

The SmartPen

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Abstract

In our work, we describe a new writing device created by Livescribe: the Smartpen. This is an intelligent pen that is very much used now, especially in the academic community. It distinguishes itself from the ordinary pens due to its innovative and computational functionalities, because this type of pen allows the user to record his notes, audio files and also gives him moments of leisure with the many different applications. In this work, we also suggest some improvements that we consider important, according to our experiments, as well as some different features.

Objectives

The objectives of this work are mainly focused on making a thorough study about the Smartpen, specifically about its operations, features and applications. It will also be done a demonstration of the functionality of the pen, from where we will take some conclusions. Finally, we will make some improvement suggestions based on the demonstration made, as well presenting new useful features.

Methods

What is the Smartpen?

The Livescribe Smartpen is an advanced paper-based computer in the form of a pen that records everything that we hear and write. It synchronizes the audio that we are hearing to what we are writing, so we never miss a word. To do so it is only necessary to tap on our notes and the Smartpen will play back what we recorded from that exact moment in time.

The Smartpen provides both audio and visual feedback, powerful processing capabilities, and substantial built-in storage. The Smartpen integrates several components and technologies. It also uses firmware and application software to support the interaction of all of its components and to enable built-in handwriting recognition, and applications such as Paper Replay, among many others.

When we switch on the Livescribe Smartpen and begin writing on Livescribe dot paper, the Smartpen captures and stores the notes that we write. To capture our writing, the Smartpen uses its built-in infrared camera to take digital snapshots of a special dot pattern on the paper as the tip moves over the paper while we write.

Features of the Smartpen

The Smartpen is able to write, to record, to replay audio files and also to transmit information to other devices.

Beside these basic features, the Smartpen has other applications such as a translator demo, a dictionary, games, and it is also possible to personalize it in the way that the user wants.

These features are described as follows :

- Paper Replay - When we begin recording with the Smartpen, it automatically links the audio to anything we write on the dot paper. The recorded audio (and any associated written notes) is called a Paper Replay session. A session begins when we start recording audio and ends when we stop recording audio. A paused recording is still one session. A session always contains audio and optionally can contain associated written notes. The Paper Replay playback controls such as jump, position bar, and bookmark, function within a single session. It is possible to jump forward or back or speed listen to only one Paper Replay session at a time.

- Translator Demo - With this feature, we can translate a small set of words and the numbers zero to nine from English into Spanish, Swedish, Arabic, or Mandarin. By writing a word in English in the notebook, it is possible to see and hear correct translation from the Smartpen.

- Piano - With the Piano application, we can draw a piano keyboard on our dotted paper and play music with the Smartpen. Also, we can change the sound of our piano, add rhythm tracks, and add sharp and flat notes. Writing the letters / and r allows the user to change the instrument and the rhythm, respectively, by simply tapping on them.

Augmented Reality and the Smartpen

The Augmented Reality is an environment that evolves either the virtual reality as the elements of the real world, creating a mixed environment in real time. The most remarkable distinction made between the AR and UC is that the second does not focus on the disappearing of the conscientious and intentional interaction, as much as the AR focuses. The UC systems, like the diffused computational devices, keep the concept of the interaction very explicit and intentional, which is involved in a typical work of AR, as Ronald Azuma's.

The Smartpen is a real object which we can interact computationally, becoming an Augmented Reality tool. This smart pen, besides writing like a regular pen, presents some technological features that allow the user to play a piano with it and with a draw on his dot paper notebook.

New Features

An infrared pen is actually a very useful tool that allows a computerized interaction in an interactive whiteboard.

The utilization of the Smartpen on interactive whiteboards would be a good feature to be implemented on it, because these two objects, when together, could form a much more powerful device on educational environments. Therefore, the tip of the Smartpen should be adapted with an infrared LED to be used as an infrared pen in an interactive whiteboard.

As the new versions of the Smartpen already have a Bluetooth connection, it is not necessary a receiving device besides the computer. Therefore, the Smartpen itself would be capable of sending the data to the computer via Bluetooth, which in turn would be projected on the whiteboard.



The Smartpen



Features of the Smartpen



The Smartpen and the interactive whiteboard

Results

After we had tested all the available applications in the Smartpen Pulse, we had registered some observations.

Starting with piano application, we found it very explanatory because the pen itself informs the user about what he has to do. We tested all the different rhythms as well as all the existing instruments. For that, we used the symbols r for the rhythm and i for the instrument, stating its good efficiency.

The second application that we tested was the Paper Replay. Initially we had some difficulties when we wanted to replay a recorded session. Since we had never used this type of pen before, in our first utilization we found the navigation between the menus a little confusing, and only after some interactions we could understand and use this application quit well.

The third application tested was the Translator Demo. In this application we did not find any difficulties on accessing it. However, we had noticed that the number of words that it is possible to write and therefore being translated is very limited, as well as the number of languages. We also observed that it is not possible to neither record the text nor write big texts. During our research on the newest models of the Smartpen, namely the Echo version, it has much more possibilities in this type of application.

At last, we also tested the Livescribe Desktop application. In our experiments, we observed that this application is only useful to the smartpen's owner or for who has their personal data, because it is not possible to perform any interaction with the computer; the application always requests for login authentication.

In general, when we use this smartpen for the first time, the navigation menu can be a little confusing. However, after some exploration and more usage of the menus, the user's options becomes simpler and more understandable, leading him to make less mistakes and get less confused.

Conclusions

Once we had concluded the verification of the Smartpen features, we can affirm that this pen has been improved over the years and becoming an extremely useful device to all kind of people, but particularly in the field of the education. This pen can be used in everyone's day-to-day, or even to professional purposes, such as conferences or lectures.

After this study had been done, we believe that the Smartpen that was used in our tests was a little limited because some of its features were just for demonstration. However, with all our research we found that the new versions of the Smartpen already are more evolved because they contain much more complex and even more useful features, which in turn makes people want to buy it. Even though the cost is a little high, we think that it does not represent a limitation to acquire the Smartpen. This new pen will be a tool with a constant evolution because it will have more and more beneficial features to the user.

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