

May/June 2006



AUGI World

The Official Publication of Autodesk User Group International

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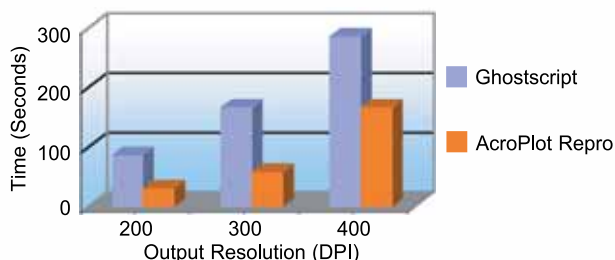
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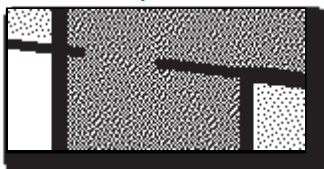
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Publications Mail Agreement # 40733013
Return Undeliverable Canadian Addresses to
Station A
PO Box 54
Windsor, ON N9A 6J5
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BPA International membership applied for August 2002.

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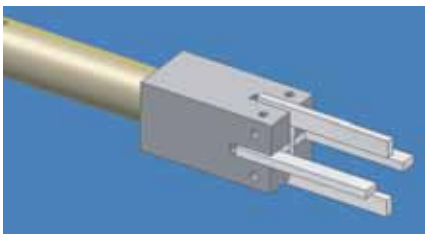
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The Cad Manager



Speak Up!

Convincing Others about the Importance of CAD Standards

CAD managers have recounted tales of meetings where the general consensus was that any kind of restrictive CAD standards, guidelines, methods, layers, pen tables, versions, deployments, templates, server structures, support, data integrity checks, process reviews, or archiving were constraining design efforts.

Frustrated CAD managers have told me about the stagnation occurring at their firms because they are not moving to new software purchases and release updates. It doesn't take much to start the flow of conversation on bad data and bad methods of production. Many managers have stories about facing hostile crowds of users and management as they try to discuss CAD negligence.

There are times when the CAD manager must speak up concerning the worth of CAD standards, proper focus on CAD issues, or holding the line on protecting CAD data. I applaud you, CAD Manager, for running the gauntlet, taking the punches, dodging the bullets, and generally standing alone against the naysayers.

I think it is imperative that CAD managers speak up on several issues whenever they are challenged (by anyone at any level in the firm).

Speak up – when people say they don't need CAD standards

The first area is CAD standards, the topic that everyone attacks, derides, and demeans. This is an easy place to start—but not end—the conversation on the importance of the CAD manager's voice. CAD standards are needed.

For those who think that standards are a waste of time, the CAD manager should speak up and talk about happens when there is no CAD standard. Not having a

standard at all will impact every project. Don't underestimate the number of people who think that CAD standards are useless.

Here are several reasons why CAD standards are needed:

1. CAD standards are needed because we share files with other users and firms. If you give or get files from others, the need for CAD standards is a no-brainer. You have seen what it means to have good CAD files in and out. If you are sharing internally with other designers, then you find out directly from them that a good standard helps. If you are sharing files with outsiders, you may not be hearing from them, but they are talking behind your back. Either way, you are developing a reputation for your CAD quality. Is that reputation a good one?

2. CAD standards are needed because your files are shared with others you don't know about. Often your files are taken by the client and given to others. Your reputation is spreading. These files might end up being used by another design firm that will want to use them on the next project for your old client. Don't give them any reason to question your ability or have a negative conversation about your firm with your old client. The word about your firm spreads fast.

3. CAD standards are needed because your clients deserve the best. Your firm is getting paid for good design. That is the bottom line. You are also most likely giving clients CAD files as an instrument of service. These files are a reflection of your design ability. Have you ever been in a meeting and heard a client comment, "If they can't get the CAD files right, what can we expect from the design?"

4. CAD standards are needed because it increases productivity. Face it—a good CAD file is a pleasure. With corpo-

rate teams working on several files and exchanging data between projects and locations, any flaw will be multiplied and cascade over several projects. If your files are standardized and organized for production, then you are saving time and making money.

5. CAD standards are needed because the firm pays for it. All of the users in your firm are paid to be productive, creative, and fast. Good standards help in all of these areas.

6. CAD standards are needed because they let you automate. By defining and knowing where and how objects are created, located, and defined, you can automate all kind of things. Xref attachment and manipulation, layer edits, insertions, title blocks, tables, layouts, etc. The list is endless. But you have to depend upon things being named, placed, and created as you expect them to be.

7. CAD standards are needed because everybody has one anyway. Every one of your users has a standard. It may be something they created and stored in their own heads. It may not be written down. It may not be shared. But they have one. No one is defining what layer to use every time they draw something. Even your worst user is creating things after some form of standard method, even if it is inconsistent.

Speak up - if you have bad CAD standards

I think that a bad standard is worse than no standard. Here's why.

1. A bad standard creates a false sense of security. Project managers, upper management, job leads—all expect that the standard is being followed and that it is sufficient to make their CAD files usable and efficient. If your standard does not do this, you are falling short.

2. **A bad standard makes you hard to work with.** Others are trying to comply with your standard. Your subs are straining to provide you with compliant files. If your standard does not define what they must do, they will be frustrated and take more time—which equals more money—to get the job done.

3. **A bad standard gives you junk files.** Take a look at your internal problems with CAD. Do they exist because your folks are not able to understand your standard? Does your standard fail to define some needed areas? Are those areas open for interpretation by the users so that you end up with scattered layer names, or block names, or design methods?

4. **A bad standard costs you money and time.** It slows people down. If it is too complex, people won't understand it. If it is too simple, it won't cover enough to keep things humming.

Speak up - if the CAD standards are not being followed

Don't grumble and gripe. Enforcement of CAD standards is your job. Make it happen. Here are several reasons why people need to follow CAD standards.

1. **Not following CAD standards causes file corruption.** There are many DWG files out there that are twisted into a standards knot. When they get that way they are unusable and sometimes corrupt.

2. **Not following the standard reduces effective file sharing.** Giving a file to another person exposes bad data and bad practices. The next person down the line has to fix your problems. They expect your data to be intact.

3. **Not following the standard actually decreases productivity.** No time to check the standard? Too much work to do it right? Well you are actually costing yourself more time. Think about how many times you have shaved the rules and been forced at a later time to go back and fix it. If you shortcut the standard, then make sure you add some time in to go back and do it right.

4. **The client expects you to follow the standard.** If you are using your standard or theirs, they expect you to follow it. They pay you to follow it. They expect deliverables to reflect the standard.

5. **Not following the standard creates bad entities.** If you fail to follow the standard, others may be enticed to do damage to the file just to get the job out the door.

When you pass on a non-standard file and the next person doesn't know how you made it or what tools you used to create the data, they explode, break apart, edit, disassociate, and otherwise obliterate the data.

So your marching orders are to speak up on these and other issues as they arise in your firm. Don't remain silent. Be ready to talk about the things that others are avoiding. Confront the issues that are costing your projects time and your firm money. People will listen if you approach them in a persuasive way. Deep down inside they all know that these issues need to be addressed. They are often just avoiding them or trying to push them off. Speak up and then be ready to fix them.



Mark W. Kiker is a member of the AUGI Board of Directors. He is the General Editor of BLAUGI and also publishes *caddmanager.com*, the *CADD Managers Journal*, and the *caddmanager.com* blog. He is currently Director of Technology for HMC Architects in Ontario, California, and can be reached at mark.kiker@augi.com

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Education & Training



What Drives You?

As a professional, you have a constant stream of daily demands in both your personal and professional life. In order to be productive in your professional environment, however, you need to allocate time and effort to update your skills and knowledge. In this article, I want to address what drives adult learners. This will help you gain the most from the limited time you have for learning.

There are a number of factors that determine whether the classes you take and the training you receive will truly be beneficial. I want to highlight those aspects so you can be sure these are incorporated into your learning plan as you look to advance your skills and knowledge.

I also want to show that these points not only affect how we learn, but also how we teach. So those of you who are trainers, listen up! This is what your adult participants in your training sessions are looking for in your presentations.

Motivation

What motivates adult learners? Typical motivations include a requirement for competence or licensing, an expected (or realized) promotion, job enrichment, a need to maintain old skills or learn new ones, a need to adapt to job changes or the need to learn in order to comply with company directives.

The best way to motivate adult learners is simply to *enhance* their reasons for enrolling and decrease the barriers. As a trainer I focus on why the students have enrolled (the motivators). If I discover what is keeping them from learning then I can plan my motivating strategies. A successful strategy may showing adult learners the relationship between training and an expected promotion, greater productivity, or even more free time.

So what are the hooks that drive us adult learners to learn?

Autonomy

As adults, we are *autonomous* and *self-directed*. After years of going through the education system, most of us are tired of being lectured on what we need to learn. We are now in the age of being free to direct ourselves. Those of us who teach must also actively involve adult participants in the learning process and serve as facilitators for them. Specifically, training must incorporate the needs and perspectives of the participants. I've covered this in previous articles on process-based learning.

Life experience

Each of us has accumulated a foundation of *life experiences* and knowledge that may include work-related activities, family responsibilities, and previous education. When we learn new topics and material, we need to connect it to this knowledge and experience base. To help us learn, we should draw upon our experience. Our experience and knowledge can be relevant to any new topic and we want it to add value to what we already know. That way we can relate theories and concepts and recognize the value of the experience in learning.

Goal Oriented

As adults, we are *goal-oriented*. Upon enrolling in a course, people usually know what goal they want to attain. Therefore we appreciate an educational program that is organized and has clearly defined elements. Instructors must show participants how this class will help them attain their goals. This classification of goals and course objectives must be done early in the course.

Relevancy

As adults, we are *relevancy-oriented*. The greatest motivator for learning is that the learner believes there is a reason for learning something. Learning has to be applicable to our work or other responsibilities to be of value. Instructors must identify objectives for adult participants

before the course begins. That means that theories and concepts must be related to a setting familiar to participants.

Practical

As adults, we are *practical*. We look at a lesson and think, "Why am I learning this and how is it going to help me?" Most of us look to see how useful it is to our work or job. If you're like me, you have so little spare time that I'm (regretfully) not interested in knowledge for its own sake any more. As a trainer, I prepare my participants for how the lesson will be useful to them on the job.

