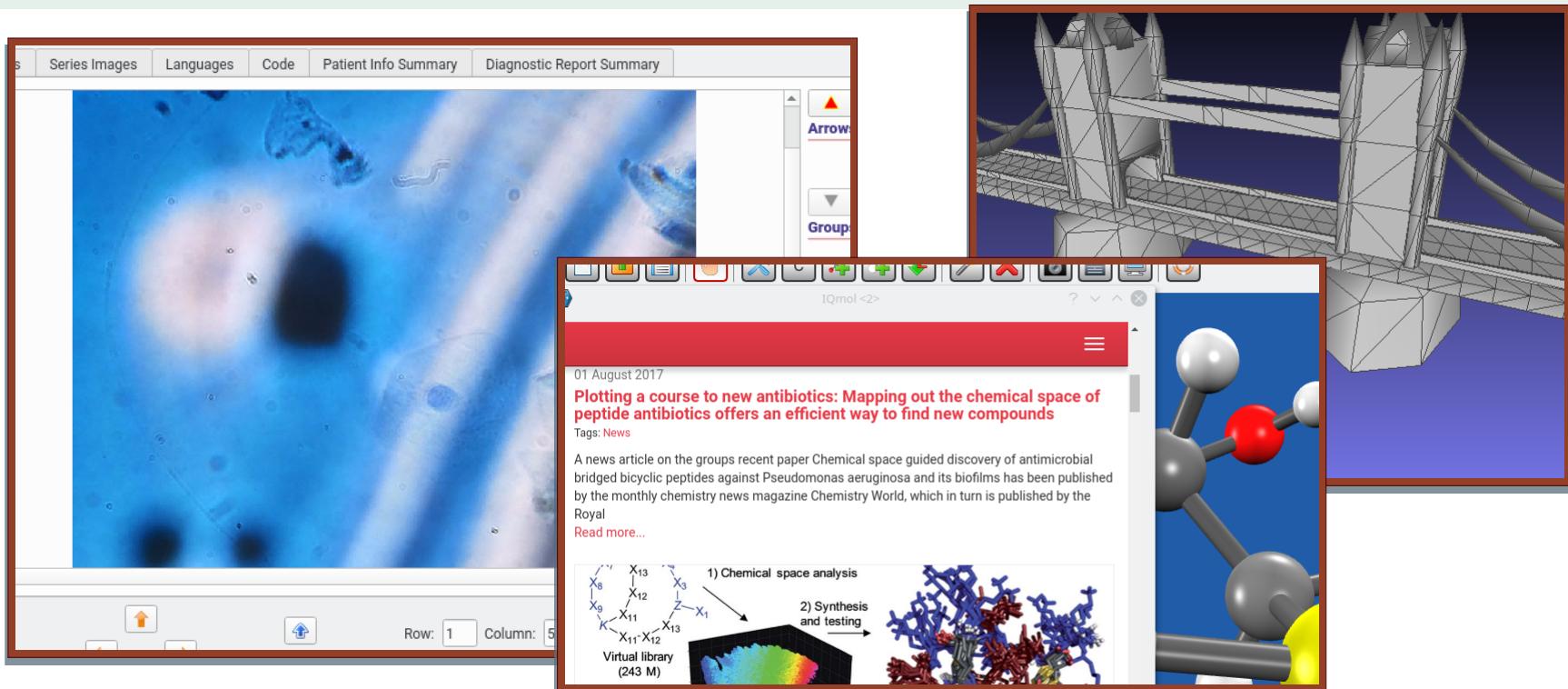


The NCN/A3R ("NA3")

Native Application Development Framework



Linguistic Technology Systems

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The NCN (Native Cloud/Native) Protocol

Cloud/Native Components as back-ends for native software

- “Native Cloud/Native” refers to native application front-ends paired with Cloud/Native container instances.
- Share 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).
- This presentation will focus on NA3’s default Qt implementation, though the technology can be ported to other application frameworks (wxWidgets, XCode, MFC, etc.).

