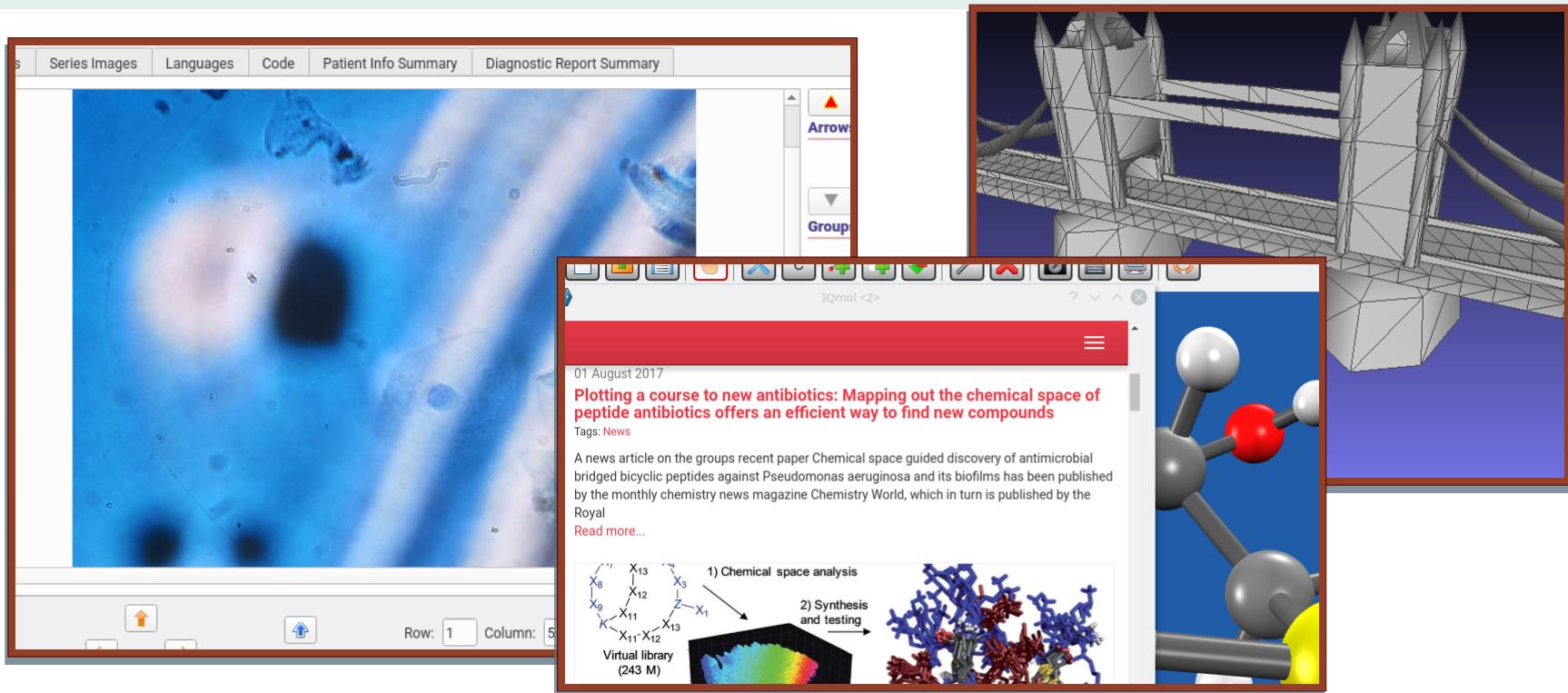


The NCN/A3R ("NA3")

Native Application Development Framework



Linguistic Technology Systems
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The NCN (Native Cloud/Native) Protocol

NA3
NCN
A3R
Qt
Examples

Cloud/Native Components as back-ends for native software

- Our “Native Cloud/Native” protocol refers to native application front-ends paired with Cloud/Native (back-end) container instances.
- Allows sharing of code libraries and data representation across both endpoints.
- Common representation on both server- and client-side streamlines network communications (no need to marshal data between different formats).
- The NA3 technology can be ported to other application frameworks apart from Qt (wxWidgets, XCode, MFC, etc.). This presentation will focus on NA3’s default Qt implementation.

How Cloud Back-Ends Enhance Native Front Ends

- Cloud Backup; Share Data between Users; Collaborative Editing
- Maintain users’ application state across different computers (home/school/office)
- Upgrade running applications without a need to re-compile

“Application-As-A-Resource” (A3R)

The A3R Application Model

- A3R Applications are self-contained, citable resources which can conform to modern resource documentation standards, such as the Research Object protocol.
- A3R Applications can use Hypergraph-structured metadata to describe data types, procedures, User Interface features, and inter-type relationships (for instance, the relation between data types and the types of GUI components which visualize them).

A3R Developer Tools

- Hypergraph-based data modeling and serialization.
- Framework for building custom scripting, parsing, and data persistence engines.
- Enhanced support for applications specifically designed to access research data sets.
- Convenient framework for sharing data among applications (to establish inter-application workflows) or between applications and cloud or web services (including leveraging “NCN” services).

The Qt Ecosystem

NA3
NCN
A3R
Qt
Examples

Qt is the most popular native, cross-platform application-development framework.

- ◆ ~1 million active developers ◆ Over 5,000 client companies ◆ Worldwide “Qt Partners” Ecosystem ◆ ~US \$250 million overall market

However ... Limited Qt Cloud Integration Support

- “Qt Cloud Services” Discontinued in 2016.
- Currently there is no standard model for accessing Cloud services from Qt applications.
- Nor is there a standard Qt-based Cloud/Native container architecture.

Example Use-Cases

Inter-Application Networking and Workflow Management

- Export data and instructions between Qt-based applications (slides 6-7).
- Embed document or multi-media viewers inside scientific or dataset applications (slides 18-21).

