DOI: 10.26314/GARR-Conf22-proceedings 13

The first international online Astrophysical Code Hunting Game

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Abstract. Five languages, six continents, over 300 places to discover: places from which we observe, study or tell stories about the universe. The international Astrophysical Code Hunting Game is a unique endeavour that involved more than 70 astronomy researchers, communicators and enthusiasts from around the world, conceived and created by INAF in collaboration with University of Urbino and DIGIT srl. This online treasure hunt bridges worldwide distances, providing the public with the opportunity to play together and discover the places that have written the history and are shaping the future of astrophysics. Developing this activity, which combines scientific dissemination with the practice of computational thinking and digital skills, required the team to collaborate with a global network to collectively build the content and share the game internationally

Keywords. Astrophysics, Public outreach, Coding, Treasure Hunt, Digital skills

Introduction

The Code Hunting Game is an online multi-player game that promotes digital skills and computational thinking (Klopfenstein et al, 2018). Borrowing the structure of a traditional treasure hunt, it poses challenges that players have to solve using the logic of computer coding in order to move around the map of a particular geographical territory. The interaction takes place through a bot via the Telegram instant messaging application, using a smartphone, tablet or computer.

In 2020, the authors – members of the Play.Coding working group at the National Institute of Astrophysics (INAF) in Italy, in collaboration with University of Urbino and the university spin-off DIGIT srl – adapted this format to create an online game to engage the public with the historical and current practice of astrophysics across the Italian territory while practicing digital skills and computational thinking. Building on this experience, the team further expanded the concept in 2021, developing a game that takes place on the global stage, exploring over 300 locations linked to astronomy around the world in several languages: the first international Astrophysical Code Hunting Game.

These activities were launched during the 2020 and 2021 editions, respectively, of the European Researchers' Night, a Europe-wide public event to display the diversity of science and its impact on citizens' daily lives. Both games are still available online on the Play Inaf

Palermo, 18-20 maggio 2022 - ISBN: 978-88-946629-1-7 - Creative Commons CC-BY

website: https://play.inaf.it

1. The Astrophysical Code Hunting Game

For European Researchers' Night 2020, the authors created the first astrophysical version of the Code Hunting Game as a response to the lockdown and social isolation measures enacted to prevent the spread of Covid-19. Unable to plan in-person events, the team chose this online format as a public engagement tool to connect remotely with individuals, families and schools, enabling players from everywhere in Italy to discover the many locations around the country linked to astrophysics: astronomical observatories and research institutes (including many INAF establishments), planetaria, museums, the birthplace of notable Italian astronomers, and more.

Each match includes quizzes to find 8 notable places on a map of 100 locations around Italy (plus the Telescopio Nazionale Galileo, located on the island of La Palma), alternating with coding puzzles from the classic version of the game. It is possible to play either competitively or collaboratively, individually or in teams: at the end of a match, each player (or team) receives a participation certificate signed by the INAF President and the Europe Code Week coordinator.