Respect

As do all learners, adults need to be shown *respect*. Instructors must acknowledge the wealth of experiences that adult participants bring to the classroom. These adults should be treated as equals in experience and knowledge and allowed to voice their opinions freely in class. This is also part of the AUGI mantra and is so true for all professionals, but especially those of us involved in the Autodesk user community. Network, learn, and share!

I hope that this identification of the key aspects of adult learner motivation has been helpful to the learners--as well as the trainers--among you. Until next time, maybe I will catch you at one of my classes at a regional training event promoted by AUGI. Check out www.cadcamp.com to see if we're coming to your neighborhood this spring or fall.

Until next time, keep that dialog box open.



Matt Murphy is a member of the Autodesk Training Center Advisory Board (ATCAB) and a Certified Technical Trainer (CTT). He teaches AutoCAD productivity seminars at Autodesk University, AUGI CAD Camps, and private companies. He can be reached at matt.murphy@ACADventures.com.

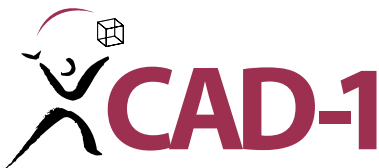
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Tips & Tricks for AutoCAD 2007

Most kids start out by learning to crawl. Then they learn to pull themselves up with the help of a handy piece of furniture or a parent's pant leg. Then they "cruise" around by grabbing onto any supporting item in their path, and finally, they take those first baby steps all by themselves.

AutoCAD 2007? This baby was born to run.

The product development team has reason to be proud. For the first time, AutoCAD® 2007 features tools specifically for conceptual design—the “ideas” stage—and for presentation of your ideas to clients who aren't CAD experts. Drafting tools from AutoCAD 2006 are even more powerful this time around.

That's not all. There's a souped-up set of technology “engines” and interface tools that make interoperability between AutoCAD and Autodesk products such as Autodesk® Revit® Building and Autodesk Inventor® software applications better than ever. And new tools let you share DWF or PDF versions of drawings.

You can find more tips and tricks for AutoCAD 2007 in the April issue of *AUGI HotNews*, and order my new booklet to get still more!

3D modeling settings

Before you create any drawings, your team prepares conceptual designs to present a client with ideas about how to solve a design problem. Conceptual designs—whether they're simple sketches or foam core assemblies—are meant to be intuitive and easy for people to understand. For the first time, AutoCAD 2007 software makes it easy to create, edit, and navigate digital solid and surface models and present them to clients. What's more, you get some pretty sophisticated controls to customize your 3D features on the new 3D Modeling tab in the Options dialog:

- 3D Crosshairs controls the display style of the crosshairs while in 3D making it

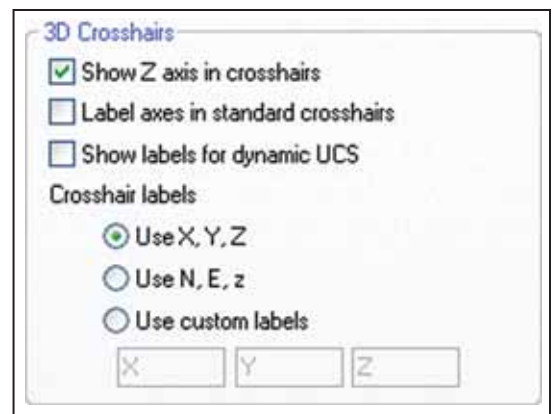


Figure 1. Control display of 3D crosshairs.

easier to always know where you are (Figure 1).

- Dynamic Input now adds in a Z coordinate field when using dynamic input (Figure 2).

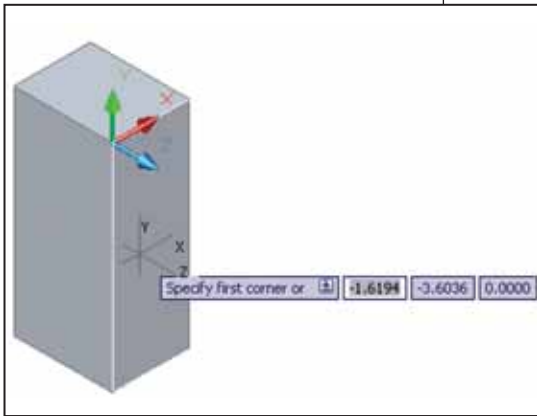


Figure 2. New dynamic input tools add a Z coordinate.

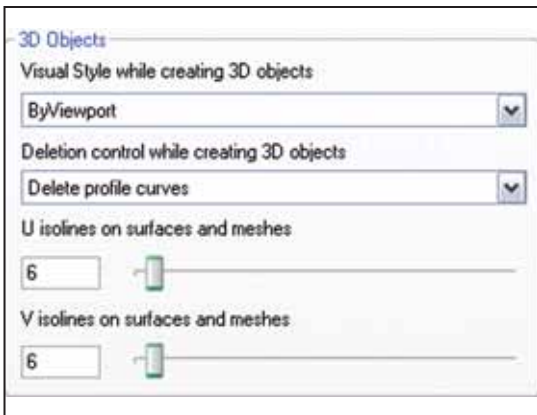


Figure 3. Use 3D Objects to control display of 3D solids and surfaces.

- The 3D Objects section controls the display of 3D solids and surfaces (Figure 3):
 - “Visual Style while creating 3D objects” offers one a means of switching the new powerful visual styles.
 - “Deletion control while creating 3D objects” determines whether or not the profile and path curves are deleted once your 3D object is created. You might prefer to be prompted to delete these details.
 - “U and V isolines on surfaces and meshes” control the number of isolines for surfaces and meshes.

Rendering

A lifelike rendering can “make or break” a design when it’s presented to a client. It’s also helpful to be able to change surface treatments, lighting, and related characteristics to show the effects of changes in design treatment—on the design itself and on related buildings, infrastructure, or product parts.

Fortunately, AutoCAD 2007 software gives you some powerful rendering capabilities without the services of a dedicated rendering specialist. It’s easier than ever to

create a realistic 2D image based on your 3D scene. The updated Render command launches right into rendering your images without the need to answer all types of technical questions. Rendering presets are tailored for quick preview renderings as well as high-quality ones. Here are some advanced tips to make rendering even more efficient and accurate (for you rendering techies).

- Use default lighting and turn off shadows for better performance.
- Don’t go crazy with the lights! Too many could potentially slow you down.
- Intersecting faces don’t render as well—use Boolean commands such as UNION and INTERSECT to correct.
- Faces that overlap and lie in the same plane (coplanar) occasionally produce ambiguous results (especially if they have differing materials). Move the objects so the faces don’t occupy the same plane.
- Twisted faces don’t render well...be sure your faces are created with the corners in the proper order.

Sharing files

No need to worry about losing access to your designs. You can open DWG files all the way back to the first version of AutoCAD. And free DWG conversion and viewer tools let you access files and exchange data regardless of file version.

- You can convert any DWG file to AutoCAD 2007. That’s because DWG TrueConvert™ software translates any AutoCAD or AutoCAD-based drawing file for compatibility with AutoCAD Release 14, AutoCAD 2000, AutoCAD 2000i, AutoCAD 2002, AutoCAD 2004, AutoCAD 2005, AutoCAD 2006, and

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Dynamic modeling

Like AutoCAD 2006 software, AutoCAD 2007 software features a host of ways to streamline 2D drafting tasks. Here are some related tips for those of you who are making the move from AutoCAD 2005 to AutoCAD 2007.

Dynamic input

You can have your command line conveniently follow your cursor! Simply turn Dynamic Input ON from the status bar or press the F12 key. Select the arrow-down key to display any command options (or use the familiar right-click shortcut menus).

- Right-click on DYN to view the Dynamic Input tab of the Drafting Settings dialog (Figure 4). Here you can indicate how much (or how little) information you want to display.
- To display the command line input and prompts from the cursor, make sure “Show Command Prompting” and “Enable Pointer Input” are toggled ON.

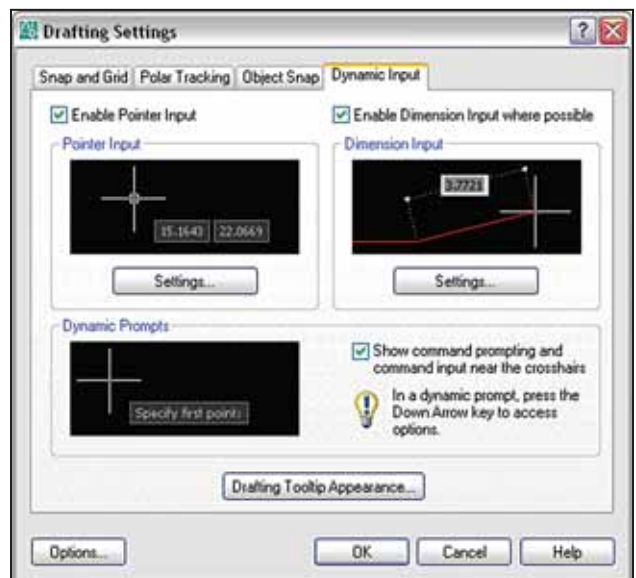


Figure 4. Turn on the Dynamic Input function to make the command line follow your cursor.

- You can turn the traditional command line on or off by pressing Control+9.

For the first time, AutoCAD 2007 features tools specifically for conceptual design— *the “ideas” stage*

You can change the length or angle of existing objects during creation or grip editing. Toggle on “Enable dimension input where possible” and input the new value directly on the screen. Use the tab key to toggle between the two values (this is nearly like AutoCAD is parametric!).

- Tip: Set the system variable TOOLTIP-MERGE to 1 to display both the indicated object snap and the command prompts.
- In AutoCAD 2007, if you enter an unacceptable value, the value automatically highlights and enables you to reenter the correct value.

Quick command and recent data access

The AutoComplete function will finish your input for you. This comes in handy should you forget how to spell a specific system variable or infrequently used command.

- Key in the text you know and use the tab key to cycle through all the possibilities. For example, if you know the system variable starts with “SP,” key that in and then hit the Tab key until the correct setvar appears on the command line.
- A Recent Input option appears on your shortcut menus, making it easy to recall a previously used value (Figure 5).

Controlling toolbar and tool palette placement

If you have all your toolbars and palettes right where you want them—lock them up!

- Right-click on the lock at the end of the status bar and select what you want to

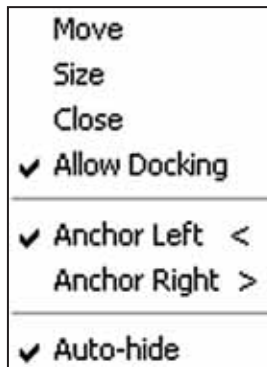


Figure 5. The Recent Input option makes it easy to find recently used values.