How Cloud Back-Ends Enhance Native Front Ends

- Cloud Backup; Share data between users; Collaborative Editing
- Persist users’ application state across different computers (home/school/office)
- Upgrade running applications without 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

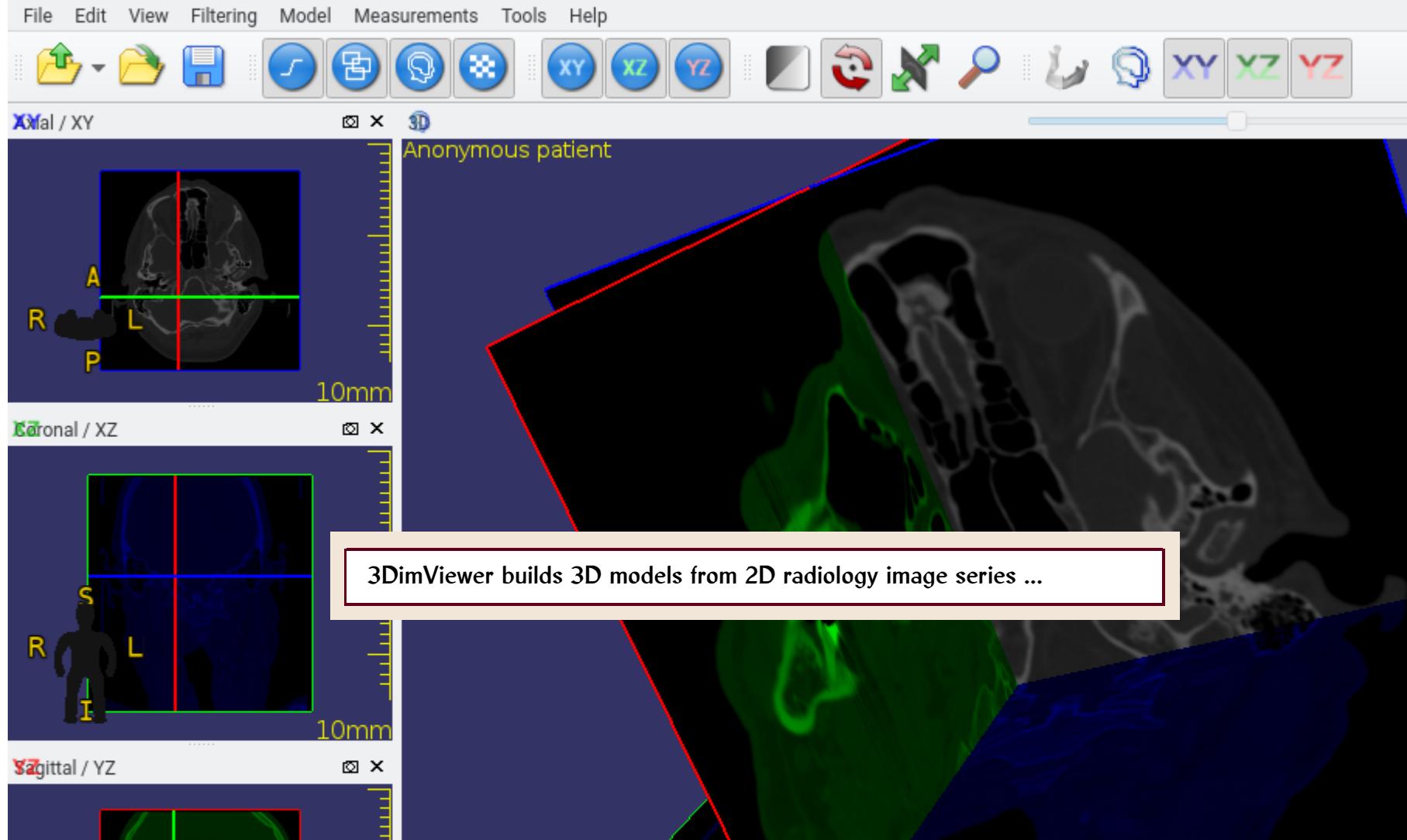
Native applications offer superior User Experience, leveraging distinct interactive features of desktop GUIs: context menus, dialog boxes, tool tips, Multiple Window Display, dock windows, and so on:

