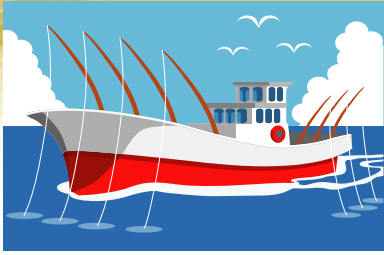


# Improvement of Service Searching Algorithm in the JVO Portal Site

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# 1. An Ocean of VO

- The Virtual Observatory (VO) is a gigantic database for astronomy, and would hide treasure ships that enable us to unveil mysteries of the universe.
- Experts in VO can salvage them.
- But new comers often lose their way in a sea of VO; they don't know how to get to their interested data...



## 2. JVO's Goal

- Our (= Japanese VO team: JVO) goal:
  - To make VO much more friendly to everyone, including experts in VO.
- Now working on implementing a smart algorithm to support user's search easily and quickly in our portal site.
- Report our approach and the current status.

# 3. Observation versus VO

➤ A standard procedure of an **observation**...

1. Choose targets,
2. Select a telescope and its instruments according to the nature of the targets, the flux in the observational wavebands, etc,
3. Observation,
4. Data analysis.

Astronomers are familiar with telescopes and instruments!

➤ A possible procedure in **VO**...

1. Choose targets,
2. **Select VO services**  
(cf. selection of a telescope and instruments),
3. Send a request and get the results
4. Perform quick looks and select interested data to download (cf. observation),
5. Data analysis.

Very similar to real observations, but how can **astronomers who are new to VO** find useful VO services?

## 4. Strategy

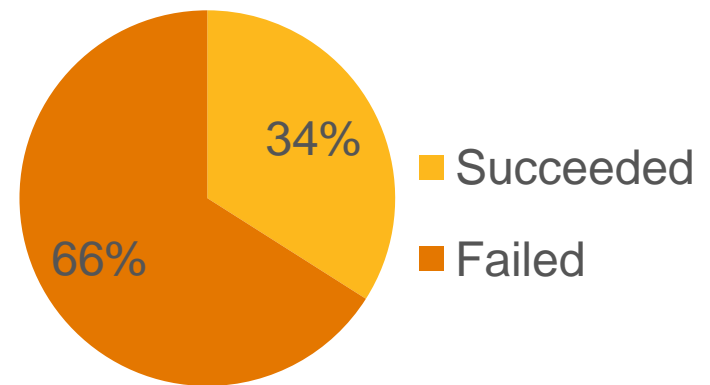
- Astronomers **don't know much about VO services** well, but they **are familiar with telescopes and instruments**.
- → **Bridging the gap** will improve the data service functionality and usability!

The problem is **how to construct the correspondence relations between services and telescopes /instruments...**

# 5. Generation of a Dictionary (1)

- Two important keywords in the resource metadata:
  - Facility : Telescope,
  - Instrument.
- But they are not always filled in most cases...
  - We can create a telescope dictionary based on items holding the two keywords.
  - Can we automatically reconstruct the keywords from titles and descriptions with the dictionary?

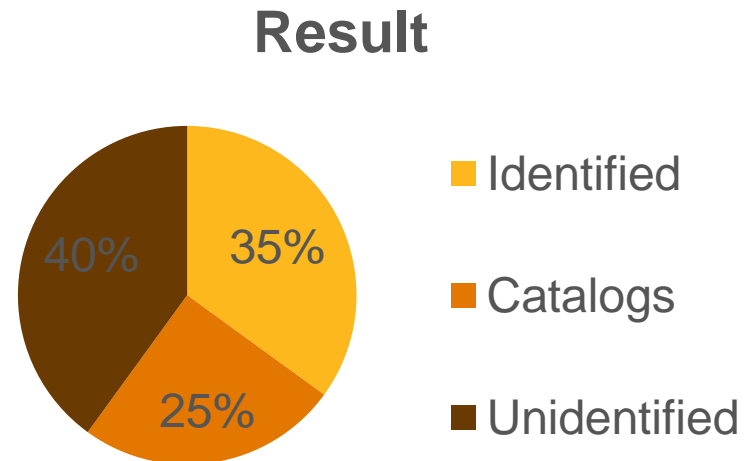
## Result



34% items holds or can be reconstructed only telescope names, but not instruments.

