

Safety/ TRAINING

Creating Simple Software

By Reginald Hammah and John Curran

"Making the simple complicated is commonplace; making the complicated simple, awesomely simple, that's creativity."

Charles Mingus, jazz musician

Creating easy-to-use software representing sophisticated technical ideas is difficult, requiring enormous creativity from developers. However, engineers need user-friendly software tools to solve the arduous technical challenges they face.

All programs must simplify the users' work by being user-friendly and reliable. As obvious as this may seem, it is sometimes overlooked by program developers. Simple software tools are as important to engineering as their underlying knowledge. User-friendly programs empower engineers to express creativity.

Software as a Knowledge Repository

The ultimate goal of research is increasing knowledge while improving practices. Computer programs offer a powerful means to translate this knowledge into a useable tool. This is fundamental to create meaningful programs while demanding great value from the knowledge contained in software.

User-Friendliness and Reliability: Keys to Effective Usage

Although it's critical that programs embody useful knowledge, they must be easy to use. This fact is inescapable when you consider a program's purpose is facilitating the work of users. Developers must make every effort to transfer knowledge into simplified tools, regardless of the complexity.

Clear-cut computer tools allow engineers and designers to focus on solving technical problems. They don't need the distraction of trying to cope with awkward instruments.

For example, when engineers design a tunnel, they need tools to help predict excavation behavior and establish support requirements. Additionally, they need to attain their ends in a cost-effective manner. Unnecessary awkwardness can divert attention from their primary goals.

User-friendly software is invaluable because it facilitates investigation of design alternatives and trade-offs. Cumbersome tools limit the number of

options engineers can consider.

On the other hand, simplified tools make it possible to simulate many different scenarios in reasonable time, helping engineers anticipate different conditions arising during a project.

New Directions in Geotechnical Software

New technology offers geotechnical engineers a unique opportunity to pursue growth and innovation, especially in software development. The industry can benefit from implementing advancements from soil and rock research, or fast-growing fields such as engineering.

New trends significantly impacting geotechnical software are outlined. We believe they have the capability to change the face of the design landscape for a long time.

Design-Oriented Programs

Many engineering programs deliver powerful analysis tools, but the design process consists of more than that. In geotechnics, design comprises a range of activities leading to determining characteristics, excavation behavior and subsurface structures before they are built.

By recognizing engineers' needs, developers have to deliver programs providing analysis, simulation and related tools. This will assist practitioners to develop solutions satisfying objectives and constraints.

Three-Dimensional Tools

Engineering design increasingly requires three-dimensional analysis tools. Many geotechnical or tunneling problems fall into this category.

For many years, tunnel designers were compelled to analyze three-dimensional problems with two-dimensional approximations, due to constraints dictated by limitations in computing power and three-dimensional programs. But significant advances are changing the status quo.

In geotechnical engineering, three-dimensional numerical codes help technical experts explore long-posed safety and production problems.

For example, a good three-dimensional model helps understand excavation behavior created by TBMs. Improved visualization tools are invaluable for engineers because they significantly improve their understanding of three-dimensional problems.

Software development must take maximum advantage of the latest techniques to have a meaningful impact on day-to-day work.

Probabilistic and Risk Assessment Tools

Probabilistic and statistical analysis techniques are being incorporated into engineering programs. This must receive considerable attention. The inherent variability of rock and soil dictates that engineers be prepared to deal with behavior during excavation design, analysis and construction.

Probabilistic tools will facilitate design processes where engineers are able to assess risks associated with various design options. With these tools, engineers can perform sensitivity analysis, identifying design parameters with the greatest performance impact. This helps engineers redirect more resources toward a better definition of influential variables.

Incorporating statistical and probabilistic tools in software will increase appreciation of associated consequences.

Conclusion

For software products to maximally benefit practitioners, they must embody useful knowledge. Equally important, they must be simplistic. It is hard to attain, but the effort is worthwhile.

User-friendly products will facilitate advancement of the industry. They play the crucial role in making recent innovations readily accessible to engineers. Knowledge simplified in software is empowering.

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