Responsive desktop-style applications for enhanced UX

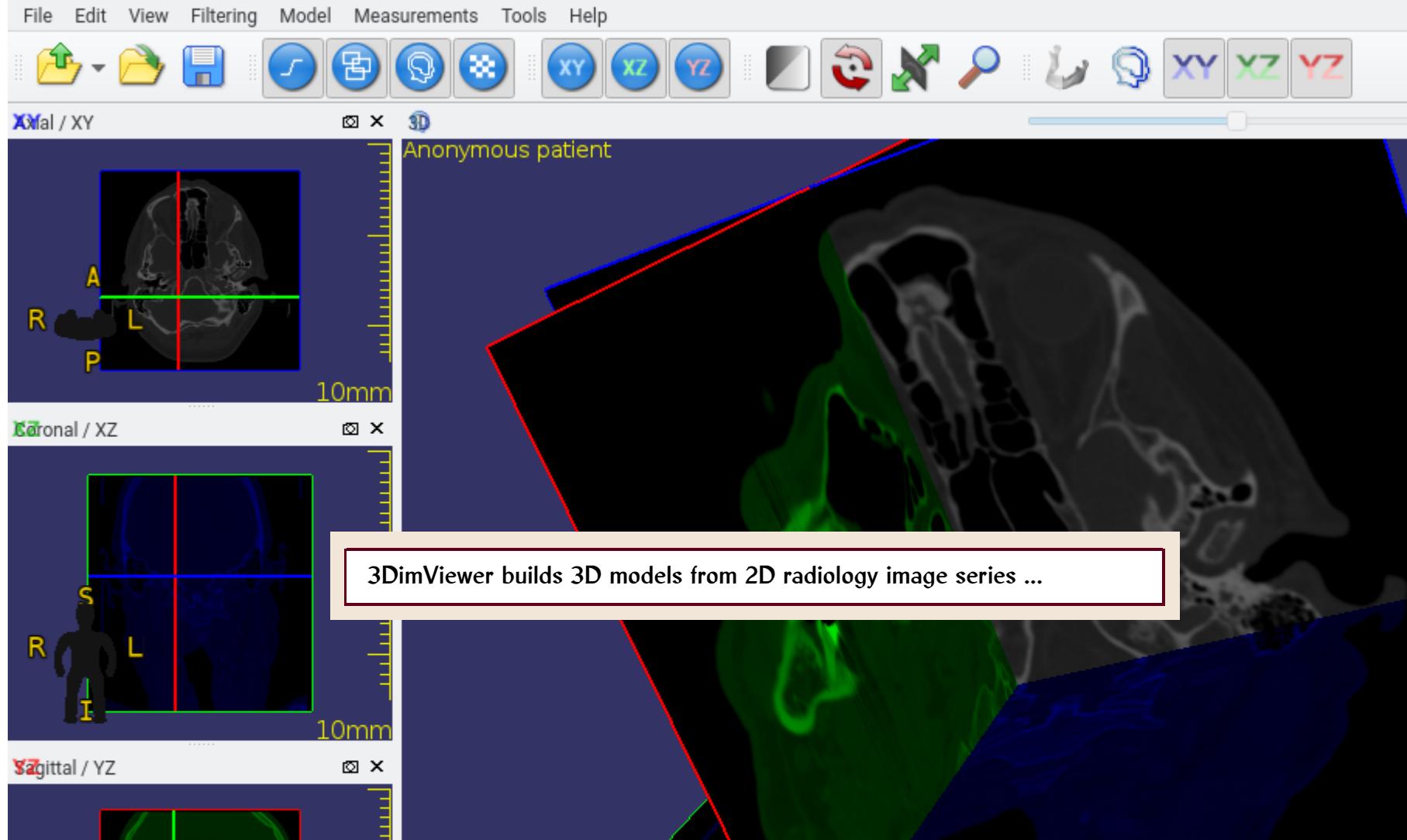
Native applications offer superior User Experience, leveraging distinct interactive features of desktop GUIs: context menus, dialog boxes, tool tips, Multiple Window Display, dock windows, and so on:

- Compelling front-ends for e-commerce, Real Estate, VR, etc. (slides 11-17).
- For scientists and researchers, build innovative data-collection instruments as well as interactive Research Object applications (slides 8-10).

An Example of Inter-Application Networking

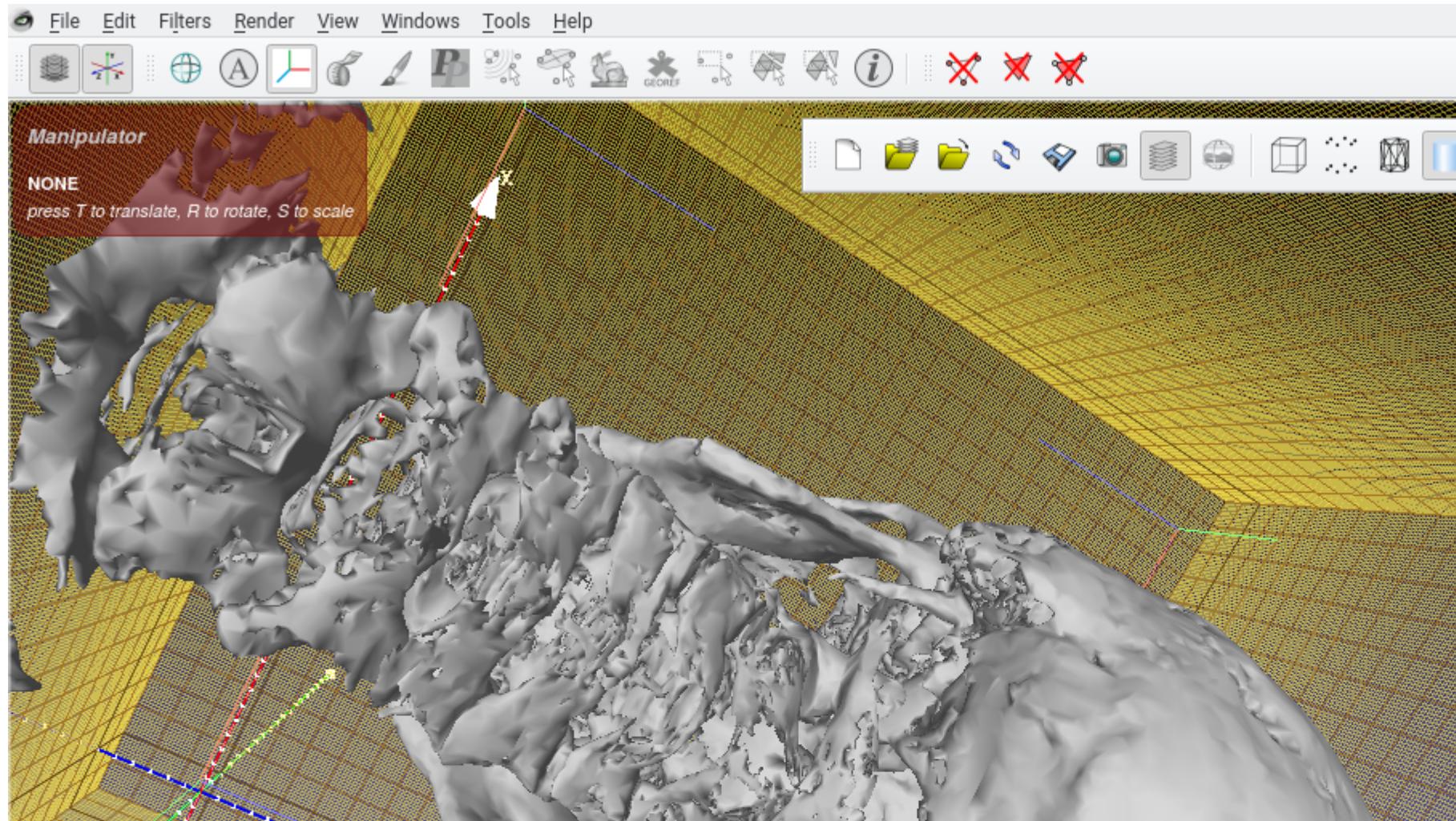
Research S
Research Slide 2
Research Slide 3
Research Slide 4
Research Slide 5