- 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

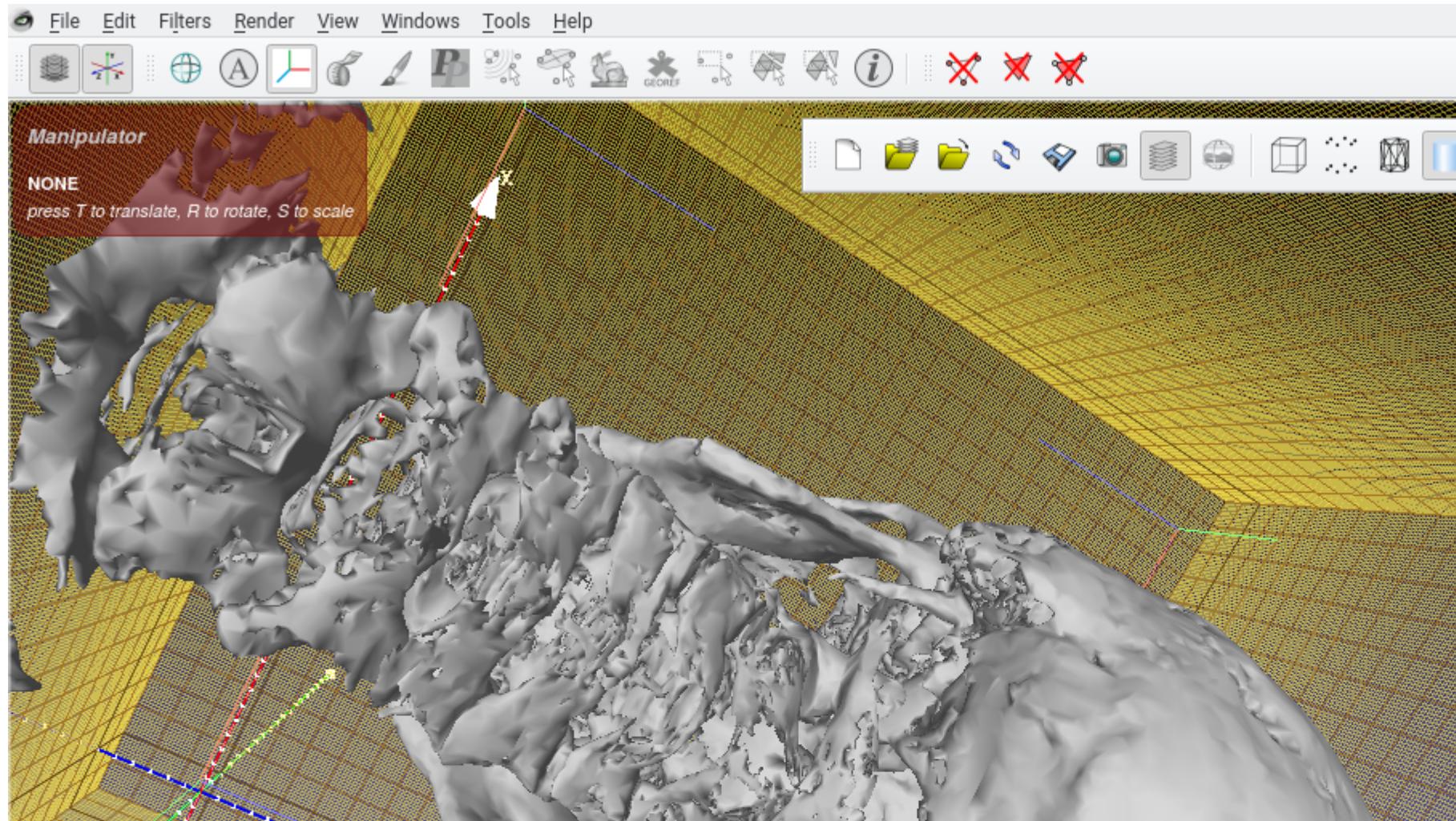
Research S
Research Slide 2
Research Slide 3
Research Slide 4
Research Slide 5

This slide and the next demonstrate a case-study where inter-application data sharing enhances two applications' capabilities — 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 components) 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 ? ^ 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> ? ^ X

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	January	Sat
		31	1	February	6
		7	8	March	13
		14	15	April	20
2	Test 1	21	22	May	27
		28	29	June	3
		4	5	July	10

