

SolidWorks WORLD 2008

SolidWorks API Demystified

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INSPIRED to Design

Lenny's SolidWorks Resources:
<http://www.LennyWorks.com/SolidWorks>
<http://designsmarter.typepad.com/LennyWorks/>

Who Am I?

- Product Designer
 - Engineering since 1982.
 - CAD user since 1991.
 - SolidWorks user since 1998.
- CAD Administrator
 - 20+ people on site.
 - Advise other sites.
- Productivity Gains - I want to:
 - Simplifying my job.
 - Make my computer do more work for me.
 - Get the most out of the tools I use to do my job.
- Certified SolidWorks Professional (CSWP)
- SolidWorks User Group
 - SolidWorks Milwaukee Area Resource Team (SMART)
 - <http://www.smart-wi.com>
 - Active member since 1999.
- Lenny's SolidWorks Resources
 - Online since Sept. 2003.
 - Free Macros, Tips & Tricks
 - SolidWorks Blog Since 2007
 - Includes Macro Tutorials
- Hobbyist programmer since 1981
 - Programmed over 45 SolidWorks macros.
 - Most of these are available for free on the Internet.
 - Experiment with programming.
 - I rarely get paid for my programs.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

What is covered here?

- Benefits.
- Definitions.
- Programming the API.
- Macro Toolbar.
- Macro Recorder.
- Look inside the macro

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

What is covered here?

- Type libraries.
- Running and testing a macro.
- Typical macro process.
- Why won't a macro work?
- Research.
- SolidWorks API Object Model

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

What is covered here?

- Progressive learning track.
- Tips for learning and exploring.
- Programming strategies.
- Getting help.
- Available resources.
- Sources of FREE examples

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

What is NOT covered here?

- Programming basics.
- Basic programming techniques.

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Benefits of learning and using.

- n Save time and reduce errors.
- n Automate tasks.
- n Develop useful tools.
- n Enforce compliance.
- n Customize SolidWorks



<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Basic Definitions

- n Program.
- n Object Oriented Programming.
- n Macro.
- n Application Programming Interface (API).
- n SolidWorks API.



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SolidWorks API

- n Many SolidWorks Add-Ins have APIs
 - eDrawings
 - FeatureWorks
 - PDMWorks Workgroup
 - PhotoWorks
- n Why does SolidWorks make this available?
 - SolidWorks Document Manager
 - SolidWorks Routing
 - SolidWorks ToolBox
 - SolidWorks Utilities



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Accessing / Programming

- n Stand alone application
 - Executable
 - Visual Basic
 - Visual Basic .Net.
 - Visual C++
 - Visual C++ .Net
 - Visual C
- n SolidWorks Macro
 - .swp file
 - Microsoft Visual Basic for Applications.
 - o Installed with SolidWorks



<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Accessing / Programming

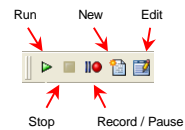
- n SolidWorks Help File Syntax
 - Syntax (OLE Automation)
 - o Visual Basic (VB)
 - o Visual Basic.NET
 - o Visual Basic for Applications (VBA)
 - Macros (.swp)
 - Syntax (COM)
 - o Visual C
 - o Visual C++
 - o Visual C++.NET



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Macro Toolbar

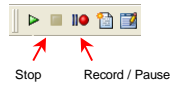
- n Run Macro
 - Tools, Macro, Run.
- n Record / Pause
 - Tools, Macro, Record.
 - Stop
- n Tools, Macro, Stop
 - Save recorded macro.
- n New Macro
 - Tools, Macro, New.
 - Launches macro editor.
- n Edit Macro
 - Tools, Macro, Edit.
 - Launches macro editor.



