HOW SOLIDWORKS SOFTWARE SPEEDS CONSUMER PRODUCT DESIGN

Overview

SolidWorks® Premium bridges the gap between industrial design and engineering by providing powerful surfacing capabilities, the ability to easily import geometry from dedicated industrial design tools, and the industry's top mechanical engineering environment—all rolled into one package. In this paper, you will learn how SolidWorks software provides a complete modeling environment for taking designs from concept to manufacturing.

3S SOLIDWORKS

Introduction

The consumer products industry faces a unique set of challenges because it must quickly bring new products to market with cutting-edge designs, market-leading functionality, and competitive manufacturing costs. One of the most critical demands is managing the transition from design to engineering. Today, consumer product designers use specialized tools to define the flowing surfaces that often distinguish state-of-the-art industrial design. Mechanical engineers, however, use different tools to turn the designers' creations into mathematically precise, functional, and manufacturable designs. Unfortunately, these individual tools have separate interfaces that require a time-consuming and error-prone translation process or that involve starting over when moving from one world to the other.

As an industrial designer you may use sketchpads, modeling clay, foam, and specialized software tools that are fine for conceptualizing complex surfaces. But when the design process is completed, these tools provide only a fraction of the information needed to fully define the design. For example, industrial design software doesn't generate the parametric history that is crucial to efficiently managing the engineering change process. Because the software only defines a surface model, you may find it difficult to move to a physical prototype. The solid volume beneath the surface often affects its appearance, such as when the surface is glass. When you create a physical prototype with a surface model, you end up with additional work, because the surface model doesn't define wall thickness, hole depth, inlays, or connections between components.

Life would be much simpler if industrial designers could use the solid modeling tools used by mechanical engineers. With these tools, you can create a feature-based, parametric model that captures all the information needed to mathematically define the design and to manage the change and documentation process. But traditional solid modeling software doesn't have the surfacing tools that you need to quickly generate the large number of design concepts to create an advanced design. Instead, you are locked into confined areas that limit you, for example, to defining a surface patch with either two or four sides, but not three, five, or more sides.

Dassault Systèmes SolidWorks Corp. has overcome this problem by offering a parametric solid modeling tool with the powerful surfacing capabilities needed to turn out a stylish consumer product with smoothly flowing lines and distinctive features. Within the same interface and with exactly the same file format, SolidWorks 3D CAD software provides the geometry definition, geometrical design, design analysis, manufacturing, and documentation tools—which your company's engineers and suppliers are probably already using—to turn concepts into reality. As a result, industrial designers and mechanical engineers can seamlessly share information and work simultaneously on the same model. This, in turn, makes it possible to move to market much more quickly, and to evaluate the functionality and manufacturability of your concept designs before investing time and money.

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Investigation and conceptualization

SolidWorks Premium bridges the gap between industrial design and engineering by providing powerful surfacing capabilities, the ability to easily import geometry from dedicated industrial design tools, and the industry's top mechanical engineering environment—all rolled into one package. Over the past several years, DS SolidWorks has been adding surface modeling capabilities that are eliminating this gap with dedicated industrial design tools.

The Fill feature provides a major breakthrough by offering an n-sided surface patch that allows you to fill in a tangent surface patch to a space defined by any number of boundaries. With the Fill feature, you can define constraint points inside the surface that can be controlled parametrically. But with mechanical engineering design software, you can only loft a surface with two or four boundaries.

Using SolidWorks software, you can also sketch a network of curves using a feature called 3D sketch. You can pull any point in a curve to modify the surface and combine both analytical entities and splines into a single feature. Plus, you can define vertices or curves anywhere in this patch and pull on the exact place you want to adjust the surface. 3D sketch splines provide curvature continuity at any point on the spline, and the tangency vector and length can be changed individually at each of the vertices. The spline points can easily be dimensioned and, unlike most systems targeting industrial designers, SolidWorks software lets you drive any number of the spline points parametrically.

In addition, you can create swept surfaces and solids with guide curves. An unlimited number of guides can be used with the path and profile. If a sweep will not complete, diagnostics are available to determine where in the sweep path the surface has failed.

What's more, SolidWorks software provides these powerful surface modeling capabilities within the same user interface that so many mechanical engineers use to define the geometry, function, and manufacturability of consumer products. Yet, SolidWorks software still makes it easy to capture native geometry from industrial design tools such as Rhino, Alias, and Vellum and bring it into a sketch or part. You can also import a bitmap image to capture design intent.