OK Print

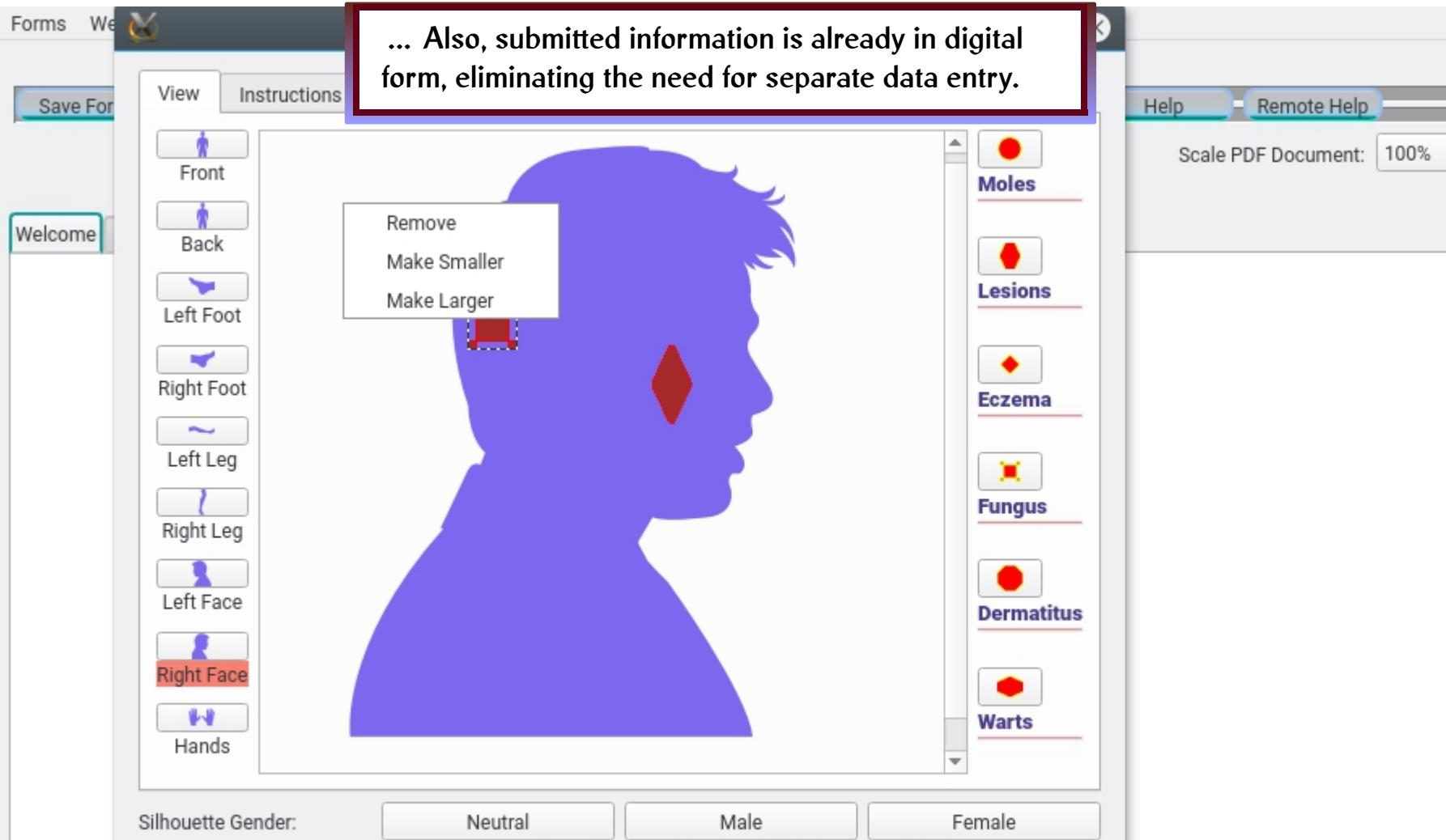
The screenshot shows a software interface for data collection. At the top, there's a menu bar with 'Forms', 'Web', 'Language', 'Help', and 'About'. Below the menu are several buttons: 'Save Form', 'Open Form' (which is highlighted in orange), 'Cloud Save', 'Cloud Open', and 'Submit Form'. There are also buttons for 'Page' (set to 0) and 'Search for' with a dropdown for 'Forwards'. On the left, there's a sidebar with tabs: 'Welcome' (selected), 'Web', 'Form Outline', and a section with a red border containing links: 'Patient Information', 'Chief Complaint', 'Review of Symptoms', 'Treatment History', 'Medical History', 'Current Medications', and 'Family History'. Below this section is a note: 'Click on a subheading to continue'. A large central window is titled 'ndp-main-outline <5>'. It contains fields for 'Referring Doctor' (Dr. New Test) and 'Referred By (Choose One)' (Clinical Specialist). A date picker shows '1/9/16' with a dropdown menu open, displaying the month 'January' and the year '2018'. Below the date picker is a section titled 'Please List your Previous Stays' with a table showing two entries: '1 Test 2' and '2 Test 1', along with a calendar for January 2018. The calendar shows days from Sunday to Saturday, with specific dates like 14th and 21st highlighted.

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

Qt-Based Interactive Forms

Research Side 1
Research Side 2
Research Side 3
Research Side 4
Research Side 5

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.