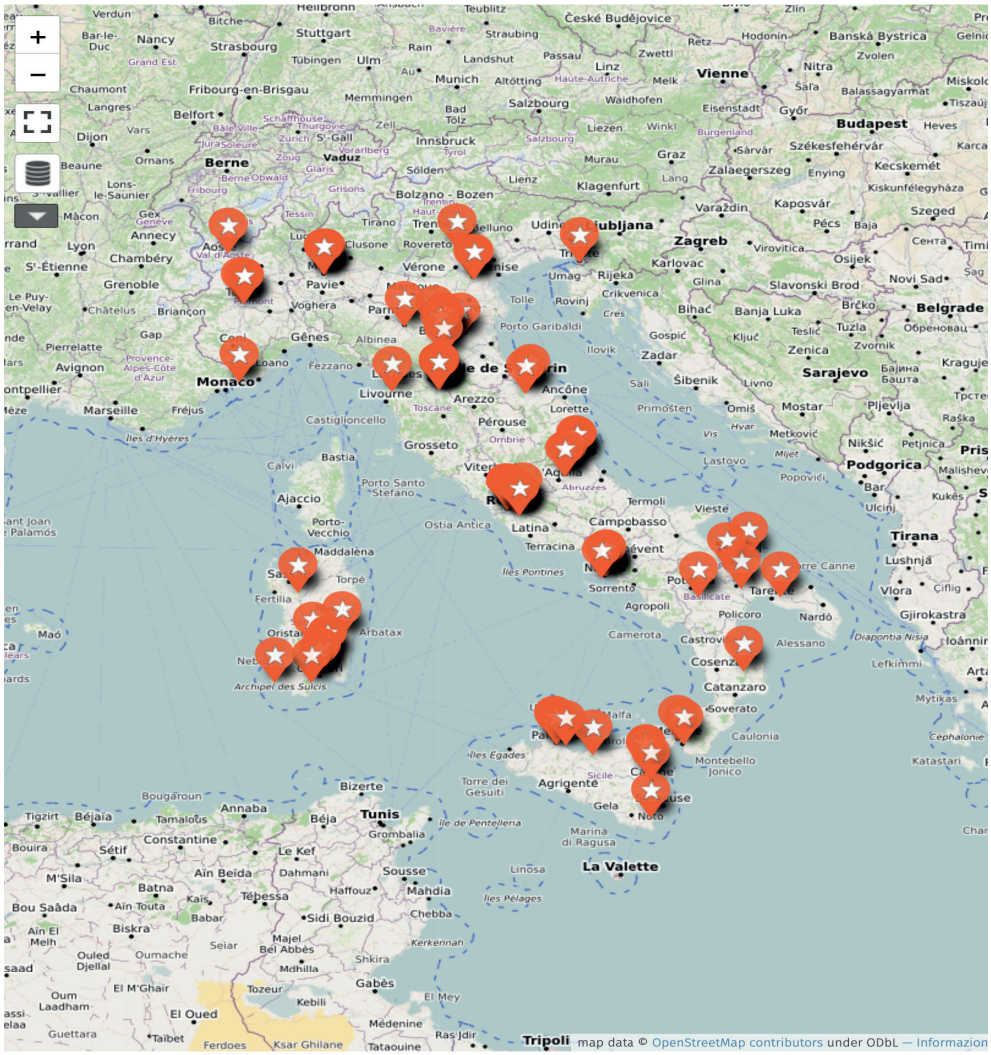

Fig. 1
The map of 100 locations in Italy.

1.1 Dissemination of the activity in Italy

The game was launched with an article on Media Inaf, the online news outlet of INAF, and a special livestream on its Youtube channel for European Researchers' Night, on 27 November 2020, during which team members played the game live. By the time of writing, over 160 teams have completed the game: this is, however, a lower limit estimate of engagement, as teams may consist of one or more players, including classrooms with 20 or more students.

Link to the game: https://play.inaf.it/inaf-code-hunting-game/

2. From Italy to the world: making the game international

Scientific research, and astronomy in particular, is an international endeavour: scientists collaborate with colleagues from many different countries, travel to observatories that are often in remote locations or even in space, share data and results across oceans. So, while implementing the first edition of the game, the team already realised the project had the potential to engage audiences well beyond the Italian national bounds, calling for a more global scope. This led to the first international Astrophysical Code Hunting Game.

To gather meaningful locations all over the planet, the team reached out to international colleagues working at astronomy institutions around the world, and an open call to propose "pins" for the game was circulated to the network of the International Astronomical Union (IAU) National Outreach Coordinators. More than 70 people participated from 33 countries, including astronomy researchers, communicators and enthusiasts. The map went on to comprise over 300 locations in over 60 countries, covering all continents, including Antarctica. Among them are well known observatories, archaeological sites and renowned researchers that have made the history of astronomy, but also hidden gems – small observatories, public sundials, astronomically relevant monuments, little known figures and stories – and even meteorites that, from the vast reaches of space, have ended their journey on planet Earth.

The international version shares the same structure of the game – interaction with a Telegram bot that proposes 8 quizzes to find astronomical locations around the globe, alternating with coding puzzles – with one addition: the possibility to play in different languages. The game is currently available in Italian, English, French, German and (partly) in Spanish; locations in Catalonia are also provided with a translation to Catalan.

2.1 Dissemination of the activity in Italy and worldwide

As for the 2020 Italy-only edition, the international Astrophysical Code Hunting Game was also shared via the Media Inaf news outlet and a dedicated livestream on 24 September 2021, on the occasion of the European Researchers' Night (both in Italian). Given the global scope of the project, a livestream in English together with international partners was broadcast on 1 October 2021 on the occasion of the IAU 100 Hours of Astronomy. The game was also endorsed by the IAU's Office of Astronomy for Outreach and promoted via its newsletter. A further live streamed event, aimed at the Italian audience, was organised around the Europe Code Week and the Science Festival in Genoa in October 2021.

