

COMPUTERS IN ASTRONOMY

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Анотація

Ця публікація досліджує як еволюція комп'ютерів вплинула на розвиток науки астрономії, які можливості вони відкрили та удосконалили і що вони принесли у наше розуміння космосу.

Ключові слова: комп'ютер, астрономія, космос.

Abstract

This publication researches the influence of computer evolution on development of astronomy as a subject, what capabilities it brought and enhanced and what new understandings they presented us.

Key words: computer, astronomy, space.

Introduction

Computer technologies influenced almost every aspect of human life, from common civilian life to medicine, economy, military and many others. Astronomy was one of those aspects as well. Recent advancements in computer technologies had brought a lot of new horizons of information, waiting to be discovered and researched.

From simple improvements of seeing and predicting things that we already saw to helping humans to see and collect data from much further in the universe. All that was due to the rise of computers. This researches aim is to look at the problems that the computer had solved and what new data became available for human to use and learn.

Research results

The jump from not having enough tools to research and develop astronomy to having giant waves of information that needs to be processed and explained by the human was very quick with arrival of computer technologies. The tools for capturing different forms of waves were built, to “look” up in the sky. But the raw information they collected could not be processed by the human himself. Just because the amount of raw work that needed to be done would outlast multiple human lifespans and it would take decades to get a useable chunk of information and there would be no certainty that there were no human error beforehand.

This is where the computer came in. With the right amount of computer power, all that information could be processed in mere hours. All the, so called, “white noise” would be found by the computer and corrected or deleted immediately, and the useable data would be left in the end. For example, there is a term for the stars in the sky that seem to be sparkling. They are called “sparkling stars”, but the stars themselves don't sparkle; it's the light that reaches our eyes, or in that matter, light lenses built by us, is getting interfered on the way. This is due to the movement of air pockets above the light receiver. This was solved by pointing a powerful laser at the star at question and having a computer constantly analyse the laser distortions and correcting what the actual lenses had received. This obviously couldn't be done by the human.

Before computers were powerful enough to do such task, scientist decided to launch a rocket with the Hubble telescope so it could sit above the atmosphere. But the launch itself was possible but very hard for a human to calculate. Nowadays the computer does it to. Not only the launch but the space movements and corrections as well.

Today there are a few of ground-based installations and space machines that are currently gathering information from space. One of the ground-based being the low-frequency array built in 2006 which consists of 20000 small antennas concentrated in 52 stations. One can only imagine how much information flows through those stations. But the computer does all the work filtering and combining those signals, so they could be used later on.

Another example of ground-based installations would be the Atacama Large Millimeter/submillimeter Array or ALMA for short, built in 2013 and consisting of 66 radio telescopes which catch electromagnetic radiation at millimeter and submillimeter wavelengths. It is basically the same low-frequency array, but this one catches high frequency waves.

The iconic James web telescope which is a space-based machine is aimed to study the beginning of the universe. It does that by collecting light emitted from the stars at the unimaginable distances. To do that, it has to be extremely precise in looking in the right direction. These corrections are calculated and performed solely by the computer.

Conclusion

Computers have had a giant influence on astronomy which led to numerous scientific discoveries and understanding the universe formation and laws. It certainly made us much more advanced in knowing how “it” all began and goes on right now.

REFERENCES

1. Victor Pankratius, MIT, Haystack Observatory, Chris Mattmann, NASA Jet Propulsion Laboratory and University of Southern California “Computing in Astronomy: To See the Unseen” Computer Sept. 2014, pp. 23-25, vol. 47
2. The Event Horizon Telescope [Електронний ресурс] – Режим доступу: <https://eventhorizontelescope.org>.

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