentration and fidgeting behaviour. This is in line with research that suggests that fidgeting is a form of calming the mind while engaged in a more strenuous mental activity (Isbester, 2017). Accordingly, it was decided to use this finding to guide the form-factor of the eventual product.

Apart from the writing tools, it was noted that many participants chose to use their phones or laptops during the reading for looking up key concepts or word meanings.

PRODUCT OVERVIEW

It was decided to use the pen as a starting point for embedding technology for enhancing the experience of note-taking. The Pen works in conjunction with an optional companion device – The Dock. The use of both simultaneously works in an ecosystem wherein all written/printed/digital notes, imagery, online reference links and content-categories can all be collated and organised and later, accessed through the digital interfaces provided via mobile and desktop applications.

THE PEN

It was established that the pen needs to be able to track its movement to enable digital copies to be made. However, it needs to be functional as a standalone note-taking tool. This requires a new kind of hybrid stylus like device that integrates a traditional writing tool with motion-tracking sensors installed in the body of the pen itself. Secondary research shows that the development of such devices is imminent and feasible in the near future (A. Geetha Vinothini, 2014) (Thomas Deselaers, 2015).

In addition to motion tracking capabilities for digital handwriting, it was deemed necessary to include a scanner module to aid cross-referencing related media by scanning text or images.

To begin with, the Pen works as a regular pen, until activated. The embedded electronics lie dormant until engaged with a ‘push-and-twist’ locking motion to avoid accidental activation. Hereon, in the active state (FOCUS mode) the pen tracks all its movements and records them to onboard storage. Gestures such as ‘circle-and-scan’ allow direct interactions with the dock screen over a bluetooth connection, to aid functions such as word lookup, thus negating the need to use other devices. In addition, scans are automatically cross-referenced with the writing session. This enables any reading material or imagery outside the writing session to be permanently linked with the recorded handwriting.

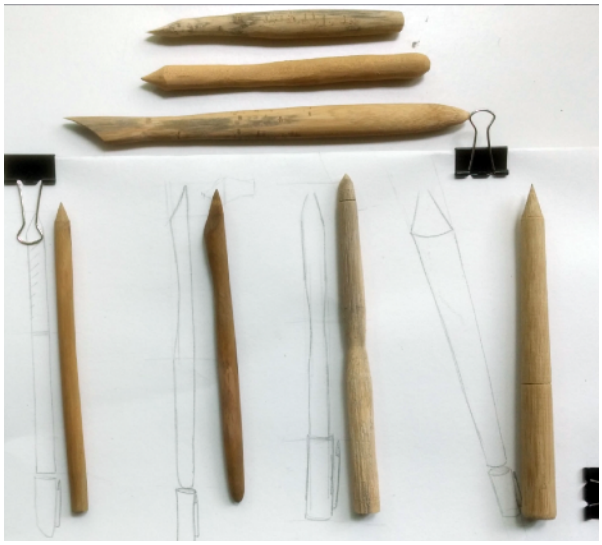

Figure 2: Form explorations (Wood carving on lathe)

The form of the pen was arrived at after careful handcrafting of various form factors that could possibly hold the different electronics while still retaining the familiarity of being a pen.

Figure 3: User-testing for the forms explored

THE DOCK

The dock serves as the home for the pen. It works as a charging station for the pen and the primary link to the application environment running in the background, connecting and syncing all notes and updates to the cloud.

Multiple form factors were considered such as a portable pocket-case with an e-ink display and an on-desk receptacle that doubles as a pen-stand. For the video demonstration, only the pen-stand option is explored.

The dock is proposed to have a colour display, not much bigger than a phone albeit with no touchscreen capabilities. This display serves as a notification centre and provides feedback for interactions such as scanning or word-lookup.

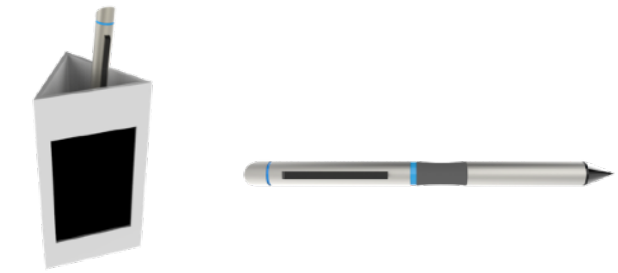

Figure 4: Digital Renderings of final product

THE APP ENVIRONMENT

The mobile and desktop application is proposed to have a notebook-like interface that maintains a digital copy of all notes taken in FOCUS mode. It also maintains hyperlinks to any cross-referenced media whose digital copies that can be found on the internet. Scans, if any, are highlighted in the digital copies and appropriately linked in place at their appropriate positions. They are organised into categories based on tags created for each.

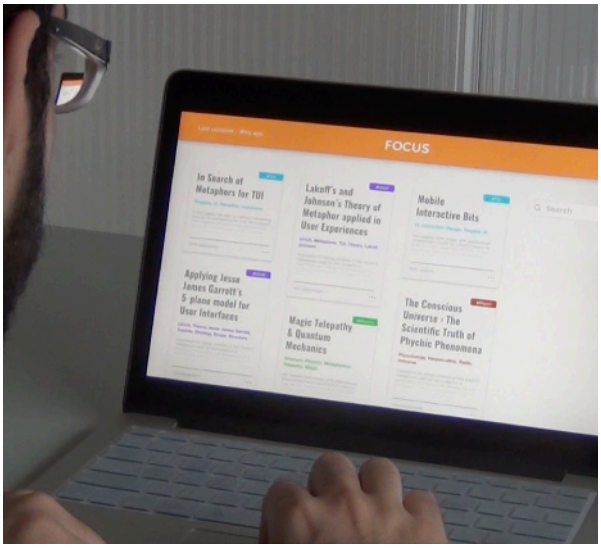

Figure 5: Using the desktop app to review all notes

Over time, it is proposed that an AI based system could help locate relevant media by automatically scouring the internet with keywords from the written material.

A further exploration considered, but not pursued, is using Machine-Learning to study the user's FOCUS mode through fidgeting feedback from the Pen, distractions encountered, work efficiency in a number of environments and how background music can affect the state of cognition.

REFERENCES

Isbester, K., 2017. *Fidget Toys Aren't Just Hype.* [Online]
Available at: https://www.scientificamerican.com/article/fidget-toys-arent-just-hype/

Geetha Vinothini, V. V. P., 2014. MEMS Accelerometer based Digital Pen. *International Journal of Innovative Research in Computer and Communication Engineering,* 2(Special Issue 1), pp. 219-224.

Thomas Deselaers, D. K. J. H. H. A. R., 2015. GyroPen: Gyroscopes for Pen-Input With Mobile Phones. *IEEE Transactions on Human-Machine Systems,* 45(2), pp. 263-271.