Technology and Disruptive Technology Influences on Geoscience Application Development with an Aim to Improve 3D Spatial Cognition*

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Abstract

Within the sphere of geoscience application development, hardware and software technology advances have brought beneficial influences to the Geology and Geophysics community. The producers (G&G software vendors) have leveraged these advances in the technology to provide better solutions to the technology consumers (G&G technical professionals).

The last real "disruptive technology" which changed the technical interpretation landscape and led to significantly improved understanding was probably the introduction of 3D visualization on the desktop in the early 90's – 20 years hence. In the last 25 years, major advances in processing power, hard drive space, physical memory, 3D graphics, and a reduction in the physical size of computer hardware have made computers a primary tool in a G&G professionals' workflow. Similarly, increasing monitor sizes and more powerful computers allow the user to view larger and more detailed models, but have not fundamentally changed the way humans interact with the machine. Some attempts to adapt solutions to utilize our natural 3D spatial senses via immersion have been developed, but have not seen widespread adoption. Examples include stereo glasses and fully immersive Caves that utilize head tracking and glove input devices to control applications using more natural human input gestures.

Introduction

Despite the many technological advances, the majority of G&G professionals today are still sitting at a workstation, with a screen, and driving the application with a mouse. The machine is smaller and faster, the screen is bigger, and the mouse has more buttons on it, but cognitively the input and output paradigm almost the same as it was 25 years ago, but now with an overuse of the mouse. What is the next big "disruptive technology" change?

Improvements in software technology have added significant functionality and faster performance, sometimes at the cost of simplicity and usability. From a provider perspective, the wealth of modern GUI toolkits and widgets, combined with and powerful software IDEs (integrated

development environment) has allowed software developers to construct much larger and many times more complex applications for the consumers. For example, better window based GUIs and in-scene manipulation allow users to work in 2D-3D environments within the same application to quickly manipulate complex data sets. Such advances often seem to need to forgo simplicity in order to have more features.

The challenge for the producer community is finding the ways in which we can tackle this cognitive roadblock in technical computing and make things simpler rather than increasingly more complex.

Discussion

The major "disruptive" computational technology on the market today is touch driven tablet computers and smart phones. These machines have taken the world by storm and have elevated Apple and Google into the position Microsoft and Intel once dominated. Due to the nature of touch driven input, applications have been designed to utilize limited input, and designed to operate on a smaller screen. This has seen a complete paradigm shift in how data is not only presented, but how we interact with it. Consequently, for software developers the new technology shares little if anything with the traditional Windows or Linux software. Any application that adopts touch and gesture in a similar way must be built from the ground up with brand new vendor specific GUI toolkits and APIs, and is subsequently deployed on an iOS or Android OS.

Midland Valley's next generation FieldMove™ application (Figure 1 and Figure 2) is developed for this new domain, and in its first iteration is a touch driven data gathering application for geology field mappers. We see the FieldMove™ development as a challenge and an opportunity to bring ideas and thinking from the new domain, and inject smart advances where appropriate into existing products or new products. We have already learned new ideas and methods that will aid our current and future interpretation software and improve spatial understanding. It is obvious already that simplicity versus complexity is something we must strive for, and this must be an aim for teaching new students and users how to learn and drive applications most efficiently.

Summary

We are also tracking developments in newly released "hands free" input devices with an aim to develop smarter and better input paradigms, and given the recent advances in sound recognition we will be taking another look at this technology as an alternative and more natural interaction technique.

We see an important part of this challenge to be programming for the next generation of technical users, and presenting the application in a way that looks and feel familiar within the context that they have grown up in rather than as a computerized version of a paper and pencil paradigm that previous generations have inherited.

