Collaborative visual analytics of large radio surveys

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Spectral-cube surveys

To date, the number of resolved images of the neutral atomic hydrogen (HI) content in galaxies has numbered in the hundreds.

With the advent of next-generation radio telescope facilities like the Square Kilometre Array (e.g. [3]) and its associated pathfinders such as the Australian SKA Pathfinder [2] and the APERTIF upgrade on the Westerbork telescope [4], thousands of resolved images of the HI distribution of galaxies are expected.

This will represent a revolution in galaxy evolution studies which will require innovative solutions to be able to make the comparisons required to understand the role hydrogen gas plays in galaxy evolution.

In large survey projects, astronomers commonly face limitations regarding:

1) interactive visual analytics of sufficiently large subsets of data;
2) synchronous and asynchronous collaboration;

3) documentation of the discovery workflow.

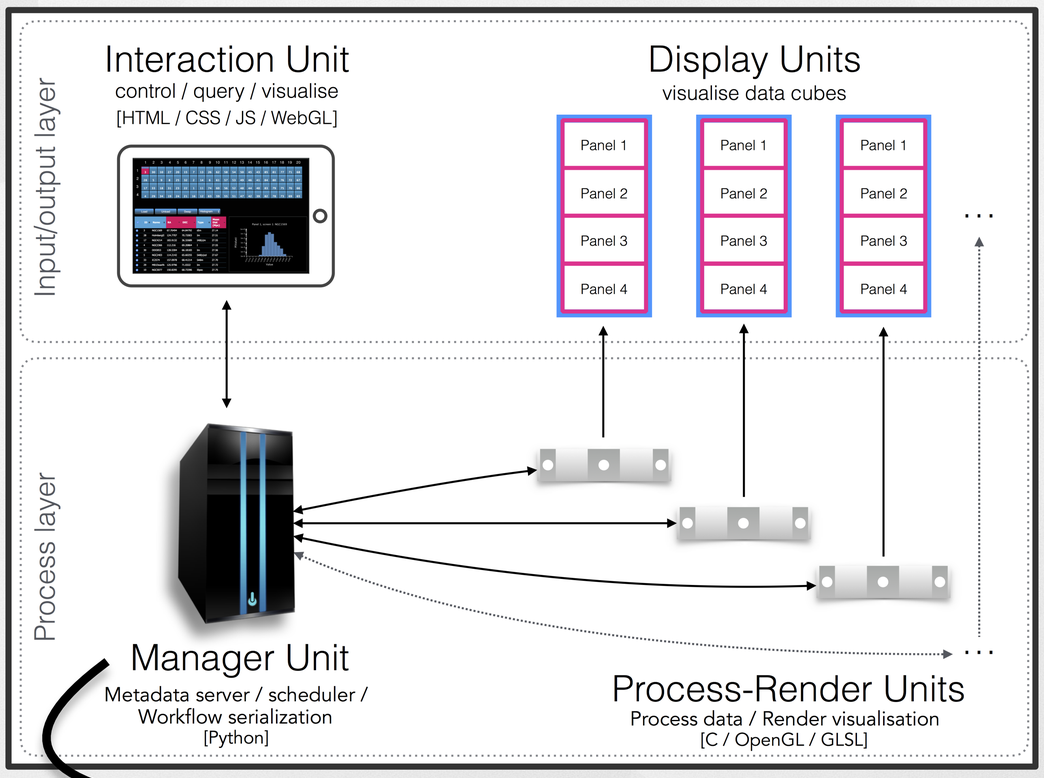
encube in action at CAVE2 visualising data from The HI Nearby Galaxy Survey (THINGS [7]).

encube : interactive visual analytics framework

To support collaborative data inquiry in large radio surveys, we introduce encube [5, 6] a large scale comparative visual analytics framework. The framework provides high quality interactive visualisations, and mechanisms for comparative and quantitative data analysis.

CAVE2. encube is tailored for use with large tiled-displays and advanced immersive environments like the CAVE2 at Monash University (Monash CAVE2). The framework harnesses the power of high-end visualisation environments for collaborative analysis of large subsets of data from radio surveys.

Desktop. encube can also work on standard desktops, providing a seamless visual analytics experience regardless of the display ecology.



The Monash CAVE2

Hybrid 2D/3D reality environment for immersive simulation and information analysis.

Part immersive visualization environment
- 8-meter diameter working area,
- 320 degree panoramic display system;
- 80 stereo-capable displays
  - arranged in 20 four-panel columns,
  - providing 84 million pixels;

Part supercomputer
- ~100 TFLOP/s of integrated GPU-based processing power

Monash University's CAVE2 is a great candidate to both visualize a large quantity of data in a collaborative manner and perform compute-intensive data analysis tasks.