This slide and the next demonstrate a case-study where inter-application data sharing enhances the capabilities of two applications: 3DimViewer (a radiology tool) and MeshLab (a 3D graphics engine).



3D Graphics Sent to MeshLab

... Once the 3D tissue sample is constructed by 3DimViewer's algorithms, an A3R inter-application networking protocol (implemented as an extension to both applications) allows 3DimViewer to export the model to MeshLab so that it may be studied in a more comprehensive 3D viewing environment.



A3R Applications as Data Collection Instruments

Research S
Research Side 2
Research S
Research Side 4
Research Side 5

Forms Web Language Help About

Save Form Open Form Cloud Save Cloud Open Submit Form

Page: 0 Search for: Forwards

Welcome Web

X ? ^ × Form Outline

Click on a subheading to continue

Patient Information
Chief Complaint
Review of Symptoms
Treatment History
Medical History
Current Medications
Family History

ndp-main-outline <5> ? ^ ×

Referring Doctor: Dr. New Test

Referred By (Choose One): Clinical Specialist

Date of Visit: 1/9/16

Please List your Previous Stays

1	Test 2	Sun	Mon	Tue	Wed	Thu	Fri	Sat
		31	1					
		7	8					6
		14	15					13
2	Test 1	21	22					20
		28	29					27
		4	5					3

OK Print

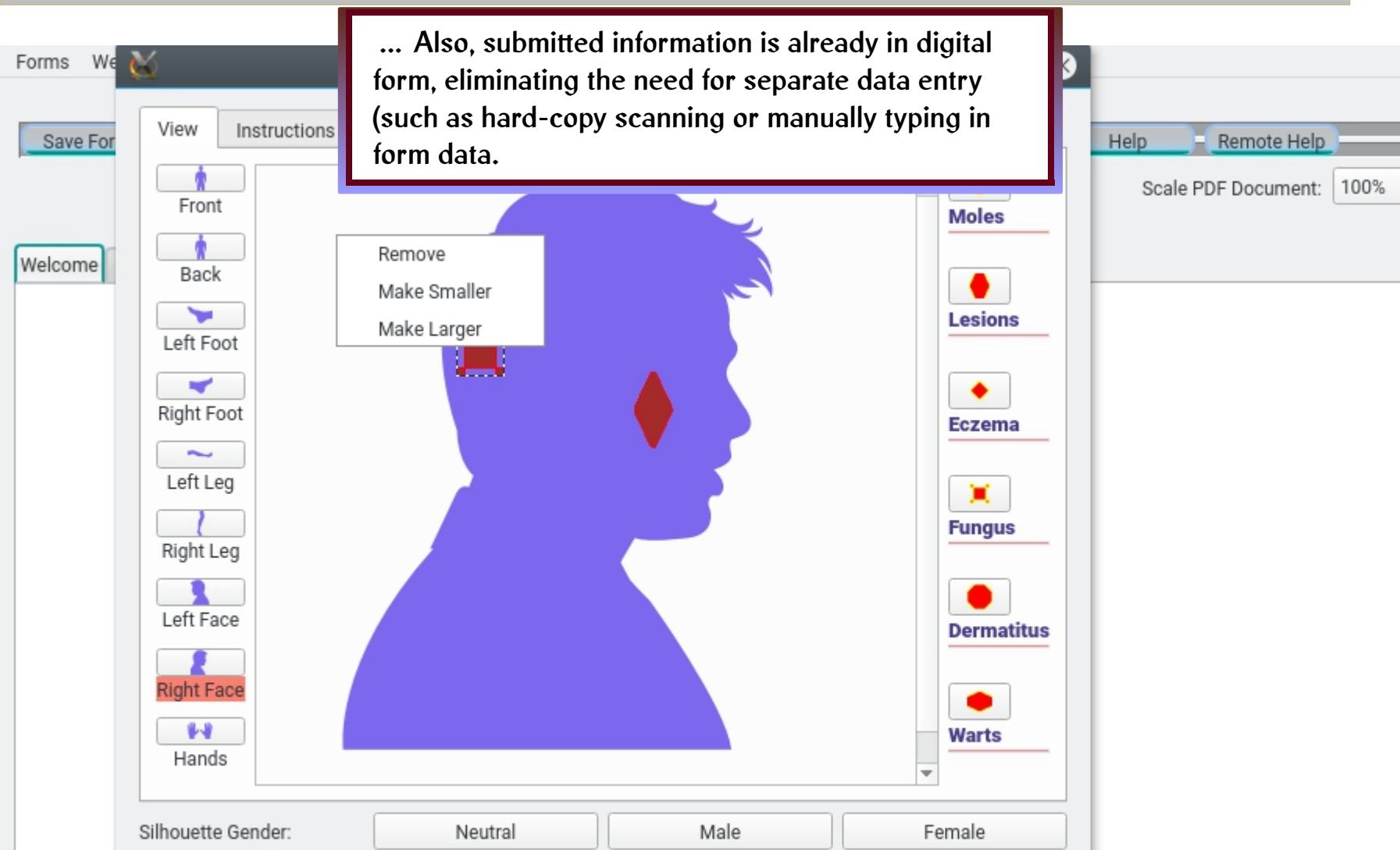
January 2018

February 6
March 13
April 20
May 27
June 3
July 10
August
September
October

In medicine and social science, “data collection instruments” (DCIs) refer to surveys, questionnaires, and other tools to obtain human feedback.