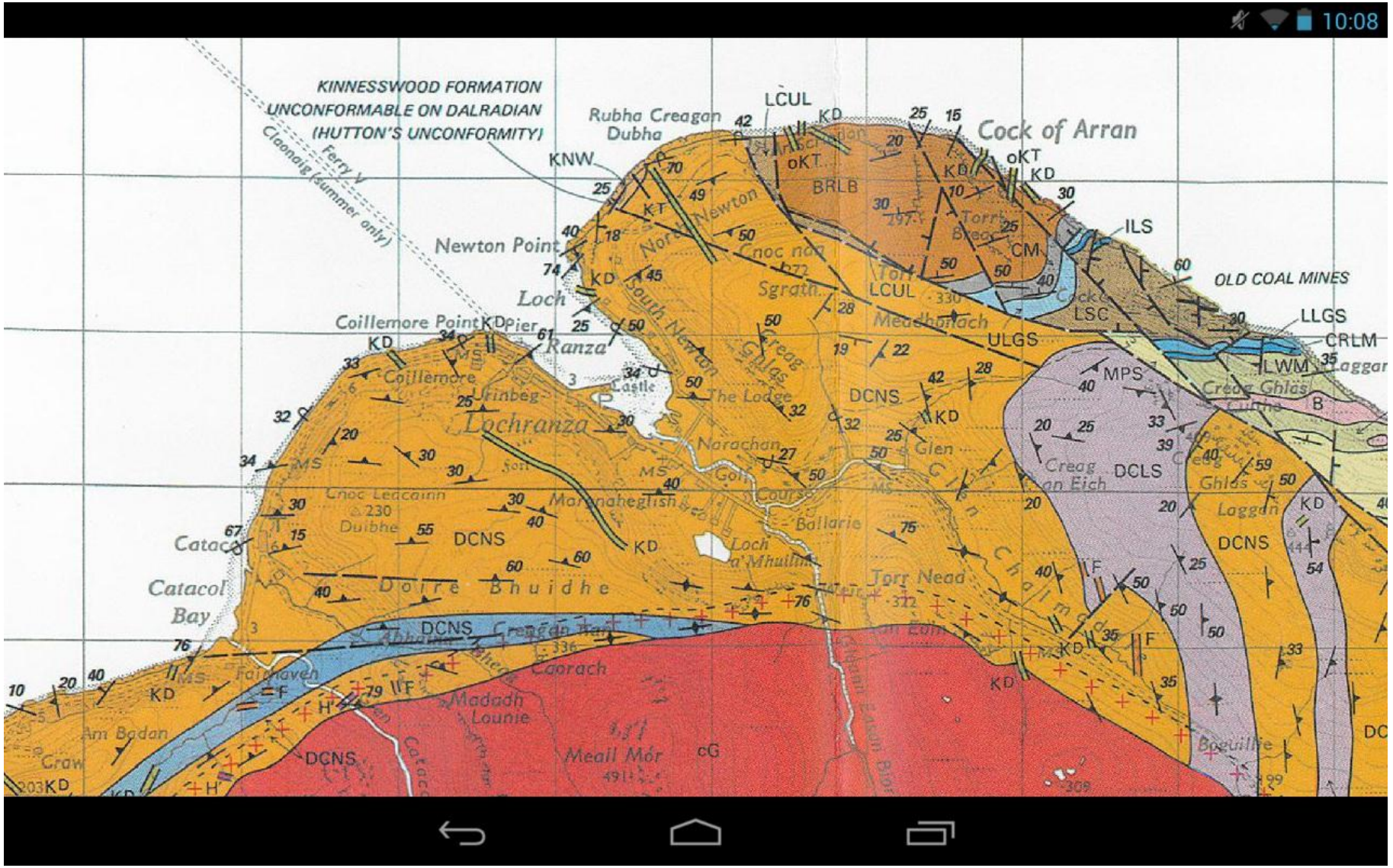

Figure 1. FieldMove^{TM} in traditional 2D mapping mode on North Arran, Scotland.

Figure 2. FieldMove™ featuring 3D visualization on a Google Nexus 10 tablet.