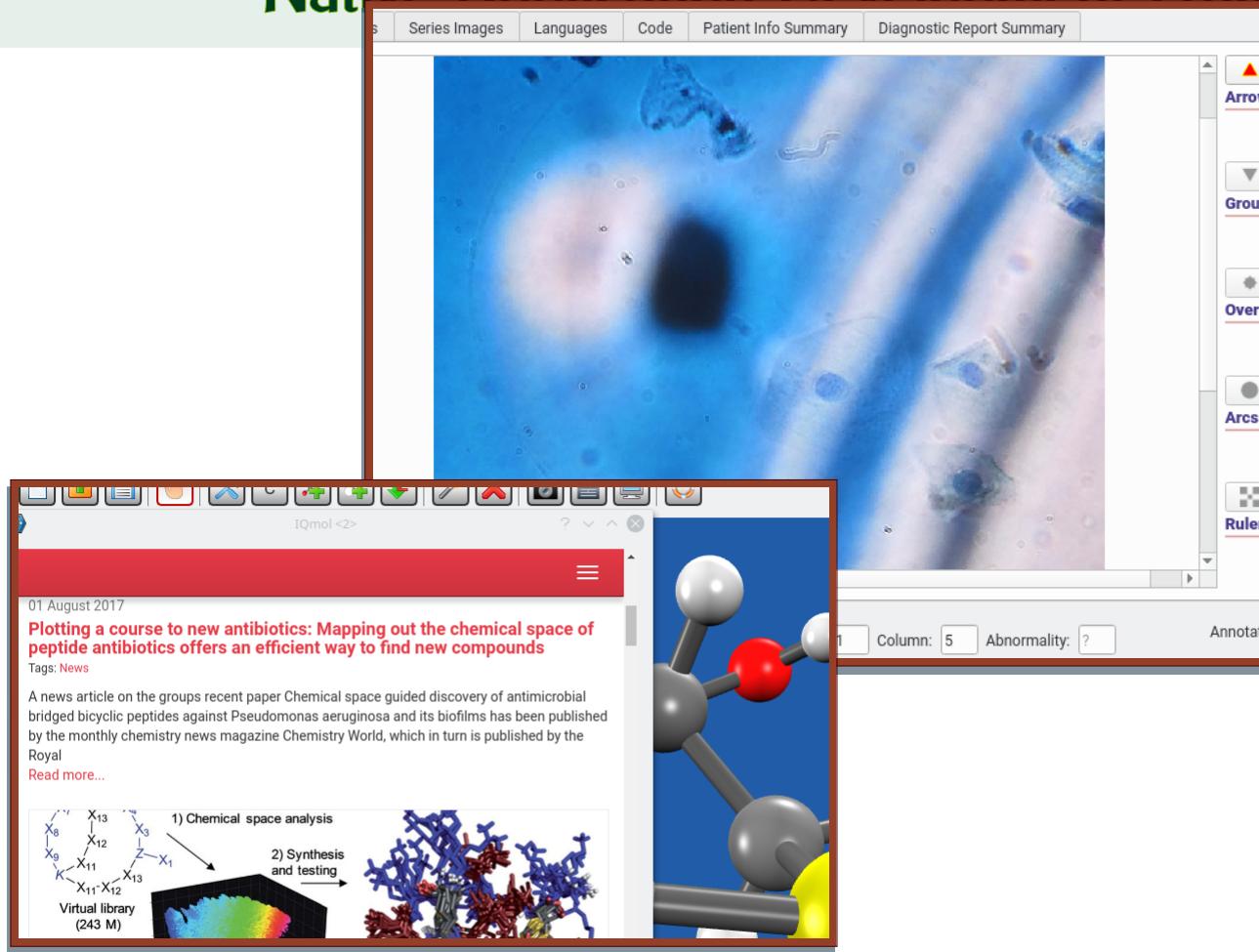


The NCN/A3R ("NA3")

