

Open Publish 2001

Production Stream - Automated Generation of Packaging Artwork

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1. Overview

The management of packaging artwork can be a complex task due to the number of people and organisations that are involved in the process. While there are some systems in place, in most instances there is no procedure that is well documented and there is often poor communication between participants. In particular the area of logo management seems to be one that causes much grief in the process of generating and maintaining artwork; this is because there are rarely formalised naming conventions for electronic files or robust version control mechanisms in place.

Most artwork for packaging is 'dumb' in that it has no inherent intelligence that identifies and manages components within the artwork. The process of artwork creation often requires a good deal of manual input in the keying of text, placement of logos and barcodes and merging with a dieline image with little or no assurance that the outcome is correct. While there may be some formal rules for barcode placement and informal rules for the layout style, these are not built into the typical tools used to generate the art.

This presentation discusses a new web based technology using the PDF libraries that can create artwork dynamically for any size package based on rules embodied in an XML template.

The art generation system is linked to a design optimisation tool together with specification management including graphic asset management, known as iSpek. iSpek is able to:

- generate and place any commonly used types of barcode according to defined rules
- generate accurate dielines to any size using a parametric CAD engine that has over 400 package styles.
- generate pallet pattern plans for inclusion in the artwork
- places, scales and rotates logos and other artwork elements sourced from an asset management library.

The resulting PDF file will have a high degree of integrity both in the accuracy of the data and the conformance to the style rules for the layout. The presentation will also cover future developments in further prepress automation.

1.1 The Intelligent Artwork Concept

Intelligent artwork is that which contains elements such as logos text or barcodes which are treated as objects whose identity is known, the position and scale is controlled, and links to databases can be made, often the actual content of the object is taken from a database record. Intelligent artwork is therefore able to recognise objects within artworks, which can be monitored or tracked. This means that more sophisticated levels of version control on artwork and artwork elements such as logos and barcodes can be applied. A good example would be where a brand logo is modified and the system is able to identify all artworks which use the superseded logo, they can be revised immediately or flagged for revision when next accessed.

1.2 Templates

In many instances there are elements of artwork that must obey certain rules, examples of these are barcodes, nutrition statements, dangerous goods symbols etc. The rules are typically minimum sizes and specific locations for placement in the layout. In the case of distribution packs such as corrugated boxes the graphics are relatively simple with little or no decoration other than corporate and brand logos, the rest of the content is information about the contents, barcodes, addresses, pallet patterns etc. Most companies have standard layouts for these elements and often use a hardcopy template to facilitate the specification of requirements for artwork. This formalised approach to artwork layout lends itself to automation of the task using electronic definitions of the layout requirements (Art Templates), which allow the generation of an electronic document which can be used for:

- viewing the compiled artwork,
- distribution for approval
- generation of film for plate making or be used to make the plate directly (Computer To Plate CTP)

2. Package Graphics Template Definition

2.1 Template Components

The Template is comprised of components, which together can generate an electronic description, or Intelligent Artwork Definition (IAD) which can in turn produce the finished artwork. The IAD can be in a proprietary format such as described in the example below or in an XML format (eXtensible Markup Language). The finished art can be in:

- PDF (Adobe's Portable Document Format)
- EPS (Encapsulated PostScript)
- AI (Adobe Illustrator)

PDF is preferred because of its portability, ubiquity and compatibility with prepress systems.

Typical Corrugated Box Artwork Proof



2.1.1 Object Definition

The Object definition describes which elements comprise the artwork, their locations and scaling. Art Objects can be Logos, Barcodes, Lines, Rectangles, Pallet Patterns and Text.

- Logos will be chosen from the nominated Logo Library: Logo(LibraryName), their default size is as they are stored in the library but they may have a minimum and maximum size declared when they are called.

- Text Objects

There are 3 kinds of Text Objects:

- TextStatements (a predefined block of text eg an Address),
- TextInput (user enters text at runtime),
- TextData (text is from a data field identified with a PackScript Tag eg BoxIntSize)

Text objects have the following attributes described in the Object definition: Type(Multiline, Single);Font(Helv,...);Style(Normal, Bold, Italic....);Point(fixed pointage, or opt and min size);Just(Left, Centre, Right, Justify). Point(Opt and Min) means the size will be determined by the amount of space available but cannot be less than the minimum. Other attributes are Tracking and Leading.