With the Configuration Management capability of SolidWorks software, you can show, hide, suppress, and alter dimensional changes in a single file. Typically, you can use this feature to show the design in different states. For example, you can show a clamshell-style cell phone closed, opened, and with an extended battery pack design just by clicking on a particular configuration.

SolidWorks software enables you to build a master part in a single multibody file, and then distribute these master parts into derived parts, which engineering can further detail and use in the master assembly. This provides a comfortable separation between the designer and engineer without compromising compatibility and integration. For example, the industrial designer might conceptualize the exterior of a cell phone as a single surface model. The mechanical engineer can then use this model as a reference to build the front cover, back cover, and battery pack as individual parts. And if the industrial designer changes the concept, the derived parts will automatically be updated.

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Concept renderings and prototyping

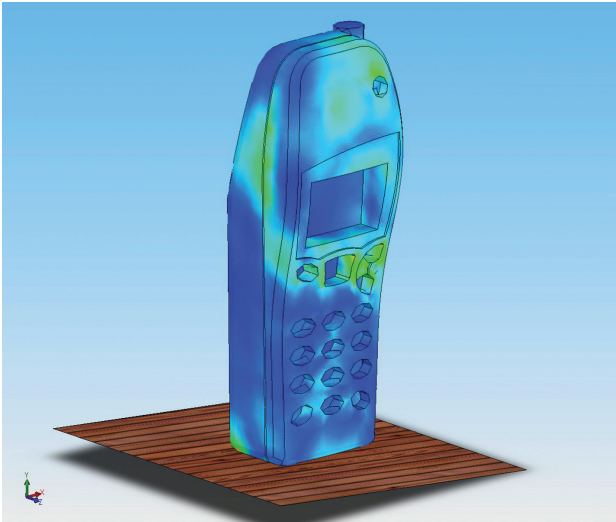Using SolidWorks software makes it possible for you to move much faster from a concept to a product. Unlike the tools used by industrial designers, SolidWorks software creates not only surfaces and curves, but also trims, fillets, shells, and extrudes. What's more, SolidWorks software provides all the other necessary operations to create a precise part definition with the same user interface and same geometrical file format used for conceptual design. You can associate design intent with features through the parametric history, which automatically adjusts the rest of the design to accommodate the change. Finally, for manufacturing and ongoing part maintenance, you can drive design changes by simply entering values in a table.

Using PhotoWorks rendering software, you can create photo-realistic images from 3D CAD models. Here, we use global illumination and realistic metal, plastic, and rubber materials to increase the impact and realism of the design.

Fully integrated with SolidWorks software, PhotoWorks™ software makes it easy for you to provide photorealistic renderings that demonstrate how a design will look without expensive mockups, prototypes, or studio photo sessions. In addition to selecting the appropriate materials characteristics for parts and assemblies, you can set the background, lighting, and scenery conditions. You can also combine PhotoWorks with the SolidWorks software animation capability to create photorealistically rendered animations. For example, you can revolve the product 360 degrees on a turntable to see how it looks from every angle, or you can capture the motion of moving parts to show a clamshell-style cell phone being opened and closed.

Integration of the industrial design with mechanical engineering behind a single user interface means you can evaluate the mechanical performance of the design at a much earlier stage. SolidWorks Simulation—included with Solidworks Premium— helps you determine the stress, strain, deformed shape, and displacement of components under operation, in order to avoid field failures. You can also use this tool to quickly identify and solve problems by generating new computer models quickly and inexpensively. After determining the exact duty cycle of components, you can often reduce the cost and weight by using lighter-duty components or by removing material where it isn't needed. Using SolidWorks Simulation Professional, a separate add-on solution, you can even perform "drop tests"—simply drop the design from a specified height to see if it breaks.

With SolidWorks Simulation Professional, you can use the drop test simulation capabilities to study the effect of impact on a model that is dropped from various heights.

Detailed design

The vast majority of consumer products' contents consist of purchased components, such as circuit boards, semiconductors, batteries, motors, bearings, fasteners, and displays. Today, you are often forced to redesign purchased and commonly used components with each project. SolidWorks software, on the other hand, provides you with the Design Library, a central location where you can access a wide range of standard, vendor-specific, and internal company design libraries. You can add new parts simply by dragging and dropping them into the design. 3D ContentCentral® saves time and improves accuracy by providing easy access to the 3D CAD models of leading component manufacturers. You can browse product categories to view competitive products, configure the supplier's parts to meet your requirements, and drag and drop products right into the design.