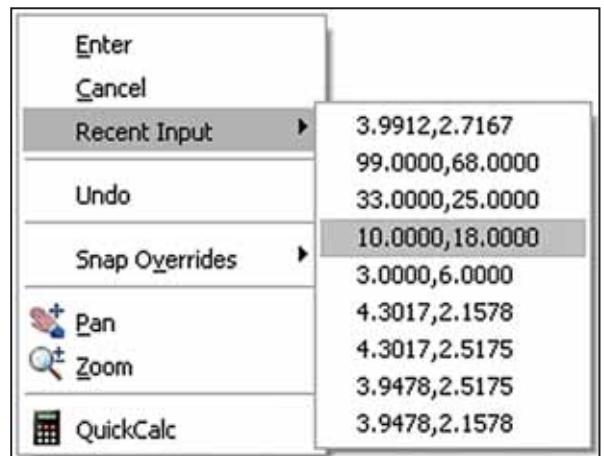


Figure 6. Attach your palettes to keep them handy but out of the way.

lock from the shortcut menu.

- You can still use the Control key to temporarily override locking.
- Attach your palettes to an anchor tab base on the left or right side of the drawing area. The palette rolls open and closed as the cursor moves across it, keeping them out of the way but available for quick access. Simply right-click on the name bar and select Anchor left or Anchor right from the shortcut menu (Figure 6).

Get ready to run!

These are just a few of the many features and functions you’ll find in AutoCAD 2007. Beyond the better drafting tools that you’ve come to expect, the latest software gives you the power to start doing conceptual design in AutoCAD—and gives a real

productivity boost to users who already do so. Get ready to run with AutoCAD 2007!



Lynn Allen, Autodesk technical evangelist, speaks to more than 30,000 AutoCAD users worldwide each year. For the past 12 years she has written a monthly column in *Cadalist* magazine called “Circles and Lines,” and has authored several books about AutoCAD. Lynn has been teaching at the corporate and college level for 15 years, and started using AutoCAD software with Release 1.4 more than 20 years ago. Visit Lynn Allen’s blog at www.autodesk.com/lynnallen and access her *Cadalist* columns at www.cadalist.com.

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Match Your World to The Real World

There aren't many techniques that create more of a visual impact than the seamless integration of 3D elements into video or photographs—for example, digital set extensions and replacements in the movie industry or in architecture by adding a newly designed building into its real world location. The math behind this technique, photogrammetry, has been around for a while, but the implementation of it has long been too difficult or too expensive for the average user to take full advantage. Though matching video and photographs are similar in concept, they are different in their execution. So for the sake of clarity I'll focus only on using the Camera Match Utility for camera matching photographs or locked-down video. Let's get started.

Preparation

As with most things in life, there is a certain amount of preparation required to achieve good and predictable results. Camera matching consists of two main areas. The first is identifying matchable points/features in your photo/video. The second is associating measured 3D information to the points/features you have chosen. The correlation between these two areas is what allows the software to replicate the position and viewing angle, in 3D, to that of its real-world counterpart. It is imperative to take photographs that have features spread out evenly throughout the scene—which represent the space from foreground to background as well as the side-to-side and up and down distance. It is also extremely important to take accurate

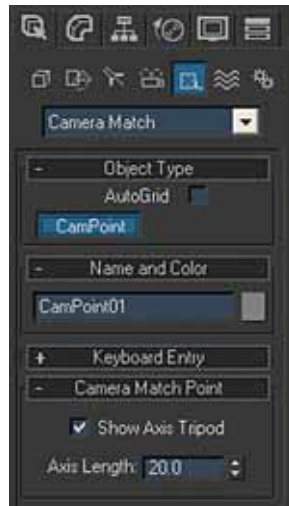


Figure 1

measurements at the scene. I can't stress this part enough. The software requires at least five points to calculate a solution, but it's a good idea to have more in case you need to refine it later. It's usually a good idea to match only five points initially...why do more work than you have to?

Scene setup

In order to match the camera, you need to model simple stand-in geometry from the measurements taken at the scene. The models should be low-resolution

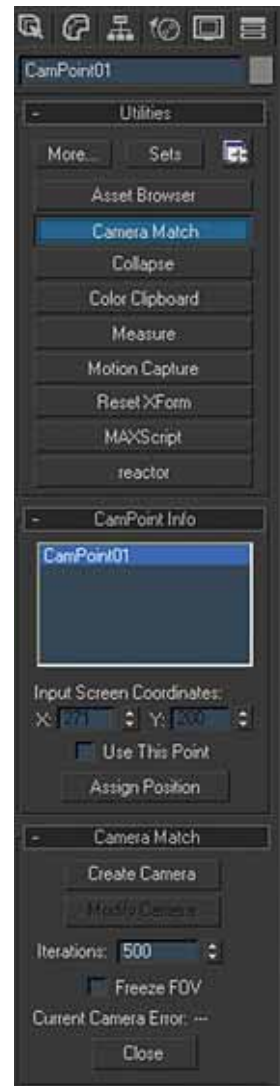


Figure 2

representations of the features in the photo. Once you have the models created in 3D, you need to insert a helper object, called a CamPoint. These CamPoints should be placed on the stand-in geometry in your 3D scene. The CamPoints should be at the 3D coordinate location of each of the features you specified in the photo background based on the scene measurements. It is good practice to name the CamPoints similar to the real-world description. For example, front left building corner or stop sign base. Once the CamPoints are named and in the proper locations, you can setup the viewport and rendering backgrounds.

On the menu bar choose Rendering>Environment. Then in the common parameters rollout, click the Environment Map button and choose bitmap from the Material/Map Browser. In the select Bitmap Image File dialog, navigate to your photo, select it, and click the Open button. This sets

your photograph as the background when rendering. Be sure to change your rendering output size in the rendering dialog so that it matches that of your photo. This is to avoid any image distortion and to assure that there is synchronization between the rendering and viewport backgrounds and the rendering output.

From this point, you can setup the viewport background. Activate the perspective viewport by right-clicking anywhere inside it. On the menu bar, choose Views>Viewport background to display the viewport background dialog box. Click the Files button in the Background Source group, choose the same photo you selected in the previous step, and click Open. Go down to the Aspect ratio group and select the Match Bitmap option. Click the Display Background checkbox and click Okay to show the map in the viewport.

Camera matching

Now that all the CamPoints have been placed in your scene at their real-world locations and the viewport and rendering backgrounds are synchronized, you can move on to placing 2D Screen Points and creating the virtual camera. Go to the Utilities tab and click the Camera Match button. Maximize the viewport and turn off the home grid. Once the Camera Match Utility is open, all of your CamPoints should be listed in the combobox in the CamPoint Info rollout. Select the first point in the list and click the Assign Position button to create a 2D screen point on the background image. You can input the screen coordinates directly using the X and Y spinners, but manually assigning the points is faster. The 2D screen points must be placed as accurately as possible. It is also good practice to pick five or six points to match and then try to solve while adding extra 2D screen points to refine the solution/camera.

You can also just make your way through all of the points repeating the same steps as above—neither has much time savings; it's more a matter of workflow. Once all the screen points have been matched to their corresponding points in the viewport background, you can click the Create camera button in the Camera Match rollout. This creates a camera with the settings that match the physical camera used to take the photo. To set the matched camera to your current viewport, right click on the viewport label and go down to Views and select the camera from the list.

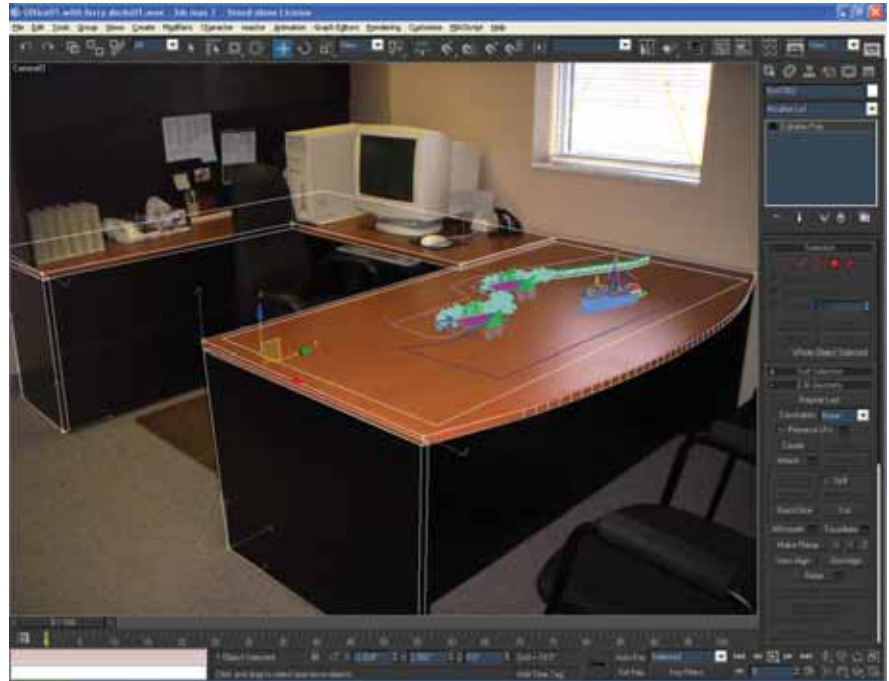


Figure 3



Figure 4

Endless possibilities, but prep time is crucial

Matching 3D geometry to 2D photographs or locked-down video is not terribly difficult, but it does take some time and a lot of preparation. When using the Camera Match Utility inside of Autodesk® 3ds Max®, you must have accurate scene measurements and good high-resolution photos with lots of distinct features. The cool thing about using the Camera Match utility is that you can use it at any scale, whether it is to insert a coffee cup on your

desk or include a proposed shopping mall complex into an aerial photograph. The possibilities are endless. Have fun.



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Make Your Assemblies Come to Life

Basic Kinematic Motion or Drive Constraints

Let's start with something very basic, like making fingers move. Now is as good a time as any to start getting ready for Halloween. You can use this exercise to design creepy fingers and send your co-workers avi files. It all depends on how much time you want to spend on dressing up your models. Let's get started.