2.1.2 Barcode engine

The barcode engine generates the symbol and text from the design database input. The image is then treated as an Art Object.



2.1.3 CAD engine (Dieline)

The CAD engine is a parametric drawing program that generates the image of the flat blank or dieline for the package. The panel definitions used in the Template are taken from the CAD definitions.



2.1.4 Pallet Pattern engine

This module generates the image for the pallet pattern plan from the data supplied by the Design Database. The image is then treated as Art Object



2.1.5 Header

The Artwork Header or Title Block contains text relating to the package specification, which will be provided by the Design Database.



3. Object Definition Detail

3.1 Panel Array

The Template environment uses conventional co-ordinate geometry to define positions of panels and objects. The location of elements in packaging artwork is best described within the frame of reference of an individual panel; this is especially useful where element arrangements are repeated in other panels. The Panel Array defines the number of panels of the layout in X and Y direction.

Co-ordinates can be either Global or Local, Global coordinates relate to the whole blank while Local coordinates are intra-panel.

3.2 Panel Grid

The templates use formulae to establish panel sizes and positions so that the blank and the graphics layout can be merged in correct register.

$$\begin{array}{ll} X1=0 & Y1=0 \\ X2=GL & Y2=(W+A2)/2 \\ X3=X2+L+A2 & Y3=Y2+D+A2+T \\ X4=X3+W+A2 & Y4=Y3+(W+A2)/2 \\ X5=X4+L+A2-SL/2 & \end{array}$$



3.3 Panel Reference Points

There are 9 reference points for each panel

PLT = Left Top	PCT = Centre Top	PRT = Right Top
PLC = Left Centre	PCC = Centre Centre	PRC = Right Centre
PLB = Left Bottom	PCB = Centre Bottom	PRB = Right Bottom

3.4 Object Scaling

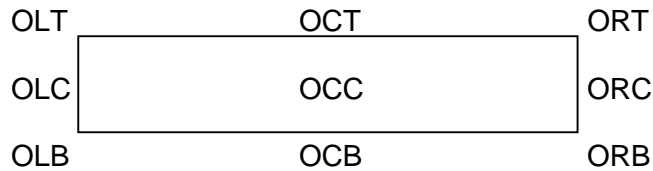
objects can be scaled in three ways:

1. **Discrete** scaling is that which applies typically to barcodes, in this case scaling is fixed to set sizes or magnifications. A barcode is normally placed at 100 percent magnitude that is to say it has a default size which in the case of the ITF is approximately 160 mm wide by 40 mm high that is deemed to be the 100% magnification. If the panel size is large enough, then the barcode may be scaled up to 120% magnification, wherever possible this should be done because it increases the potential for correct scanning.
2. **Proportionate** scaling is where the object will resize according to the size of the panel. If the template required the object width to be 30% of the panel width, it would be scaled to that size but would maintain its aspect ratio, ie it would adjust its vertical scale by the same amount as the horizontal scaling to maintain the same shape of the object.
3. **Disproportionate** scaling is where the aspect ratio is variable ie an object may always be 30% of the panel width and 20% of the panel height, in which case it will change shape to match the panel shape. This case applies mainly to blocks of colour or decoration and will typically occupy certain region on the panel.

3.5 Object Location

There are also 9 reference points for each Art Object identified by:

OLT = Left Top	OCT = Centre Top	ORT = Right Top
OLC = Left Centre	OCC = Centre Centre	ORC = Right Centre
OLB = Left Bottom	OCB = Centre Bottom	ORB = Right Bottom



There are 3 ways to position an object in a panel:

3.5.1 Direct placement

The placement of an Object in a panel requires an Object reference point and a Panel reference or reference to a previously placed object.

Eg

placing the centre of the object in the centre of the current panel

placing object's Right Bottom at Panel Right Bottom, then Offsetting 19mm left and 19mm up from Panel Right Bottom (this is a typical Barcode position).