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Macro Recorder

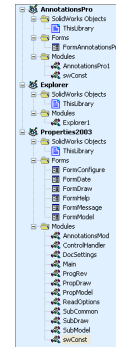
- n Records Actions
- n Getting Started
- n Discovery Tool
- n Programming Aid



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A Look Inside a Macro File

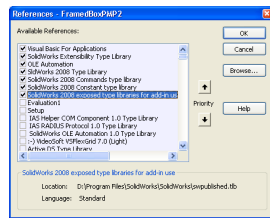
- n SolidWorks Objects
- n Forms
- n Modules
- n Class Module



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Visual Basic Editor – References / Type Libraries

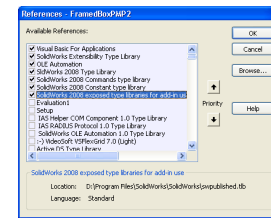
- n What are they?
- n How to set / change
- n Notes:
 - Set during macro recording.
 - Specific to each major SolidWorks release.
 - Must be set for each macro.



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Visual Basic Editor – References / Type Libraries

- n What libraries may be needed:
 - SolidWorks 2008 Type library
 - SolidWorks 2008 Constant type library
 - SolidWorks 2008 Commands type library
 - SolidWorks 2008 exposed type libraries for add-in use



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Running a Macro – Where does the macro start?

- n Run Macro
 - Last "public" procedure of the last module inserted into the macro.
- n Toolbar Button
 - User must set module and routine as starting point.
 - Only "public" routines are listed.
- n Hotkey definition
 - User must set module and routine as starting point.
 - Only "public" routines are listed.

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Testing a Macro

- n [F5] - Run macro.
 - Start in current procedure.
- n [F8] - Step thru code
 - Line-by-Line.
- n Yellow bar – Current position
- n Red bar – Stop at this line

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Running a Macro – Typical Steps

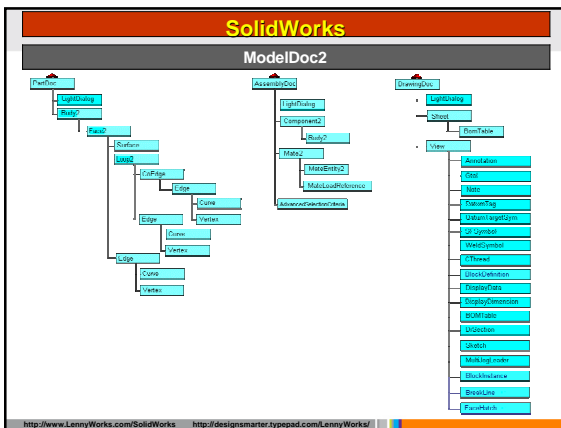
- n Launch Macro.
- n Attach to SolidWorks.
- n Document Loaded and Type.
- n User Form Initialization.
- n Process User Request.
- n Clean-Up and End Program.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

SolidWorks Help File

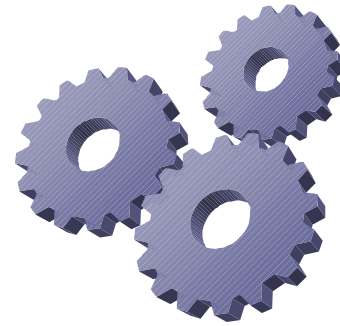
- n Common
 - See Also
 - Example
 - Availability
- n Objects
 - Methods
 - Properties
 - Events
 - Accessors

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>



<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Examples



<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Why won't some recorded macros work?

- | | |
|---|---|
| <ul style="list-style-type: none"> n Obvious reasons: <ul style="list-style-type: none"> - SolidWorks Version. - Type Libraries. - Macro improperly started. | <ul style="list-style-type: none"> n Not so obvious reasons: <ul style="list-style-type: none"> - Some selections may not have been recorded. - Macro requires preselections. - Selected objects may not exist. - Work may already be done. |
|---|---|

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Macro may not work on other computers?

- n These SolidWorks settings may affect macro performance
 - Automatic Relationships
 - Automatic Inferencing
 - Snap to Points to Grid.
 - SnapEnable / Snap Options.
 - Insert dimension value on creation.
 - Use Fully Defined Sketches.
- n Other users probably set these different than what you are used to.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Make your macro work on other computers!