Note: this article is taking shortcuts due to space limitations; not all parts are properly connected for actual movement. For example, there aren't any rods, pins, or wires connecting the fingers to the lever to control movement. We are controlling all movement with parameters. Okay, so this is more than just using constraints, but isn't that what learning is all about? Not only how to do it, but to do it coolly as well. Parameters is a table of dimension and constraint setting values. We will use those pre-defined values to set up a formula to drive our fingers.

First we need to create some basic fingers; these are pretty plain and easy to create. Create a finger, 1/2 inch thick (see Figure 1).

- Create a wrist (see Figure 2).
- Create an arm (see Figure 3).
- Save all three models in a common folder.

Start an assembly drawing. You will need to start placing parts or components into your assembly model.

A shortcut menu is available by right-clicking in the model area of the display. Next, you can select the place component option. Another way to place a part is to press the "P" key, the shortcut key for Place Component. After you have placed a part into your assembly, you may right-click and select Done or you may keep dropping in parts until you have as many as you need.

Hint: If you need to place additional parts, do not right-click and select Done, but press the "P" key and keep going. This will save you time when placing lots of

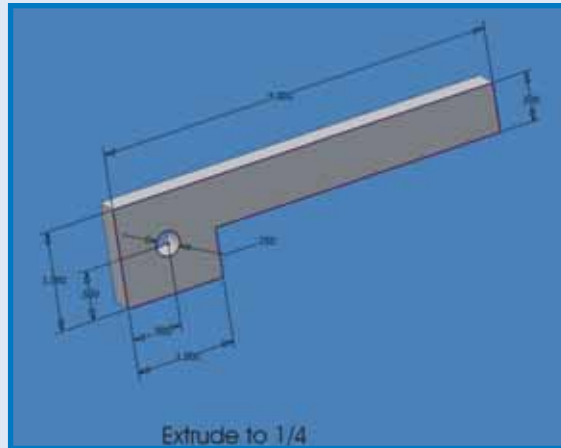


Figure 1: Finger

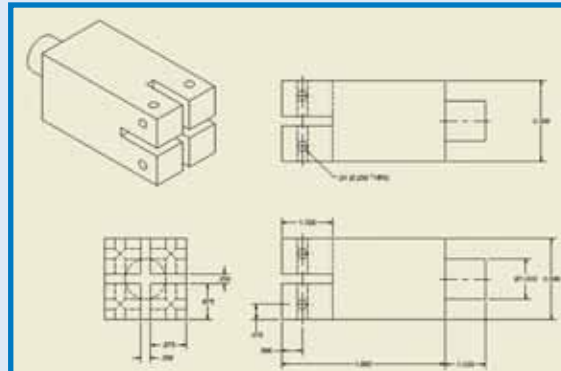


Figure 2: Wrist

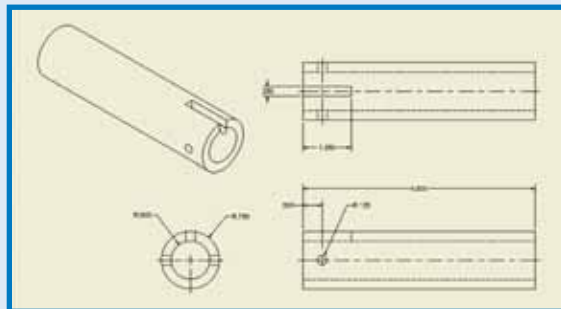


Figure 3: Arm

parts for a large assembly.

Now place the arm, as the first part, in the model. This will ground the arm, and will allow the other parts to move in relation to the arm. The first part placed in an assembly is grounded by default and the

origin of that part is placed at 0,0,0 in the assembly model.

Locate the finger and drop or place it five times. We will use one of the fingers as a lever in back to operate the fingers. We will also use the reference angle of the lever to rotate the wrist, as the fingers are moving. We now have one more part to place in our assembly; use one of the methods listed above and place the wrist into your assembly.

Now to assemble all of your components into a wrist assembly. This is where you need to pay attention to how you place your constraints and to how you assemble your components. This will make setting up and configuring the equation within the Parameters dialog box easier.

Select the constraint button, with the Assembly tab, select the fourth button, "Insert," under type, Fit (see Figure 4). Select an inside hole of the wrist, then select a hole on one of the fingers. You may have to rotate one or several of the fingers before you place the constraints. Start constraining the fingers as pictured on the assembly diagram (see Figure 5). At this point, the fingers may not all be pointing as shown in Figure 5. We need to place angular constraints to accomplish that. In Figure 4, choose the second button, Angle, and select the top surface of the finger, then select the point on the wrist that would be parallel if the finger were straight out. Make sure the angle is at 0 degrees. Then select Apply, this will force the finger to become parallel to that surface. Follow the same procedure for

each of the other three fingers. Now let's use the parameters feature of Autodesk Inventor® to set the angle for the second, third, and fourth fingers to be equal to the angle constraint of the first finger. The parameter button,

in the Assembly Tool Bar, looks like an “fx”. The Parameter dialog box will open, and look something like Figure 7. There will be four Equations, which have 0.00 deg or 0 deg, and they should be in order—for example d15, d16, d17 and d18. Highlight the “0 degree” of d16 and type in d15, repeat this for d17 and d18. Click Done, then update your model. If you don’t update your model, any changes made in the parameters will not immediately be affected in your model.

Now, let’s change the degree value of the angle constraint for the first finger. In the part tree, expand the branches for your finger:1 part. There should be a constraint listed as angle1 and, there should be a value of 0 or 0.00. Select that value and at the bottom of the tree, the value will be shown and can be changed; change the value to 20 and press enter. If that is the correct angle, the fingers should open. If the fingers close towards each other, you need to use -20. If one or several of the fingers open, and others close, you will need to open the Parameters dialog box and, for the fingers that closed, change the equation value to -d15. Close the dialog box, select the angle constraint for the first finger, and try changing the value again. All fingers should open. If all the fingers open, let’s move on, if not, repeat changing the values in the Parameters Dialog box and changing the constraint value again.

Go to your Model dialog box and select the angle constraint for the first finger. When you right-click on top of the angle constraint, a shortcut dialog box opens. Select “Drive Constraint.”

A dialog box opens (see Figure 6). One of two direction arrows will highlight on the left side. Click that and see what happens—all fingers should move together. If they move together, click on the other arrow, which should be dark. This will move the fingers back to their starting position. Change the default setting for the “End” from a negative num-

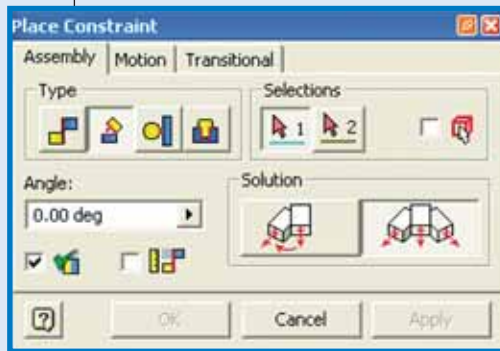


Figure 4: Place Constraint

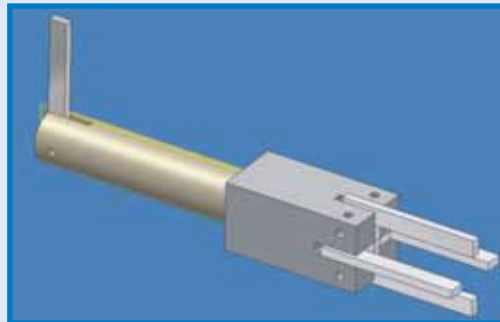


Figure 5: Wrist Assembly



Figure 6: Drive Constraint

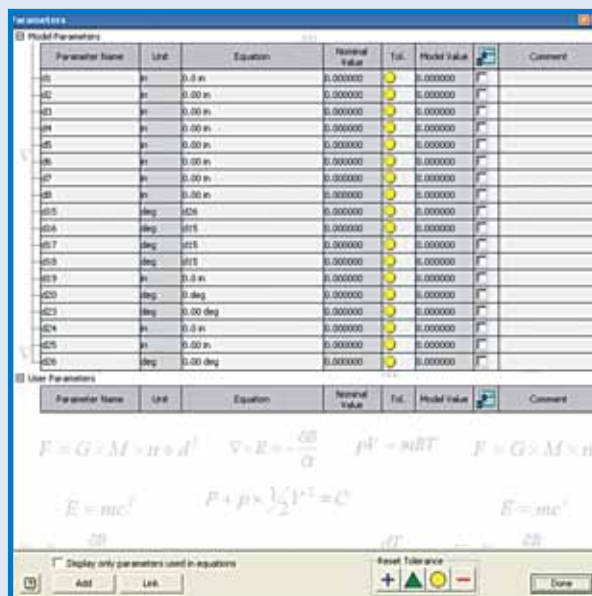


Figure 7: Parameter

ber to a positive number and click on the dark arrow, and all fingers should move outward together.

Once we have all fingers moving together, use constraints and place the last finger into the Arm, similar to how we placed the fingers into the wrist. Use an Angle Constraint and set the top of the arm to the top of the wrist at 90 degrees. Open the Parameters dialog box again, see what value you just created for the last Angle Constraint. If that is d24 (for example) change the equation value for d15 (the angle constraint for the first finger) to d24. Close the Parameter dialog box and find the angle constraint for the last finger. Let’s call this a lever. Right-click on the angle constraint, select the “Drive Constraint,” and click the dark arrow. As the lever moves, so will the fingers.

If you were to open the parameter dialog box and change the equation value from d24 to d24/2, then as the lever moves, the fingers will open or close half the distance. You can now set different values and move the fingers in your desired ratio between the lever and fingers. Other options are to ground the arm, un-ground the wrist, set an angle constraint between the side of the wrist and the lever, set a value in the parameters dialog equal to the wrist, d24. As the lever moves, the fingers will move and the wrist will twist. You could have a lower arm, an upper arm instead of the lever, a shoulder, etc. As you move one angle constraint with the drive constraint, the whole arm will move at the joints, and the fingers will move.

Now, how do I make an .avi file and send it to a friend? In the Drive Constraint dialog box, there is a button that looks like a red target. Once you have set the amount you want your fingers to move, select that red target button, record, and answer the questions to create an .avi movie file.

Experiment with this and remember: creating solid models can be fun!



David Keener is a Design Engineer for SMT Industries in Sidney, Ohio, and also an Adjunct Professor at Edison Community College in Piqua, Ohio.

He has been using AutoCAD for 10 years and Autodesk Inventor for more than two years. He can be reached at d_keener@smt-ind.com

What is the horizontal approach?