Workflow serialization

encube builds a bridge between the CAVE2 and the classical desktop, preserving all traces of the work completed on either platform – allowing the research process to continue wherever you are.

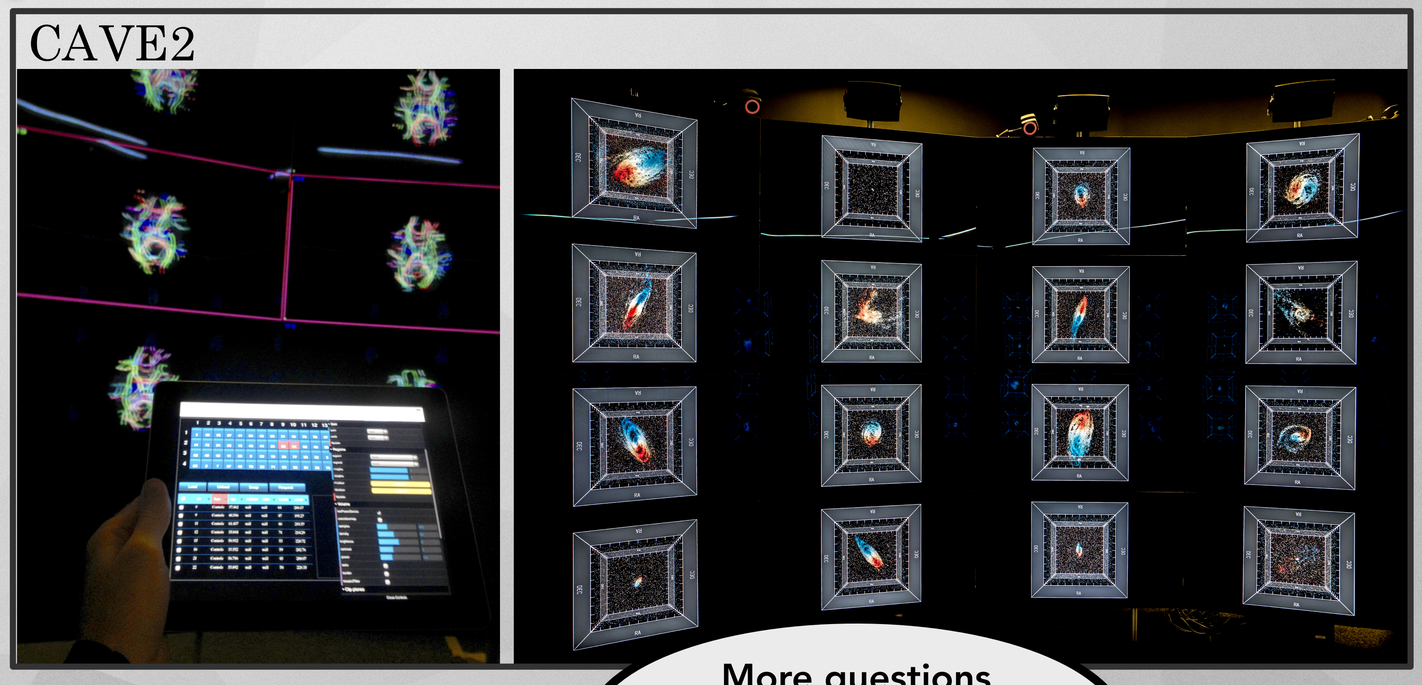
At the heart of encube is a data management unit built in Python — making it simple to incorporate other Python-based astronomical packages and Virtual Observatory capabilities developed within our community.

Final remarks

- Visual analytics of ~100 sources at once.
- encube is not only viable for astronomy, but for any volumetric scientific data surveys (e.g. medical imaging).

Desktop

CAVE2



Figures

***Desktop*. (A)** One Display Unit showing volume rendered spectral-data from THINGS [7]. **(B)** Interaction Unit used to interact with visualisation parameters (e.g. transparency, camera position, query data).

***CAVE2*. (A)** Interaction Unit (iPad) controlling the Display Units. We show encube rendering brain scan data as part of the neuroscience study IMAGE-HD [1]. **(B)** Display Units (four columns and four rows) showing volume rendered spectral-data from THINGS [7].

References

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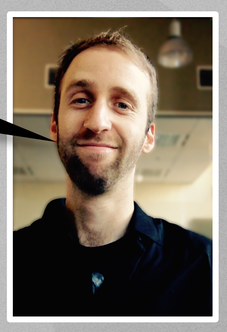
[7] Walter *et al*. 2008, AJ, 136, 2563.

More questions about encube? Come and ask me!



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