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

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

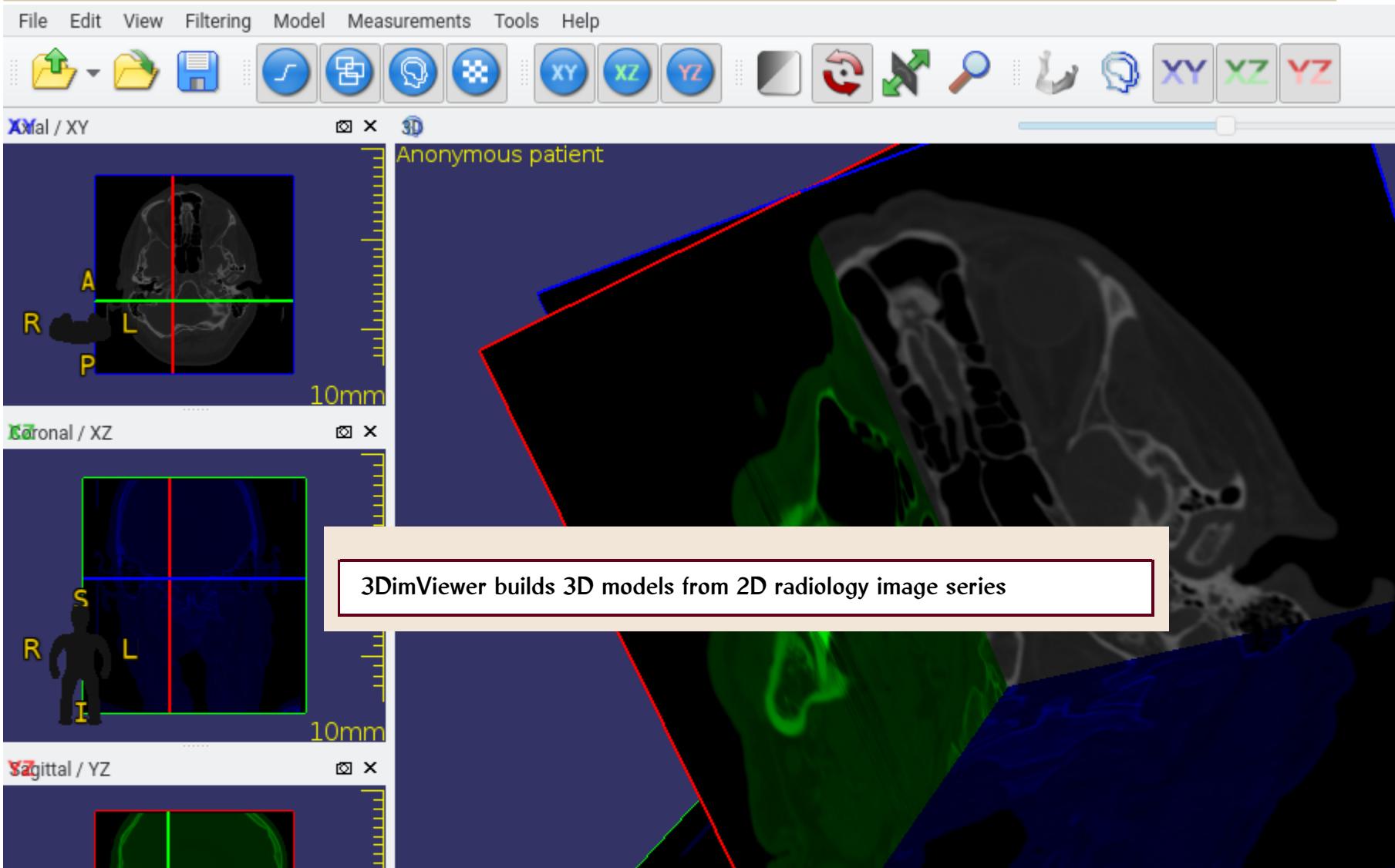
- Export data and instructions between Qt-based applications (slides e-e).
- Embed document or multi-media viewers inside scientific or dataset applications (slides e-e).

Responsive, desktop-style applications for enhanced UX

- Compelling front-ends for e-commerce, Real Estate, VR, etc. (slides e-e).
- Native applications offer superior User Experience, leveraging distinct interactive features of desktop GUIs: context menus, dialog boxes, tool tips, Multiple Window Display, dock windows, etc.
- For scientists and researchers, build innovative data-collection instruments as well as interactive Research Object applications (slides e-e).