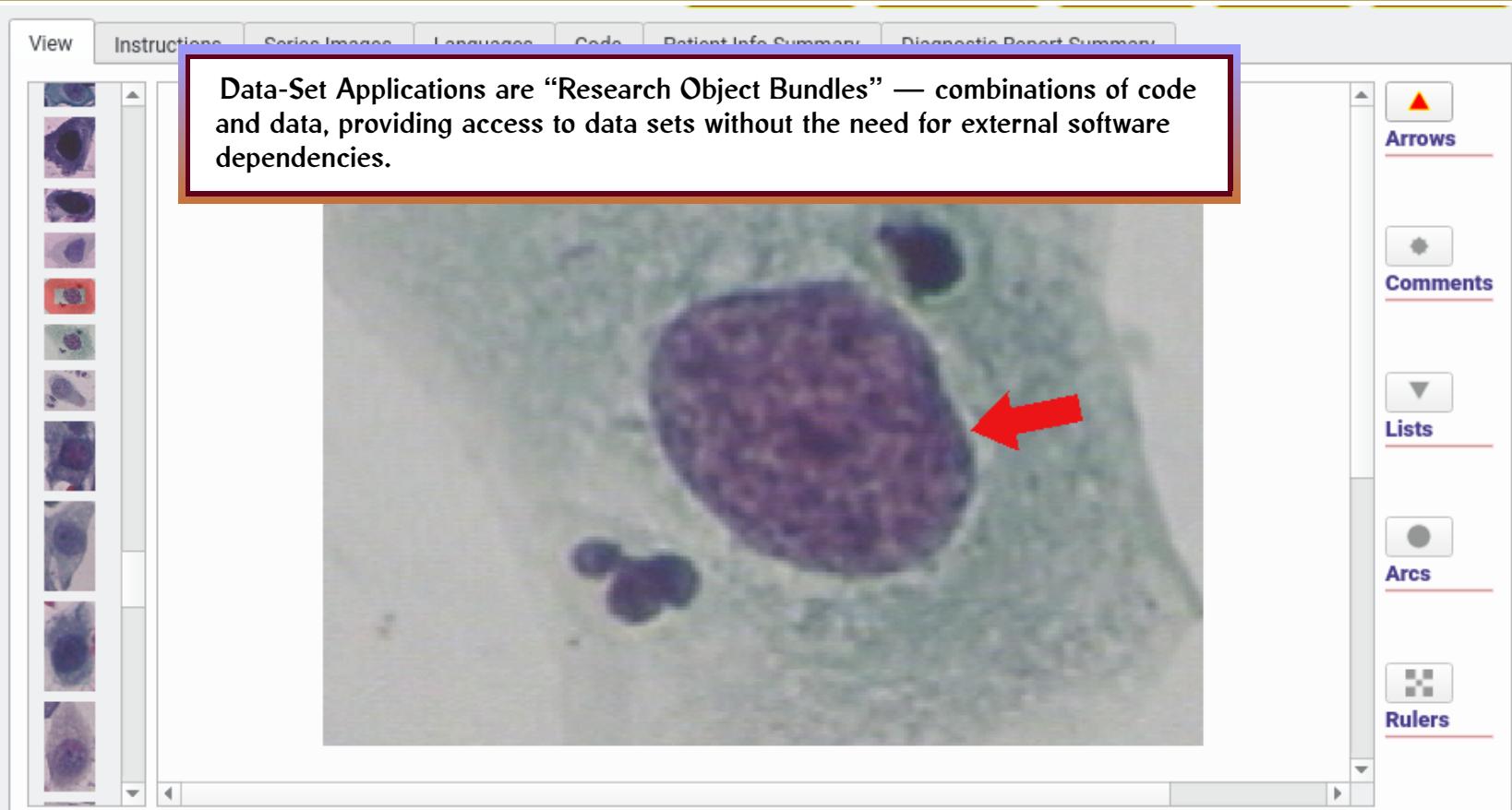
Qt-Based Interactive Forms

Data Collection Instruments implemented as native desktop applications can have easily navigable, interactive forms that make it simpler for people to provide information ...



A3R Applications as Research Objects

Complementary to A3R components which facilitate *obtaining* research or experimental data, A3R “Data-Set Applications” are also powerful tools for visualizing and analyzing research findings.



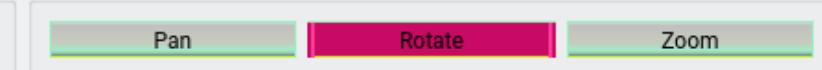
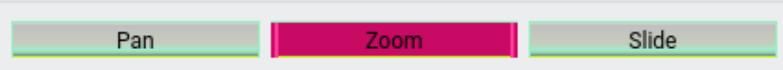
Silhouette Zoom:



Clear

Image Transforms ...

Annotations Transforms ...



Native Applications as Interactive Catalogs

E-Commerce
Slide 1

E-Commerce
Slide 2

E-Commerce
Slide 3

E-Commerce
Slide 4

E-Commerce
Slide 5

E-Commerce
Slide 6

E-Commerce
Slide 7

As a case-study in enhanced User Experience afforded by native applications, consider how static PDF catalogs and brochures can be turbo-charged into engaging, interactive software-based presentations.