## 6. Generation of a Dictionary (2)

- Does **manual modification** of the auto-generated dictionary improve the success rate?
- **Why are there so many services that cannot be identified the telescopes of?**



- **The manual modification contributes only 1% improvement.**
- **Most catalogs have little information about telescopes.**
- **Most of remains (unidentified) are services for cataclysmic variables with minor telescopes.**
- **Cannot recover the information of instruments...**

**The algorithm using a dictionary succeeded to reconstruct the telescope keyword.**





## 7. User Interface (1)

- We adopt a manually-generated dictionary because we can include arbitrary information about telescopes and instruments (wavebands, etc).
- Do you think it is easy to use if you can select telescopes and instruments visually?
- For a fast development, we adopt Google Web Toolkit.






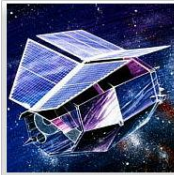







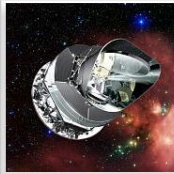
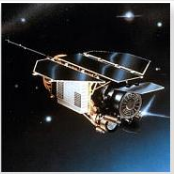


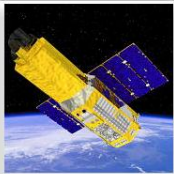




# 8. User Interface (2)

Find Services by Telescopes a...  

file:///mnt/raid0/home/eguchi/workspace/SelectServiceByInstrument/war/SelectServiceByInstrument.html

