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Remote Virtual Observatory schools.

Mas-Buitrago, P.[1], Solano, E.[1], Aller, A.[1], Cortés-Contreras, M.[1], Cruz, P.[1], Gálvez-Ortiz, M. C.[1], Jiménez-Esteban, F.[1], López-Martí, B.[1,2], Murillo-Ojeda, R.[1] Rizzo, J. R.[3], and Rodrigo-Blanco, C.[1]

[1] Centro de Astrobiología (CAB), CSIC-INTA. Camino Bajo del Castillo s/n. E-28692, Villanueva de la Cañada, Madrid, Spain
[2] Universidad CEU San Pablo, Boadilla del Monte, E-28668 Madrid, Spain
[3] ISDEFE, Beatriz de Bobadilla 3, E-28040, Madrid, Spain

Abstract

The Spanish Virtual Observatory (SVO) is an initiative whose main goal is to boost and coordinate Virtual Observatory activities in Spain. SVO has a large experience organising VO schools and workshops both at national and European level.
In the context of the pandemic situation caused by COVID-19, we made a large effort to carry on with these educational activities by making them virtual. At the time of writing these proceedings (December 2022), six VO schools have been carried out remotely.
The main conclusion that can be drawn from the online schools is that neither a negative impact on the follow-up of the tutorials nor on the communication with the participants was detected. Moreover, the online activities benefited from the advantages that remote teaching presents in particular in terms of number of attendants and geographical flexibility.

1 Introduction

National and international ground- and space-based observatories produce terabytes of data per year, which are publicly available all around the world from data centres. Theoretical models, as well as results, published in electronic journals are also available on line.

The Virtual Observatory (VO) is the e-infrastructure necessary to efficiently exploit the scientific contents of the huge databases that populate the distributed worldwide astronomical data centres. VO is an ecosystem of interoperable tools and services that enable discovery, access, and subsequent analysis of multi-wavelength, multi-epoch data. Underpinning the VO are data discovery and access protocols that enable archives to interoperate through common interfaces. The protocols themselves are negotiated on behalf of the worldwide astronomy community by the International Virtual Observatory Alliance (IVOA). This is a diverse organization, consisting of 21 nationally funded VO projects on all continents and two intergovernmental organizations (ESA and SKAO). The IVOA has been promoting Open Science and what have become formalized as FAIR (*Findable, Accesible, Interoperable, Reusable*) [1] principles since its founding in 2002.

VO's ultimate goal is to produce better, new, and more efficient science. To work toward this aim, IVOA established in 2009 the Standing Committee on Science Priorities. However, the lack of familiarity of the astronomical community with the VO tools and services may limit the scientific impact of the VO. Also, the absence of strong links between VO and the research groups may lead to futile efforts. So, for instance, if the services and tools developed by the VO are not scientifically oriented, they will not be used by the community.

Training is, thus, considered a key element to ensure the adoption of the VO framework by the astronomical community. This is why, since its early times, IVOA has explored different approaches to reach astronomical researchers. The so-called *Research Initiatives*, an activity aiming at actively supporting research projects which require the unique capabilities offered by VO tools and services, was conducted in the framework of the European Virtual Observatory Astronomical Infrastructure for Data Access FP7 project (EuroVO-AIDA, 2008-2010)[1]. A couple of workshops on spectroscopy and multi-wavelength astronomy were also organised in the framework of the same project. Nevertheless, schools have proven to be the most effective mechanisms to attract astronomers to the VO. The Euro-VO initiative began to organise regular VO schools during the EuroVO-AIDA project. The usefulness of these schools was immediately obvious, and they were continued in the framework of the projects EuroVO-ICE (2010-2012), CoSADIE (2012-2015), ASTERICS (2015-2019) and ESCAPE (2019-2023). SVO is, among all VO projects, the most active one in the organisation of VO schools, with 22 schools held in Spain since 2009 and nine schools (in collaboration with Euro-VO[2] partners) at European level.

2 The schools

In all cases, both for the national and international schools, the goals were twofold: On one hand, to expose astronomers to the variety of currently available VO tools and services so that they can use them efficiently for their own research, and, on the other hand, to gather their feedback on the VO tools and services and the school itself. Although schools are mainly aimed at targeting early-career scientists, other profiles (senior researchers, technical staff, amateurs,...) showing a clear interest on the use of VO tools and services are also accepted.

The programme of the schools is typically structured around four main topics:

- Introductory presentations about the VO in general and the school itself in particular, to ensure that all participants are well informed of the organisational background before the hands-on sessions start.

- Hands-on sessions where VO experts guide participants on the use of the tools through a series of predefined science cases. This is the activity that takes most of the allocated time. Different tutorials adapted to the participants' profile (beginners, intermediate, advanced) are offered. In these tutorials, the most important functionalities of the most used VO tools and services (Aladin, TOPCAT, VOSA,...) are described. Thanks to the

[1] http://cds.u-strasbg.fr/twikiAIDA/bin/view/EuroVOAIDA/WebHome
[2] http://euro-vo.org

feedback gathered in previous schools, tutorials are continuously updated to best suit specific scientific cases and their duration fitted to match the mean time users need to go through them for the first time. The latest functionalities implemented in VO tools and services and the latest data releases of publicly available data are also taken into account when improving the tutorials.