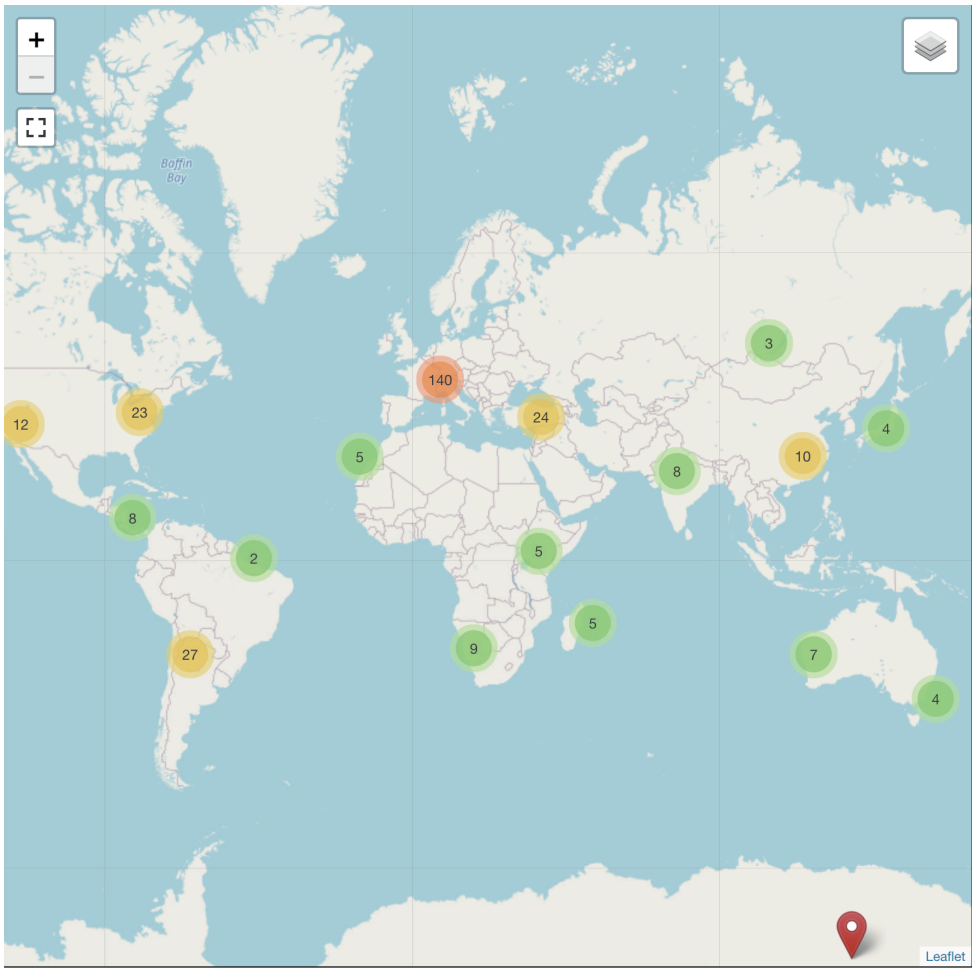

Fig. 2
The map of 300+ locations around the world.

By the time of writing, almost 200 teams have completed the game; as mentioned earlier, this is a lower limit estimate of engagement.
Link to the game: https://play.inaf.it/code-hunting-game-internazionale/

3. Engaging a global network

The international version, featuring three times more locations than the first edition and multilingual text, required a significantly larger effort by the team in terms of content production, translation, implementation and coordination with a global network of international partners. The global network was instrumental in the collective creation of a rich and insightful map, as well as in the international dissemination. We acknowledge participation from: Argentina, Australia, Austria, Belgium, Chile, Czech Republic, Finland, Germany, Hong Kong, India, Indonesia, Iran, Italy, Japan, Liechtenstein, Malta, Mauritius, Namibia, The Netherlands, Poland, Portugal, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Tanzania, Turkey, United Arab Emirates, the United Kingdom, the United States of America.
Local partners from some countries were especially engaged, proposing a large number of

locations: 31 from Spain, 23 from Slovenia, 16 from Chile, 12 from Turkey. Several institutes endorsed the project becoming institutional partners and disseminating the game to their local audience: the Inter-University Centre for Astronomy and Astrophysics in Pune (India); Observatório Astronómico da Universidade de Coimbra (Portugal); Institut d'Estudis Espacials de Catalunya in Barcelona (Spain); Instituto de Física de Cantabria in Santander (Spain); the University of the Basque Country in Bilbao (Spain); Armagh Observatory and Planetarium (UK); the School of Physics and Astronomy at Cardiff University (UK); and the Herschel Museum of Astronomy in Bath (UK).
Colleagues from the Communication & Outreach Team at the Institute of Space Sciences (ICE-CSIC) provided translations of some of the content in Spanish and Catalan. Partners from other countries have also offered to translate the content to their local languages, however the large amount of text to be translated has discouraged these efforts so far.

4. Conclusions

The Astrophysical Code Hunting Game, both in its Italian and worldwide editions, has received positive comments by members of the public who played the game and followed the livestream events in 2020 and 2021. In addition to that, the international version has enabled the team to liaise with an international network, posing challenges both on content production and implementation that were overcome only thanks to a collaborative, open and confrontational approach with all partners involved.

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