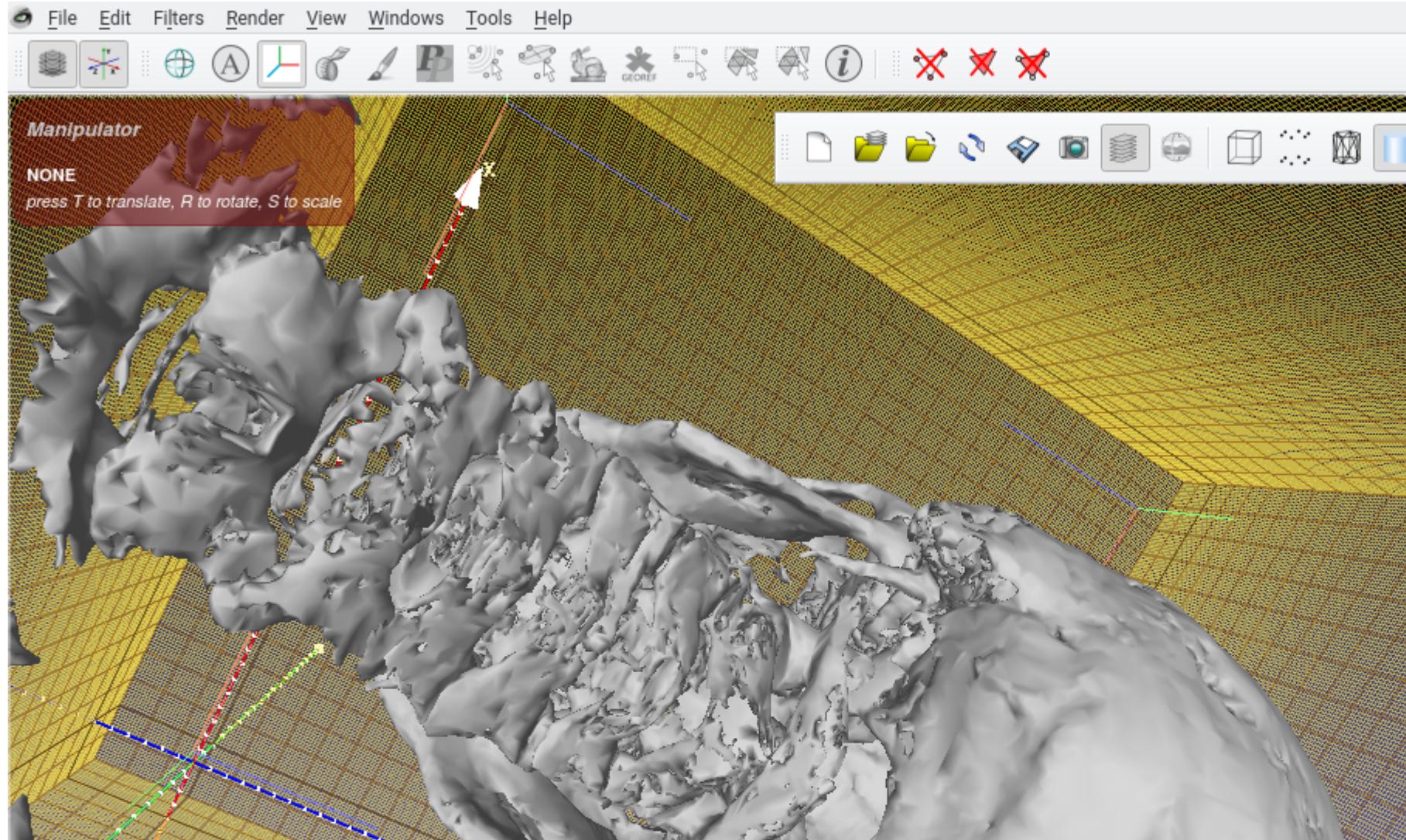
An Example of Inter-Application Networking

This slide and the next demonstrates a case-study where inter-application data sharing enhances applications' capabilities.