This month's columnist, Jim Balding of WATG, trains architects and designers in Autodesk Revit. Here he warns against trying too much too soon

Editor's Note:

This month's article is a continuation of Jim Balding's "Horizontal Approach" to schematic design using Revit, in which he outlines time-saving ways to take a project into Design Development.

In the next issue we will look specifically at the new kid in the Revit family, Revit Structure, which is undergoing rapid development.

In March Chris Fox attended an Autodesk Update Technology Day in Sydney, Australia. It was a real eye-opener. Kiwi CAD Software, creator of third-party packages for 3D concrete and steel detailing on the AutoCAD platform, announced that it will develop versions of these detailing applications for Revit Structure. This is confirmation that the Revit platform is gaining wider acceptance in the marketplace and should be exciting news for structural engineers.

In my last article I outlined the "Horizontal Approach," a method for using Autodesk® Revit® efficiently during the early, conceptual design phase of a project. This method emphasizes incorporating 2D information from other sources (hand drawings, CAD) into a Revit project to

illustrate design ideas rather than spend time modeling prematurely.

Once the traditional deliverable package—plans, sections, elevations, etc.—for the conceptual design phase has been presented, the design program has been organized into areas and rooms, and design character accepted by the client, then further modeling becomes worthwhile.

When to go vertical

The next phase is taking the schematic design model into Design Development. The emphasis will be on modeling the exterior skin and adding more pertinent building info. The goal is to be able to remove imported raster images and/or CAD files from the presentation drawing set and replace them with accurately modeled information.

Now is the time to model all the exterior geometry—3D railings, mullions, wall caps and kickers—add materials, add the floors, and even some of the site work. In addition, we change our sheets from presentation sheets to documentation sheets with added notes, dimensions, and other annotation.

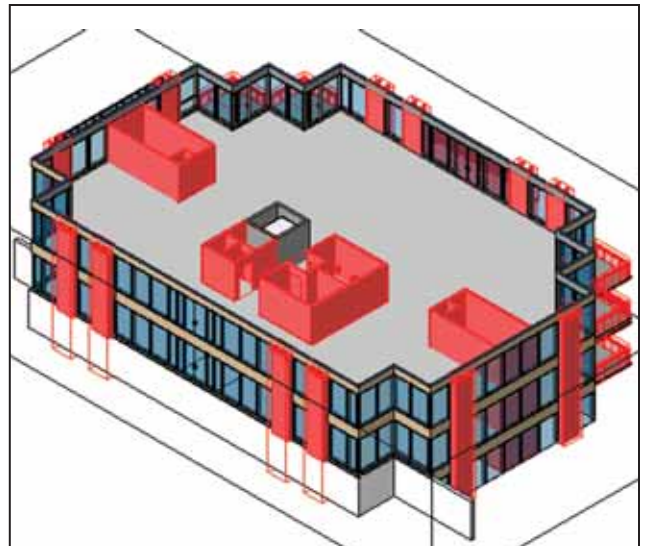


Figure 1 – Groups in the project model are highlighted red. They include stairs, bathrooms, balcony handrails, and exterior columns. Plan views of stair and bathroom groups include room tags.

Place holders

In essence you are going from the horizontal to the vertical. Just as we took baby steps into the first phase of this project, we will continue with that philosophy. When just beginning the DD phase of a project, I like to implement "The Place Holder Approach," which dictates that you now model all the components possible. That said, you will not have all the information nor the design input required to FULLY model each piece; so you model generically and use these components as "place holders." These place holders are reasonable replications of what the final components might be. Further into DD and during the Construction Document phase you take the place holders to REAL components (named, with manufacturers, materials, model numbers, etc).

One way to leverage the Place Holder concept, and it starts with the first plans you create, is the use of Groups. Try using Groups whenever you have content that will repeat across a design, such as stairs, bathrooms, or balconies. In the sample project we used all those from the beginning, and we add exterior columns as groups in the Design Development/Place Holder phase.

Group think

Groups save time and effort because all copies of the group update when the group is edited. Groups can include annotations along with model content. Detail Groups can be attached to model groups, so you can include room tags, for instance, that will automatically update.

In the DD phase, now that elevations show the model rather than raster images, we replace generic exterior walls with columns that are groups. The wall components of the columns are still partially generic, but with materials defined. Column caps have been added but not fully detailed and the "kickers" are in place pending complete development.

The illustration shows the design sketch of column tops, the generic walls put in place to make the plan accurate in the SD pages, and developing column caps for the DD set. By using groups, only one column of

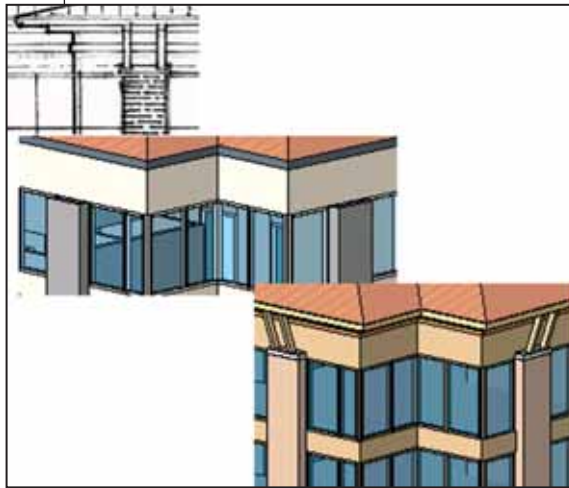


Figure 2 – Development of the roof, soffit, eaves, and column caps from sketch to generic wall-to-wall combined with in-place family in a group.

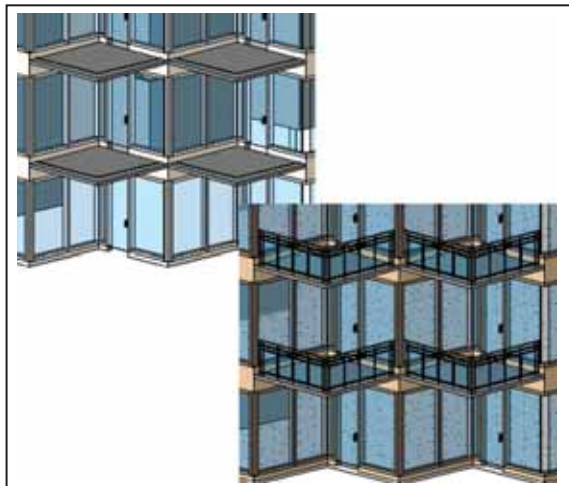


Figure 3 – 2D balcony rails (model lines, actually) become 3D railings.

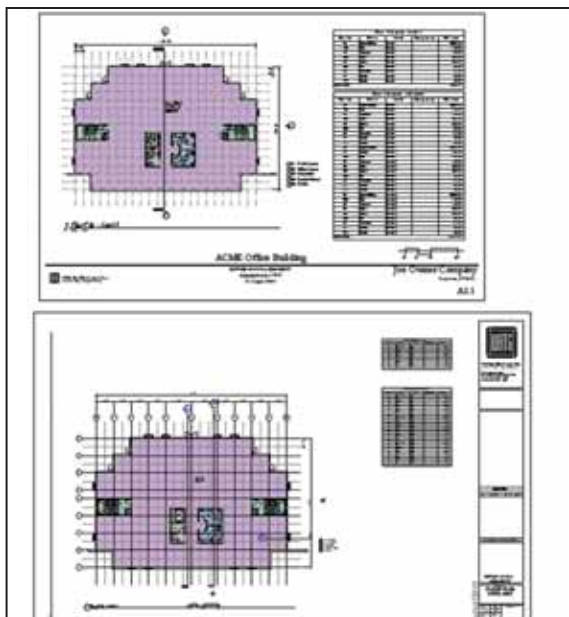


Figure 4 – Swap out an informal sheet style for a larger documentation type, all pages at once.

each type (short and tall, in this case) needs to be edited.

The other exterior modeling task in this phase of the project is taking the balconies to 3D, developing a handrail type, and specifying curtain wall mullions and doors. Here again, using a group allows you to edit one instance only.

Between the sheets

Changing presentation SD sheets to larger DD titleblocks and more formal annotation is a breeze with a little planning and preparation. Load the project, or better yet the project template, with the necessary annotations in the appropriate style for the project phase. Simply select any titleblock (or tag, gridline, or dimension), right-click, and pick Select All Instances, and you can swap your entire sheet set from one style to another. Items do not have to be visible for Select All Instances to work its magic.

Wrapping up

In summary, the use of the horizontal approach in the early stages of design saves time and effort by managing to a specific, traditional deliverable. Going vertical is reserved for a time when the design has settled down and the use of generic (or semi-generic) content is widespread, allowing for the development of the building through the use of the place holder approach. The use of groups adds to the efficiencies in accelerating the replication of repeated components.

The sample office building illustrated in this article can be downloaded from https://projectpoint.buzzsaw.com/watg/WATG_Public/AUGIWorld/AUGIWorld-PHA.rvt?public. Please feel free to examine it as an example of the place holder approach. All design copyrights remain property of WATG.



James J. Balding, AIA is a licensed architect and the Director of BIM Implementation at WATG. Jim is the AUGI Revit Product

Chair and co-Author of *Introducing and Implementing Autodesk Revit Building* (Autodesk Press).

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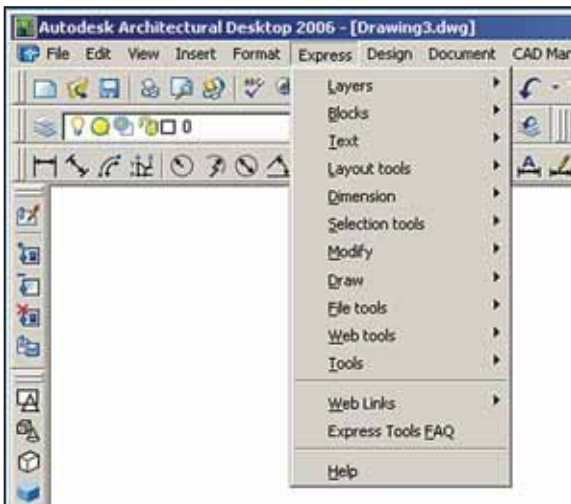


Figure 1

SUPERHATCH

SUPERHATCH is similar to the hatch command, but it allows you to use an image, block, xref, or WIPEOUT as a hatch pattern. The SUPERHATCH dialog box provides several options:

- Image – Attach Image dialog box opens and allows for specifying the image for the hatch pattern.
- Block – Opens a dialog box that allows you to specify the block for the hatch pattern.
- Xref Attach – Xref File Name dialog box opens and allows for specifying an xref file for a hatch pattern.
- Wipeout – Selects WIPEOUT as a hatch pattern.
- Select Existing – Selects an existing image, block, xref, or WIPEOUT for a hatch pattern.
- Curve Error Tolerance – Specifies error tolerance for curves.
- Help – Accesses the Help information menu.