Data-Set Applications are “Research Object Bundles” — combinations of code and data providing access to data sets without the need for external software.

The image shows a screenshot of the A3R application interface. At the top, there is a navigation bar with tabs: View, Instructions, Series Images, Languages, Code, Patient Info Summary, and Diagnostic Report Summary. Below the navigation bar is a toolbar with various icons for image processing and annotations. On the left, there is a vertical stack of small thumbnail images. The main central area displays a histology image of a cell with a prominent purple nucleus. A red arrow points to the right side of the nucleus. To the right of the image, there is a vertical panel containing icons for different annotation tools: Arrows, Comments, Lists, Arcs, and Rulers. At the bottom, there are several control buttons: Silhouette Zoom (with a slider), Image Transforms ..., Annotations Transforms ..., and a Clear button. There are also buttons for Pan, Zoom, and Slide on the left, and Pan, Rotate, and Zoom on the right.

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 to 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 shoes. At the bottom of the screen, there are navigation buttons for item selection (Item: 3), image zoom, and a horizontal scroll bar. Below the main image, there are tabs for 'Overview', 'Features', 'Specs', and 'Reviews'. Under the 'Specs' tab, there is a bulleted list: • Leather upper, • Lace-up, • Round toe. To the right of the main image, there is a product description for the 'Grand Crosscourt II Sneaker', a list of actions (Add to Cart, Explore Colors), and two color swatches for the shoe's sole.

Grand Crosscourt II Sneaker

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!

Actions:

- [Add to Cart](#)
- [Explore Colors](#)

Item: 3 Image Zoom:

Overview Features Specs **Reviews**

- Leather upper
- Lace-up
- Round toe

Interactive “Shopping Carts”

Instead of static lists, shopping carts can be 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", and "Broadleaf". Below it, a toolbar shows "Page: 0", a search bar, and a zoom level of "100%". A grid of flower images is visible above the main content area.

The interface features two main product windows:

- Window 1 (Left):** Displays a bouquet of purple peonies and greenery. The product details are:

Lily Garden Silk
Peony Bouquet
Home Decoration,
Lilac, 18 Inches
High

Below the image are tabs for "Overview", "Specs", "Reviews", and "Q & A".
- Window 2 (Right):** Displays a large bouquet of pink hydrangeas. The product details are:

Frosted
Hydrangea,
Mauve, 32
Inches High, 12
Floral Sprays

Below the image are tabs for "Overview", "Specs", "Reviews", and "Q & A".

At the bottom of each window are "OK" and "Cancel" buttons.