SolidWorks product data management software gives you the creative freedom to vault many versions of the same part, assembly, or drawing. You can create personal digital assistants with different styles of screens and keyboards for design review. Plus, you can explore various "what if" scenarios by studying different saved versions of a part or an assembly, and then use SolidWorks software analysis tools to evaluate their performance.

With SolidWorks Routing software—included in the SolidWorks Premium design solution—you can map the route of wiring harnesses within the product. You can import electronic design automation (EDA) data from tools to determine the number and size of wires and cables and other information. This data is imported in Microsoft® Excel format. Whenever the electronic design changes, you can import new data to drive the resizing of the electrical routes within the product.

Documentation and release

You can easily use the 3D assembly model in SolidWorks software to quickly create production-level 2D drawings. For example, create section views by simply drawing a line. With SolidWorks software, you can section the assembly and create the drawing view automatically. You can quickly create exploded views that describe how to assemble the consumer product by first arranging components in 3D, and then selecting sections to define 2D detailed drawing views. Then you can easily annotate these views with balloons keyed to the bill of materials that highlight components of interest.

As the design is generated, SolidWorks software automatically maintains the bill of materials, and can export it as an Excel spreadsheet or in other formats for import into the material requirements planning system. With this information, you'll save time and eliminate errors during the purchasing process. The software tracks a wide range of information, such as the manufacturer of purchased components, model number, size, and weight. You can generate a single bill of materials for multiple projects with numerous parts, quantities, and configurations, in order to speed the transition to manufacturing and also to purchase in greater quantities at lower prices.
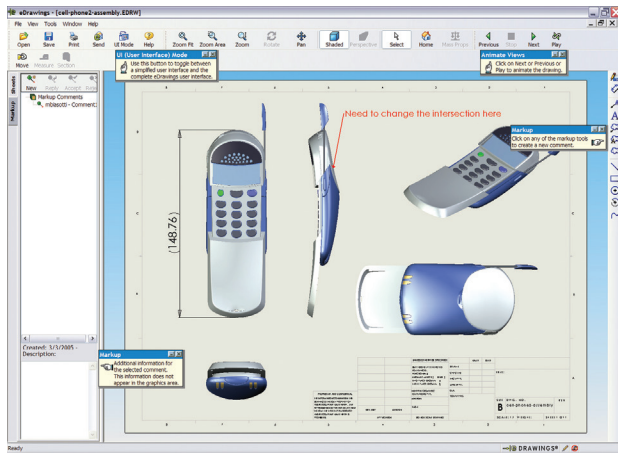
Engineering changes typically occur at a release phase. Using SolidWorks software can help you avoid costly mistakes by ensuring that changes made anywhere in the process automatically update all product documentation, including parts, assemblies, and drawings.

The SolidWorks Manufacturing Network simplifies the process of finding design and manufacturing service providers that use SolidWorks software and work with native SolidWorks software files, thereby avoiding the need for converting or re-creating design files. You can easily find the right supplier on the network by browsing through 21 categories, ranging from a machine shop to an outside design firm, or by searching on keywords.

SolidWorks eDrawings® is a free CAD viewing and collaboration application that lets you distribute 2D and 3D drawings to others who can view them—without having to install any software. When you need to determine your design direction, it provides the perfect tool for simplifying communications among industrial designers, mechanical engineers, engineering management, and marketing. A single document contains a compressed version of a 3D model and its associated 2D drawing, as well as animated views and a self-extracting viewer. The recipient doesn't need a CAD program, and file sizes are small enough to easily distribute via email. With eDrawings, you can distribute drawings to customers and suppliers without revealing sensitive design data. Recipients are able to view, measure, and interrogate the drawings with enough detail to verify that their specifications are met and to accurately submit quotes for production. You can even add comments that are tracked successively in the history of the document as it is passed from person to person.

You can browse product categories to view competitive products, configure the supplier's parts to meet your requirements, and drag and drop products right into the design.

SolidWorks eDrawings Professional allows an unlimited number of recipients to mark up your product designs and provide feedback via email.

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Conclusion

By allowing industrial designers and mechanical engineers to work with the same software tools, the same geometry database, and the same user interface, SolidWorks Premium makes it possible to bring superior products to market in less time and at a lower cost. You can improve product performance by evaluating functionality at the concept design stage and by rapidly generating superior alternatives that can be inexpensively implemented. In addition, you can reduce time-to-market by eliminating the need to translate designs or to re-create them from scratch in the mechanical engineering environment. Finally, you can lower manufacturing costs by considering the manufacturability of alternate concepts in the early stages of the design process.