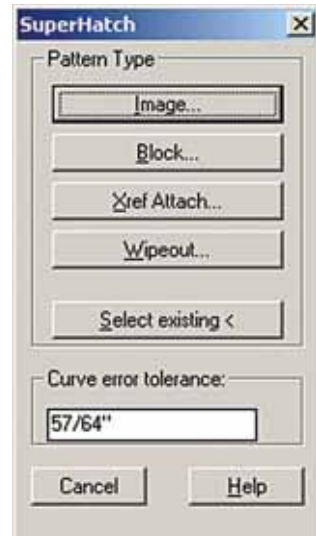


Figure 2

BREAKLINE

BREAKLINE will create a polyline and will insert the breakline symbol. To control the relative size and appearance of the breakline symbol, the following options are provided:

- Block – Determines the block that will be used as a breakline symbol.

- **Size** – Determines the size of the breakline symbol.
- **Extension** – Determines the length of the line extension beyond the selected points.

If you want to use your own block for the breakline symbol instead, then make sure that the block contains two point objects on the Defpoints layer. Those point objects will determine how the line will be broken as well as the placement of the symbol.

FASTSELECT

FASTSELECT is used to create a selection set of objects that touch the selected object. The behavior of FASTSELECT is controlled with the command FSMODE. If FSMODE is set to ON (which is the default), FASTSELECT will select only those objects that are touching the selected object. When FSMODE is OFF, FASTSELECT will select all the objects that are touching the selected object and any objects that are touching those objects. The command will continue down the chain of unselected objects that are touching the selected object until no more unselected objects are visible on the screen.

FASTSELECT can be used at the command line and also in many commands. It is important to note that FASTSELECT will select only lines, polylines, circles, arcs, attribute definitions, text, mtext, ellipses, and images.

Cookie cutter trim

EXTRIM is used to trim all objects at the cutting edge specified by a selected polyline, line, circle, arc, ellipse, mtext, text, or attribute definition.

Explode attributes to text

BURST will explode blocks and convert attribute values to text objects. The exploded attributes will assume the original attribute definition's style and layer.

Synchronize viewports

VPSYNC will synchronize one or more viewports with a master viewport. All synchronized viewports will take on the zoom factor of the master viewport. To give your drawing a cleaner appearance, you can place all the viewports on a separate layer and then turn that layer off after running VPSYNC so that the edges of the viewport are not displayed.

Convert text to Mtext

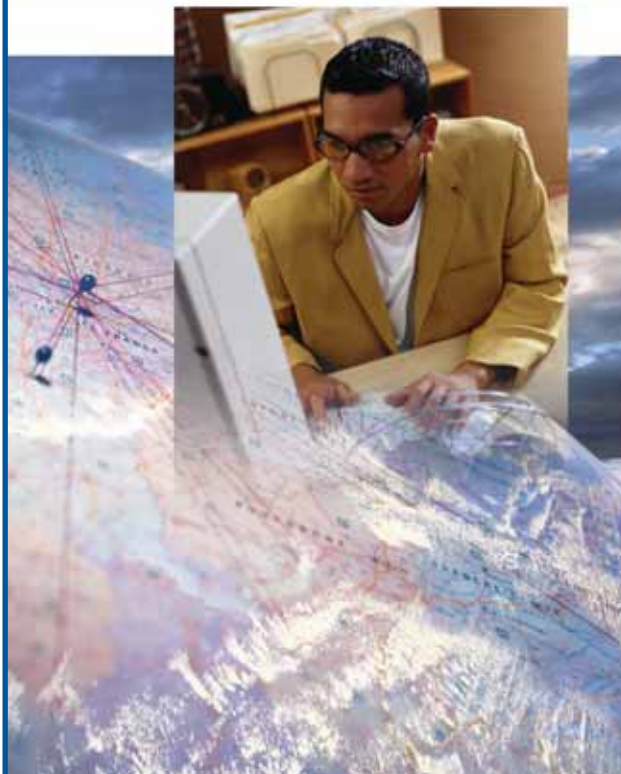
TXT2MTXT will convert one or more lines of text to Mtext. TXT2MTXT will work on any text objects that are created with the TEXT or DTEXT commands. The selected text objects will be removed from the drawing and a new Mtext object will be inserted. This command attempts to honor the text size, font, and color changes between text objects. If the original set of text objects was created with DTEXT or with successive text commands, you will need to enable the Sort top-down option and disable the Create word-wrap Mtext options, which will produce the most visually similar results.

Layer freeze

LAYFRZ will freeze the layer of the selected object. This Express Tool has three options:

- **No Nesting** – Freezes the layers of the selected objects. If a block or an xref is selected, the layer that contains that block or xref is frozen.
- **Entity Level Nesting** – Freezes the layers of the selected objects, even if they are nested in an xref or in a block.
- **Block Level Nesting** – Freezes the lay-

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ers of the selected objects. If a selected object is nested in a block, the layer containing that block is frozen. If a selected object is nested in an xref, the layer of the object is frozen.

Command alias editor

ALIASEDIT will allow you to create, delete, and modify command aliases. Aliases can be created for AutoCAD or DOS executable commands. There are two tabbed sections: Command Aliases and Shell Commands. Options common to both sections include:

- Add – Displays a dialog box that allows you to add a new AutoCAD alias and command or DOS alias, command, and prompt.
- Remove – Removes AutoCAD or DOS command alias from the acad.pgp file.
- Edit – Displays a dialog box where you can edit the currently selected AutoCAD alias and command or DOS

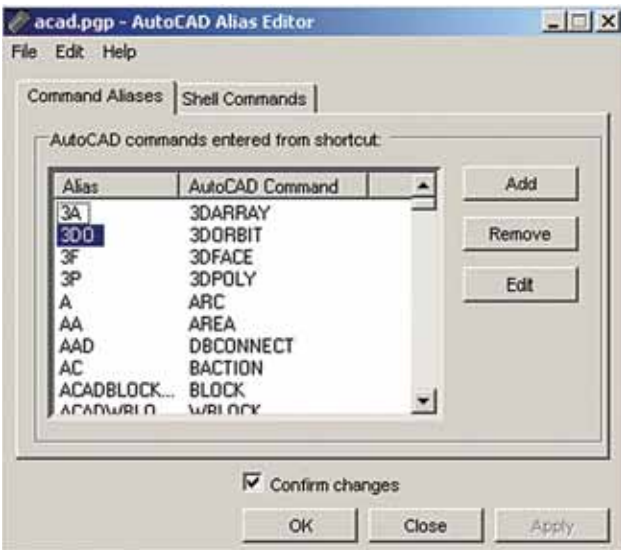


Figure 3



Figure 4

alias, command, and prompt.

- Confirm Changes – Turns the display of the confirmation dialog box on or off.
- Apply – Saves changes in progress, and then allows you to continue editing.

Isolate layer

LAYISO will isolate the layer of one or more selected objects by turning all the other layers off.

System variable editor

SYSVDLG will allow you to view, save, and edit system variable settings. It is important to note that no changes are saved to the drawing until you choose OK. All of the pending changes can be discarded with the Cancel button. New system variable values are validated as they are

changed. The dialog box includes the following options:

- List Box – Displays a list of system variables. The edit field above the list box allows for filtering the list box display based on user input. If nothing is entered in the edit field, the list will display all of the system variables. If more than one system variable is highlighted, all of the edit and display options are unavailable.

- New Value –

Displays the current value of the system variable highlighted in the list box and allows you to edit that value. No changes are committed until the dialog box is closed with the OK button. The edit field will be unavailable if the selected variable is a read-only type.

- Current Value – Displays the value of the system variable that is highlighted in the list box as of when SYSVDLG was started.
- Initial Value – Displays the initial value of the system variable highlighted in the list box. This is the value that the system variable has in a new drawing.
- Saved In – Displays where the value of the highlighted system variable is saved.
- Type – Displays the type of the highlighted system variable.
- Save x – Saves the current system variable settings to an SVF or SCR file. SVF files can be read into SYSVDLG. SCR files are AutoCAD scripts, which can be run from the AutoCAD command line. The button will display Save All, Save Filtered, or Save Selected, which depends on the condition of the system variable list.

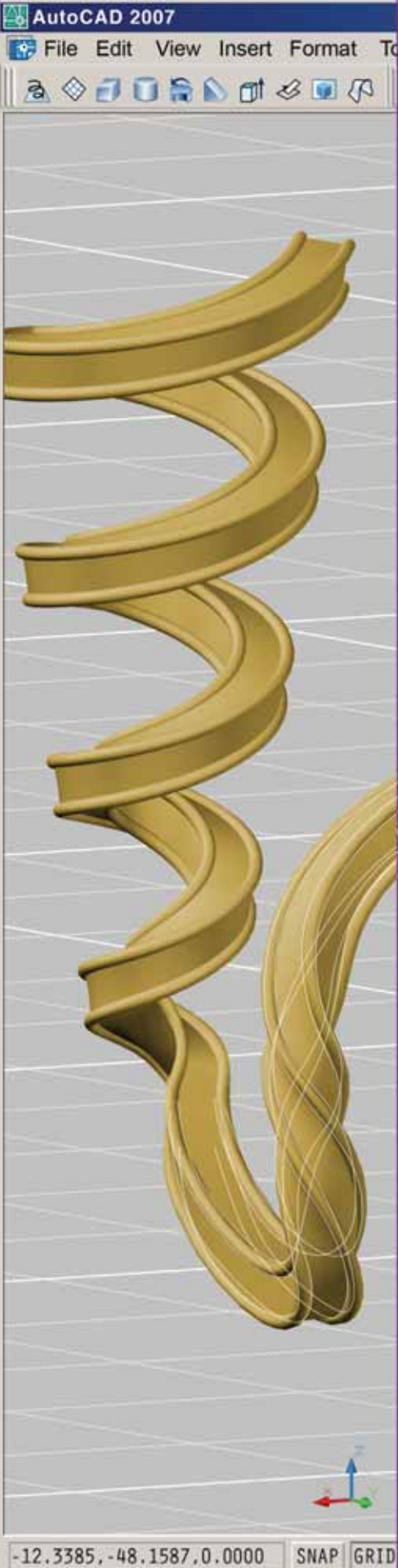
If only one system variable is selected and the list is not filtered, then all of the system variables will be saved. If more than one system variable is selected, then only the highlighted items will be saved. If the list has been filtered, as with a wild-card, the list is saved as displayed.