☒ Images ☒ Spectra ☒ Lightcurves Search I'm feeling lucky

**All** Radio Infrared Optical Ultraviolet X-Ray Gamma-Ray ← Tabs to filter wavebands of instruments

 <b>Akari</b> <ul style="list-style-type: none"><li><input type="checkbox"/> FIS</li><li><input type="checkbox"/> IRC</li><li><input type="checkbox"/> Others</li></ul>	 <b>Arecibo</b> <ul style="list-style-type: none"><li><input type="checkbox"/> ALFA</li><li><input type="checkbox"/> C-Band</li><li><input type="checkbox"/> P-Band</li><li><input type="checkbox"/> S-Band</li><li><input type="checkbox"/> X-Band</li><li><input type="checkbox"/> Others</li></ul>	 <b>Chandra</b> <ul style="list-style-type: none"><li><input type="checkbox"/> ACIS</li><li><input type="checkbox"/> HETGS</li><li><input type="checkbox"/> HRC</li><li><input type="checkbox"/> LETGS</li><li><input type="checkbox"/> Others</li></ul>	 <b>Einstein</b> <ul style="list-style-type: none"><li><input type="checkbox"/> FPCS</li><li><input type="checkbox"/> HRI</li><li><input type="checkbox"/> IPC</li><li><input type="checkbox"/> MPC</li><li><input type="checkbox"/> SSS</li><li><input type="checkbox"/> Others</li></ul>	 <b>Fermi</b> <ul style="list-style-type: none"><li><input type="checkbox"/> GBM</li><li><input type="checkbox"/> LAT</li><li><input type="checkbox"/> Others</li></ul>
 <b>Hinode</b> <ul style="list-style-type: none"><li><input type="checkbox"/> SOT</li><li><input type="checkbox"/> EIS</li><li><input type="checkbox"/> XRT</li><li><input type="checkbox"/> Others</li></ul>	 <b>HST</b> <ul style="list-style-type: none"><li><input type="checkbox"/> NICMOS</li><li><input type="checkbox"/> STIS</li><li><input type="checkbox"/> WFC3</li><li><input type="checkbox"/> ACS</li><li><input type="checkbox"/> COS</li><li><input type="checkbox"/> Others</li></ul>	 <b>IRAS</b> <ul style="list-style-type: none"><li><input type="checkbox"/> CPC</li><li><input type="checkbox"/> LRS</li><li><input type="checkbox"/> Survey Array</li><li><input type="checkbox"/> Others</li></ul>	 <b>IRSF</b> <ul style="list-style-type: none"><li><input type="checkbox"/> SIRIUS</li><li><input type="checkbox"/> Others</li></ul>	 <b>ISO</b> <ul style="list-style-type: none"><li><input type="checkbox"/> ISOCAM</li><li><input type="checkbox"/> ISOPHOT</li><li><input type="checkbox"/> LWS</li><li><input type="checkbox"/> SWS</li><li><input type="checkbox"/> Others</li></ul>
 <b>MAGIC</b> <ul style="list-style-type: none"><li><input type="checkbox"/> IACT</li><li><input type="checkbox"/> Others</li></ul>	 <b>Planck</b> <ul style="list-style-type: none"><li><input type="checkbox"/> HFI</li><li><input type="checkbox"/> LFI</li><li><input type="checkbox"/> Others</li></ul>	 <b>ROSAT</b> <ul style="list-style-type: none"><li><input type="checkbox"/> WFC</li><li><input type="checkbox"/> HRI</li><li><input type="checkbox"/> PSPC</li><li><input type="checkbox"/> Others</li></ul>	 <b>Spitzer</b> <ul style="list-style-type: none"><li><input type="checkbox"/> IRAC</li><li><input type="checkbox"/> IRS</li><li><input type="checkbox"/> MIPS</li><li><input type="checkbox"/> Others</li></ul>	 <b>Subaru</b> <ul style="list-style-type: none"><li><input type="checkbox"/> COMICS</li><li><input type="checkbox"/> FMOS</li><li><input type="checkbox"/> IRCS</li><li><input type="checkbox"/> MOIRCS</li><li><input type="checkbox"/> FOCAS</li><li><input type="checkbox"/> HDS</li><li><input type="checkbox"/> Suprime-Cam</li><li><input type="checkbox"/> Others</li></ul>
 <b>Suzaku</b> <ul style="list-style-type: none"><li><input type="checkbox"/> HXD/GSO</li><li><input type="checkbox"/> HXD/PIN</li><li><input type="checkbox"/> XIS</li><li><input type="checkbox"/> HXD/WAM</li><li><input type="checkbox"/> Others</li></ul>	 <b>UKIRT</b> <ul style="list-style-type: none"><li><input type="checkbox"/> CGS4</li><li><input type="checkbox"/> IRPOL</li><li><input type="checkbox"/> Michelle</li><li><input type="checkbox"/> UFTI</li><li><input type="checkbox"/> UIST</li><li><input type="checkbox"/> WFCAM</li><li><input type="checkbox"/> Others</li></ul>	 <b>VLA</b> <ul style="list-style-type: none"><li><input type="checkbox"/> 4 Band</li><li><input type="checkbox"/> C Band</li><li><input type="checkbox"/> K Band</li><li><input type="checkbox"/> L Band</li><li><input type="checkbox"/> P Band</li><li><input type="checkbox"/> Q Band</li><li><input type="checkbox"/> U Band</li><li><input type="checkbox"/> X Band</li><li><input type="checkbox"/> Others</li></ul>	 <b>VLT</b> <ul style="list-style-type: none"><li><input type="checkbox"/> AMBER</li><li><input type="checkbox"/> MIDI</li><li><input type="checkbox"/> SINFONI</li><li><input type="checkbox"/> VISIR</li><li><input type="checkbox"/> X-shooter</li><li><input type="checkbox"/> FORS</li><li><input type="checkbox"/> Others</li></ul>	 <b>WMAP</b> <ul style="list-style-type: none"><li><input type="checkbox"/> K Band</li><li><input type="checkbox"/> Ka Band</li><li><input type="checkbox"/> Q Band</li><li><input type="checkbox"/> V Band</li><li><input type="checkbox"/> W Band</li><li><input type="checkbox"/> Others</li></ul>

A button to check/uncheck  
all the instruments with a  
picture of the telescope

