On Making Books More Dynamic

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Abstract

The emergence of dynamic learning systems is inevitable. In a future not so distant from today reading tools have incorporated interactive elements that would have rendered the process of learning very rewarding. These systems are radically different from current reading tools in that they provide users with functionalities that try to act as the extensions of human brain. This note is an attempt to describe some elements of a (fictional) proto-humanity-first reading tool.

Make what people need.
Alan Kay

Introduction

Computers are dynamic media deserving their own unique message. It has been 70 years since the first computer came to this world and we argue that the ways humans use computers are still very rudimentary. Today, computers act solely as simulation tools for previous media. We listen to music, watch movies, read books and so on, almost no interaction exists. What can be done with computers is limited to consuming and we treat computers as if they are modern version of TVs. In this note our concern is directed towards the reading tools and the impact they have on learning and education. Books are still the best tools to educate. Books are one-way information manipulation systems where the side that produces the material has the authority to decide what to put there. Books printed or electronic, are still in the same shape they used to be four centuries ago. Anything found in books is read only and there is no way of modifying the content on the fly. This is fine for printed books since the paper provides no means for live interaction but what about computers?
Imagine the writer of a science book based in the US decides to use the Imperial units for his upcoming book. The book is finished and shipped to the rest of the world, somebody from Iran buys the ebook and to her unfortunate fate, the units are not familiar. Surely the author can put a unit conversion reference at the end of the book, but it is not hard to predict the kinds of difficulties when someone deals with different systems of units. Another common situation where the reader has difficulty is when the material is not written in her native language. Some book reading systems provide embedded dictionaries and these tools are a bit helpful. The reader stumbles upon a word and has no idea what the meaning could be, she invokes dictionary and tries to compare different

meanings and finally picks one. She is probably not certain if the meaning is correct but has no choice but to continue. Today's dictionaries are not concerned with the level of knowledge of their users and just act as references. For a physical dictionary this is not a problem since there is no way to connect the dictionary with context of the words. But what about computers? Computers have processing capabilities that could easily aid readers in situations like this. Mainstream high quality translation engines exist today that can translate a whole paragraph in less than a second.
We believe that computers are capable of offering lots of powerful functionalities. In this note we will discuss a reading software system where the dynamical nature of the computers is employed. Our system is composed of a curated dictionary module, an unit conversion module, a tables to charts module and finally a descriptions to experiments module. Let's call our hypothetical apparatus "Sapibook".

1 Curated Dictionary

The prominent language of the science is English. Every important piece of written material is either English or there exists high quality English translations. If we examine current book reading systems, we would notice that some of these systems provide built-in dictionaries. The dictionary is usually invoked by highlighting a word and then manually picking the most fitting definition from the provided list. This is an erroneous process specially if the material being read is not written in reader's native language. The user has no way but to pick the most probable definition, apply it to the word and see if the meaning is logical. This uncertainty could not be eliminated unless there is a teacher that would help in finding the right meaning. It is rather easy to predict that such a difficult learning curve will render the whole experience of reading boring. We believe that there are capabilities in computers that could help make the reading sessions more rewarding. These capabilities are unique to computers and they stem from the very dynamic nature of computers. Imagine you are reading a romance book about ancient Persia and you stumble upon a word where you have no idea which definition is correct, what can you do? finding somebody with enough knowledge to help is not always feasible. To overcome difficulties like this, we propose an curated dictionary module that when asked for the right definition of a word, it scans the whole paragraph or even a few pages back and forth and finds the most accurate definition. The dictionary module takes advantage of the fact that when authors write a book they tend to use a limited set of words for describing various phenomena. When we have an adaptive dictionary like this, we could have a clear image of the components of the written material that is not found in old dictionaries. The interface of our module does not differ that much from current reading systems and it is the curated content that makes a lot of difference. A dictionary taking advantage of the context of the material is a little bit better than a passive dictionary acting solely as reference. If we treat any reading session as a playground for interaction with the computer then our module should provide means to customize and expand dictionaries too. Not only our dictionary module is context sensitive but it is also malleable just like other physical tools.