The screenshot shows a native application interface for a shoe catalog. In the center is a large image of two brown leather sneakers with white soles. A context menu is open over the right shoe, listing options: Detach Image, Detach Noteboook, Detach Description, **Detach Everything** (which is highlighted), Merge Windows, Explore Color Matches ..., View 3D Model ..., Take Screenshot, View Item List, and View Shopping Cart. To the left of the main image is a sidebar containing three smaller thumbnail images of different shoes. At the bottom of the screen, there are navigation controls: a double arrow icon, the text "Item: 3", an "Image Zoom:" slider, and zoom in/out icons. Below these controls is a horizontal ellipsis (...). At the very bottom of the interface, there are tabs for "Overview", "Features", "Specs", and "Reviews". Under the "Overview" tab, there is a bulleted list: • Leather upper, • Lace-up, • Round toe. On the right side of the interface, there is a vertical sidebar with the title "Grand Crosscourt II Sneaker" followed by a descriptive text: "Sleek and simple, the Grand Crosscourt II sneaker from Cole Haan is the perfect way to add some tailored casual style to your every day look!". Below this text is a section titled "Actions:" with two items: • [Add to Cart](#) and • [Explore Colors](#). There are also two small circular icons, one orange and one black, below the "Actions:" section.

Interactive Shopping Carts

E-Commerce
Slide 1

E-Commerce
Slide 2

E-Commerce
Slide 3

E-Commerce
Slide 4

E-Commerce
Slide 5

E-Commerce
Slide 6

E-Commerce
Slide 7

Instead of static lists, shopping carts can be made into multi-dimensional, multiple-window interactive displays.

The screenshot illustrates a multi-dimensional shopping cart interface. At the top, a navigation bar includes File, Email, Events, APIs, Web, Broadleaf, Page: 0, Search for:, and a zoom setting of 100%. Below the navigation bar, a grid of flower images is visible. Two detailed product windows are open:

- Product Window 1 (Left):** titled "tecs-db-main <2>". It shows a bouquet of purple peonies and hydrangeas. The description on the left reads: "Lily Garden Silk Peony Bouquet Home Decoration, Lilac, 18 Inches High". The window has tabs for Overview, Specs, Reviews, and Q & A, with "Overview" selected. Buttons for OK and Cancel are at the bottom.
- Product Window 2 (Right):** titled "tecs-db-main <3>". It shows a large cluster of pink hydrangeas. The description on the right reads: "Frosted Hydrangea, Mauve, 32 Inches High, 12 Floral Sprays". This window also has tabs for Overview, Specs, Reviews, and Q & A, with "Overview" selected. Buttons for OK and Cancel are at the bottom.

Explore Products with Native Software

E-Commerce
Slide 1

E-Commerce
Slide 2

E-Commerce
Slide 3

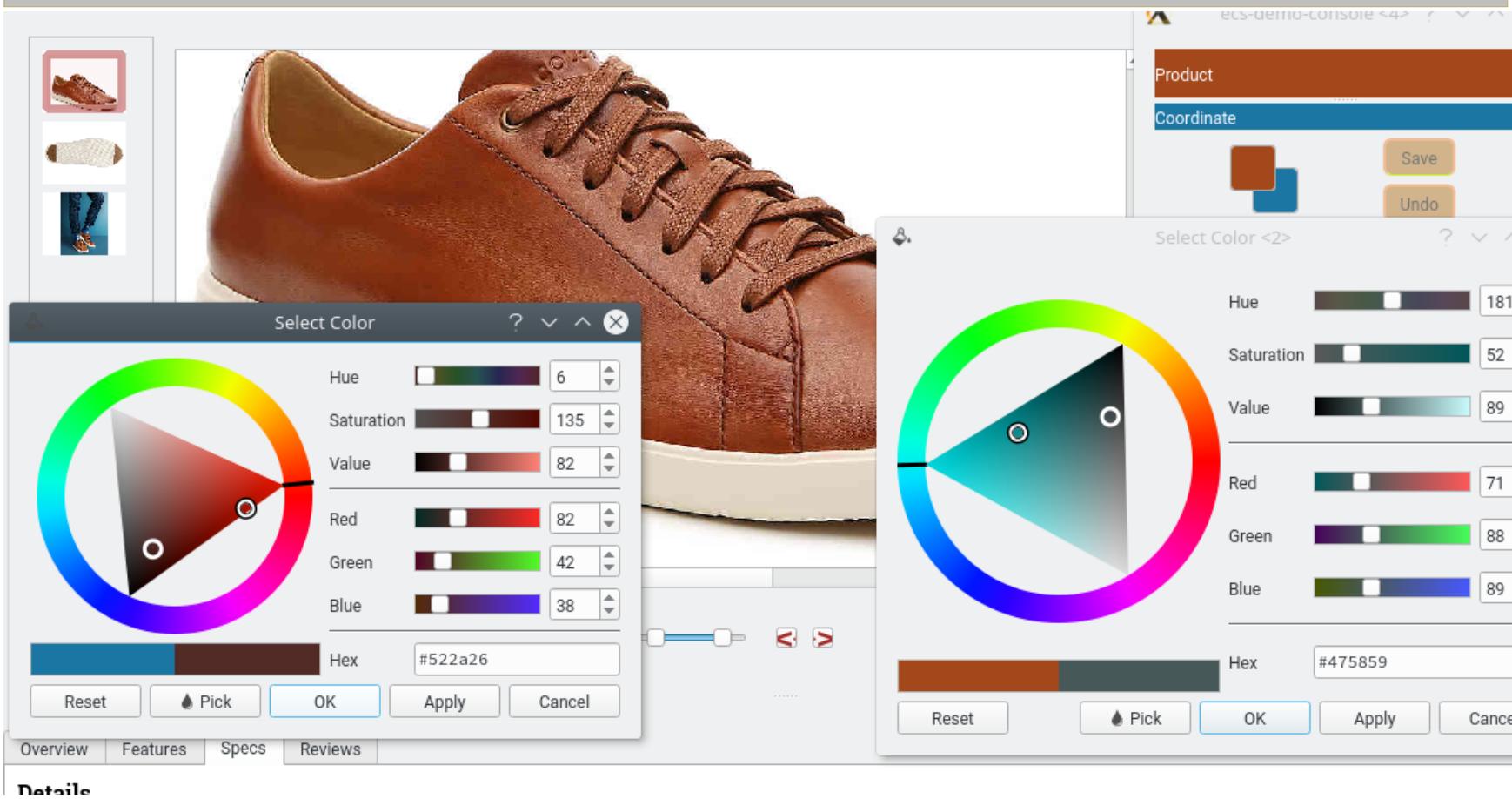
E-Commerce
Slide 4

E-Commerce
Slide 5

E-Commerce
Slide 6

E-Commerce
Slide 7

Interactive catalogs allow designers to incorporate many unique features and capabilities of desktop applications, such as using HSV color-wheel controls to explore color coordination while shopping.