3D Graphics Sent to MeshLab

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



A3R Applications as Data Collection Instruments

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

Forms Web Language Help About

Save Form Open Form Cloud Save Cloud Open

Page: 0 Search for: ndp-main-outline <5>

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

Referring Doctor: Dr. New Test

Referred By (Choose One): Clinical Specialist

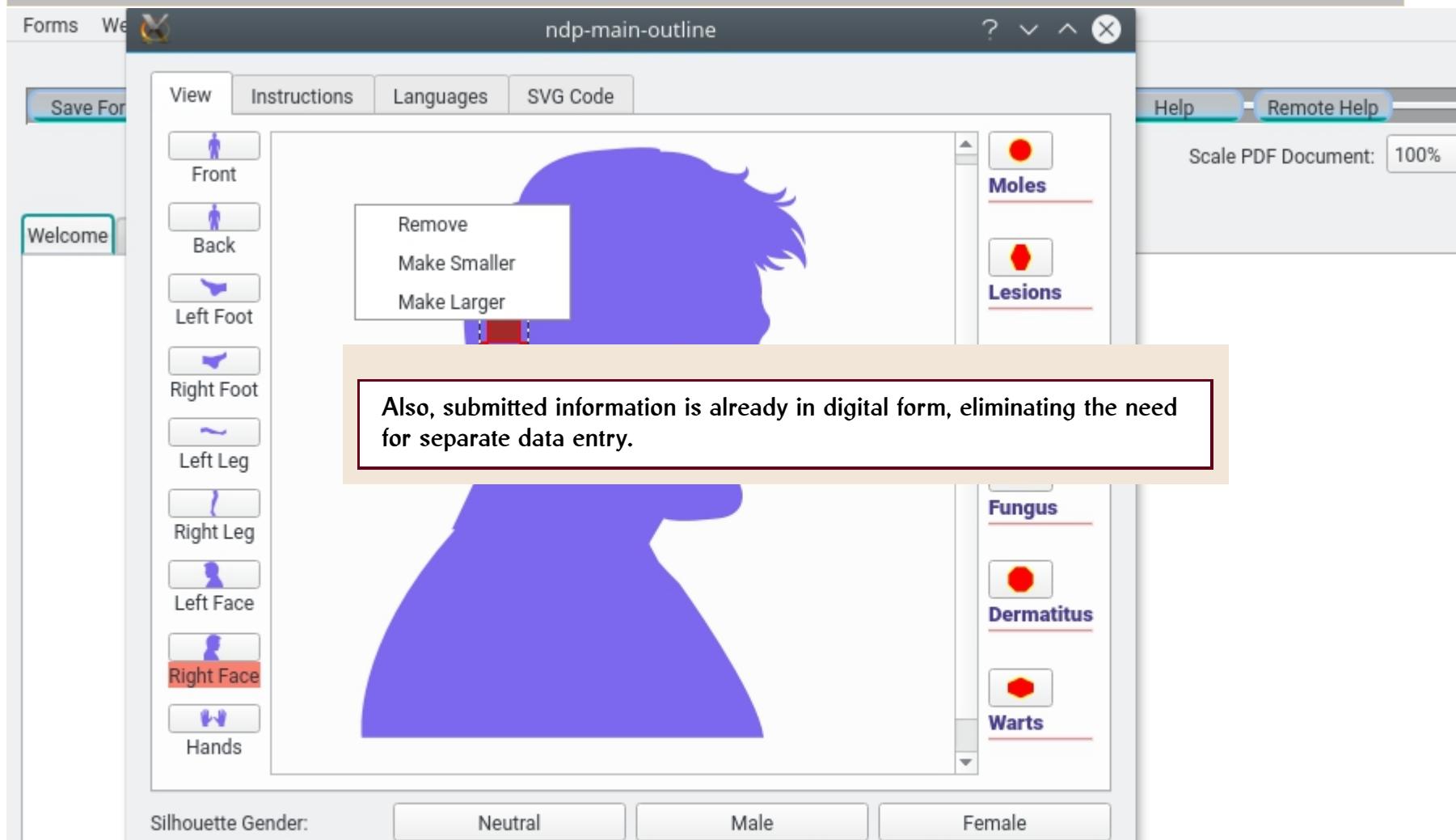
Date of Visit: 1/9/16

Please List your Previous St

1	Test 2	Sun	Mon	Januar
2	Test 1	31	1	Februa
		7	8	March
		14	15	April
		21	22	May
		28	29	June
		4	5	July

Qt-Based Interactive Forms

DCIs 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 the benefits of native applications for “obtaining” data, A3R components are also powerful tools for showing and analyzing research findings.

Patient Info Dialog Diagnostic Report Open Folder Open Image

View Instructions Series Images Languages Code Patient Info Summary Diagnostic Report Summary

Native Applications as Interactive Catalogs

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.