Explore Products with Native Software

E-Commerce
Slide 1

E-Commerce
Slide 2

E-Commerce
Slide 3

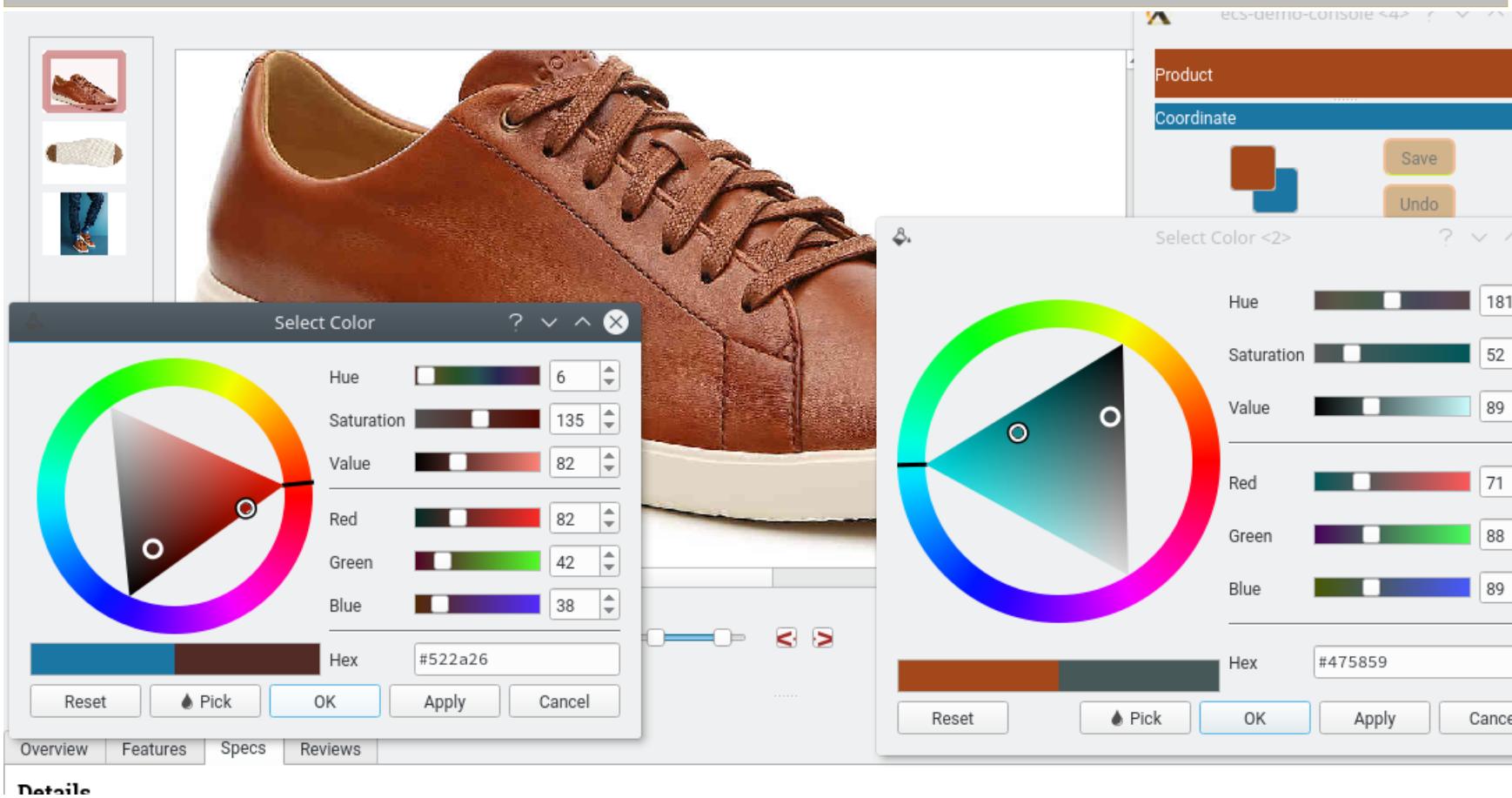
E-Commerce
Slide 4

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 may be displayed via interactive, multidimensionally-organized, color-coded photo viewers.

The screenshot shows a software application window titled "rpdf-emb-console". On the left, there is a grid of thumbnail images representing different rooms of a house. A specific thumbnail in the bottom 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 image of a master bedroom with green walls, a wooden bed, and a chaise lounge. This image is enclosed in a white box with the text "Current Photo". At the bottom of the screen, there are navigation controls (left and right arrows), an item counter ("Item: 19"), an "Image Zoom" slider, and standard "OK" and "Cancel" buttons.

Groupings

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

Color-Coded Groups

Current Photo

Image Zoom:

OK Cancel

Photo Viewer Interactive Cues

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

The screenshot shows a photo viewer interface with a grid of thumbnails on the left and a large preview image on the right.

- Already Viewed (vertical color band):** A callout points to a thumbnail in the top row where a vertical purple bar overlaps it, indicating it has been viewed.
- Not Yet Viewed (horizontal color band):** A callout points to a thumbnail in the middle row where a horizontal purple bar overlaps it, indicating it has not yet been viewed.
- Current Photo (viewed for the second time):** A callout points to a thumbnail in the bottom row that is surrounded by a thick purple border, indicating it is the current photo being viewed for the second time.

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 a list of room categories and a 'Check Boxes' section below it.

Visible Groups: Entrance/Foyer/Hall, Living Room/Den, Bedroom/Closet, Master Bedroom/Spa.

Check Boxes: Kitchen/Dining Room, Bath/Powder Room, Basement/Game Room.