Interactive Real Estate

E-Commerce
Slide 1
E-Commerce
Slide 2
E-Commerce
Slide 3
E-Commerce
Slide 4
E-Commerce
Slide 5
E-Commerce
Slide 6
E-Commerce
Slide 7

A3R programming can also bring enhanced UX to Real Estate presentations: instead of just groups of photos, properties can be displayed via interactive, multi-dimensionally organized, color-coded photo viewers.

The screenshot shows a software interface for viewing real estate photos. On the left, a grid of thumbnail images represents different property scenes. A specific thumbnail in the middle row is highlighted with a red border and has an arrow pointing to it from a callout box labeled "Color-Coded Groups". To the right of the grid is a large window displaying a detailed photograph of a bedroom. The bedroom features a large wooden bed with a headboard, a matching wooden dresser, and a chaise lounge. The walls are painted green, and there are windows with valances. A callout box labeled "Current Photo" points to the bedroom image. At the bottom of the interface, there is a "Groupings" section containing a list of room categories, each associated with a colored bar corresponding to the groupings in the grid. Navigation controls, an item counter (Item: 19), an image zoom slider, and standard "OK" and "Cancel" buttons are also visible.

rpdf-emb-console

Groupings

- Entrance/Foyer/Hall
- Kitchen/Dining Room
- Living Room/Den
- Bath/Powder Room
- Bedroom/Closet
- Master Bedroom/Spa
- Basement/Game Room

Current Photo

Color-Coded Groups

Item: 19

Image Zoom:

OK Cancel

Photo Viewer Interactive Cues

E-Commerce
Slide 1
E-Commerce
Slide 2
E-Commerce
Slide 3
E-Commerce
Slide 4
E-Commerce
Slide 5
E-Commerce
Slide 6
E-Commerce
Slide 7

These slides demonstrate visual cues to aid photo navigation, such as color bands (overlays) that switch from horizontal to vertical indicating which photos have already been viewed; and the thumbnail of the current viewed photo marked with a thick colored border (surrounding the thumbnail photo and its overlays).

Already Viewed (vertical color band)

Not Yet Viewed (horizontal color band)

Current Photo (viewed for the second time)

The screenshot shows a photo viewer interface with a grid of thumbnail images on the left and a larger detailed view on the right. The thumbnails are overlaid with color bands: some have vertical bands (green for viewed, red for not yet viewed), while others have horizontal bands. A large arrow points from the text 'Already Viewed (vertical color band)' to a thumbnail with a vertical green band. Another arrow points from the text 'Not Yet Viewed (horizontal color band)' to a thumbnail with a horizontal red band. A third arrow points from the text 'Current Photo (viewed for the second time)' to the large living room image, which has a thick red border around its thumbnail and its corresponding overlay.

Groupings

- Entrance/Foyer/Hall
- Kitchen/Dining Room
- Living Room/Den
- Bath/Powder Room
- Bedroom/Closet
- Master Bedroom/Spa
- Basement/Game Room

Item: 10

Image Zoom:

Filtering Photos

Another feature which may be conveniently implemented in A3R-style photo viewers is a filtering option, which — given a collection of pictures classified into several groups — allows users to show or hide photos based on the group they belong to (note the check-box buttons on the group listing).

The screenshot shows a photo viewer interface with a sidebar of thumbnail images and a main view showing a living room. The sidebar includes a 'Groupings' section with several filter options.

Visible Groups: Entrance/Foyer/Hall (checked), Living Room/Den (checked), Bedroom/Closet (checked), Master Bedroom/Spa (checked). These are highlighted with a green oval.

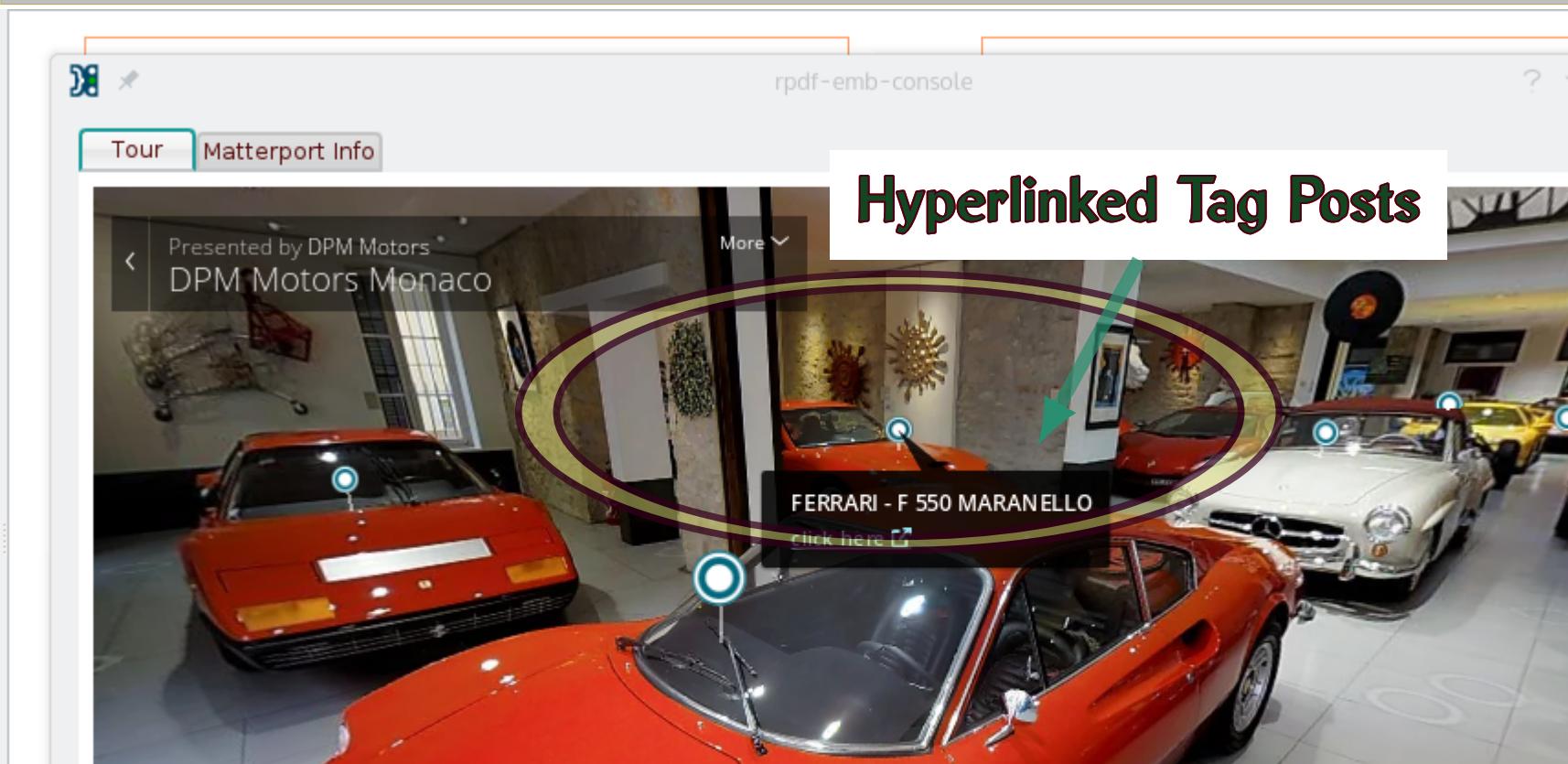
Check Boxes: Kitchen/Dining Room, Bath/Powder Room, Basement/Game Room. The 'Bath/Powder Room' checkbox has a red arrow pointing to it, and the 'Basement/Game Room' checkbox is circled in red.