- Use cases proposed by the participants. In schools with a duration longer than two days, each participant is encouraged to propose a scientific case related to his/her research and, if possible, a case in which his/her own data could be used. During the school, they can work on it under the guidance of VO tutors. This session is conducted on the last day of the school to profit the knowledge gained throughout the previous days. Also on the last day, a selection of the projects is made and participants give a short presentation on their scientific use cases and how VO tools and services helped for their projects. Examples of science cases proposed by the participants can be found here.

  To ensure that all participants get the best out of this session, each one is asked to fill in a questionnaire before the school. The purpose of this is to better understand the science cases proposed by the participants, along with the type of data (images, spectra, catalogues, data cubes,...) and wavelength range to be used, and also to assess their feasibility using VO tools and services. This way, a picture of the participants' interest and needs is obtained. Based on this information, a suitable tutor is assigned to each participant. Every tutor typically coaches two to three students.

- Feedback. Participants are requested to anonymously fill in a feedback survey with questions about the quality, length and level of difficulty of the tutorials, about their previous knowledge of VO tools and services, their plans to use them in the own research as well as on other aspects of the school. The results of the survey are commented before the closure session. They help us to improve the organisation and programme of subsequent schools.

After the schools, participants are encouraged to act as VO-ambassadors in their research institutes by giving informal talks with colleagues, seminars, scientific workshops and conferences, and making use of the material employed during the school, which remain publicly available.

Detailed information on the schools organised by the SVO can be found at the SVO portal[3].

3 Virtual Observatory schools become virtual

The COVID-19 lockdown that affected many countries in the Spring of 2020 and the long period in which the pandemic situation was far from being under control, made us to move the schools to an online format.

The online school sessions are carried out using Zoom[4]. To provide an adequate response

[3]https://svo.cab.inta-csic.es/docs/index.php?pagename=Meetings
[4]https://zoom.us/

to the needs of the participants, tutors are assigned to cover the following roles:

- Host tutor: Responsible for setting up sessions, organising breakout rooms, taking care of the chat and delivering participant's questions to the main tutor and backup tutors.
- Main tutor: Runs the tutorial and answers questions of general interest in the main room.
- Backup tutors: Support participants via chat and breakout rooms. While the main tutor conducts the tutorial at the main room for all participants, backup tutors are available to answer the participants' question through the Zoom chat. In case of complex questions, the backup tutor and the participant are sent by the chair to a breakout room for a closer interaction. In these breakout rooms the participant is able to directly talk to the tutor and shares his/her screen if necessary. Typically, 3-4 backup tutors are assigned per tutorial.

Once the school session is finished and the Zoom connection is closed, a Slack[5] channel is, sometimes, open for off-line communication between the students and tutors. At the beginning of each day, 5-10 minutes are devoted to comment on the most relevant topics discussed on Slack the previous day. The Slack channel remains open to allow tutors - students interactions well after the school. Finally, "virtual" coffee-breaks are also conducted using the Slack platform to allow for informal interactions between participants and tutors in a relaxed atmosphere.

Six virtual VO schools have been organised so far. Four schools were oriented towards MSc and PhD students from Spanish universities and research centres, one focused on the Spanish amateur community, and one targeted at the Brazilian astronomical community. The main result that can be drawn from the organisation of these events is that they have allowed us to reach a more numerous and more geographically distributed audience (Fig. 1). Being more accessible, they increase the participation for those who may experience travel restrictions due, for instance, to financial restraints. The organisation of a school for the Brazilian astronomical community with more than 100 participants from different centres or the participation in the last school of two students from Ethiopian research institutes are good examples of the strength of virtual meetings.

4 Conclusions

Running a high-level interactive event in an online setting is a challenging task and the SVO has pioneered this format in the IVOA environment. The experience is being extremely successful and no negative impact on the schools has been observed. On the contrary, we are taking advantage of the benefits of the virtual format to reach a larger audience and geographical flexibility and to lower economic and environmental costs.

[5] https://slack.com/

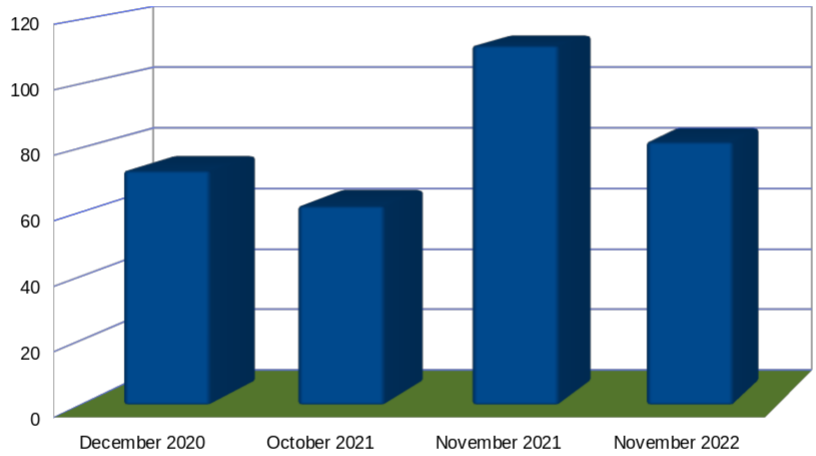

Figure 1: Number of participants in the last four online schools. As a comparison, the average number of participants in physical meetings was typically below 35-40.

Now that the pandemic is becoming part of the past, we plan to conduct future VO schools in an hybrid format, combining face-to-face and virtual participation. This way, in-person attendants would benefit from the more natural face-to-face interaction, while the option of remote learning remains open for those unwilling or unable to travel without losing access to a high quality VO formation program.

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References

[1] Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., et al. 2016, NatSD, 3600, 18W