- n These SolidWorks settings may affect macro performance
 - Automatic Relationships
 - Automatic Inferencing
 - Snap to Points to Grid.
 - SnapEnable / Snap Options.
 - Insert dimension value on creation.
 - Use Fully Defined Sketches.
- n Other users probably set these different than what you are used to.
- n How to check for these effects
 - Toggle settings.
 - Re-test macro.
 - Verify results.
- n How to bypass these effects
 - Capture current setting.
 - Change setting as needed.
 - Change setting back.
- n **KEEP YOUR MACRO USER FRIENDLY.**

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Research



- n Every macro you write will require some research.
- n Visual Basic
 - Online tutorials
 - Help file
- n SolidWorks
 - Learning the SolidWorks API
 - Document Structure
 - SolidWorks API Add-Ins and Help File
- n Existing macros

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Visual Basic Programming - Objects



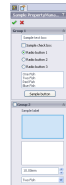
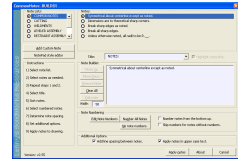
- n What are they?
- n Can be accessed or modified by a macro or external program.

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User Interface: UserForm vs. PropertyManagerPage



- n UserForm **Beginner**
 - More flexible with more options.
 - Display lots of options to user.
 - Large form can get in the way.
- n PropertyManagerPage **Intermediate / Advanced**
 - User programmed PageClass and PageHandlerClass.
 - Requires "SolidWorks Exposed Type Library for Add-In".
 - Out of the way - Looks like it's part of SolidWorks.
 - User needs to scroll to see all info/inputs.
 - See example: "VBA_PropertyManagerPage.swp"
- n Programmer must write code for each control.



<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Progressive Learning Track



- n Easy (Relatively speaking)
 - Macro Recorder.
 - Anything the macro can Search for, Predict or Control.
 - Examples

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Progressive Learning Track



- n Still Easy (A bit more work)
 - Load new model and create new geometry.
 - SolidWorks Settings.
 - Building a UserForm to interface with user.
 - Traversals. (Assembly / Part / Drawing)

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Progressive Learning Track



- n Intermediate (More of a challenge)
 - Unpredictability or Uncontrollability.
 - Refine operation of a recorded macro to work in other existing models.
 - PropertyManagerPages.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Progressive Learning Track



- n Advanced (You better know your stuff)
 - External applications that interface with SolidWorks data.
 - SolidWorks Add-Ins. (Run within SolidWorks environment)
 - Event Monitors and Triggers.

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Progressive Learning Track - Exploring Further



- n Other Reference Libraries of Interest
 - Use Object Browser to see what is available within library.
- n Use Object Browser to see what is available within each library.
 - Common Dialog Control
 - o Access and use common Windows controls and dialog boxes.
 - DS: OLE Document Properties Object Library
 - o Edit document/file properties without MS Office or SolidWorks installed.
 - o Search, download and install DsoFileSetup....
 - Microsoft Scripting Runtime
 - o File System Object

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Tips - Learn by Example



- n Learn by example
 - Find a good macro, and study how it works.
 - o Use [F8] in VB Editor to step thru code line-by-line.
 - SolidWorks Help File
 - o Over 490 Visual Basic examples
 - VBA_PropertyManagerPage.swp
 - o Best example for implementing SolidWorks' PropertyManagerPage

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Tips - Learn by Example - Included Examples



- n FramedBox macro
 - Geometry creation
 - PropertyManagerPage
 - Includes articles on multiple stages of development.
- n ChannelPMP
 - PropertyManagerPage
- n QuickSlot / QuickRectangle macros
 - Geometry creation
 - Setting common options
- n CommonNotes
 - Read data and settings from an external file
 - UserForm controls.
- n DelRevTriangles
 - Traversing thru a SolidWorks drawing
- n Toggles (Quick & Dirty)
 - No interface.
 - Simple error checking.
- n More...