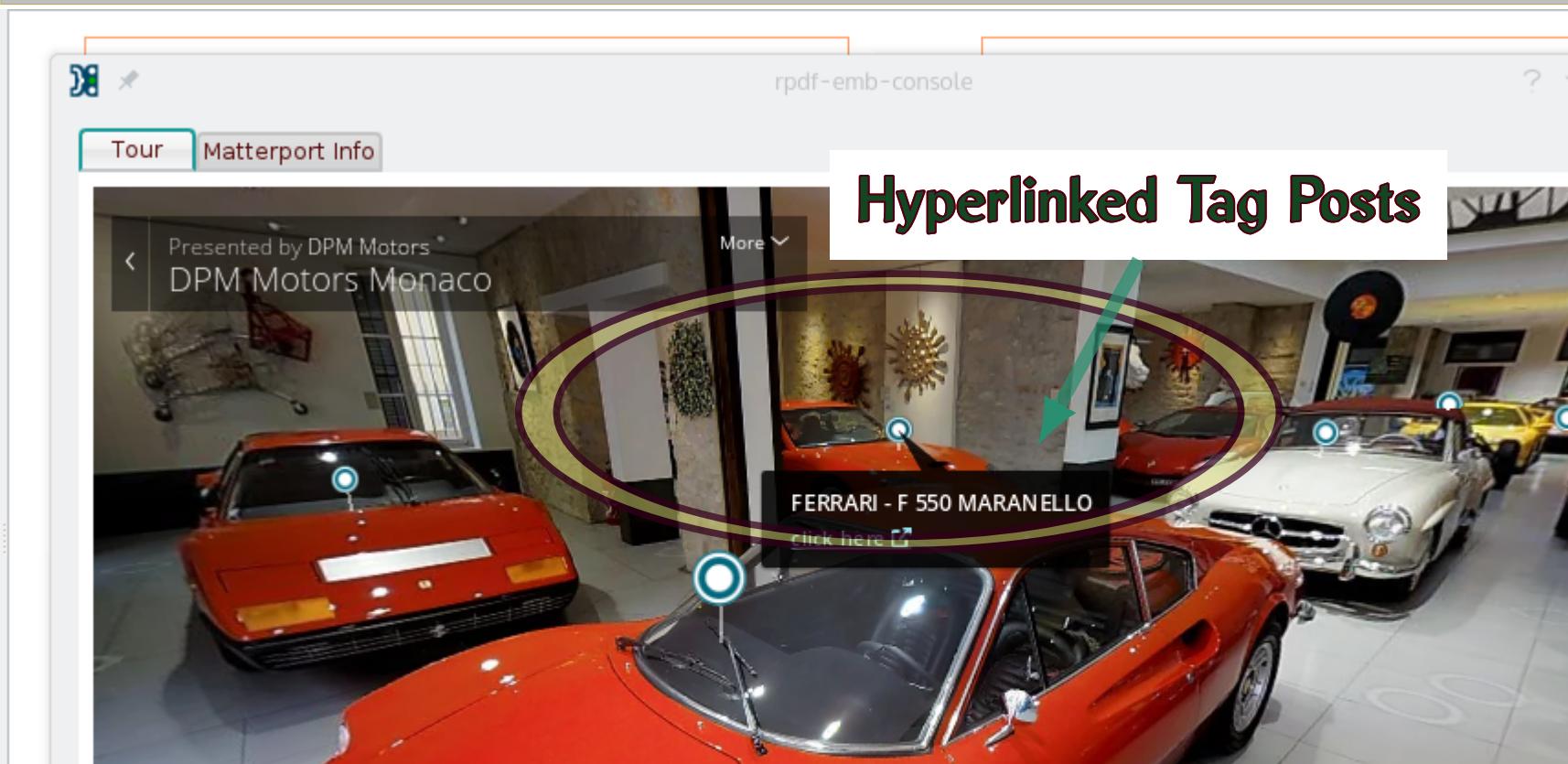
Hidden Groups: (None are visible)

Item: 3 Image Zoom: [Slider] OK

Annotations: A green oval highlights 'Entrance/Foyer/Hall' in the 'Visible Groups' list. A red circle highlights 'Basement/Game Room' in the 'Check Boxes' list. A red arrow points from the 'Check Boxes' list to the 'Hidden Groups' label.

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 — here, 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 a book. Below them are links for 'References', 'Library', and 'Reading'. A navigation bar at the bottom includes 'HTML Source', 'Lisp', 'CSS', and 'XML'. The main content area features the title 'ANTHROPOLOGY AND HUMANISM' in large brown letters. Below it is a blue link 'Explore this journal >'. A red horizontal bar spans across the page.

This screenshot shows a specialized A3R viewer window. At the top, it says 'Display Tala Types: Jhoomra/Dhamar (14 beats)'. Below this is a diagram showing two horizontal rows of colored rectangles. The top row is red, and the bottom row is divided into four sections by green lines, with the first section being purple. Below the diagram is a scroll bar. Underneath the diagram, the word 'Patterns' is followed by a slider with 'Pattern 1 (3-4-3-4)' on the left and 'Pattern 2 (' on the right. At the bottom, there is a 'File' field containing the path '/extension/ScignSeer/articles/svg/tala.svg' and a 'Proceed' button.