- Read – Restores saved settings from a SVF file.



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The Secrets to Productivity – Revealed!

Manage Your Block Libraries with Tool Palettes

If you remember from my previous articles on tool palettes in *AUGIWorld*, you should realize the productivity gains and increased functionality such as Command Tools, Object Tools, Content Tools, Table Tools, Fly-outs, Palette Groups, and true drag-and-drop creation from inside AutoCAD® and outside AutoCAD with Microsoft directory sources.

Palettes are powerful, but there is no easy way to manage multiple palettes across the releases that support them, nor is there a clear enterprise solution.

In this article I will cover the secrets to managing and implementing multiple tool palettes as a secure standard across your network in an enterprise solution.

Managing tool palettes

Managing tool palettes with paths
Just like managing your support path statements in AutoCAD, you can set a tool palette path location and not use the group feature.

To demand-load palettes, you can set the tool palette path using a system variable. Having multiple paths set with a small toolbar macro will allow you to switch between palettes. This technique uses a system variable called `*_TOOLPALETTEPATH` and allows you to change the location in which AutoCAD is looking for tool palettes. By default the location is: `C:\Documents and Settings\Application Data\Autodesk\AutoCAD 200XR16.X\enu\support\ToolPalette`

If you copy the tool palette directory to a location on the network and give it a different name, you can use a macro like the

one below with a toolbar button to switch to that location. This allows you to create multiple smaller palettes and to demand-load them in a more manageable way.

For example: `^C^C*_TOOLPALETTEPATH "H:/Tool Palettes/Electrical Tools"`.

This macro would set the environment variable for the tool palettes file location. Notice I switched the standard backslash to a forward slash as the backslash is reserved for a pause in a command macro.

Here is where the secret is located. You could also write this macro into a custom command and access it from a shortcut key or menu.

SECRET REVEALED: You could also create a command tool that could be used to switch between different directories of tool palettes paths. You can use this method to share tool palette content while allowing users to add and manage their own content by having multiple tool palette paths, like this macro: `^C^C*_TOOLPALETTEPATH "C:/Documents and Settings/Application Data/Autodesk/AutoCAD 200XR16.X/enu/support/ToolPalette,H:/Tool Palettes/Site Plan Tools"`

SUPER SECRET REVEALED: You can also create a blank palette window with no tools by setting an empty path or a path to a folder that is empty. As soon as

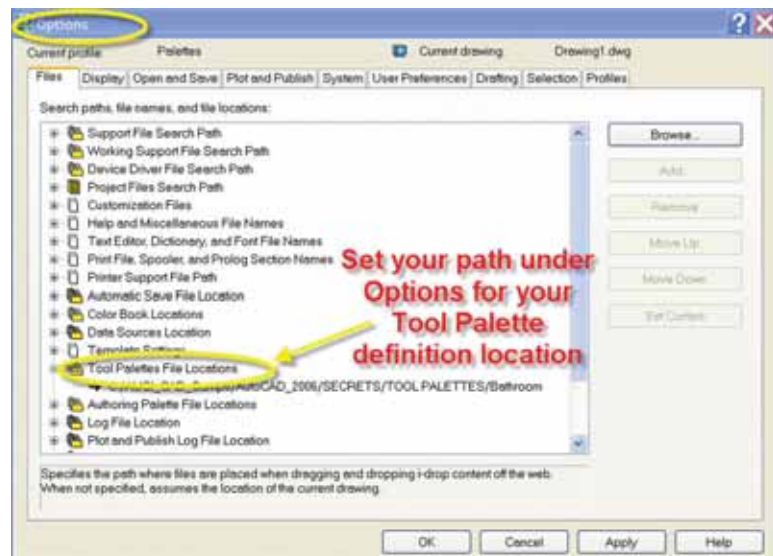


Figure 1

you set this path under Options, then AutoCAD will automatically build the necessary XML content with a catalog ATC file in the root level of this folder and will automatically create a support folder with each additional palette as a new ATC file. AutoCAD will also automatically create a folder to hold all the tool images.

SAFETY TIP:

If you plan on building your tool palettes as an enterprise solution for your company, I recommend building all your palettes and content locally first. Make sure your palette tools map to the same network drive locations for each of the users.

Note: It might seem obvious, but it's worth saying: Make sure the path locations for the source files exist in your support path locations under Options... Files.

Protecting your tools

Once you have created your content and set your palettes in a shared folder, you'll want to protect them from being modified. Network drives can be set to read-only and local drives can be set by right-clicking on the file in Windows Explorer and setting the properties of the folder to read-only.

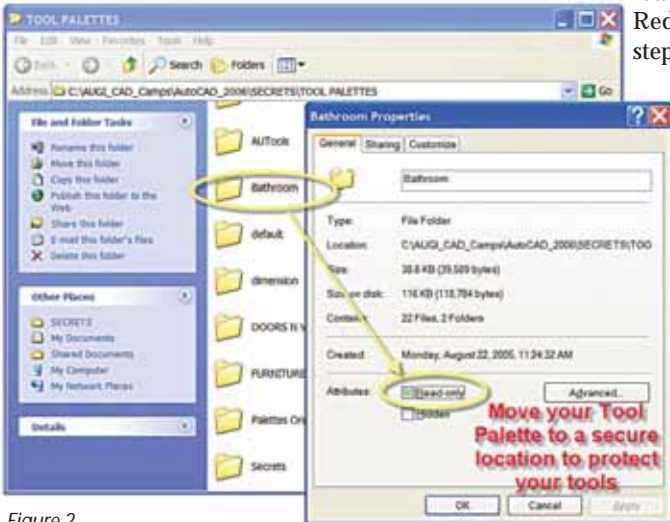


Figure 2

The next time you restart AutoCAD and open the tool palette Windows, you'll see a small padlock in the lower corner.

SECRET REVEALED: Locking the tool palette folder only prevents the content from being changed. Individuals who have access to the folder that contains the definition will still have the ability to rearrange the tools on the palette as well as control the appearance of the palette.

SECRET REVEALED: When moving ATC files and folders to new locations,

tools that appear in the palette will appear in the order they were created.

SUPER SECRET REVEALED: Tools and palettes will appear in the order they were created! If you want to maintain the order of tools on shared palettes, you'll need to move the original profile (.AWS) file to the local machine. As long as the profile exists locally with the same name as the original profile, the .AWS file will maintain the order of the tools based on their most recent locations.

Summary

I believe that the creation and incorporation of tool palettes into AutoCAD is the greatest productivity tool ever! If you learn to apply palettes you will never go back to using pull-downs and toolbars. Tool palettes provide the easiest way to customize without the need for programming. You gain valuable drawing real estate and you can organize or group your tools into tabs. You can't do that with toolbars or pull-downs without tedious cascade and fly-out programming.

Finally, tool palettes will make you more productive because you will be able to do your design work with fewer clicks and picks. Reducing repetitive steps and reducing clicks

and picks is how you become more productive working with AutoCAD, period!



Matt Murphy, is a member of the Autodesk Training Center Advisory Board (ATCAB) and a Certified Technical Trainer (CTT). He teaches AutoCAD productivity seminars at Autodesk University, AUGI CAD Camps and private companies. He can be reached at matt.murphy@ACADventures.com.

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Modeling AutoCAD 2007

AutoCAD® 2007

delivers several new 3D solid modeling tools that go beyond simple analytic solids such as prismatic, cylindrical, and conic shapes. The new tools include Helix, Sweep, Presspull, Polysolid, and Loft. There are also several tools that make the creation and editing of solids easier, including improved Imprinting, Dynamic UCS (DUCS), UCS with Z-axis vector based on selecting an object, Planar Surface, Slice with Surface, and Dynamic Grips Editing.

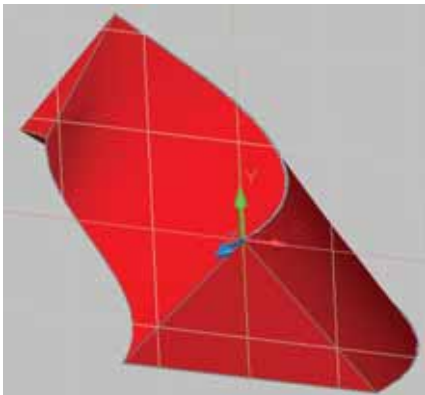


Figure 1: Sweep on Helix

In Figure 1 the UCS Z-axis vector was set with a single click on the cyan helix curve, then a triangle was created perpendicular to the start of the curve and the Sweep tool was used to create the solid.

Then, in Figure 2, I created a Planar

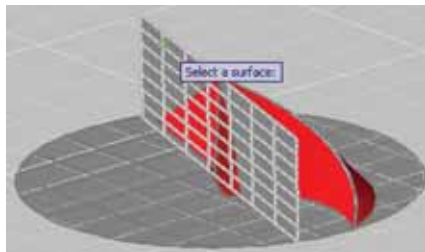


Figure 2: Slice with Surface



Figure 3: Imprint on Planar Face

Surface and an Extruded Surface and used these two surfaces to Slice away unwanted portions of the swept solid.

A Polar Array of the first spoke of my star wheel, then Union, another Slice and the star is ready for text. In Figure 3 the text was imprinted using the improved Imprint tool that does not require that the text be extruded before imprinting on the planar face of the solid.

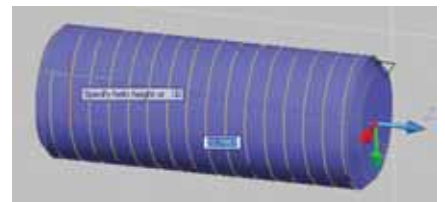


Figure 4: Helix

I have taught 3D modeling for more than 10 years. My students are required to make a solid rapid prototype with a "stl" file output from AutoCAD. Perhaps the most common question I get from students is, "How can I create a solid helical screw thread in AutoCAD?" With the new Helix command in AutoCAD 2007, it is now possible to create helix and spiral based solid geometry. Figure 4 shows a helical path created using the Helix command.

Figure 5 shows internal and external threads created using a combination of the Helix tool and the Sweep tool.