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Tips - Learn by Exploring



- n Experiment
 - Write "do nothing" macros for Visual Basic.
 - Write "do nothing" macros for SolidWorks API.
 - Save your "experiments" for later use.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Tips - Learn by Exploring



- n Look for visual clues that identify SolidWorks document structure.
 - SolidWorks FeatureManager.
 - SolidWorks API object model.
- n SolidWorks Journal File
 - <drive>\Documents and Settings\<username>\Application Data\SolidWorks
 - File: swxJRNLSWJ

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Programming Strategies



- n Start small and work your way up
- n Know that there are multiple ways to complete tasks
- n Use subroutines and functions
- n Early Binding
- n Use variable/constant/enumeration names that make sense

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Programming Strategies



- n Add comments to your code
- n Use existing code
- n Error trapping.
- n Plan for use in multiple versions of SolidWorks.
- n Plan for multiple users or distribution.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Tips - Getting Help



- | | |
|--|--|
| n SolidWorks API | n Visual Basic |
| - SolidWorks API Help file. | - Visual Basic Help file. |
| - SolidWorks API Forum. | - Visual Basic Forum. |
| - SolidWorks API Support. | - Online Tutorials |
| - Be specific! | - Be specific! |
| - Don't expect help with programming techniques. | - Don't expect help with programming techniques. |

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Resources - Installed with SolidWorks



- n SolidWorks Application Programming Interface.
- n SolidWorks API Help file.
- n Visual Basic for Applications (VBA) Version 6.
- n SolidWorks Help File
 - Online Tutorial - SolidWorks API.

```
Option Explicit
Dim swApp As SolidWorks.SldWorks
Dim Part As SolidWorks.ModelDoc2
Dim boolStatus As Boolean

Sub Main()
Set swApp = Application.SldWorks
Set Part = swApp.ActiveDoc
boolStatus = Part.Extension.Se1
Part.InsertSketch3 True
Part.ClearSelection2 True
End Sub
```

SolidWorks API
Record and modify a macro.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Resources - SolidWorks' website



- n API programming tips and updated help files.
- n SolidWorks Express Newsletter
- n Download projects, sample programs and macros.
- n SolidWorks Developer Kit. (SDK)
- n SolidWorks World Presentations.
- n List of SolidWorks Resellers.

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Resources - Examples (Users)

- n Lenny's SolidWorks Resources Macros, Tips, Blog
 - <http://www.lennyworks.com/solidworks>
 - <http://designsmarter.typepad.com/lennyworks/>
- n Matt Lombard Macros, Tips, Blog
 - <http://mysite.verizon.net/mjlombard/>
- n Stefan Berlitz's SolidWorks Tools Macros, Tips, Blog
 - <http://www.swtools.de>
- n Mike Wilson's Modeling Techniques Macro Feature
 - http://www.mikejwilson.com/solidworks/solidworks_files.htm
- n Joe Jones at New Hampshire CAD Tutorials
 - http://www.nhcad.com/sw_macros/index.html
- n SolidWorks Tips & Things API Tips
 - <http://www.solidworkstips.com/>

<http://www.LennyWorks.com/SolidWorks> <http://designsmarter.typepad.com/LennyWorks/>

Resources - Books

- n Teach Yourself Visual Basic 6 in 24 Hours
 - Author: Greg M. Perry Publisher: SAMS Publishing
- n SolidWorks API Fundamentals Training Manual
 - SolidWorks Corporation
 - Must take an API Training Class
- n Automating SolidWorks 2006 using Macros
 - Author: Mike Spens Publisher: Schroff Development Corp.
- n SolidWorks 2007 Bible (Not much VB)
 - Author: Matt Lombard Publisher: Wiley Publishing, Inc.
- n SolidWorks For Dummies (Not much VB)
 - Authors: Jankowski/Doyle Publisher: Wiley Publishing, Inc.

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Questions & Thanks

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