2 Unit Conversion

SI and Imperial unit systems are major measurement systems. Other primitive systems exist but they are not the focus of our discussion. Imagine you are authoring an essay in physics intended for college students. You are basing your measurements on the Imperial units but the audience of the essay use SI units. Being thoughtful, one way to relieve the pain is to include some unit conversion tables as a reference. But we can observe that this is often a source of errors in measurements. What if some units used by the audience are omitted? if there is no conversion pairs, the reader have to find a local reference and start a chain of conversions that would make the problem hard to approach. Measurements encountered in scientific material are usually delicate sets of numbers, even a tiny error in the first chain of conversions would lead to unrecoverable errors. So basically nothing could be done when dealing with static materials whether printed or electronic. We propose a module that is capable of understanding numbers and their units and switching between different unit systems. Such a tool would enable seamless knowledge transmission and provides the reader with a slightly amplified reading system. The user interface of such a system could be something like a tiny overlay window above the numbers or the replacement of the numbers altogether. What we are offering here is system that is built not only for reading but for experimenting with written material. The module should be able to work both automatically and manually. In manual mode, the user could select a numeral and ask for a different unit. In automatic mode, the module would scan the whole material or the current page, detect the units, and come up with a set of numbers in other units. Our module should have the ability to work with different textual formats and there should be no difference between a unit in a sentence with a unit in a table or with units used in a chart. Like the curated dictionary module, the unit conversion tool should provide means for its users to expand it and users have to be free in adding their own unit system. It is not surprising that a symbiotic relationship between unit conversion and curated dictionary modules could arise benefiting both subsystems.

3 Tables To Charts

Tables are among the most abundant data representation tools used to convey information. Each written material could contain several tables in different formats. Tables are usually used to display comparative or statistical data and often encode large volumes of information in a non intuitive way. Humans are not comfortable at interpreting numbers displayed as tables especially if the table contains large volumes of data. Imagine you are reading a report about the amount of rain in the past 50 years in your local neighborhood. If the author were thoughtful, she would have put the data into a chart making interpretation easier, but this is not always the case. Even if the chart is provided the reader might not be interested in the look and feel of the chart. Data might be presented as a bar chart but the reader is interested in a pie chart or even simply the colors used by the chart are not supported by user's display. If the chart is not provided by the author what we usually do is to take data into some statistical software and visualize it. This is both time consuming and there is no guarantee that everybody is fluent in tasks like this. We would like to have

a system that is able to understand tabular data and simple charts and has the ability to transform tables into charts and charts into more comprehensive charts. The system should provide different families of charts for data and let the users select the most appropriate chart and provide means to customize look and feel of the charts. Here again we are interested in a tool that is not only capable of consuming but also aids its users in producing high quality materials. The user interface of this module could be simple overlay frames displayed on top of the original content.

4 Descriptions To Experiments

Every chapter of a science book is a microworld. If an author decides to write about a pendulum, she should go on and on to describe the behavior of the pendulum in different conditions. Descriptions are usually accompanied by mathematical formulae and sometimes there could be figures depicting critical moments. We would like to argue that every moment of a moving pendulum is critical in its own sense and what people are really interested in might be a live pendulum. It does not really matter how much the author writes about a pendulum's behavior, there is no way to simulate things in a static media. Another interesting scenario could be in biological sciences. Imagine somebody is trying to describe the basic cell division process of bacteria. The best she could do is to provide a schematic description of the process with time being depicted as labeled vertical displacements. Time is very crucial here! The whole idea of simulations revolves around the notion of time. Static media provide no means to incorporate time and the best tool to achieve the interactive nature of the sciences is to use computers. If a chapter is about cell division, then the reader should have access to a gallery of different cell division processes in different organisms. If a chapter is about the ecological behavior of rabbits, then it would be very rewarding if the reader could try different types and volumes of grass, different mating strategies, and more challenging predators. The kinds of worlds that could be simulated are not limited to physical sciences. There are so many programming books that try to teach people how to program and almost all print the code and the schema of the data structures and then ask the reader to grab a computer and run that piece of code. Imagine you have a reading system that integrates an interpreter for some programming language and you could run the code while reading the stuff. We believe that having such a system could be a playground to encourage learning by doing. We do not intend to include all of the sciences in our Sapibook. We just want to incorporate a few important experiments found in every general science book. More important, the system itself should be modifiable and expandable by its users. If no simulation is found for a given problem then the system should provide tools for the user to add a new simulation and let her share the contribution with everyone else.

Conclusion

Current reading systems are obsolote consumption entities providing no ways for interaction and simulation. Here we tried to project some faint ideas in

order to introduce systems that would aid humans in learning. We introduced a hierarchy of subsystems for more humane reading experience. We discussed a curated dictionary, an unit conversion module, a tables to charts module, and finally a description to experiments module. We believe that computers have the ability to introduce interaction and simulation into static materials and we think that the systems of the future would be playgrounds to experiment different aspects of various phenomena.

What is more romantic than animating our books?

References

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