Introduction to stargazing and image processing with automated observation stations

O. Parisot, P. Bruneau, P. Hitzelberger (LIST),
G. Krebs, C. Destruel, B. Vandame (VAONIS)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST

Fonds National de la Recherche Luxembourg

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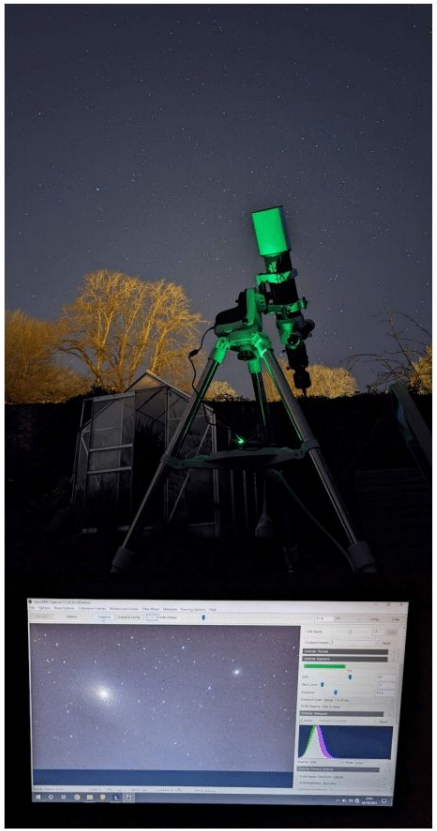
Electronically Assisted Astronomy ?

Direct observation through a telescope is often frustrating for participants, especially because of the lack of contrast and color of the views. Moreover, people with physical constraints will not be able to take full advantage of it (poor eyesight, handicap, etc.).

Nowadays, Electronically Assisted Astronomy (EAA) is widely applied by astronomers to observe deep sky. By capturing images directly from an image sensor coupled to a telescope and applying lightweight image processing, this approach allows to **generate enhanced & colored views of celestial targets** that can be displayed in near real time on a screen.

Unfortunately, preparing a EAA session is **far from simple** with conventional equipment (hardware, setup, software, etc.).



Astronomy with automated telescopes

During outreach events or practical workshops with a lay audience, automated telescopes makes **EAA easy**!

With these instruments, **required steps are automatized**: tracking, focus, capture, lightweight image processing, and then live display – according to outdoor conditions (e.g. humidity, temperature, light pollution).

Automated telescopes can be easily controlled to **inspect the sky map** and **understand its evolution during seasons** (galaxies in Spring, Milky way in Summer, etc.).

It is thus possible to easily show **live views of visible objects** (stars clusters, galaxies, nebulae) while **describing their characteristics** (e.g. apparent size, magnitude, and even distance from Earth).

Image processing with automated telescopes

Playing with settings of automated telescopes allows to impact the acquisition process – i.e. exposure time (in seconds) and gain (in decibels).

During observation session of a given celestial object, **live image evolves**: noise is reduced, signal appears sharper, the image is cropped… Important concepts are made visible: Signal-to-noise ratio, images alignment and stacking.

After observation sessions, **images can be post-processed** with dedicated software (Gimp, Photoshop, etc.) to **make them more beautiful**.

Acknowledgements and references

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Redfern, G. I. (2020). Astrophotography is Easy!: Basics for Beginners. Springer. https://doi.org/10.1007/978-3-030-45943-7

Parisot, O.; Bruneau, P., Hitzelberger, P.; Krebs, G.; Destruel, C. (2022). Improving Accessibility for Deep Sky Observation. ERCIM News 130.

Parisot, O. (2022). MILAN project: raw images of deep sky objects captured with a Stellina observation station -- [2022-03] (1.0.0) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.6865830

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