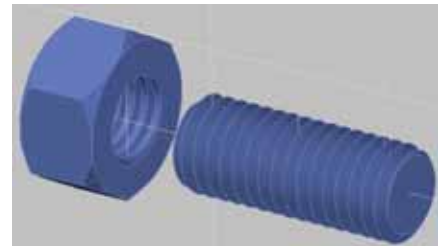


Figure 5: Cut Threads

With the Helix command you can control the beginning and end diameter, number of turns, turn height (pitch), direction



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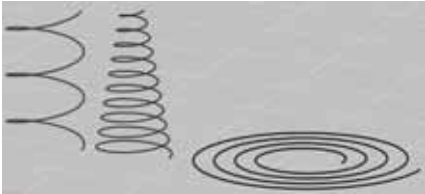


Figure 6: Coiled Paths Created with the Helix Command

of rotation and overall height to create a variety of coiled paths as shown in Figure 6.

The resulting geometry can then be used as Sweep paths as shown in Figure 7.

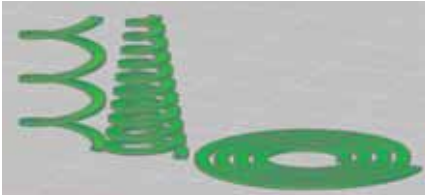


Figure 7: Swept Helical and Spiral Solids

The Sweep tool can also be used to align regions and sweep along a wire-frame. This technique is sometimes referred to as “skeletal” or master modeling. In Figure 8, the first member of a tubular machine frame was created by sweeping a region representing a cross-section of the rectangular tube shape. The entire frame can be quickly laid out with direct distance entry and created as a solid model.

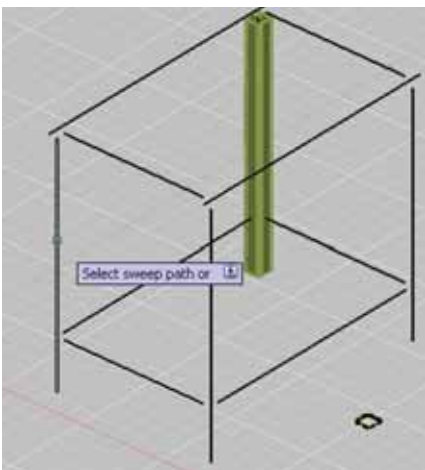


Figure 8: Swept Region as a Solid

In AutoCAD 2007 there is no need to create a closed polyline, do an extruded solid and finally solid edit – subtract to get a hole in a part. Using the new “Presspull” command you can use a circle to “press” a hole through a solid part. In Figure 9 one hole has already been created and the second hole is in the process of being pressed through the part. When the mouse is released the red solid will be cut from the frame tube.

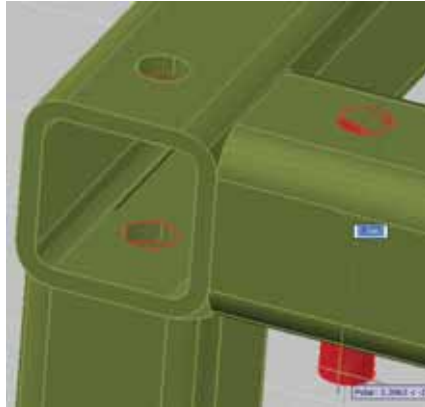


Figure 9: Presspull a Hole

The Presspull command does not require a closed polyline to create or edit a solid—it requires only a closed boundary. In Figure 10, I have sketched a polyline, line, arc, and spline.



Figure 10: Combination Entity Type Sketch

With the Presspull command I simply pull the closed sketch to the desired height as a solid. A boundary for a solid like the one in Figure 11 was not possible in previous AutoCAD releases.

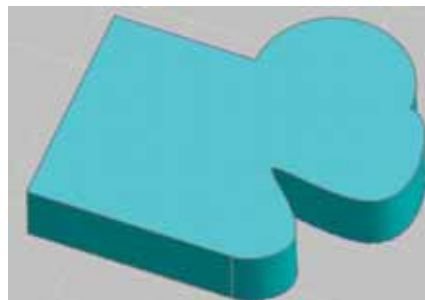


Figure 11: Presspull a Sketch

With the new dynamic UCS (DUCS) you can create geometry on any planar face without having to manually reset the UCS. Figure 12 shows the in-process cre-

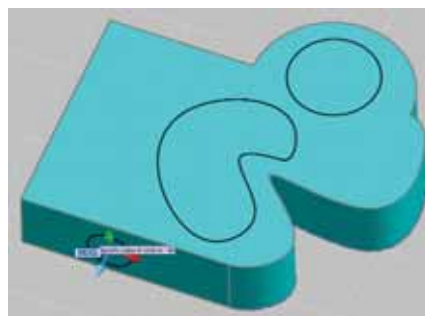


Figure 12: Dynamic UCS (DUCS)

AutoCAD 2007 delivers several new 3D solid modeling tools that go beyond simple analytic solids

ation of a circle on the side of the part after having just created the two sketches on the top of the part, all without ever changing the UCS from the base of the part.

With the new Polysolid command, solid geometry of a uniform width and height can quickly be created from existing single lines, arcs, polylines and splines. In Figure 13, I set my wall height and width and simply selected the original 2D geometry to create the 3D solids.

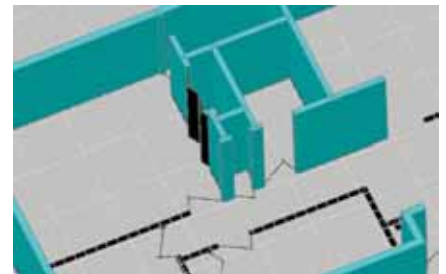


Figure 13: Polysolid 2D-to-3D

Ctrl selection of solid faces, edges, and vertices allow quick dynamic grip editing of solids. In Figure 14, I have selected the face of the wall while holding down the Ctrl key and then clicked the grip at the center of the face to stretch the wall out.

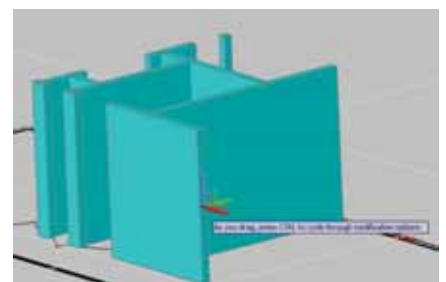


Figure 14: Ctrl Select for Dynamic Grip Editing

Another common question is, “How can I create a solid transition from one shape to another in AutoCAD?” The new Loft command in AutoCAD 2007 includes several options making it possible to create complex transitions from one section to another.

Figure 15 shows the neck of a plastic bottle created with the Loft command.



Figure 15: Lofted Solid

In Figure 16, two lofted surfaces have been created to slice away volumes of material from a solid block.

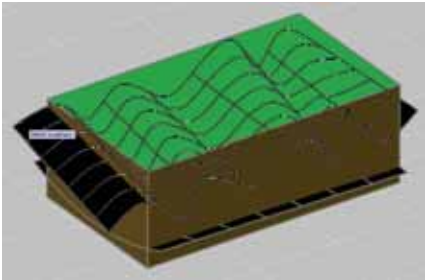


Figure 16 Surface Editing of Solids

"Freeform" solids can be formed by using surfaces created with AutoCAD 2007 in combination with the Slice tool. In Figure 17, the Slice command with a surface was used to remove a volume from the solid and to separate the volume into multiple solids.

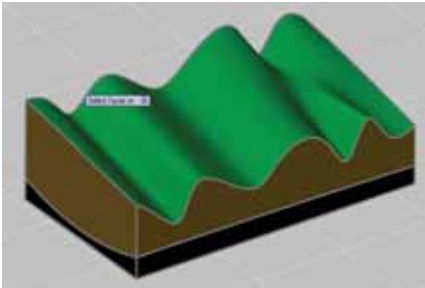


Figure 17 Slice with Surfaces



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for 12 years and has been an Autodesk Inventor Certified Expert since release 7. Previously he worked in industry for 15 years. Dr. Mather can be reached at jmather@pct.edu

With a combination of all of the new Solid tools in AutoCAD 2007, some very complex shapes can be modeled. You can get started on experimenting with the new tools by trying the AutoCAD 2007 solid modeling tutorials available at: http://home.pct.edu/~jmather/content/CAD238/AutoCAD_2007_Tutorials.htm

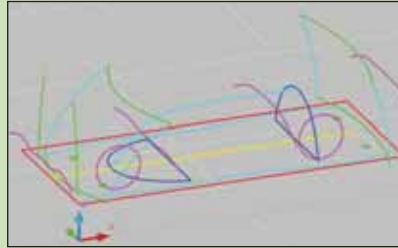


Figure 18a: Wire-frame Sketches

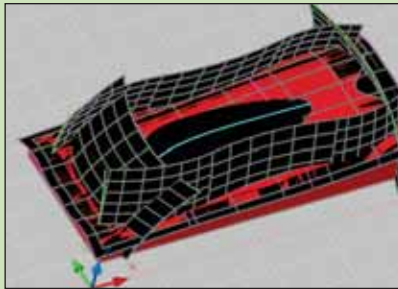


Figure 18b: Sweep, Loft and Slice



Figure 18c: Solid from AutoCAD 2007 Tutorial



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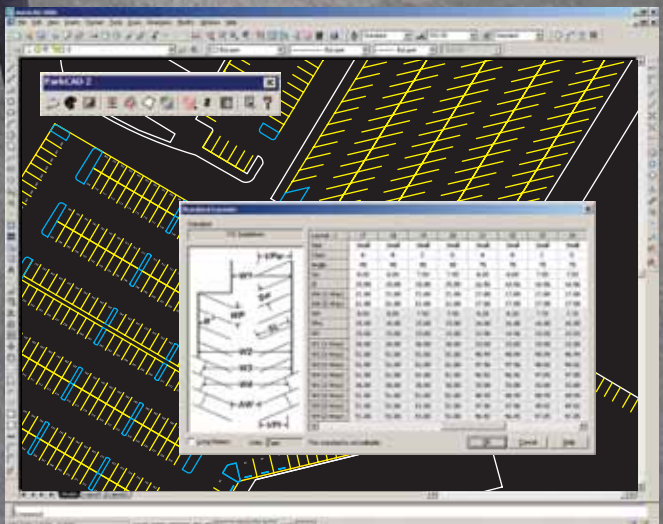
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