Instruments for  
the telescope

1920 pixels × 1080 pixels

## 9. User Interface (3)



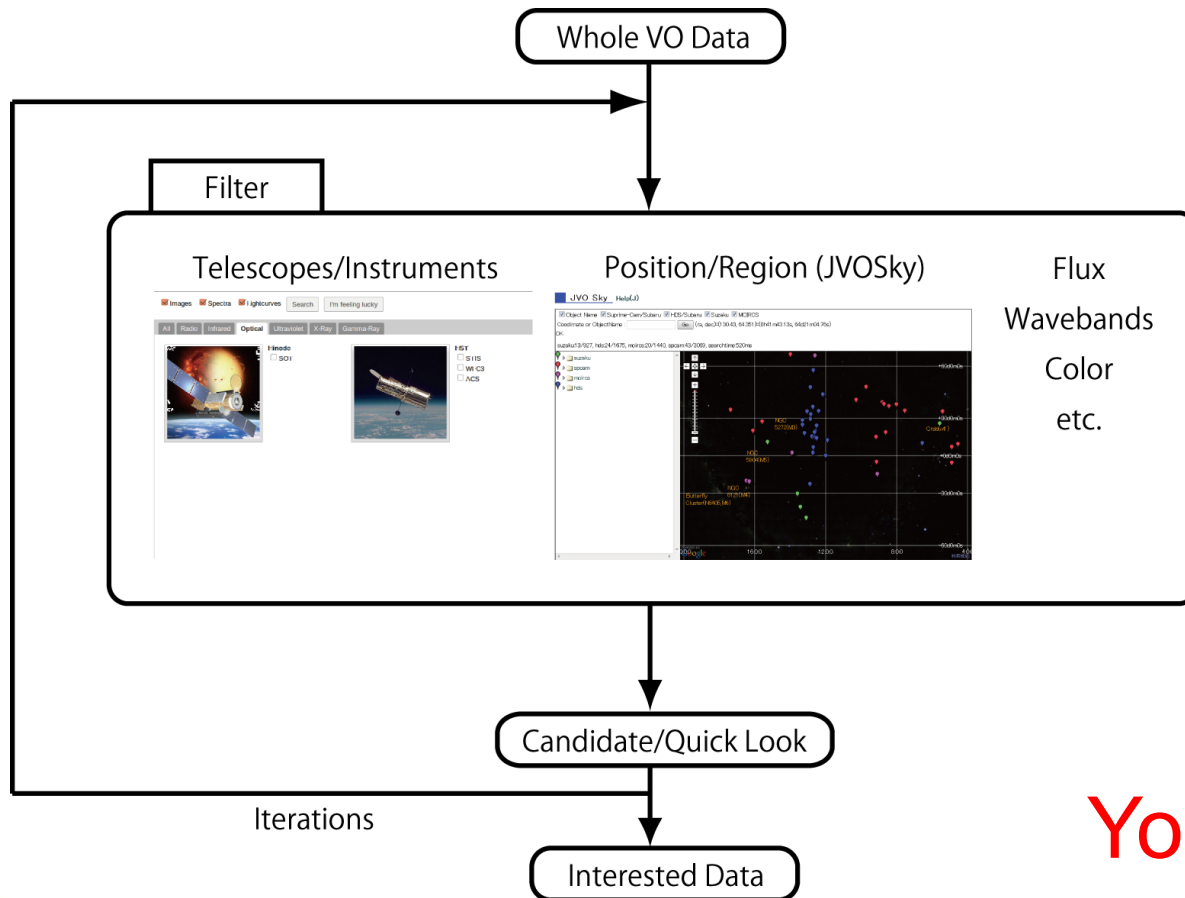
Instruments sensitive in the optical bands are listed.

*It is a very smart user interface, isn't it?*

# 10. VO Crawler

- We have been developing **VO Crawler** (see Komiya et al. at the conference: P071).
- It provides **much simpler access to the whole VO data in the world.**
- This also means that we can **filter data with not only the metadata but also themselves**, e.g., the range of the wavelengths.

# 11. Combination of New Features



- Interactive search with graphical user interfaces
- Under development

You can “crawl”  
in a sea of VO!



## 12. Summary

- We JVO team are aggressively developing new functionalities which will evolve VO into a very powerful tool for astronomy.
- These will be available in a few months.
- So, please check our portal site [jvo.nao.ac.jp/portal/](http://jvo.nao.ac.jp/portal/) frequently!