Detach Image
Detach Notebook
Detach Description
Detach Everything
Merge Windows
Explore Color Matches ...
View 3D Model ...
Take Screenshot
View Item List
View Shopping Cart

Item: 3 Image Zoom: < >

Overview

Features

Specs

Reviews

Grand Cross

Sleek and s
Crosscourt
Haan is the
some tailor
your every

Actions:

- [Add to](#)
- [Explor](#)



Interactive “Shopping Carts”

Instead of static lists, shopping carts in a native context can be multi-scale, multi-window interactive displays.

The screenshot illustrates a native application interface for a shopping cart, featuring multiple windows and a central navigation bar.

Top Navigation Bar: File, Email, Events, APIs, Web, Broadleaf. Page: 0. Search for: [input field]. Document: 100%

Central Grid: A grid of six flower arrangements, each with a small thumbnail preview.

Left Window (tec5-db-main <2>): Displays a detailed view of a purple peony bouquet. The text on the left side reads: "Lily Garden Silk Peony Bouquet Home Decoration, Lilac, 18 Inches High".

Right Window (tec5-db-main <3>): Displays a detailed view of a large hydrangea bouquet.

Bottom Status Bar: Includes icons for back, forward, search, and other application functions.

Explore Products with Native Software

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.

The screenshot shows a product catalog interface for a brown leather sneaker. On the left, there's a sidebar with three thumbnail images: a brown shoe, a white sock, and a person's leg. The main area features a large image of the brown leather sneaker. In the bottom-left corner, a "Select Color" dialog box is open, displaying an HSV color wheel with a red-to-black gradient. The color settings are: Hue (6), Saturation (135), Value (82). Below the wheel are sliders for Red (82), Green (42), and Blue (38), and a hex color code field (#522a26). Buttons for Reset, Pick, OK, Apply, and Cancel are at the bottom. To the right of the main image, there are two separate HSV color wheels. The top one is labeled "Coordinate" and has a color bar below it with hex #522a26. The bottom one is labeled "Select Color" and also has a color bar with hex #522a26. Navigation tabs at the bottom include Overview, Features, Specs, Reviews, and a tab that is partially visible.

Product
Coordinate
Select Color

Hue
Saturation
Value
Red
Green
Blue
Hex #522a26

Reset Pick OK Apply Cancel

Coordinate

Select Color

Red
Green
Blue
Hex #522a26

Reset Pick OK

Overview Features Specs Reviews

Interactive Real Estate

Native applications can also bring enhanced UX to Real Estate presentations — instead of just groups of photos, properties may be introduced via interactive, color-coded photo viewers visually organized according to desktop-software conventions.

rpdf-emb-console

The screenshot shows a user interface for viewing real estate properties. On the left, there is a grid of small thumbnail images representing various rooms and exterior views of houses. On the right, a larger image of a bedroom is displayed, featuring a large bed, a chaise lounge, and a dresser. Below this main image, the text "Current Photo" is overlaid. At the bottom of the screen, there are navigation controls (back/forward arrows), an item counter (Item: 19), an image zoom slider, and standard window control buttons (OK, Cancel). A sidebar on the left contains a list titled "Groupings" with items such as "Entrance/Foyer/Hall", "Kitchen/Dining Room", "Living Room/Den", etc., each associated with a colored bar.

Groupings

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

Current Photo

Image Zoom:

OK Cancel

Photo Viewer Interactive Cues

These slides demonstrate visual cues to aid photo navigation, such as color bands 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 (this border will surround the thumbnail and both horizontal and vertical overlays).

The screenshot shows a photo viewer interface with the following features:

- Vertical Color Band:** A red arrow points to a thumbnail in the grid where a vertical red bar overlaps it, labeled "Already Viewed (vertical color band)".
- Horizontal Color Band:** A blue arrow points to a thumbnail in the grid where a horizontal red bar overlaps it, labeled "Not Yet Viewed (horizontal color band)".
- Current Photo:** A large image of a living room/kitchen area is displayed on the right, labeled "Current Photo (viewed for the second time)".
- Groupings:** A sidebar on the left lists categories with corresponding colored bars:
 - Entrance/Foyer/Hall (red)
 - Kitchen/Dining Room (blue)
 - Living Room/Den (green)
 - Bath/Powder Room (orange)
 - Bedroom/Closet (purple)
 - Master Bedroom/Spa (pink)
 - Basement/Game Room (gray)
- Navigation:** At the bottom are standard photo viewer controls: back/forward arrows, item number (Item: 10), and image zoom sliders.

