

AI's Impact on the Evolution of User Interfaces

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Abstract—This literature review is regarding the impact of Artificial Intelligence in User Interfaces and how it is overlooked when designing user interfaces, describing how beneficial each one is when put together. The first article discusses how AI and UI work well together when developed properly, but how it's not easy to find a balance between functionality and usability. The next describes abstract ways of creating a user interface, not only just general functionality, but how to come up with ways to implement them. Lastly is how product can adapt to users based on their usage.

Index Terms—CMPE185, \LaTeX Tutorial, IEEEtran, journal, \LaTeX , User Interface Integration, Artificial Intelligence.

BACKGROUND

ARTIFICIAL intelligence is the general concept of computers being able to perform human tasks. This includes multiple areas such as visual and speech recognition, smaller things such as spell checking and decision making. While Artificial Intelligence (AI) has significantly evolved over the last few years and has also gained popularity, it's constantly being integrated into newer technologies such as operating systems, applications and even simple tools like text editors. However, many people seem to skip over how this integration began and how it has evolved to make our interaction with technology more convenient as well as make our devices more aware of our usage.

This literature review will discuss 3 articles:

- *Artificial Intelligence (AI): What About the User Experience*
- *Computer Vision Face Tracking For Use in a Perceptual User Interface*
- *Adaptive User Support*

1 *Artificial Intelligence (AI): What About the User Experience*

This article is written by a technology specialist Tom Taulli from Forbes and published on Forbes as well. This article describes how artificial intelligence is continuously evolving, but

those that are developing the new applications are skipping over the user interface. If the developers want people using their applications, they need to develop a welcoming interface that anyone can use. This has allowed for the emergence of Automated Machine Learning (AutoML), which is automating the machine learning process to apply the learning to real world applications.

When data scientists use algorithms to develop learning patterns, the UX is usually a forgotten portion of creating the application. Using AutoML, it gives more people the opportunity to use these AI based algorithms even if they do not have a data science background. Taulli speaks with Florian Douetteau, the CEO of Dataiku. Dataiku is a company that utilizes AI for businesses to understand trends and data, but also gives those without the data science experience a clean and simple user interface so that anyone can use it. The product is developed by data and computer scientists, but designed in such a way that anyone can use it.

Not losing any functionality but giving more people the opportunity to use it is the overall goal. Functionality and usability is what companies should be aiming to do. However, the balance between functionality and usability is difficult to find in each application. However, if it is found, it truly makes the experience memorable.

From the article, a proper combination of AI and UI allows for more people to use these AI based apps without having to lose any functionality.

2 Computer Vision Face Tracking For Use in a Perceptual User Interface

This article was written by Gary R. Bradski, the founder of OpenCV which is a library for real-time computer vision. Bradski is a researcher with Intel and this paper was written at the Microcomputer Research Lab at Intel, located in Santa Clara, CA. The purpose of this paper is to understand gestures, movements, and possibly emotional expressions. Using these different movements, Bradski explains how they can be integrated and used as a potential interface when interacting with a machine.

To utilize face tracking in a user interface, an algorithm that can detect faces needs to be developed. Facial tracking and recognition is a growing area, and is constantly being updated according to the article. There are many factors to creating an accurate facial tracker, such as working through any distortion or noise as well as movement. With factors like those considered, the algorithm also has to be efficient.

Facial tracking and generalized computer vision can have many applications, and one of the applications discussed in the paper is using facial movement and detection to control things in 3D games like your player. This is done using a part of OpenCV called CamShift, which is a tracking algorithm that can track simple targets using color. This gives an abstract way to interact with the computer. Instead of using buttons and clicking, the computer tracks your own movements, giving them a way to move naturally and create a memorable experience. Camshift is a good algorithm to use when tracking simple objects without too many variables, but when it gets more complex, it is not the best option.

This article gives us a general idea how artificial intelligence can be applied to create an abstract type of user interface. In this instance, interaction between the user and computer is the movement of the person. This provides insight on the different ways a user interface can be designed and implemented depending on the application one is trying to create.

3 Adaptive User Support

This book discusses Adaptive User Interfaces, and how they can adapt based on the user and how it's more convenient that they do. Written by Reinhard Oppermann, who is a professor at the German National Research Center for Information Technology, the book covers many areas of user interface design, but focuses more on the adaptive aspects in creating UI's that more people can use.

In one of the sections, Oppermann discusses the ways interfaces can adapt. He describes this sort of software development to be more like a biological system rather than a mechanical one. The reason for this is because in a mechanical system, if something needs to be changed, the entire machine needs to be taken apart fixed or possibly rebuilt based on the size of the issue. In a biological system, such as our own human bodies, if there is an issue, the body does what it can to fight and fix the issue. For example a paper cut, at first there is blood, but after a few minutes, cells are patching up the cut and it can stop but the skin is very thin. Over time it heals itself, and has adapted to the situation. This idea links to the artificial intelligence concept of neural networks.

Another important idea that Oppermann discusses is how the user interface integrates the changes based on usage. The way this works is by combining adaptations and adaptivity. While they have similar meanings, they play different roles when designing the new user interface. For example, when using a software or tool, you are offered different ADAPTATIONS. While you are using it, you are offered different things to change and use which

are considered ADAPTIVE. This more open and free usage creates a more personal interaction with the product wanting someone to come back and use it more often because it feels more connected to the user. Over time, the adaptive suggestions as technology has advanced more, they have become more helpful and useful for the user.

From the article, we can see that adaptive interfaces make a better overall experience. Being able to adapt in different ways to the user and now learning based on usage and data makes for the experience to be better.

4 CONCLUSION

Artificial Intelligence connected with User Interfaces is something that people overlook a lot, however, when one looks at how much goes into the design, research and development of these adaptive user interfaces it's much more than anticipated. With all the different ways of creating a user interface and now essentially having it be a requirement to integrate AI such that users will use it more and feel more connected, it is important to acknowledge how much detail goes into the development of user interfaces. Artificial intelligence is definitely the future in terms of development, but when it comes to usage, it has to be usable for anyone: those with or without technology backgrounds. From the articles we can see that user interfaces when developed using AI not only make a better experience, but create more usage and returning users because of the personalization done by different learning algorithms to make the product more unique for the user.

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