3.5.2 The Picture Box method.

The picture box is a container into which any object such as a logo from a library of logos (selected by the user) can be inserted, it is a convenient device because it controls scaling independently of the included art object itself. It may be convenient for example to use picture boxes to define a horizontal band of artwork elements, which need to be proportionately spaced across the panel. The scale of each object will be determined such that it does not exceed the size of the picture box and may also require a border or Inset, which can be part of the Picture Box definition. The Picture Box will most often have the aspect ratio of the art object set to 1 but it may be useful at times to have the object scale disproportionately. The Picture Box method is similar to that used in Visual Basic programming.

3.5.3 The Text Box method

This method is similar to the Text Box used in page layout programs such as Adobe Illustrator and Quark Xpress. This device differs in that it will resize the text to fit the box. The size of the Text Box and the amount of text will determine the size of the Font used, if the Text Box is set to multi-line it will allow word wrapping. A text Box may also allow a certain amount of disproportionate scaling of the font and may also invoke adjustments to tracking (overall character spacing), and leading (space between lines of text) to fit the text into the defined space.

3.6 Object Array

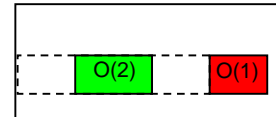
Art Objects are referred to by the Object Array Number eg O(1) is the first to be defined, O(2) the second and so on. The Object array is local to the panel so that renumbering is easier; the system however tracks the objects globally. Objects can be repeated into another panel in the same arrangement, but may be subsequently modified.

The order of the objects will be consistent with the 'Paint Order', ie if an object is defined after another one and they overlap, the latter will paint over the first.

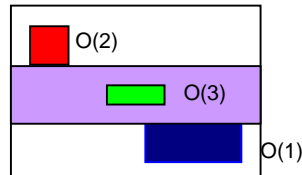
3.7 Regions

While many objects are placed relative to the 9 panel reference points, others need to be positioned relative to a space left after one or more objects have been placed previously. These spaces are called Regions and are defined by Left, Right, Top and Bottom Bounds

This example is a Region defined by the Left, Top and Bottom Bounds of Object O(1), and the Left Bound of the Panel. The Object O(2) is centred in the Region.

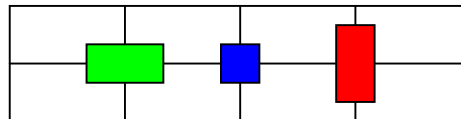


This Region is defined by the Left and Right Bounds of the Panel, the Bottom of O(2) and the Top of O(1). The Object O(3) will be placed at the centre (CC) of the region.



3.8 Panel Grids

Objects sometimes need to be placed at even centres across a panel so a panel grid may need to be defined eg
 PG(3,1) declares a Panel Grid which is like putting 3 evenly spaced vertical construction lines and 1 horizontal at the centre.

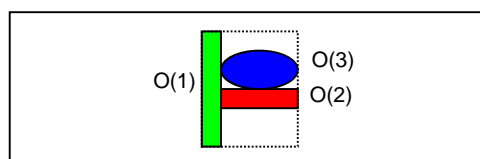


This places three objects evenly spaced on the panel.

3.9 Groups

Grouping objects before placement is a convenient way to avoid complex arrangements. Objects can be called, referencing each other to define the relationship within the group; the group can then be located using reference points of the combined objects as one grouped Object. Eg

This groups object 1 right centre with object 2 left top and object 3 centre bottom with object 2 centre top. The group is centred on the panel.



4. Intelligent Artwork

4.1 Object Management Information (OMI)

Objects stored in libraries such as logo libraries, will have a set of rules which can control the placement, scaling, colour, font etc of the object. These records will also have the filename, creation and modification dates, as well as the version number of the object so that the object can be tracked in the artwork. (See object Links below). The information associated with each object will be known as the Object Management Information (OMI).

4.2 Object links (logos to artwork, and artwork to logos)

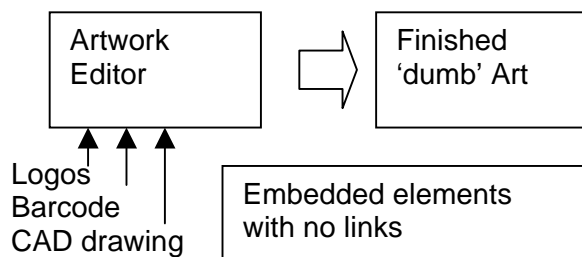
When a library object is used in an artwork the version control information (OMI) will be embedded in the Artwork as:

- text on a separate layer which is not printed in Adobe Illustrator
- text with no Stroke or Fill (not visible) in Illustrator or PDF
- as annotations in PDF.
- embedded in the raw file as DSC (Document Structuring Convention) comments for example.