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.

The screenshot shows a photo viewer application with a sidebar of thumbnail images and a main viewing area. On the left, under 'Groupings', there is a list of room categories with checkboxes:

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

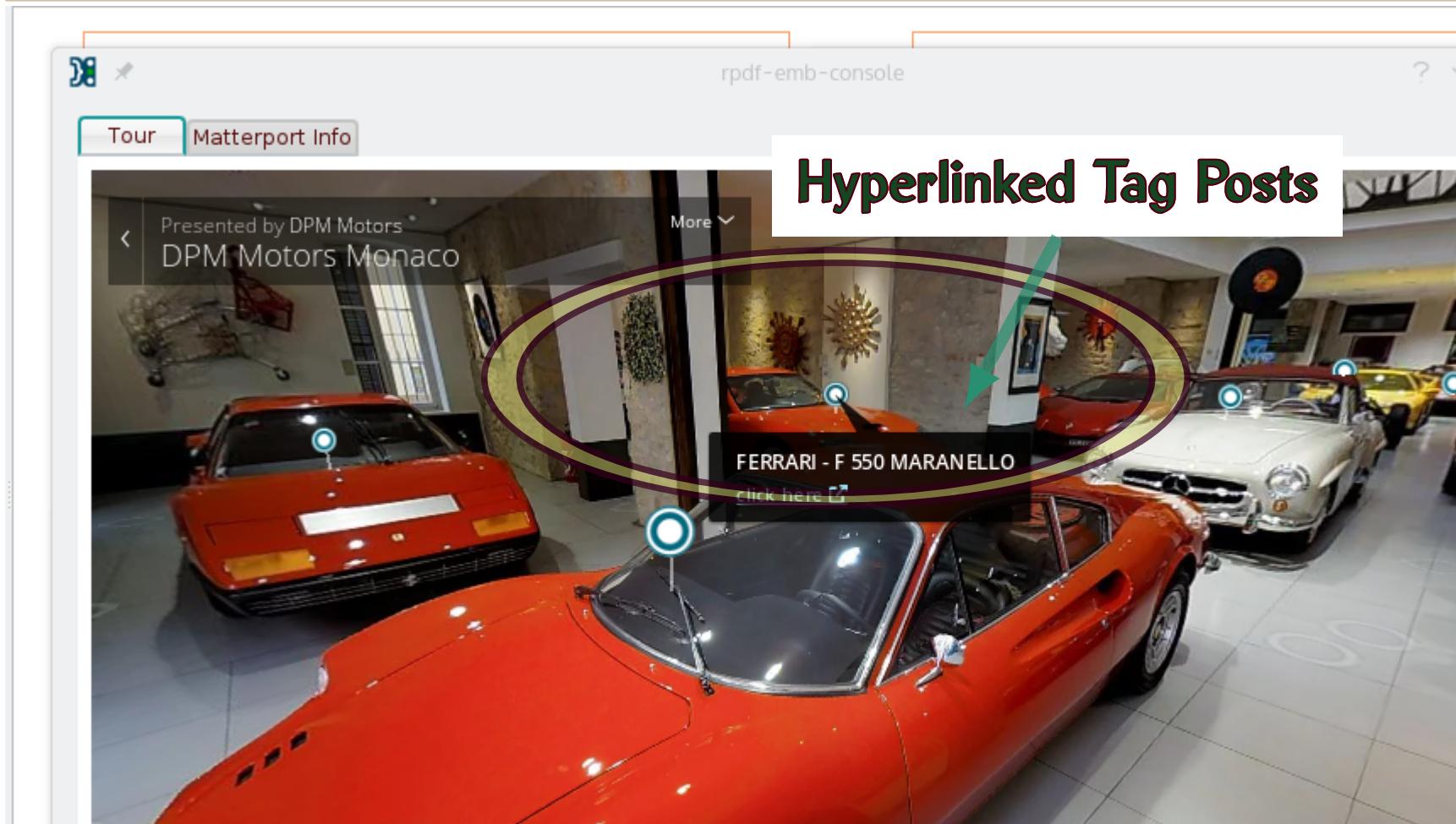
A green oval highlights the 'Entrance/Foyer/Hall' checkbox, and a red oval highlights the 'Basement/Game Room' checkbox. Arrows point from these ovals to labels 'Visible Groups' and 'Hidden Groups' respectively. The main viewing area displays a large image of a living room with two arched windows and a sofa. At the bottom, there are navigation buttons (left/right arrows), an 'Item: 3' indicator, an 'Image Zoom' slider, and 'OK' and 'Cancel' buttons.