Hidden Groups: The 'Kitchen/Dining Room' and 'Bath/Powder Room' checkboxes are shown in a greyed-out state, indicating they are currently hidden.

Below the sidebar, there are navigation arrows, an 'Item: 3' indicator, an 'Image Zoom:' slider, and 'OK' and 'Cancel' buttons.

Interactive VR: Hyperlinked Tag Posts

Another emerging technology, relevant to both e-Commerce and Real Estate, is the use of Panoramic Photography to create immersive Virtual Reality scenes. Panorama-Photography-based VR engines, like Matterport, allow “tag posts” with embedded hyperlinks, which in a native-application context become channels of communication between the VR renderer and the host application. The full capabilities of this interactive modality — combining VR with clickable links and text “bubbles” — can only be fully realized via Virtual Reality engines (such as WebGL) embedded in native software.



A3R Document Viewers

Publishing
1
Publishing Slide
2
Publishing Slide
3
Publishing Slide
4

A3R applications may embed viewers for document formats such as e-Pub, HTML, and PDF; then supplement conventional publications with special components customized for individual manuscripts: e.g. (as in this case), a widget allowing readers to visually explore patterns in classical Indian music.

The screenshot shows a digital journal interface. At the top, there are three icons: a gear, a book, and a person reading. Below them are links for 'References', 'Library', and 'Reading'. A navigation bar includes 'HTML Source', 'Lisp', 'CSS', and 'XML'. A large red rectangular area covers the main content area. Below it, the text 'Read article view' is visible. At the bottom, there's a small icon of a person sitting at a desk.

ANTHROPOLOGY AND HUMANISM

[Explore this journal >](#)

Ethnographer as Apprentice: Embodying omusical Knowledge in South India

da Weidman

Published: 26 December 2012 [Full publication history](#)

This screenshot shows a specialized A3R application window. At the top, it says 'Display Tala Types: Jhoomra/Dhamar (14 beats)'. Below is a visual representation of musical patterns as colored rectangles (red, purple, green) arranged in a grid. A horizontal slider labeled 'Patterns' allows switching between 'Pattern 1 (3-4-3-4)' and 'Pattern 2'. The file path '/extension/ScignSeer/articles/svg/tala.svg' is shown below the slider. A 'Proceed' button is at the bottom right. The background of the application window features a decorative sunburst graphic.

Volume 37, Issue 2
December 2012
Pages 214-235



A3R Document Viewers as Embedded Components

Document Viewers may also be embedded in host applications which provide domain-specific visualization capabilities. For example, chemistry papers might be viewed within IQmol (a Qt-based program for molecular visualization and physical/chemical analysis) via an A3R document-viewer plugin.

The screenshot shows a chemistry application interface. At the top is a menu bar with options: Display, Build, Calculation, SONIC, and Help. Below the menu is a toolbar with various icons. On the left, there's a sidebar with a "Springer" logo and a search bar showing "Showing 157 results." Below the search bar are filters for "ENT" (157 results), "CS", and "Jemi" (37 results). The main area features a 3D ball-and-stick model of the amino acid cysteine, with atoms represented by spheres in blue, yellow, red, and white. In the center, a search results window is open, displaying a list of results for "Cysteine Proteases of Pathogenic Organisms". The results include the book cover, author (Mark W. Robinson, John P. Dalton, Eds.), and a brief description: "Cysteine proteases expressed by pathogenic organisms play key roles in virulence including host". At the bottom of the search results window is a URL: www.springer.com/gp/search?query=cysteine&submit=Submit. The overall interface is designed to integrate scientific document viewing with molecular visualization tools.

Document Viewers Augmented With APIs

Publishing
1
Publishing
Slide
2
Publishing
3
Publishing
Slide
4

Another strategy for interactive publications is linking documents with APIs maintained by publishers, or by cultural or educational institutions.

As an example, documents mentioning artifacts held in a museum can provide features to view more information about those museum-pieces through the host institution's API.

MEDAL

Click the icon to save

This is a **Medal**. We acquired it in 1920. It is a part of the **Product Development** department.

Cite this object as

Medal; bronze; 1920-3

Row: 0 Column: 0

Embedded Multimedia

Publishing
1
Publishing Slide
2
Publishing Slide
3
Publishing
4

Custom-built A3R document viewers can provide convenient access to multimedia content embedded in or linked to texts — including audio files, videos, and 3D graphics scenes or models.