This information can then be searched by using search engines to find artworks which contain certain objects, a good example is when a brand logo is modified, it will be useful to know which artworks have used the superseded logo. Having located these artworks they may be upgraded with the new logo either manually or automatically if the object was 'Placed' as an external reference file. They may also be only flagged such that when they are accessed in future a message is invoked, which says that the content is out of date, the file may also be locked so that it can't be used until the object is updated.

4.3.1 OMI and Intelligent Artwork

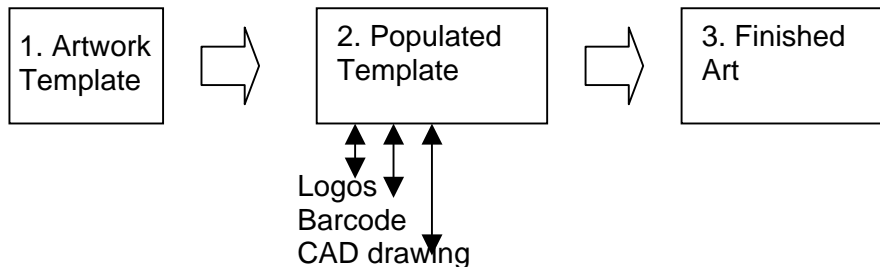
Most artwork is prepared using an electronic editor such as Adobe Illustrator or Quark Xpress and will often be comprised of elements such as logos and CAD drawings etc that have come from external sources. They will typically be copied into the new file without any link to the original. This could be termed 'dumb art' because the artwork file only has primitive artwork elements such as text lines and arcs, all identification of components is lost. The ability to 'Place' objects as external references is available but is rarely used for logos etc because the external file is often not included (forgotten) in the file transmission to the prepress house. Placing is even less often used for the purposes of version control of the artwork components, ie if the master external file is updated the artwork is also updated by default.



The OMI concept is a means of storing information which identifies artwork components within an artwork, their links to the source files from which they are derived for the purposes of version control of components and general artwork management.

4.3.2 Template Art

The process of generating artwork from templates is 1. a generic (empty) template, to 2. a populated template then to 3. finished art. The populated template at stage 2 is the OMI layer which provides a valuable resource for managing artwork, because of the level of information it can contain. The process could also embed OMI in the finished art to allow component tracking either from the Populated Template or the artwork itself.



5. Future Applications

5.1 Managed Art

This is the concept of managing formal elements of consumer pack artwork throughout the whole process eg capture the nutrition statement from a Food Technologist such that it is stored as an asset and delivered, pre-formatted, into the artwork without being re-keyed or manually manipulated ('smart table format'). The value would be in more streamlined processes and reduced costs incurred in current manual handling (mistakes, extra approval cycles, rework etc).

5.2 Extensible Artwork

The concept of finished artwork, which is designed from the outset to allow new variants to be spawned by non-graphic designers (eg Marketing Brand Managers), to produce 'families' of packs. This means that certain elements beyond text such as colour backgrounds on variety banners etc are selectable by the template user. The graphic designer will need to produce elements and layouts which are conducive to redefinition.

5.3 Controlled Interactivity

Font selection and clip art inclusion of elements such as 'starbursts' may also be accessible. The initial designers still determine (and the system controls) the 'family style' ie colour ranges clipart choices etc.

5.4 Corporate Style Management

Maintain the 'Style Manual' together with templates to generate letterheads, business cards, site and truck signage etc.

6. Conclusion

The ARTemplate concept recognises the difference between decoration and formal or 'business' elements of artwork, the latter being generally of great importance either for branding purposes or compliance with regulations. Given their importance and the fact that they are now digital, it is natural to see the emergence of tools that manage them efficiently in terms of content management, storage, delivery and version control. The digital environment allows artwork documents to have embedded or associated intelligence, which will facilitate the creation and management functions. XML is emerging as the logical repository for this intelligence layer.