Visible Groups

Hidden Groups

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 Materport, 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 feasibly realized with VR embedded in native software.



A3R Document Viewers

A3R applications may include viewers for popular document formats such as e-Pub, HTML, and PDF. The application may then supplement conventional publications with special software components, perhaps customized for individual manuscripts — in this example, a widget allowing readers to visually explore patterns in classical Indian music.

The screenshot displays a hybrid document viewer interface. At the top, there's a navigation bar with icons for Open Book, Book Info, Preferences, Library, and Reading. Below this is a toolbar with tabs for PDF, HTML (which is selected), NAV, HTML Source, Lisp, CSS, and XML. A large red rectangular area covers the main content area. Below this area, there's a link to "Go to old article view" and a row of icons for PDF, i (info), and a file icon. The main title "ANTHROPOLOGY AND HUMANISM" is displayed in large, bold, brown letters. Below the title, the subtitle "The Ethnographer as Apprentice: Embodying Sociomusical Knowledge in South India" and author "Amanda Weidman" are shown. A small "ECI" logo is in a box. On the right side, a sidebar titled "ScignSeer SVG Vi" shows a "Patterns" section with a "Display Tala Types: Jhoomra/Dhamar (14 beats)" dropdown. It features a grid of colored rectangles (red, purple, green) representing musical patterns, with a slider labeled "Pattern 1 (3-4-3-4)". The sidebar also includes a "File" field with the path "/extension/ScignSeer/articles/svg/tala.svg". The bottom right corner shows a thumbnail of the document page and page numbers "Volume 3 December Pages 2".

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 molecular visualization program) via an A3R document-viewer plugin.

The screenshot shows the IQmol molecular visualization software interface. At the top is a menu bar with File, Edit, Display, Build, Calculation, SONIC, and Help. Below the menu is a toolbar with various icons. On the left, there's a "Model View" panel showing a tree structure with "Global" and "L-cysteine" selected. A context menu is open over the "L-cysteine" entry, listing options like Configure, Select All, Reperceive Bonds, Duplicate Geometry, Atomic Charges, Remove, and SONIC. The "SONIC" option is highlighted. An "A3R Reader" window is embedded in the interface, displaying search results for "Cysteine". The window has tabs for "SONIC Reader", "Springer Keyword Search: Cysteine", "Springer Web Search Home", and "Search Saved Articles". It shows 157 results for "Cysteine Proteases of Pathogenic Organisms" by M.W. Robinson and J.P. Dalton, published in 2011. The main workspace displays a 3D ball-and-stick model of the L-cysteine molecule, with carbon atoms in grey, hydrogen atoms in white, and the sulphur atom in blue. The oxygen atom is red.

File Edit Display Build Calculation SONIC Help

Model View

► Global

► L-cysteine

- Configure
- Select All
- Reperceive Bonds
- Duplicate Geometry
- Atomic Charges
- Remove
- SONIC

SONIC Reader

Springer Keyword Search: Cysteine

Springer Web Search Home

Search Saved Articles

Refine Search Showing 157 results.

CONTENT TYPE Book

Book 157

TOPICS

Piochomi

Cysteine Proteases of Pathogenic Organisms

Robinson, M. W. (Ed), Dalton, J. P. (Ed) (2011)

Cysteine proteases expressed by pathogenic organisms play key roles in virulence including host

Cysteine Proteases of Pathogenic Organisms

Mark W. Robinson, John P. Dalton, Editors

February 2, 2020 19 / 22

Document Viewers Augmented With APIs

Another strategy for realizing interactive publications is to link documents with publisher's APIs, or APIs maintained by other 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 Design** department.

Cite this object as

Medal; bronze; 1920-3

Row: 0 Column: 0

Embedded Multimedia

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 syriani (also known as *a. f. fulgens*). 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 cases where 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/

ScignSeer Video Player

ARKIVE
www.arkive.org

Moving images copyright
© BBC Natural History Unit

Sound recordings copyright
© BBC Natural History Unit
© Natural FX

Restart Pause Play

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

OK Proceed Cancel

Thanks!

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