Ailurus fulgens styani (also known as *a. f. fulgens*): Only found in China (in the Hengduan

Mo
My
The
ab

In this case a video player is launched in a dialog box, floating above the article text. For those reading digital books or articles, videos and other multimedia content can be presented through secondary windows launched via context menus; text and multimedia may thereby be viewed side-by-side.

Behavior

Red pandas are generally solitary, but there are a couple of cases where they develop extended associations with their mothers that last throughout the breeding season.



ark.org/red_panda/about-the-red-panda/

In terms of territoriality, red pandas tend to have overlapping home ranges with other. This means that they do not search for the same food sources, which helps them to avoid competition.

ARKIVE
www.arkive.org

Moving images copyright
© BBC Natural History Unit

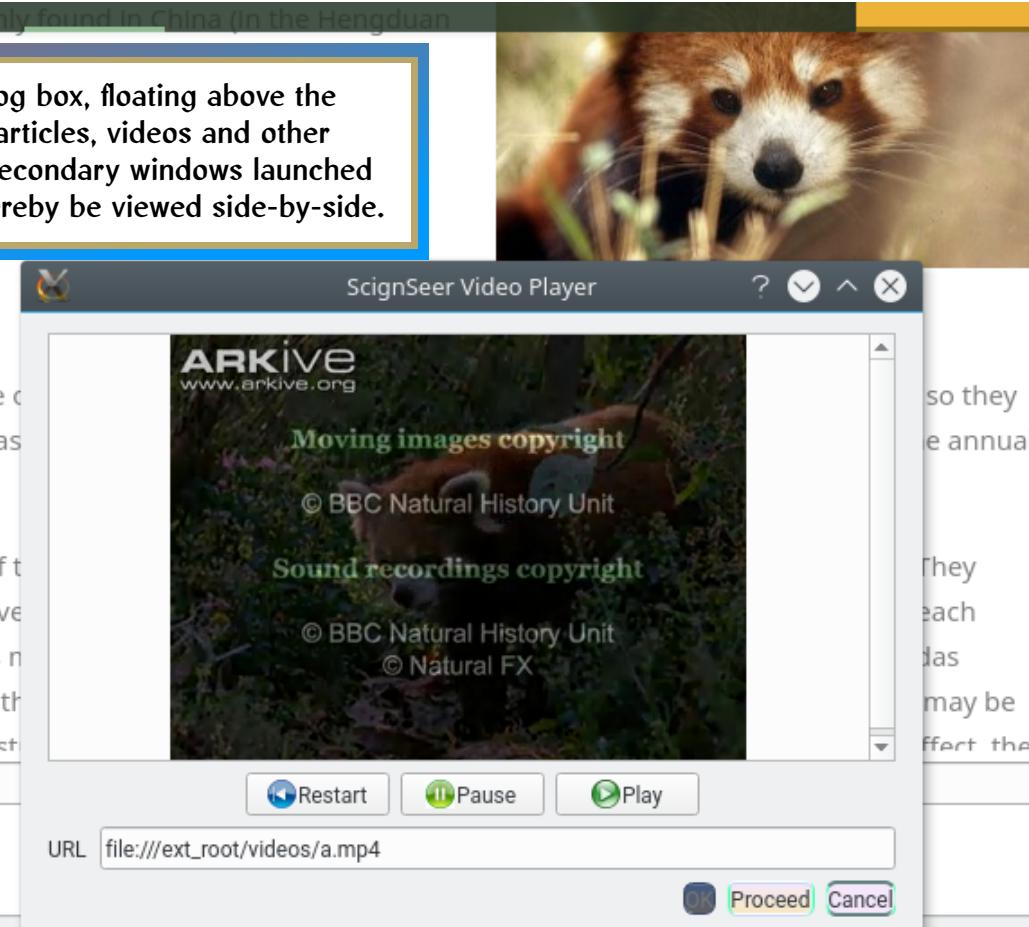
Sound recordings copyright
© BBC Natural History Unit
© Natural FX

ScignSeer Video Player

Restart | Pause | Play

URL: file:///ext_root/videos/a.mp4

OK | Proceed | Cancel



Thank You!

Thanks

Please contact Linguistic Technology Systems for more information about NA3 and/or other Software Development and Software Language Engineering Solutions: (917) 817-2184.

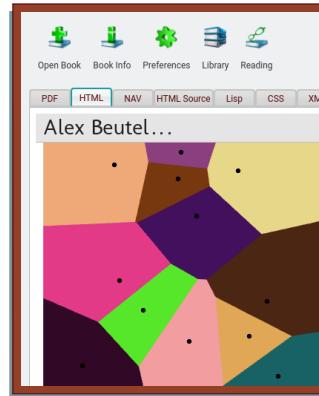
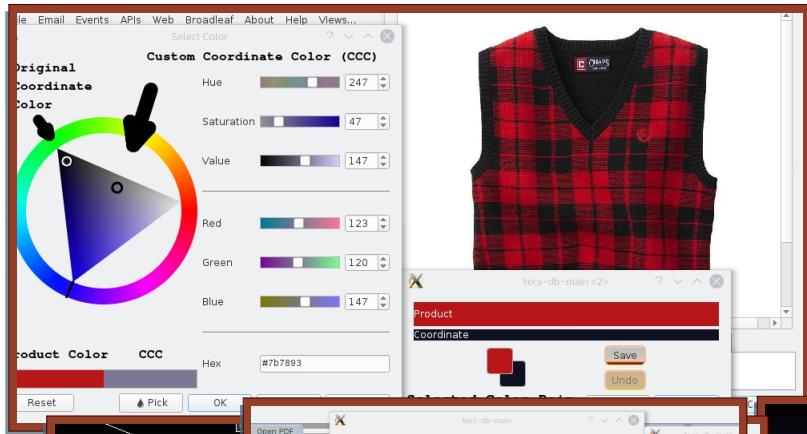


Figure 2 The Voronoi Diagram of the set of Melbourne's inner city train stations.

It should also be noted that this account aims to represent space partitioning at a cognitive rather than at a physical level. What this means is that *at* will not be