ANTHROPOLOGY AND HUMANISM

[Explore this journal >](#)

Ethnographer as Apprentice: Embodying omusical Knowledge in South India

da Weidman

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

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 search fields for "Search" and "Book". The main area features a 3D ball-and-stick model of the amino acid cysteine, with its characteristic sulfur atom highlighted in yellow. To the left of the molecule, a context menu is open over a carbon atom, showing options like "Configure", "Select All", "Reperceive Bonds", "Duplicate Geometry", "Atomic Charges", and "Remove". A sub-menu for "SONIC" is also visible, containing "Springer Keyword Search: Cysteine", "Springer Web Search Home", and "Search Saved Articles". At the bottom left, a URL is displayed: www.springer.com/gp/search?query=cysteine&submit=Submit. The bottom right corner of the slide contains navigation icons for a presentation slide.

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 publishers, or by cultural or educational institutions.

View Instructions

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 documents — including audio files, videos, and 3D graphics scenes or models.

Ailurus fulgens styani (also known as *a. f. refulgens*): Only found in China (in the Hengduan Mountains in Sichuan and the East Nujiang River of Yunnan Province) and northern Myanmar.

The head and body length of red pandas averages 56 to 63 cm (22 to 25 in), and their tails about 37 to 47 cm (15 to 19 in).



Behavior

Red pandas are generally solitary, but there are a couple of exceptions. They develop extended associations with their mothers that last through the breeding season.



In terms of territoriality, red pandas tend to have overlapping ranges with other. This may be due to the fact that they search for their food in different areas, which may be patchily distributed.

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

so they e annual

They each das may be effect the

ARKIVE
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Moving images copyright
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Sound recordings copyright
© BBC Natural History Unit
© Natural FX

Restart Pause Play

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

OK Proceed Cancel

February 3, 2020 21 / 22

Thank You!

Thanks

Please contact Linguistic Technology Systems for more information about NA3 or other Software Development and Software Language Engineering solutions.

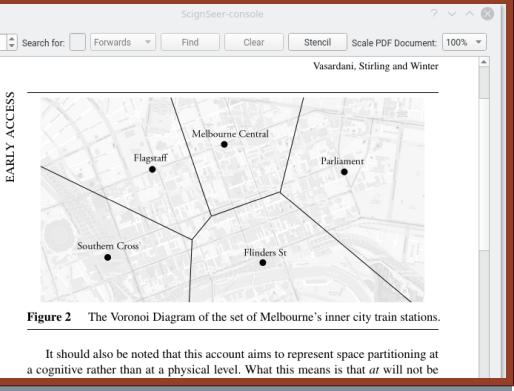
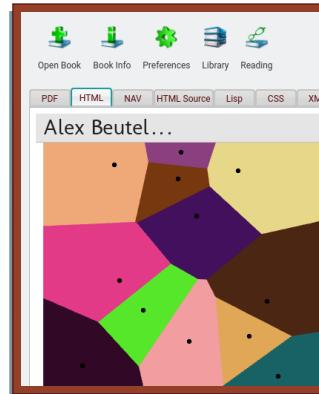
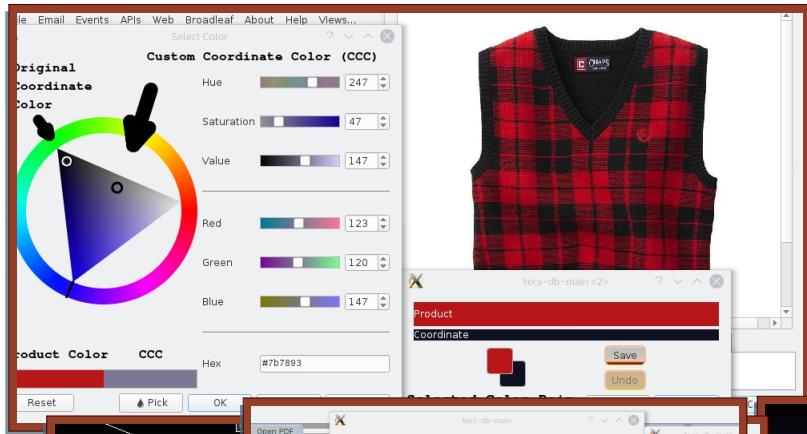


Figure 2 The Voronoi Diagram of the set of Melbourne's inner city train stations.

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

